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PROPERTY RIGHTS IN FISHING

Effects on the industry and effectiveness for fishery management policy

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ABSTRACT

PROPERTY RIGHTS IN FISHING; EFFECTS ON THE INDUSTRY AND EFFECTIVENESS FOR FISHERY MANAGEMENT POLICY

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The study identifies measures that have created property rights in the Danish, Dutch and UK fishery sector. Property in this respect is not considered as an asset in the stock of fish but as a stream of benefits, resulting from the right to fish.

The limited access to the fishery by the vessel licence and by the recognition as a commercial fisherman have created two forms of property rights in the Danish fishery.

In the Netherlands, the national TACs for the individual species have been transformed into transferable individual quota (ITQs).

In the UK, gradually more and more fleet segments and species were brought under restrictive licencing schemes. The approach varies by species and sector with the licences giving access to the fisheries reflecting this.

The study assesses the consequences of property rights on individual enterprises and on the fishing industry as a whole. These consequences have been most important for the Dutch and UK fishing enterprises. Transfers of rights have led to high prices of ITQs, Track Records and licences. Valuable rights may hamper the transfer of the enterprise to the next generation or to other family-members in these two countries.

Some concentration of rights i.e. ITQs has occurred in the Netherlands, though not as intensively as in the New Zealand and Iceland ITQ regimes.

Finally, the study evaluates the effectiveness of property rights for fisheries management policy, within the framework of the Common Fisheries Policy (CFP).

The study also compares the property rights systems in Denmark, the Netherlands and the UK on a scale, running from 'state property' towards 'private property' of the resource flow. Although there are big differences, all three systems have moved or seem to move into the direction of private rights.

Fishery management/Common Fisheries Policy/Property Rights/Denmark/The Netherlands/United Kingdom

Overname van de inhoud toegestaan, mits met duidelijke bronvermelding.

CONTENTS

	Page
SUMMARY AND CONCLUSIONS	11
1. OBJECTIVE	17
2. INTRODUCTION	18
3. MATERIALS AND METHODS	19
4. PROCEDURE	23
5. PROPERTY RIGHTS AND LEGAL FRAMEWORK	25
5.1 Defining the concept of property rights	25
5.1.1 Property rights and institutions	25
5.1.2 Property rights in the fisheries sector	26
5.1.3 Characteristics of property rights	27
5.2 Limitations for the fishing industry resulting from the Common Fisheries Policy	29
5.2.1 End of open access and creation of property rights	29
5.2.2 Establishment of the Common Fisheries Policy	31
5.2.3 Conservation policy	32
5.2.4 Structure policy	33
5.2.5 Market policy	34
5.2.6 Relationship with property rights	35
5.2.7 Possible changes which may affect property rights	35
5.3 Property rights and legal framework in Denmark	36
5.3.1 Implementation of the Common Fisheries Policy in Denmark	36
5.3.2 Limitations for the industry resulting from the Danish fisheries policy	37
5.3.3 Property rights in the Danish fishing industry	40
5.3.4 Changes in the Danish situation relating to property rights in the period 1994-1996	46
5.4 Property rights and legal framework in the Netherlands	48
5.4.1 Implementation of the Common Fisheries Policy in the Netherlands	48
5.4.2 Limitations for the industry resulting from the Dutch fisheries policy	48
5.4.2.1 National quota management	48
5.4.2.2 National capacity management	49

	Page
5.4.2.3 National effort management	50
5.4.2.4 Other national measures resulting in property rights	50
5.4.3 Property rights in the Dutch fishing industry	50
5.4.3.1 Property rights in the cutter sector in 1993	51
5.4.3.2 Property rights in the freezer trawler sector	56
5.4.3.3 Institutional environment	56
5.4.3.4 Summary of property rights characteristics	57
5.4.4 Changes in the situation relating to property rights in the period 1993-1996	59
5.5 Property rights and legal framework in the United Kingdom	60
5.5.1 Implementation of the Common Fisheries Policy in the United Kingdom	60
5.5.2 Limitations for the industry resulting from UK fishery policy	63
5.5.3 Property rights in the UK fishing industry	69
5.5.4 Changes expected in the UK situation relating to property rights	72
5.6 Property rights in other countries	74
5.6.1 Property rights in Iceland	74
5.6.2 Property rights in Norway	76
5.6.3 Property rights in Canada	77
5.6.3.1 Bay of Fundy Herring 1976-1981	78
5.6.3.2 Bay of Fundy and Gulf of St. Lawrence Herring 1983 onwards	79
5.6.3.3 Atlantic offshore groundfish 1982 onwards	80
5.6.3.4 Newfoundland inshore cod 1984 onwards	81
5.6.4 Property rights in the United States	82
5.6.4.1 General characteristics	82
5.6.4.2 Wisconsin: lake Superior lake trout	83
5.6.5 Property rights in New Zealand	84
5.6.5.1 Implementation	84
5.6.5.2 Property rights	85
5.6.5.3 Effectiveness of the system	85
5.6.6 Property rights in Australia	86
5.6.7 Property rights in Japan	87
5.6.7.1 Coastal areas	87
5.6.7.2 Governor licensed fishery	87
5.6.7.3 Ministry licensed fisheries	88
5.6.7.4 Institutions	88
5.6.7.5 Problems in practice	88
6. ECONOMIC ASPECTS OF PROPERTY RIGHTS IN FISHING	89
6.1 Economic aspects of property rights in fishing in Denmark	89
6.1.1 Introduction	89

	Page	
6.1.2	Distribution of rights in 1993	91
6.1.3	Market characteristics	95
6.1.4	Changes in the distribution of rights	96
6.1.5	Conclusions	98
6.2	Economic aspects of property rights in fishing in the Netherlands	99
6.2.1	Introduction	99
6.2.2	Distribution of rights in 1993 and 1994	99
6.2.3	Market characteristics	102
6.2.4	Changes in the distribution of ITQs	107
6.2.5	ITQ per vessel in 1995 and 1996	109
6.2.6	Summary and conclusions	109
6.3	Economic aspects of property rights in fishing in the UK	110
6.3.1	Introduction	110
6.3.2	Distribution of rights	111
6.3.3	Market characteristics and performance	112
6.3.4	Changes in the distribution 1983 to 1993	117
6.3.5	Conclusions	120
6.4	Economic aspects of property rights in other countries	121
6.4.1	Economic aspects of property rights in Iceland	121
6.4.2	Economic aspects of property rights in Norway	123
6.4.3	Economic aspects of property rights in North America	124
	6.4.3.1 Canada	125
	6.4.3.2 United States	127
6.4.5	Economic characteristics of property rights in New Zealand	127
6.4.6	Economic characteristics of property rights in Australia	129
6.4.7	Economic characteristics of property rights in Japan	132
7.	PROPERTY RIGHTS IN AGRICULTURE	135
7.1	The EU milk quota system	135
7.2	Property rights in the Danish agriculture	136
	7.2.1 The Danish implementation of the milk quota system	136
	7.2.2 Effects of milk rights on the Danish agricultural industry	137
7.3	Property rights in the Dutch agriculture	142
	7.3.1 The Dutch implementation of the milk quota system	142
	7.3.2 Effects of milk rights on the Dutch agricultural industry	143
7.4	Property rights in UK agriculture	151
	7.4.1 The UK implementation of the milk quota system	151
	7.4.2 Effects of property rights on UK agriculture	153

	Page	
7.4.3	Conclusions	154
7.5	Property rights in Agriculture and Fisheries: some similarities and differences	155
7.5.1	General remarks	155
7.5.2	Similarities between milk quotas and fish quotas	156
7.5.3	Differences between milk quotas and fish quotas	158
7.5.4	Conclusions	159
8.	STRUCTURAL IMPLICATIONS OF PROPERTY RIGHTS	160
8.1	Structural implications of property rights in the Danish fishing industry	160
8.1.1	Introduction	160
8.1.2	Structural changes in the fishing industry	161
8.1.3	Explanations for the structural changes	165
8.1.4	The regulation	172
8.1.5	The decommissioning scheme	173
8.1.6	Conclusions	174
8.2	Structural implications of property rights in the Dutch fishing industry	175
8.2.1	Introduction	175
8.2.2	Changes in the structure of the Dutch cutter fishery	175
8.2.3	Causes of changes in the structure of the cutter sector	179
8.2.4	Effects of property rights on the structure of the cutter fishery	182
8.2.5	Concentration of ITQ ownership	183
8.2.6	Conclusions	186
8.3	Structural implications of property rights in the UK fishing industry	187
8.3.1	Introduction	187
8.3.2	Structural changes in the UK fishing industry	189
8.3.3	Structural implications of property rights	194
8.3.4	Conclusions	195
9.	EFFECTS OF PROPERTY RIGHTS AT ENTERPRISE LEVEL	196
9.1	Danish fishing enterprises	196
9.1.1	Profitability of selected fleet segments	196
9.1.2	Conclusion	199
9.2	Effects of property rights at enterprise level in the Dutch cutter fishery	199
9.2.1	Effects of quota investments on the profitability of fishing enterprises	199

	Page	
9.2.2	Effects of investments in property rights on the financial position of fishing enterprises	202
9.2.2.1	Financial conditions for investments in rights	202
9.2.2.2	The financing of quota investments	203
9.2.2.3	Property rights as an asset on the balance sheet	204
9.2.3	The capitalised values of ITQs	205
9.2.4	Property rights and profit calculations	209
9.2.4.1	Consequences of property rights for fiscal profits	209
9.2.4.2	Consequences of property rights for economic or commercial profits	211
9.2.4.3	How to deal with property rights in costs and earnings studies	212
9.2.5	Property rights and succession of ownership	216
9.2.5.1	Financial problems connected with transfer of rights	216
9.2.5.2	Regulations and solutions to facilitate transfer of rights	216
9.3	Effects of property rights at enterprise level in the UK	218
9.3.1	Introduction	218
9.3.2	Effects of property rights on costs and profits	218
9.3.3	Effects on investment and funding aspects	221
9.3.4	Property rights and profit calculations	223
9.3.5	Property rights and succession of ownership	223
9.3.6	Conclusions	224
10.	PROPERTY RIGHTS EXPLORED IN MODELS	225
10.1	Possible consequences of implementation of Individual Transferable Quotas in the Danish Fishery	225
10.1.1	Introduction	225
10.1.2	Policy analysis and models	226
10.1.3	Measures of effects	229
10.1.3.1	The effects of allowing trade in an individual quota system	230
10.1.3.2	The effects of going from Command and Control regulation to INTQ regulation	232
10.1.3.3	The effects on the incentives to invest	233
10.1.4	The structure of the Danish fisheries in the North Sea and Skagerrak	235
10.1.5	Formulation of the empirical model	238
10.1.6	Results of individual non-transferable quotas	240
10.1.7	Results of individual transferable quotas	241
10.1.8	Conclusions	246

	Page
10.2 Perspectives on continuity of individual enterprises in the Netherlands	246
10.2.1 Methodology of the model	247
10.2.2 Results	248
10.2.3 Sensitivity analysis	250
10.2.4 Prediction for 1997	250
10.3 Modelling the effects of UK property rights	251
10.3.1 Scenarios	251
10.3.2 Scenario 1, transfer of licences to allow for new entries	252
10.3.2 Scenario 2, annual licence fee	257
11. EFFECTIVENESS OF PROPERTY RIGHTS FOR FISHERIES MANAGEMENT POLICIES	258
11.1 Effectiveness of property rights for the Danish fisheries management policy	258
11.1.1 Main conclusions regarding the Danish fishery limitations and property rights	258
11.1.2 Property rights in the Danish fishery and the objectives of Common Fisheries Policy	259
11.1.3 Property rights in the Danish fishery and the national objectives of fisheries management	259
11.1.4 The possible review of the Common Fisheries Policy related to property rights, the Danish position	260
11.2 Effectiveness of property rights for the Dutch fisheries management policy	261
11.2.1 Main conclusions regarding the Dutch property rights	261
11.2.2 Property rights in the Dutch fishery and the objectives of the Common Fisheries Policy	263
11.2.3 Property rights in the Dutch fishery and the national objectives of fisheries management	266
11.2.4 Possible future developments with respect to the Dutch property rights	271
11.3 Effectiveness of property rights for the UK fisheries management policy	275
11.3.1 Main conclusions regarding the UK fishery limitations and property rights	275
11.3.2 UK property rights and CFP objectives	276
11.3.3 UK property rights and national objectives	277
11.3.4 Possible CFP review of property rights - UK effects and views	277

	Page
11.4 Comparison of the property rights systems in Denmark, the Netherlands and the United Kingdom	278
11.4.1 The nature of the property rights	278
11.4.2 Factors influencing property rights regimes	282
11.5 Lessons from other countries	290
11.5.1 Fishing rights in Iceland	290
11.5.2 Fishing rights in Norway	291
11.5.3 Fishing rights in Canada	292
11.5.4 Fishing rights in the United States	293
11.5.5 Fishing rights in New Zealand	294
11.5.6 Fishing rights in Australia	295
11.5.7 Fishing rights in Japan	296
11.5.8 OECD Synthesis report for the study on the economic aspects of the management of marine living resources	297
11.6 The implementation of property rights in a fishery	298
11.7 Some juridical aspects with respect to property rights	300
APPENDIX	303
1. References	304
2. Dutch cutter fishery	311
3. Data regarding the Danish ITQ model in chapter 10	312
4. Specifications of the Danish model	316

SUMMARY AND CONCLUSIONS

Description

- *Objective*

The main objectives of this study are:

- to identify measures that have created property rights and to distinguish the main types of property rights in the Danish, Dutch and UK fishery sector;
- to assess the consequences of property rights on individual enterprises and on the fishing industry as a whole;
- to evaluate the effectiveness of property rights for fisheries management policy in Denmark, the Netherlands and the United Kingdom, within the framework of the Common Fisheries Policy.

- *Main types of property rights*

The study considers property not as an asset in the stock of fish but as a stream of benefits. Subject of the research are protected rights to a benefit stream, generated with fishing. Rights are considered as 'property rights' when they are exclusive.

Three types of property rights can be distinguished: 1) state property 2) private property and 3) common property. Open access can be seen as a situation of non-property.

The Danish fishery is characterized by a flexible, multi-purpose fleet, which relatively easily can move from one fishery to another. There is an overall limited access to the fishery by the vessel licence and by the requirement to be recognized as a commercial fisherman. These two entitlements are a form of property right, giving access to the benefit stream.

In the Netherlands, the different national TACs have been transformed into individual quota for sole and plaice (in 1976), entitlements to fish on cod and whiting, and permits for the herring- and mackerel fishery. The MAGP has led to a capacity limitation in the form of horsepower licences. All these limitations have evolved towards tradable, valuable private property rights.

The UK had a tradition of virtually open access to fisheries until CFP was established. After that, gradually more and more fleet segments and species were brought under restrictive licencing schemes. Currently, the UK approach varies by species and sector with the licences giving access to the fisheries reflecting this. All licences are subject to Ministerial discretion which means that uncertainty remains about the quality and duration of this property right.

The study also intends to draw lessons from property rights in other, non-EU countries. Therefore, ITQ systems in Iceland, New Zealand and Australia and

a variety of property rights regimes in Norway, North America and Japan have been investigated.

- *Property rights explored in models*

A model has been developed for the Danish fishery to estimate the effects of a possible introduction of I(T)Qs.

The Dutch sole and plaice ITQs dropped sharply in 1996, following the national part in the TACs. A financial economic vessel simulation model has been used to explore how many individual enterprises will not survive under these circumstances.

For the UK, two possible future scenarios have been analyzed. The first scenario explores the impact of investments in property rights when new owners replace those who had the licences originally. The second scenario assumes that the government charges an annual licence fee to compensate for administrative and management costs.

Results

- *Economic characteristics of property rights*

In the Danish fishery, the market for licences is difficult to separate from the market for vessels and therefore not very transparent. The decommissioning scheme sets, generally spoken, the minimum market price for a vessel licence.

Property rights have become a separate production factor in the Dutch cutter fishery. Effective enforcement of the individual quotas has led to a scarcity of this production factor since 1988. Hence, high prices for ITQs and for other rights were paid, i.e. at least four times the auction price per kg for 'permanent' ITQs for sole and plaice. Investments in rights exceeded those in vessels in the early nineties.

In the UK, property rights generally are not considered to be a significant entry barrier for newcomers in the industry. There are some exceptions, however, in the pelagic and beam trawl sector where licences can be worth around 30% of the value of the vessel. The existence of the necessary licences is taken by bankers as a pre-requisite in allowing loans but the value of the licences (except when realised in a sale of the vessel) is generally not regarded as part of the capital structure by them.

- *Structural implications of property rights*

The implementation of a decommissioning scheme in 1987 has had a major influence on the structure of the Danish fleet, rather than the property rights mentioned before.

The structure of the Dutch cutter fishery has changed importantly since 1983, whereby private property rights have played an important role. Decommissioning of vessels has been stimulated, since the leavers could get extra proceeds by selling their ITQ. Quota hopping has arisen, induced by lower prices of rights abroad. Some concentration of rights i.e. ITQs has occurred, though not as intensively as in New Zealand and Iceland. For example, the 3% owners

of the largest ITQs possess 47% of the national quota in Iceland (1994) whereas this percentage is 17.5% for the Dutch flatfish quota (1997).

The UK, experience seems to indicate property rights having relatively little influence so far on structural developments. The relevant factors appear to be technical changes, profitability and decommissioning payments. One feature which does derive from UK property rights has been the reflagging of foreign vessels by acquiring UK licences. Another feature related to property rights has been the increasing strength of POs.

- *Effects of property rights at enterprise level*

Limitations in the fisheries for human consumption in Denmark have resulted in more investments in industrial fisheries. The restrictions on extension of capacity add an extra cost to consider in investment decisions. These extra costs cause uncertainties for individual enterprises since future fishing possibilities are not secured enough by fishing rights.

Investments in Dutch flatfish ITQs can only contribute to profits through a marginal approach, when only variable costs are matched against the extra proceeds from the purchased ITQ. A net present value analysis points out that the pay-back period for these investments exceeded eight years in 1994. On the other hand, the present (capitalized) value of a large, a 'full' ITQ would only be some 40% of its purchase cost for the 1994 situation. This shows that existing ITQ holders have a strong preference to continue their enterprise. They could indeed sell their right and realize a much higher proceed than they would get from future fishing activities.

Valuable rights may hamper the transfer of the enterprise to the next generation or to other family-members. Fiscal allowances, in force for production rights in the Dutch agriculture, have partly been applied for fishery enterprises.

In the UK, the most obvious effects of property rights at the enterprise level are in increasing the costs to new entrants and those vessel owners expanding their businesses. The returns from such investments would appear to be negative at the current cost of licences. Equally property rights have introduced a new economic dimension for those wishing to leave the industry. Besides of the vessel their assets now include the value of the licence.

Succession of ownership has become more difficult. It contains more complicated effects where families or other close knit groups are involved.

- *Property rights explored in models*

The results of the Danish ITQ model indicate that the adjustment of the fleet, which has taken place since 1987, is not finished yet. Implementation of an ITQ-system could increase the gross margin of the fleet by about 12%. In case of a comprehensive ITQ-system, covering the vessels catching a significant amount of roundfish in the North Sea and/or Skagerrak, the gain in gross margin could be up to 70 million DKK per year.

The Dutch model exploration regarding the low 1996 flatfish quota learns that in the short term (1-3 years) about 50 to 90 vessels, on average some 12%

of the horsepower capacity, will run into serious financial problems. This situation has worsened on the basis of the again lower 1997 quota.

New owners of UK fishing rights have to make more profits to compensate for higher costs related to purchased licences. The impact of deducting charges based on a purchased licence would be considerable in the pelagic sector.

The second scenario assumes that the government charges an annual licence fee to compensate for administrative and management costs. It seems certain that pressure to reduce capacity would be even greater under this policy compared with the first scenario.

- *Effectiveness of property rights for fisheries policy*

The effects of property rights on the realisation of the goals of the Common Fisheries Policy can be considered as being minor in Denmark. With respect to stock conservation it can be said that the Danish TAC-share has not been overfished in recent years. The MAGP-objectives have been achieved by Denmark due to decommissioning schemes and overall capacity limitations.

A central element in the Danish regulation up to now has been open access to the different fisheries and this will remain important in future. This may explain to some extent the Danish position regarding the CFP-review in 2002, which shows a preference to change the current quota management system into an effort or fishing day based system.

For the Dutch situation, the regime of individual rights (ITQs) has developed to an adequate TAC distribution system, supported by heavy enforcement and co-responsibility through the co-management groups of the industry.

The Dutch sea fisheries policy, bound by agreements made within the EU framework, has the own responsibility of the industry as a specific approach. This explains the development towards individual rights and also the co-management by the groups of right holders. Interviews that were held for this study in 1995 and 1996 revealed that the individual rights have led to vested interests and that a change from a hunting behaviour towards an attitude of a calculating manager is developing gradually.

Future developments of the Dutch property rights will probably include a further concentration of rights. Different scenarios with respect to a possible review of the CFP in 2002 are thinkable and it seems now that the Dutch system of rights is enough flexible to meet possible changes at that time.

It is clear on balance that the emergence of property rights in the UK industry is helpful in achieving CFP objectives. Property rights ensure that the UK fleet is restructured in a way that reduces capacity.

Regarding CFP-review, the most likely scenario is that the new system will be broadly the same as the current approach. The current property rights in track records or fixed quotas provide a basis for further development. The benefits of having an annual charge on property rights to pay for the enforcement and other costs seem clear both in terms of equity and of encouragement to reduce capacity.

- *Comparison of property rights regimes*

The study compares the property rights systems in Denmark, the Netherlands and the United Kingdom on a scale, running from 'state property' towards 'private property' of the resource flow. The Danish system has the features of state property whereas, on the other hand, the Dutch one is a regime of private rights. The UK system can be situated in the middle, having characteristics of common property, apart from private rights. All three systems have moved or seem to move into the direction of private rights. This confirms statements in literature (Christy, 1996 and Hannesson, 1994) including that the transition to (individual) property rights regimes in fisheries is 'inexorable'.

However, the study concludes that property rights systems are to a certain extent dependant variables, but on the other hand they may induce developments (e.g. concentration of rights, quota hopping) after their implementation.

Lessons from property rights in other countries confirm that that systems of rights have to be considered in a political and fishery environment.

- *Juridical aspects with respect to property rights*

There are important juridical aspects in defining the fishing rights as state-, common- and private property.

An Article in the EEC-Treaty (nr. 222) regards property ownership in general in the context of European and national laws. The article is 1): 'This Treaty leaves the regulation of the property ownership in the Member States unimpeded'. The study investigates briefly jurisprudence proving that national rules on property ownership are bound by EU principles, such as 'competence of harmonisation' and 'free movement of goods, persons and services'.

On the other hand, article 222 does not mean that the Commission of the EU does not have the competence to implement rules on property ownership. The relevancy for the fishery sector is that the Commission may have the competence to establish or influence private property rights, such as (EU) licences, on the basis of EU Regulations.

Conclusions regarding property rights in the fishery sector

- A useful definition for property rights in fishing is (Bromley, 1991): 'Property is not an object such as land but is rather a right or group of rights to a benefit stream that is only as secure as the duty of all others to respect the conditions that protect that stream'.
- This definition means for fisheries that the right can be defined in terms of harvest and not in terms of stocks.
- '...the duty of all others...' is a key element in this definition and this makes clear that the security of the rights importantly depends on enforcement.

1) Translated from Dutch.

- **Property rights in fishing are frequently confused with individual rights. It is, however, necessary to distinguish between three types of rights: state-, common- and private or individual property rights.**
- **Fisheries management should firstly define the property rights and make a choice between these three types of rights, or combinations of them, and from this basic choice necessary measures can be taken.**
- **Property rights which exist in the Danish (mainly state property), Dutch (individual property rights) and UK fisheries (combination of the three types) are not or hardly the result of a well-considered policy choice, but have gradually developed from the implementation of limiting measures.**
- **Management systems tend to evolve unavoidably into the direction of individual property rights regimes from the moment that a limitation has changed into a right and vested interests have arisen.**
- **Property rights don't have advantages in itself, but they have to be considered against a background of preferences and attitudes of policy makers and fishermen.**
- **An important advantage of ITQs mentioned in literature, stimulating management behaviour of fishermen, is supported by evidence in the Dutch beam trawl sector.**
- **Under a regime of individual property rights effective protection of the rights leads to proper protection of the fish stock.**

1. OBJECTIVE

The main objectives of this study are:

- to identify measures that have created property rights and to distinguish the main types of property rights in the Danish, Dutch and UK Fishery Sector;
- to assess the consequences of property rights on individual enterprises and the Fishing Industry as a whole;
- to evaluate the effectiveness of property rights, allocated by public and private sector organisations in Denmark, the Netherlands and the United Kingdom, within the framework of the Common Fisheries Policy.

2. INTRODUCTION

The implementation of the Common Fisheries Policy in 1983 has resulted in different kinds of limitations for the fishing industry. Total Allowable Catches (TACs) and Multi-Annual Guidance Programs (MAGPs), aiming at limiting the fishing effort, determine the 'economic space' for EU fishing enterprises.

The developments since 1983 show that some limitations, more or less unintentionally, have evolved towards rights for individual fishermen or for their communities. In fact, limitations and rights may be two sides of the same coin, i.e. the regulations. This study focuses on the right aspect of the regulations.

The report starts with an analysis of the concept of property rights. Having defined this concept, different types of rights in Denmark, the Netherlands and the United Kingdom, and also in some non-EU countries, are identified.

Limitations create scarcity so that property rights have economic characteristics. This is the subject of chapter 6 and chapter 7 explores whether lessons for the fishing industry can be drawn from property rights, i.e. milk quotas, in agriculture.

Chapters 8 and 9 are devoted to the second objective of the study, i.e. structural implications of property rights in the three countries mentioned before and consequences of the rights at enterprise level.

The use of models in chapter 10 intends to explore possible future aspects of property rights from the questions:

- What would happen if individual transferable quotas would be introduced in the Danish fishery?
- What are the possibilities for survival for individual Dutch beam trawlers in view of their much lower individual flatfish quotas in 1996 and 1997?
- What could be the consequences in the long run for British vessels of taking over all the necessary rights (licences) in case of succession and, as a second scenario, which could be the effects of a licence fee, imposed by the Government?

Finally, chapter 11 assesses the effectiveness of property rights in the three countries for fisheries management policy, which concerns the third objective of the study.

Conclusions, attached to the summary, intend to express that imposing limitations by fisheries management means creation of rights and that not all rights are property rights.

3. MATERIALS AND METHODS

The workprogramme for this study distinguishes eight different parts. These parts correspond nearly completely with the chapters 5-11 in this report. The methodology of the study will be described, following these eight different parts, which will be characterized in this respect as 'tasks'.

Task 1, Description of measures which have created property rights in Denmark, the Netherlands and the UK

This task has been carried out by conducting of literature research. The results have been included in chapter 5. General concepts of property rights are described by Bromley in his book 'Environment and Economy' (1991) and Scott in his contribution to the NATO Advanced Research Workshop on Scientific Foundations for Rights Based Fishing (1988). A more general concept of property rights concerning the exploitation of environmental resources, has been the basis of this study on property rights in the fishery sector. Thus, the situation in this sector can be compared with problems and solutions elsewhere in environmental economics.

The relevant fishery limiting measures and the property rights resulting from them have been derived from the description of the EU policy by Holden in 'The Common Fisheries Policy' (1994), and the relevant Danish, Dutch and UK legislation.

Task 2, Characteristics of property rights

More juridical characteristics (contents of entitlements etc.) have been included in chapter 5. Furthermore, the focus have been on the economic characteristics of the rights.

The study on this subject has been based upon available files, containing vessel- and fishing rights data, from the ministries in the three countries, on own expertise, on collection of price data of property rights and to a limited extent on talks with representatives from the industry (the explanation on task 8 contains more about these interviews).

Literature research (appendix 1) has been carried out to study economic characteristics of property rights in other countries, i.e. Iceland, Norway, Canada, the US, New Zealand, Australia and Japan. Furthermore, extensive information about the Icelandic situation was obtained during a seminar in September 1995 in Reykjavik. The proceedings of this seminar ('Property rights in the fishing industry', appendix 1) contain a description of economic and juridical aspects of the Icelandic property rights in fishing.

Chapter 6 includes all these economic aspects of property rights.

Task 3, Property rights in Agriculture

The description and analysis of the Danish milk quota system is based on annual reports from the Danish milk agency and discussions with agri-researchers.

For the Dutch part of the study researchers of the department 'Agriculture' of LEI-DLO have contributed to the subject 'property rights in agriculture'. Costs and earnings investigations for dairy farms, studies about trade in milk quota, about effects of quota on the dairy industry and about alternatives for the superlevy have been the basis for this contribution.

The Agricultural Departments of MAFF have been a useful source on the statistics of the UK dairy industry. Furthermore, much of the information has been derived from literature, i.e. the volume edited by Burell (Milk Quotas in the EC, 1989).

The three country contributions on the agricultural property rights are analyzed and compared with the fishing rights. The resulting conclusions are included in chapter 7 of this report.

Task 4, Effects of property rights on the structure of the Fishing Industry

For the Danish part of the study, data about catches and prices and about costs development have been collected for the main fisheries of the fleet segments which were mostly reduced in the period 1985-1992.

The Dutch part measures the structural changes in the near-water fisheries ('cutter fleet') mainly in terms of fleet number, number of enterprises, engine capacity and external organisation of the industry. Data about these issues have been collected and files of the ministry 1) containing fishing rights have been the basis to analyse the impact of property rights on the industry's structure.

For the UK an important source has been the Fisheries Departments which have responsibilities for licensing vessels, supervising quotas, collecting statistics and administering the decommissioning schemes. Data from the Departments have been used in examining the effects of property rights and other influences on structural changes in the industry. Similarly, the Producers Organisations and other associations of fishermen play a role in negotiating and distributing the rights; they thus contributed to the understanding of developments.

Chapter 8 contains the results of this part of the study.

Task 5, Investments in property rights, profitability and financing aspects

Task 6, Consequences of property rights for succession of ownership

These two tasks have been combined to the subject 'property rights at enterprise level', included in chapter 9 of this report.

Costs and earnings studies in the three countries have been the main source for the analyses of effects of property rights at enterprise level. These effects are most important in the Dutch fishery, so that this part has become most elaborated. A discounted cash flow analysis, in LOTUS spreadsheet, has

1) Ministry of Agriculture, Nature Management and Fisheries.

been carried out to investigate the relationship between investments in rights and the present value of the possible future proceeds.

The guidelines of the International Accountancy Standard Committee (IASC) have been studied to consider how property rights in fishing can be dealt with for profit calculations.

Interviews, on a limited scale, with representatives from the industry, bankers and accountants have been held to get more insight of the effects of property rights at enterprise level.

Task 7, Exploring effects of property rights in models

Property rights only play a minor role in the Danish fishery up to now (spring 1997). Therefore, the purpose of this part of model analysis has been to explore what would happen if private property rights, i.e. individual (non)-transferable quotas would be introduced in the Danish fisheries. A linear programming model has been constructed to carry out this analysis. Appendices 3 and 4 contain more details about this model.

For the Dutch part, a financial economics simulation model (in FORTRAN) has been used to investigate how many vessels will be in danger of survival because of the much lower flatfish quotas in 1996 and 1997. Therefore, an existing model has been adapted for this more recent situation. Chapter 10.2 explains this model briefly.

For the UK situation, calculations have been made on the basis of costs and earnings data to explore the questions 1): What could be the consequences in the long run for British vessels of taking over all the necessary rights (licences) in case of succession and 2) which could be the effects of a licence fee, imposed by the Government?

The outcomes of the model analyses have been included in chapter 10.

Task 8, Implications of property rights for the Common Fisheries Policy and for national management measures

This task has been elaborated in chapter 11. Therefore, relevant policy documents have been studied and recent discussions on property rights (i.e. Hannesson, 1994 and Christy, 1996) have been a source for reflection.

Furthermore, interviews have been an important source to evaluate the existing property rights regimes in the three countries and also to investigate the opinions on the possible review of the CFP in 2002. Filling in a questionnaire has not been the method, therefore, but talks have been held whereby a questionnaire has served rather as a checklist.

For the Danish situation, interviews have been held, on a limited scale, with fishermen (10) and their representatives, accountants (5) and bankers.

These categories of persons have also been contacted for the Dutch situation. The number of fishermen has been more extensive (31) and the chairman/member of the Board of each of the two Unions of fishermen has been interviewed.

For the UK part a questionnaire was used to structure various discussions with the industry over the period of the study. Those in the industry included fishermen, fishing companies and fish salesmen, as well as the executives of

Producers Organisations and National Associations of fishermen. Those in related areas were mainly fishermen's agents, bankers, accountants and brokers. Government departments were also involved because of their input to involving policy on fishing entitlements and property rights.

4. PROCEDURE

This FAIR-project on property rights has been carried out by:

- the Agricultural Economics Research Institute (coordinator), The Hague;
- the Danish Institute of Fisheries Economics Research of the South Jutland University Centre, Esbjerg;
- Seafish Industry Authority, Edinburgh.

The study started by November 1st, 1993, after signature of the contract between the three partners and the Commission of the European Union by October 28th, 1993.

The coordinator has proposed guidelines for each part of the study to get as much as possible a common approach for the different subjects. Thirty two documents have been prepared by the coordinator for this common approach, for discussion otherwise or as minutes of the meetings.

Seven meetings were held in the course of the project, until May 1997:

- The Hague, January 1994, for discussing of the general approach of the study and for deciding the contents of chapter 5 'Property rights and legal framework';
- Crete, March 1994, during the annual conference of the European Association of Fisheries Economists, for discussion of the completed texts of chapter 5 and the proposal for chapter 6 'Economic characteristics of property rights';
- Billund, Denmark, November 1994, to finalize the texts of chapter 5 and discuss the study of the economic characteristics of property rights. Furthermore the contents of the interim report was decided and a proposal of the coordinator for the study of property rights in agriculture (ch. 7) has been discussed in Billund also;
- Edinburgh, March 1995, to finalize the texts of chapter 6 and to discuss the draft text of chapter 7. A proposal for the chapters on 'structure' (8) and 'enterprise level' (9) was also discussed;
- Reykjavik, September 1995, to discuss the chapter on 'structure' (8) and to decide the contents of the second progress report. Furthermore, papers were presented by the members of the project team during a seminar on property rights in the fishing industry, held in Reykjavik by September 6th. This seminar has been organised by the Fisheries Research Institute of the University of Iceland in cooperation with the coordinator of the property rights project;
- The Hague, October 1996, to discuss the contributions on property rights in 'other countries', chapter 9 'enterprise level' and the Danish contribution, the ITQ model, for chapter 10. Furthermore, the contents of chapter 11 'property rights and policy' was discussed;

- Esbjerg, February 1997, to complete the parts 'property rights on structure' and property rights at enterprise level'. Furthermore, the chapter on policy (11) was discussed.

The draft final report has been completed in the period April/May 1997 by the coordinating institute.

5. PROPERTY RIGHTS AND LEGAL FRAMEWORK

5.1 Defining the concept of property rights

5.1.1 Property rights and institutions

A definition of property rights is needed so as to set limits to the extent of this study. It is helpful to start by considering the two elements, property and rights. *Property* may be regarded loosely as something which can be owned. It may be a material thing, such as land and buildings or it may be immaterial such as a patent or a copyright. Similarly ownership may reside in an individual, a group, a community or the state but it should be stressed that without potential ownership, property does not exist. The Roman legal code of Justinian (6th century AD) helpfully provides four categories, other than privately owned property:

- res communes : held by the law of nature to be common to all humanity such as the air or the sea;
- res publicae : dedicated to public use such as roads;
- res universitatis : held by the municipality such as theatres;
- res nullius : held by no-one such as wild animals.

The middle two categories define state property either at the national or local level while the last category indicates that animals in the wild (including fish) can not be regarded as property unless and until they have been captured.

Rights are entitlements under the law to engage in certain actions, whether they relate to personal behaviour having no relation to property, such as merely existing, or to the use of property or other resources, as in industry or commerce. It is of course possible to have different rights in the same thing, as the owner, as the user under lease and as the creditor who funded the acquisition. The reference to the law indicates that rights do not lead an independent existence as physical facts but may be regarded only as claims that the courts may recognise and enforce. Without potential enforcement, there can be no guaranteed rights except briefly for the strong.

Property rights bring the two concepts together. In general they can be thought of as a bundle of legal and customary rules that define (a) who is entitled to use a particular asset, resource or invention, (b) how, where and when it may be used, (c) what creates, transfers and extinguishes ownership and (d) who the owner is or owners are. On the one hand property rights are conferred and defined by rules while on the other hand rules may constrain the exercise of those rights. In the housing market, for example, the rights of the owner or the tenant may be restricted in terms of use by zoning regulations

which forbid commercial activities or the owner may face joint responsibilities for repair and maintenance.

The legal context makes it clear that property and associated rights are *institutions*. Scott (1989) defines the latter as '... socially recognised and supported procedures and rules. They are unchanging relative to the fluctuating economic activities that they guide and constrain. In a society the structure of Government itself is one institution. Another is the system of property rights'. While the implication that institutions are unchanging needs qualification in the light of regulatory and governmental flux, the relationship with economics underlines the relevance of the discipline of institutional economics. Such insights as those by North on historical aspects are helpful; he ascribed the superior economic development of the Netherlands and the UK compared with Spain in the 16th and 17th centuries to their better guaranteed property rights.

5.1.2 Property rights in the fisheries sector

In terms of the current fisheries sector, the concept of property rights needs more specific definition. It is perhaps helpful to regard them less as relating to an asset in the stock of fish but more as concerning a *resource flow* (in the harvest or catch over time). Bromley (1991) suggests that '*Property is not an object such as land but is rather a right or group of rights to a benefit stream that is only as secure as the duty of all others to respect the conditions that protect that stream*'. Such an approach applies to all kinds of management regimes for natural resources, not just for fisheries.

Consideration of *open access* provides a way to understand property rights better. Open access means that everybody is free to exploit the natural resource in the fish stocks. No-one is excluded from the common pool and this situation has often been called 'common property' which is a misunderstanding of the concept (Bromley, 1991). Common property stands for a regime where a certain group has the right to a benefits stream with all those outside the group excluded. Open access exists where there are no property rights recognised in an exhaustible resource. (Some might maintain that open access to a virtually inexhaustible resource, such as air to breathe and space for navigation on the sea, is in a special sense a property right of the earth's population but this is irrelevant in fisheries.)

Two basic conditions are thus needed for the existence of property rights: the *exclusion* of those outside the owner, user or group concerned and the *protection* of those rights by authority. The absence of protection and enforcement would lead by default to a situation of open access in practice. This is brought out in the definition: 'A right is the capacity to call upon the collective to stand behind one's claim to a benefit stream (that is to one's property)' (Bromley, 1991).

Bromley (1991) indicates four broad regimes reflecting ownership of property and the constraints implicit in the associated rights. These are in slightly altered form:

- a. state property, where managing agencies have a right to determine rules of access or use and individuals have a duty to observe them, in exercising

their right of access or use (Similar descriptions cover municipal and other local authorities);

- b. private property, where the individuals have rights for socially accepted uses of their property and duties to avoid the socially unacceptable while the rest of the community have a duty to support socially accepted uses and a right to expect only those uses (individuals include companies or firms);
- c. common property, where in addition to the relevant elements relating to private property and its socially accepted uses, there are balances to be maintained between the group and the rest of the community as well as within the group in terms of individual behaviour in using and maintaining the resource;
- d. non-property, where the individuals have no rights but the resource is open to all subject only to constraints of a wider nature relating to individual behaviour within a society (navigational or safety regulations give examples of such constraints).

These various categories can be exemplified in the *EU fisheries sector*. The move towards extended Exclusive Economic Zones in the 1970s led to state property in the sea bed out to 200 miles or medians and to a kind of EU property in the waters around member states. Legislation in the Netherlands allowed the creation of transferable individual quotas which are clearly private property as are the individual vessel licences in the UK. Management of parts of the TAC by Producers' Organisations shows the characteristics of a common property regime. As for non-property, this is seen in certain un-regulated fisheries, whether for some shellfish species or in recreational activities.

The holders of property rights in fishing may have a *diverse bundle of rights*. The rules creating those rights, and constraining them as well, may specify the capacity in power or tonnage and the restrictions on timing, area, gear and other aspects, as well as the catch of fish allowed. The constraints may be on inputs or on outputs. This in turn affects the way that fishermen re-act and whether their re-actions lead to efficient outcomes or not.

5.1.3 Characteristics of property rights

It is suggested by Scott (1989) that the bundles of right, together with the associated rules, can be evaluated in terms of the presence or absence of certain *characteristics*. He lists six but his ordering of 'duration, flexibility, exclusivity, quality of title, transferability and divisibility' is presumably arbitrary (figure 5.1).

Quality of title seems likely to be paramount as questions as to who really owns the property are critical. Quality is best where ownership can not be contested and worst where there is uncertainty and conflict. All the other dimensions seem self explanatory except flexibility which presumably means that the property is not constrained as to how it may be used, perhaps as in being free to live in a house or lease it to someone else or in using an allocation of days-at-sea in whatever way suits the fisherman and his vessel. The concept embod-

ied in figure 5.1 is that each characteristic may be rated up to 100% depending on the type of property right conferred.

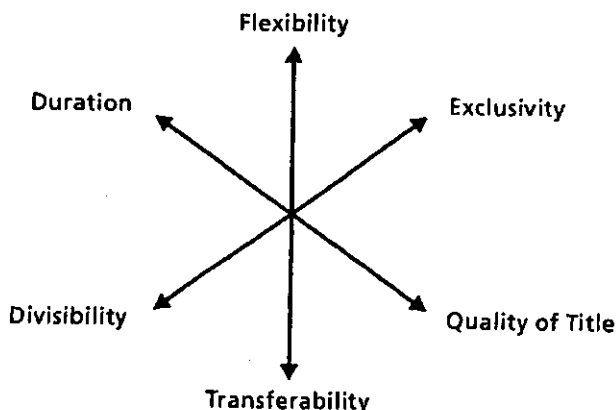


Figure 5.1 Characteristics of property rights

Figure 5.1 covers the elements which describe individual property rights and help to establish their value. It is, however, essential to bring all the other aspects of property rights into consideration and this is done in summary form in figure 5.2.

This study will concentrate on property rights along the lines of Bromley's definition in considering only *protected rights to a stream of benefits generated within fishing*. This covers resource regimes which may vary from the very general, such as restricting entry to the fishing grounds by allowing access only to fishermen of the state concerned, to the very specific, as in an individual transferable quota. While much will depend on the legislation creating these very general and very specific property rights, it would be expected that the scaling on figure 5.1 would differ greatly. The general licence would result in points near the origin on the six axes, enclosing a small area, as against an ITQ with more elements tending towards 100% giving a larger area. It should be stressed that continual change in detailed policy on catch allocations with longer stability in restrictive vessel licensing may alter this outcome; uncertainty may result in some discounting of the duration and quality of title elements. Stability in vessel licensing may in turn diminish the superiority of the ITQ to the general restrictive licence.

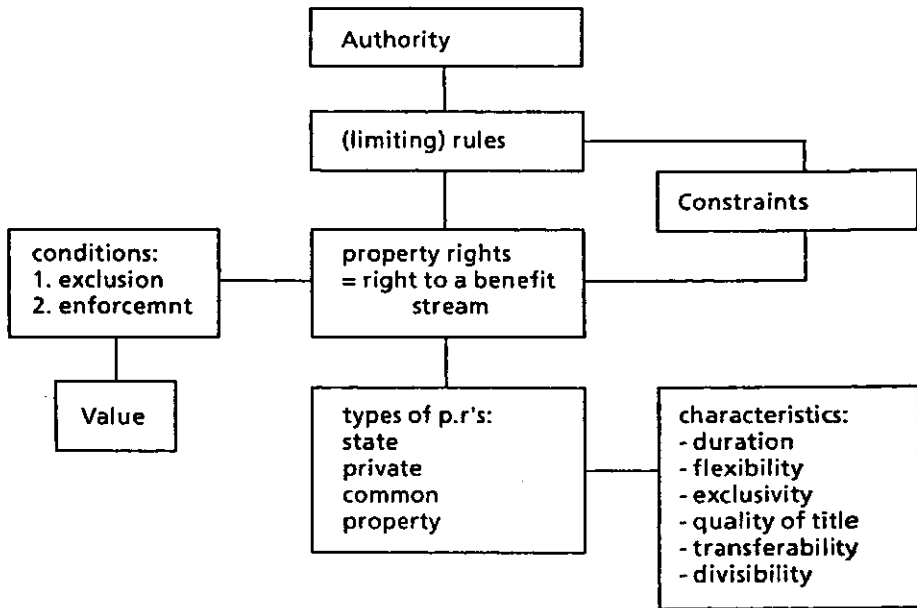


Figure 5.2 Aspects of property rights

The definition of rights in terms of benefit streams makes them *goods in an economic sense*. The pre-requisites of scarcity and utility are met because creating a property right excludes certain potential users from their desired access to a resource thereby causing scarcity in an economic sense. As for utility it is clear that the rights enable economic activity to proceed and generate additional welfare. Thus economic theory can be applied and tested on this subject.

In the following, the concept of property rights will be used for rights that meet Bromley's definition. When also other (not quite exclusive) rights are concerned the concept 'fishing rights' is used.

5.2 Limitations for the fishing industry resulting from the Common Fisheries Policy

5.2.1 End of open access and creation of property rights

Figure 5.2 illustrates that property rights may result from limitations and, therefore, it is useful to consider firstly limitations in fisheries.

The decrease in open access for the individual fisherman is a process, that has been going on for a longer time. The area that came under the jurisdiction of a managing authority has grown continuously.

The first international agreed limitation was already in 1882. The North Sea Fisheries Convention allowed the North Sea countries to establish an exclusive three mile zone for fisheries. Fishing in this zone could be reserved for citizens of the country in question.

The situation remained about the same until 1964. Until then most of the fishing outside the three mile zone was free. The NEAFC 1), a cooperation between all the coastal states in the Northeastern Atlantic, could only give recommendations to the Member States about fisheries management issues. In the early sixties some countries (especially the UK and Nordic countries) wanted to extend their coastal zone in order to protect their local fishermen. The European Fisheries Convention 2) allowed the coastal countries to enlarge their coastal zone to six or twelve miles. Extending of the zone to twelve miles was only permitted, if also the historic rights of other countries fishing in these waters (between six and twelve miles) are taken in account. Not all countries extended their zone to six or twelve miles. Some countries (West Germany, the Netherlands and Belgium) made bilateral agreements that even permitted fishermen to fish inside the coastal zone.

EEC jurisdiction

The result of all these agreements is that the width of the coastal zone differed a lot within and among the countries. This has had also consequences for the jurisdiction of later Common Fisheries Policy. The legislation on fisheries started only very late because there was very limited interest in such policy by the six Member States 3). This changed due to the accession negotiations with Norway, UK and Denmark. In 1970 the Six agreed on a Structural Regulation (2141/70), which also established the principle of equal access. This Regulation (later on replaced by 101/76) stated that 'Member States shall ensure equal conditions and access to and the use of fishing grounds ... for all the vessels flying the flag of a Member State'.

The article on the principle of equal access caused a lot of difficulties in the access negotiations with the UK, Norway and Denmark. The three countries asked for a bigger coastal zone than the EEC would allow them. In the end a transitional period was agreed until 1983 which meant that some areas were derogated from the general principle of equal access. All the countries could keep their coastal zone and some zones were extended further (e.g. Norway Pout Box, Shetland Box) in order to protect the interest of local fisheries communities. The derogation had to be reconsidered after the transitional period ending on 31 December 1982. The derogation is still in force and the next revision will be in 2002.

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- 1) North East Atlantic Fisheries Commission, founded in 1959.
 - 2) Countries from EEC and EFTA represented.
 - 3) The six Member States in the fifties and sixties.

The Third United Nations Conference on the Law of the Sea (1974) allowed coastal states to establish a coastal zone of 200 miles. This led in 1976 to the decision of the EEC also to establish a coastal zone of 200 miles (starting on 1 January 1977). The 200 miles zone, apart from the smaller national zones (three to twelve miles), came more or less under the jurisdiction of the EEC. For the first time the Community could have substantial influence on the management of fisheries resources. Even then the real Common Fisheries Policy could only start in 1983, because of the difficulties in negotiating access to the water of Member States.

The accession of Spain and Portugal caused another change in the access regulations of the EC. Until 2002 only 300 listed vessels are allowed to fish in the (old) EC waters ¹⁾. No Spanish nor Portuguese vessel is allowed to fish in the North Sea or Baltic Sea (also until 2002).

The succession of regulations limited further the access of the individual fishermen to existing and new fishing areas. For some areas the citizenship of a certain country became more valuable, because of the potential fishing rights. Therefore, citizenship also represented a kind of property right. Some local fishermen could have benefits from their citizenship because other companies were prepared to pay a sum for their service being a citizen of the country in question. A good example is the invasion of Spanish ships re-flagged in the UK. The Anglo - Spanish companies used enough British labour and services to fulfill the British legal requirements.

5.2.2 Establishment of the Common Fisheries Policy

On January 25 1983 the Council agreed on the new Common Fisheries Policy. The new regulations gave the EC more power because the Member States had agreed on the area that came under the jurisdiction of the Community. Three new regulations were adopted by the Council namely:

- Regulation 170/83 establishing a Community system for conservation and management of fisheries resources. Later on replaced by Regulation 3760/92;
- Regulation 171/83 laying down certain technical measures for the conservation of fisheries resources. Later on replaced and amended by Regulations 3094/86 and 345/92;
- Regulation 172/83 - 181/83 fixing for certain fish stocks and groups of fish stocks occurring in the Community's fishing zone, total allowable catches for 1982, the share available to the Community, the allocation of that share between Member States and the conditions under which the total allowable catches may be fished.

These three regulations also form the framework of the Common Fisheries Policy of the present EU. The goal of the CFP is stated as follows: 2)

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- 1) Not more than 150 at one time, art. 159/160 Iberian Act of Accession.
 - 2) Regulation 3760/92.

- 'as concerns the exploitation activities the general objectives of the common fisheries policy shall be to protect and conserve available living marine aquatic resources, and to provide for rational and responsible exploitation on a sustainable basis, in appropriate economic and social conditions for the sector, taking account of its implications for the marine ecosystem, and in particular taking into account of the needs of both producers and consumers'.

Three main goals that can be derived from this Regulation:

1. conservation of resources - conservation policy;
2. viable fishing industry - structure policy;
3. stable market conditions - market policy.

These three goals are also reflected in the names of the various EU regulations, although some of the regulations are a more mixture of the different policies.

5.2.3 Conservation policy

The following measures and instruments are part of the present EU policy on conservation of resources:

1. *total allowable catches (TAC) and national quotas*

In January 1983 the Member States agreed on a system of TAC and national quota. Before 1983 the NEAFC (see note 1) only made recommendations on national quotas. Some Member States used these advisory quotas as a base for their national fisheries management (e.g. ITQ plaice and sole in the Netherlands). The responsibility for the management of national quotas is at the national authorities, like it was in the forerunner of the Community quota system.

Important issues of the agreement of 1983 are the definition of the fishing regions (Reg. 171/83) and the national shares in the overall TAC (Reg. 172/83-181/83). The base for the division of the TACs into national quotas is the average landings in the period 1973-1978. Some areas got extra quotas because of losses of fishing grounds outside EC waters (e.g. Iceland). There is also an allowance for regions that are heavily dependent on fisheries (mainly in the UK and Ireland) 1). These regions get a larger share when the total TAC falls below a certain level.

The next revision of the shares of the Member States will be in 2002, but there is also a possibility for revision in 1996.

2. *technical measures 2):*

- a. minimum mesh sizes for the different species and fishing areas (first EC regulation on this subject from 1977). Most of these regulations

1) The Hague Preference Zone, 1976.

2) Reg. 171/83, later amended by reg. 3094/86 and reg. 345/92.

- are based on the forerunner NEAFC regulations, that already had more impact than only a recommendation;
- b. limitation in fishing in certain areas. There are large number of fishing areas with special regulation. There are seasonal bans for instance fishing of mackerel in the western end of the English Channel or cod in the German Bight. There also areas with restrictions on gear or engine power. In the twelve miles zone along the continent, fishing is only allowed for a listed group of vessels with engine power of 300 BHP or less (Eurocutters) 1). Due to this limitation a place on the EU list, 'an Eurocutter licence', also has become a property right (see also section 5.3-5.5);
 - c. limitations in the use of gears. For instance maximum beam length of 24m outside and 8m inside coastal zone (since 1989);
 - d. tie up schemes. The Council imposed in 1991 and 1992 a tie up scheme for vessels fishing for cod, because of the very low stocks.
3. *enforcement measures*

The responsibility for the enforcement of the Community measures rests with the Member State. There is no direct control of fishermen by Community inspectors. The task of the Community inspector concerns whether the Member State carries out the control measures in the right way. Several regulations have been made on how to carry out the control e.g. on logbooks (reg 2241/87) and vessel registration (reg 109/94).

However, the Community has very limited possibilities to 'punish' Member States which do not comply with the rules, apart from instituting Article 169 proceedings.

5.2.4 Structure policy

The aim of the first EU Structural Regulation (2141/70) was mainly on expanding the total production of the fishing industry. Gradually other goals have become more important, especially the process of adapting the capacity to the fishing possibilities. In the last regulation (3760/92) conservation, socio-economic and regional aspects are also taken in account. Most of the structural policy is laid down in the MAGP. The core of the MAGPs are the goals on the capacity for the national fishing fleets. The goals on capacity of the MAGP of 1987 was a reduction in 1991 of the overall tonnage by 3% and installed engine power (kW) by 2%. For some Member States this was a reason to set up a licensing system or to limit the issue of licences in order to meet the targets of the MAGP. Therefore, the MAGP created indirectly a property right linked with the licences. A more detailed description of the licensing systems is in section 5.3-5.5 of this chapter (national limitations).

Although some effort was made, not all Member States succeeded to meet the objectives. The Community has no real means to make Member States

1) Art. 20 of 171/83.

meet the goals. The only tool is to restrict the grants only to countries or fishing fleets that meet the capacity requirements.

The goals of the MAGP (1992-1996) are reduction of the capacity of 20% for demersal bottom trawl and 15% for benthic stocks (nephrops). It is allowed to realize 45% of the total reduction by other means like limiting the number of days-at-sea. This may give an impetus to the creation of another property right, the number of days-at-sea.

Other measures and instruments of the Community Structural Policy are:

- a. funds for restructuring, renewal and modernization of fishing fleets. These funds are only available for Member States and fishing fleets that meet the targets of the MAGP;
- b. funds for development of aquaculture, processing and marketing;
- c. community support for adjustment of fishing capacity by temporary or permanent withdrawal of fishing vessels from fishing activities. There is a possibility of a Member State to ask the Community for financial support for the national decommissioning scheme;
- d. funding for the search for new outlets of surplus products (species that are abundantly available);
- e. support for regions lagging behind because of industrial decline and underdeveloped areas (also money from EU Regional Fund);
- f. social policy: training, health care.

5.2.5 Market policy

An important part of the Market Regulation is derived from agriculture, which is especially reflected in the first Regulation (2142/76). Even though there are some important differences, the amount and the share of price support is much lower than in the field of agriculture. Only a decreasing share of the total costs for withdrawal of fish is reimbursed to the PO by the Community.

The Producer Organization (PO) plays a vital role in the Market Policy. A PO can carry large number of legislative and coordinating activities. One of the goals of the market policy is to encourage the formation of POs.

Measures and instruments of the present Market Regulation 1) are:

- a. System of withdrawal and guiding prices:
the EU sets guide prices for large number of fish species and fish products. This guide price plays an important role in the import regulations (minimum important price, tariff contingent).
The guide price is the basis for the minimum price that PO is allowed to set (maximum 90% of the guide price). The PO gets the storage cost and a decreasing share of withdrawal cost reimbursed. The maximum support is limited to 20% of the total landings;
- b. specification of marketing standards for grading (size classes) and freshness for major commercial species;

1) Regulation 3759/92.

- c. support for formation of producers organizations;
- d. setting up a system of import regulations.

5.2.6 Relationship with property rights

Limiting measures may create rights, more as certain groups or individuals are exempted from constraints. It seems that in many cases on EU and on national level limiting measures have unintentionally created (property) rights.

The scheme in figure 5.2 may clarify the relationship between limiting measures and property rights.

The EU structural and market policy have resulted in different kinds of support for the industry. This also may create rights, more valuable as the 'benefit stream' (from Bromley's definition in section 5.1) is more exclusive.

It will be considered in sections 5.3-5.5 to which extent property rights have been created in the Danish, Dutch and British fishing sector.

5.2.7 Possible changes which may affect property rights

Although it is difficult to foresee the future of the EU fisheries policy (legislation), some future changes in the policy can be expected on the basis of developments already going on or simply because these revisions have been built in the system.

It can be expected that the following issues will play a key role in the coming years:

a. *changes built in the CFP*

There are several derogations and transitional periods in the EU fisheries regulation. Many of them will have to be reconsidered. For instance the transitional period on the access of Spain and Portugal into the 'old' Community waters will end in 2002 for Community waters except the waters west of Ireland. It is obvious that the granting of fishing rights to the 'newcomers' will have consequences for the fishing possibilities of the current users of the resources;

b. *discussion on the principle of relative stability 1)*

The reconsideration of national quotas is planned to take place in 2002. The share of the national quotas in the total TACs is supposed to be unchanged until 2002. The present scheme of fixed shares based on the general principle of 'relative stability', means that Member States get a fixed share of the TACs;

The division of TACs into national shares which are supposed to be caught by national fishermen is a derogation of the general Community principle of non-discrimination on the basis of nationality. Therefore, the principle of relative stability should be abandoned but strong opposition of member countries could prevent or ease this abandonment (Holden, 1994, p. 242).

1) Laid down in Regulations 172-181/83.

c. *more attention for input control;*

At this moment the MAGP goals on capacity are not enforceable. This situation might change when a Community licensing system is introduced. A beginning is made with the new legislation on vessel registration 1). Starting from 1 January 1995 all fishing vessels need to be registered and information from the register need to be handed over to the Community. Changes in the registers must be reported within a certain time limit.

In the future this Community vessel register could probably be used as an instrument to regulate the total fishing capacity (Holden, 1994, p. 246). A better adjustment of fishing capacity to fishing possibilities would result in better protection of fishing rights;

d. *effort control*

Control on effort might become more important in the future. In the present MAGP also a reduction of days-at-sea is allowed to reach the goals on capacity. For the control of such a system the Commission already proposed to install satellite equipment (Holden, 1994);

e. *changes in the quota system*

There is discussion and research on how to increase the flexibility of the quota system. A problem within the present system is that by-catches often do not match with quota. Multi-species quota might offer the necessary flexibility.

Another way to increase flexibility is to introduce multi-annual TACs which would prevent large variations in the level of the TAC.

5.3 Property rights and legal framework in Denmark

5.3.1 Implementation of the Common Fisheries Policy in Denmark

The Member States are responsible for the implementation of the CFP in their countries.

The fish stocks situated inside the Member States Economic Zone are property of the EU and the Member States. The resource and conservation management of these fish stocks is the responsibility of the Community, i.e. the Commission and the Council, while the national Governments, in consideration of the management of Community, regulate the fishing activities of the national fleets. The national fishing policy must be at least as restrictive as the Community policy, because the national policy must respect the Community policy.

The main measures in the resource and conservation policy are Total Allowable Catch (TAC) for the important stocks (the quota based species) and technical measures. The TACs set a upper limit for the Danish catches of the species in question, while the technical measures regulate the distribution and

1) Art. 5 of Regulation 3760/92.

composition of the fishing activity. Whether it is fair to say that this limitation is only due to the Common Fishery Policy (CFP) can be discussed, because without the CFP another regulation system should have been in force, probably including some kind of distribution of the catch possibilities.

The Structure Policy, particular the MAGP with fixed objectives for reduction in the capacity of the fleet, has been implemented by a decommissioning scheme in Denmark. In the first years (until) 1987 the funds allocated to the structure policy were mainly used to restructure and extend the Danish fleet, while after 1987 the main part of the funds has been used to fulfill the goals of the MAGP. The effect of the MAGP for 1987-91 have been a reduction in the capacity of the Danish fleet by 15.7% in terms of GRT and 14.6% in terms of kW. The MAGP for 1992-96 operates with reductions in GRT and kW of the Danish fleet by 4.5% and 15.3%, respectively.

There are more measures resulting from the CFP which importantly affect the operation of the Danish vessels, but this short description refers only to measures which can be assumed to form the basis of more or less individualized property rights in Danish fisheries.

5.3.2 Limitations for the industry resulting from the Danish fisheries policy

There is at least one characteristic of the Danish fishery and management that must be taken into account, when dealing with limitations from the Danish Fishery Policy. The Danish fishery is characterized by a flexible multi-purpose fleet, which relatively easy can move from fishery to fishery, i.e. they can change area and target species, which all things equal affects the possibility for an effective regulation. Moreover, many of the fisheries are multi-species fishery, i.e., more than one species are caught during the fishing action.

National quota management

The basic for the Danish regulation of the fishery is the yearly TACs determined by the Community, of which Denmark is allocated a certain share. According to the Danish law of regulation of the fisheries is the purpose of the Danish regulation to achieve a better exploitation of the resources compared to the outcome of a free fishery, which in practice means division of the available resources/quotas in time periods and on fleets/vessels.

At the output side the main instruments are, in general, when dealing with quota based species, i.e. cod, haddock, saithe, whiting, plaice, mackerel, herring, hake, sole, deep water prawn, salmon and sprat:

1. quarterly based (total) quotas;
2. allocation of individual vessel rations for a given period; and
3. fishing stops. If the national quota is fished up before the end of the year, then the fishery is simply closed.

Quarterly quotas (1) secure that the Danish quotas and consequently the fishing activity are spread over the year, while assignment of rations (2) divides the quotas among the fishing vessels normally by gear and length. If the landings during the season are above the quarterly quotas the fishery is in many

cases closed (3) until the landings for the rest of the season are believed to be within the total Danish quota.

For the non-quota based species there is no regulation on the output side.

Another restriction on the output side is minimum landing size (see section 5.2). Here Denmark has for several species chosen more restrictive measures.

National capacity management

It is appropriate to divide the description of the national capacity management into two different parts according to whether the time horizon is short or long. Long term capacity management deals with entry and exit to the fishery, in economic terms changes in the fixed costs, while short term capacity management regulate how, where and when to use the current capacity. Finally the effort regulation (days-at-sea) will be described.

Long term capacity management

Access to the Danish fishery sector is nowadays limited. To achieved the right to access the fishery sector two authorizations are needed, first a recognition as a commercial fisherman and second a vessel licence.

To become authorized as a commercial fisherman three conditions must be fulfilled:

1. Danish citizenship or affiliations to Danish fishery.
2. Been occupied by commercial fishery in the last 12 month.
3. Over 3/5 of last year personal gross income came from fishery.

A company can also be registered as entitled to conduct commercial fishery, if at least 2/3 of the participants are registered as commercial fishermen.

To become entitled to insert (a vessel) capacity into the Danish fleet depends on two things:

1. An authorization from the ministry of fisheries to use the vessel to commercial fishery. In practice the Ministry only gives a permission if either corresponding capacity leaves the fishery or the capacity is directed towards definite species. However, the last possibility is seldom used.
2. The capacity (vessel) must for the part of 2/3 be owned by persons, who are authorized as commercial fishermen. Or the vessel must be owned by a company, which is entitled to conduct commercial fishery.

There is at the overall level limited access of vessels to the Danish fishery sector, while there are restrictions at whom can conduct commercial fishery.

The regulation of the total *existing* capacity is based on control of the capacity of the individual vessels. Only with a permission from the Ministry of Fisheries it is allowed to extend the capacity of the existing vessels. The capacity is measured along six dimensions: GRT, length, width, depth, hold capacity and power of the engine. It is allowed the change gear without permission, however, it is not allowed without permission to rebuild the vessel, which make fishery with beam trawl (only if engine power >500 HP) and (purse) seine gear

possible. It should be pointed out that the capacity of vessels can be changed in other directions than the six mentioned above, e.g. through improvement of storage or catch technology.

Short term capacity management

In principle all the vessels are allowed to participate (sometimes a permit/licence is required) in the fisheries (defined by target of species and area). The exceptions in 1993 were:

- a. the purse seiners which are not allowed to fish in the Kattegat, the inner Danish waters and the Baltic Sea;
- b. vessels with engine power >300 HP are not allowed to fish in the ICES area IIIc, i.e., inner Danish Water;
- c. vessels longer than 22m are not allowed to participate in the sprat fishery in the Skagerrak;
- d. vessels longer than 19m are not allowed to participate in the sprat fishery in the Kattegat;
- e. a fishery in the North Sea targeting sole is not allowed in the month of marts;
- f. in the Kattegat fishery after herring is not allowed in the months of June and July;
- g. in the ICES area IIIc is fishery after herring and sprat not allowed in the period 1th of July to 15th of August.

Participation in some of the fisheries requires a special permission from the Ministry. The fisheries are:

- a. the herring fishery;
- b. the mackerel fishery (not required in 1994);
- c. the cod fishery in ICES areas 23-32, if the vessel is longer than 12m;
- d. the sprat fishery in the Skagerrak, the Kattegat and ICES areas 23-32.

A permission is given for a certain time period and specifies an individual ration given for that period. Decision about the number of issued permissions in the individual fishery depends on the supply situation and rational exploitation of the quantities that are available at a given time. When selection between applicants are necessary, the Ministry of Fisheries can give priority to those that are depended on the fishery in question.

Entry and exit of the fisheries, in which the target of specie(s) are species without quota, are not regulated. For fisheries, in which the target of specie(s) are quota based species, it is possible to change fishery during a ration period. In fisheries on human consumption species a vessel can change from one area to another, given that the catch corresponds to the ration at the time of change in the ration period. The ration in the new area is proportional adjusted based on the time of change. (Only) one change between a fishery on human consumption species and a fishery on industrial species is possible during the ration period for the fishery on human consumption species. Again the rations are adjusted corresponding to the time of change and when changing to a fishery on human consumption species by-catches of human consumption

species sorted out in the industrial fishery are included in the landings from the human consumption fishery. For the TAC-regulated species only in the herring fishery a licence is required.

Licence is, however, also required to participate in:

- a. the common shrimp fishery by the Westcoast of Jutland;
- b. the mussel and oyster fishery; and
- c. the mussel and cockle fishery in the Wadden Sea.

Among the conditions for obtaining these licences are special demands to the equipment of the participating vessels, limits in fishing time and areas, and maximum allowed catch per vessel per time period.

Other restrictions on the input side is mesh size regulations, by-catch rules and boxes/closed areas (see section 5.2).

National effort (days-at-sea) management

In three fisheries some kind of effort management was in force in 1993. In the herring and mackerel fishery each participating vessel is required to apply for a certain amount of fishing days within ration periods of 120 days. The vessels can apply for less than 120 days. On days which are not 'herring or mackerel fishing days' the vessels can participate in other fisheries under the regulations that are in force for the fisheries in question. After deciding the number of fishing days, the vessels are then assigned a maximum allowed catch of herring or/and mackerel for the ration period depending on the number of fishing days and the length of the vessel. Thus these fisheries are regulated by both an output and input measure.

As an experiment effort regulation was introduced in the sole fishery in the Kattegat in the month of November 1993. Within a period for 14 days the vessels are allowed to have maximum 7 days-at-sea, and have only obligations concerning the regulation of the Community (i.e. minimum landing size, mesh size and so on) and the Danish regulation of other species which are by-catches in the sole fishery, mainly cod. The vessels were allowed to participate in other fisheries during the period, but days used in other fisheries were deducted from the allocated number of days to the sole fishery.

5.3.3 Property rights in the Danish fishing industry

In this section the existence of property rights will be considered from the viewpoint of the different fleets segments. The fleet segments will be defined following the division used by the EEC in the MAGP for 1993-1996. The main segments for Denmark (Commission decision 92/558/EEC) are (1) purse seiners, (2) trawlers fishing in Greenland waters, (3) trawlers and Danish seiners and (4) Gill-netters and others. However, the segments should follow three different categories depending on the target species, of which the fishing effort should be reduced by 20%, 15% and 0%, respectively:

1. vessels fishing after demersal stocks with pair bottom trawl net or otter bottom trawl net;

2. vessels fishing after flatfish stocks with beam trawl net;
3. others (e.g. vessels fishing after pelagic stocks).

Table 5.1 Danish fleet in main fleet segments by numbers, GRT and kW (92/558/EEC) 1.1.1992

	Numbers	GRT	kW
Gill-netters etc.	1,273	16,433	93,998
Trawlers a) and Danish seine b)	1,463	88,064	374,655
Trawlers, Greenland waters	2	3,480	3,810
Purse seine	11	6,949	15,815

a) Must be further divided into demersal, pelagic and specialized trawlers in order to determine the reduction according to the MAGP; b) The final reduction figure depends on evaluation of selectivity and catch composition.

As described in section 5.3.2 there is an overall limited access to the Danish fishery and limited possibilities to extend the existing vessel (capacity). Since 1987 it has not been possible to insert a vessel or extend existing vessels in certain directions (new capacity) without taking just as much capacity out of the fleet. All things equal this situation should increase the value of the resource for the fishermen, that are in the sector, because the limited access to the benefit stream from the resource may increase exclusivity. The decommissioning scheme in Denmark has, given this system of limited access, contributed effectively to reduce the number of fishermen/vessels and the capacity in terms of GRT and kW in the sector.

The Danish regulation of the vital human consumption species is based on quarterly based quota, rationing and fish stops and to a limited extent permissions, while the only fishery of the industrial fisheries in the EEC-zone, that is national regulated, is the sprat fishery. In the Norwegian zone Denmark is allocated a quota of sand-ell and norway pout. Only if the quotas are exploited to a certain extent within a given period, national regulation is carried out.

This system can regulate the individual vessels fishing possibilities, but the system can not control the total fishing effort in the fisheries, because the access to each fishery, in general, is non-regulated. The most economic attractive fisheries will attract effort and each fisherman will try to fulfill his ration first, because when the quarterly quota or the total Danish quota is exhausted the fishery is stopped. The conclusion is, therefore, that the overall limited access to the Danish fishery and limited possibilities to extend the existing capacity will not reduce the overcapacity in the most profitable fisheries, maybe the effort in the least attractive fisheries are reduced. The result is still that too much effort is attracted into certain fisheries.

Property rights in the purse seine sector

The purse seiners participate in the herring and mackerel fishery in the North Sea and the Skagerrak. They are not allowed to fish in other Danish Wa-

ters. The regulation of both fisheries is based on allocation of special permissions, which specify:

- a. a number of fishing days within a given ration period where the vessel can participate in the fishery; and
- b. a maximum allowed catch for the ration period depending on the number of fishing days, the length of vessel and the type of fishery (human consumption fishery, mixed human consumption and industrial fishery).

However, to participate in the herring fishery a general licence is required. The licence gives only a general access right to the fishery and if a vessel obey certain technical standards the vessel is entitled to a licence.

Also trawlers participate in the herring fishery, while only purse seiners participate in the mackerel fishery.

Property rights in the trawler sector

This sector is very heterogeneous in two ways. First the vessels participate over the year in several fisheries, i.e. multi-purpose fleet. Second the vessels participate in different fisheries, i.e. they don't have the same fishery pattern. However, there seems to a connection between the size of the vessels and the fisheries they actual participate in.

The access to the trawler fleet is a certain degree limited (gill-netters and Danish seiners can change the gear to trawl), but the access to the different fisheries are, in general, not limited, which implies that in the different fisheries no property rights in terms of exclusivity exist. However, allocation of individual vessel rations can be viewed as a right to fish a given amount within a given period, i.e., a kind of an individual non-transferable quota.

The main fisheries after industrial species for the trawler fleet are (Remark that in general all the fisheries are multi-species fisheries):

- Norway Pout (by-catch of roundfish) in the North Sea (Fladen);
- sandell (almost pure) in the North Sea; and
- sprat (by-catch of herring) in the North Sea and in ICES IIIA.

The main fisheries after human consumption species are:

- herring (almost pure) in the North Sea and Skagerrak;
- mixed roundfish in the northern North Sea and in Skagerrak;
- plaice (with other human consumption species as well) in the North Sea and in Skagerrak;
- mixed human consumption in the North Sea;
- shrimp (by-catch of roundfish, lobster and monk) in the North Sea and in Skagerrak;
- lobster (by-catch of human consumption species in general and of sole in particular in Kattegat) in Skagerrak and Kattegat (ICES IIIA); and
- cod in Inner Danish Waters (ICES IIIBC).

The smaller trawlers (<20 GRT) are represented in all the fisheries after human consumption species except in the herring fishery and only a very small

part of the smaller trawlers participates also in the fisheries after industrial species: the sprat fishery in ICES IIIA and the sandell fishery in the North Sea.

Only vessels greater than 100 GRT participate in the fisheries after industrial species all year round. Only a few of the trawlers (>100 GRT) are human consumption trawlers, i.e. participate only in fisheries after human consumption species (the main fisheries are herring, shrimp, lobster and mixed roundfish and human consumption).

But from a technological point of view nearly all the trawlers can participate in every fishery after industrial and human consumption species. Which fisheries the vessels actually participate in depend on, in part of the relative profitability between the different fisheries and in part of the regulation. In the North Sea only the Herring and Mackerel fisheries are access regulated. In ICES IIIbcd also the Sprat (an industrial species) fishery are access regulated and in ICES IIIbd the cod fishery is access regulated as well for vessels with length larger than 12 metres. Expect from these fisheries it is possible to participate in all the other fisheries, if of course the other parts of the regulation is respected (e.g. minimum mesh size, vessels restrictions, rations, boxes).

Property rights in the Danish seine sector

The Danish seine vessels participate in fishery after plaice mainly in the North Sea and Skagerrak, and to a smaller extent in Kattegat. The most important by-catch species are cod and haddock. The proportion of the by-catch varies over the season and area. The fishery after plaice is not subject to any national regulation at the beginning of the year. Only if the quota of plaice is exploited to a certain extent within a given period, national regulation is carried out by imposing rations. So the main restrictions (if any) in the Danish seine fishery are coming from the regulation of the by-catch species.

Property rights in the gill-net sector

The main fishery for the gill-netters is the cod fishery in the North Sea and the Skagerrak. The by-catch of other species in this fishery is relatively small. Some of the vessels greater than 20 GRT combine the cod fishery with a turbot fishery and/or a sole fishery. The two latter fisheries are season fisheries and take normally place from April to July. The vessels smaller than 20 GRT participate besides the cod fishery in the sole fishery, the turbot fishery and the plaice fishery with by-catch of mainly cod and sole. The most typical fishery patterns are (a) cod fishery the whole year (b) cod and turbot fishery (c) plaice and sole fishery and (d) cod and sole fishery.

There are no special regulations for the gill-netters. They are restricted mainly by the rations in the cod fishery and the sole fishery.

In figure 5.3 the different measures with respect to fleets and type of regulation resulting in some source of property rights are shown.

	Special vessels	Purse seine	Trawlers	Danish seine	Gill-netters
<i>Licence:</i>					
- Vessel	+	+	+	+	+
- Herring			+	+	+ a)
- Common shrimp	+				
- Mussel and Oyster	+				
- Mussel and Cockle	+ b)				
<i>Permission to fish:</i>					
- Herring		+	+		+ c)
- Mackerel d)			+	+	
- Sprat (ICES IIIabcd)				+	
- Cod (ICES IIIbd)				+ e)	
- Industry fishery (ICES IIIbcd)			+		
- ICES IIIc				+	+
<i>Area restrictions:</i>					
- ICES IIIbcd + Kattegat			+ f)		
<i>Vessellength restrictions:</i>					
- Sprat (Skagerrak)				+ g)	
- Sprat (Kattegat)				+ h)	
<i>Engine power restrictions:</i>					
- ICES IIIc i)			+		+
<i>Rations per time period depending on vessellength:</i>					
- Cod (North Sea, Skagerrak, ICES bcd)		+	+	+	
- Sole (North Sea)			+	+	+
- Mackerel			+	+	
- Herring		+	+		+
- Sprat (North Sea)				+	
- Sprat (IIIbd)				+	
<i>Rations per timeperiod:</i>					
- Cod (Kattegat)			+	+	+
- Haddock			+	+	+
- Saithe			+	+	+
- Hake (ICES IIIa)			+	+	+
- Sole (IIIabcd)			+	+	+
- Sprat (IIIac)				+	
<i>Permission to rebuilding:</i>					
- to another vesselttype		+ j)	+		
<i>Increase of capacity</i>	+	+	+	+	+

Figure 5.3 Survey of fishing rights in Danish Fishery Industry

a) Expect gill-netters with vessellength <12m; b) In the Wadden Sea; c) Expect gill-netters with vessel length <12m in the Kattegat and ICES IIIc; d) Only if the catch is over 50 tonnes per month; e) Expect vessels with length <12m; f) Not allowed; g) Only vessels with length <22m are allowed; h) Only vessels with length <19m are allowed; i) Vessels with engine power >300 HP are not allowed; j) Only if rebuilding to beam trawler with engine power >500 HP.

Institutional environment

The fishermen's associations have a statutory status in the decision-making process, when the Danish fishery policy is formulated. This status is given

both when the Danish fishery policy with respect to the Community is established and when the internal Danish policy is formulated.

In both cases a consultative committee advises the Minister. In the case of the Community the committee advises the Minister about the Danish attitude to proposals from the Commission. Further, the committee advises about the regulation, which is necessary in order to implement the Common Fishery Policy. In the case of the internal Danish fishery policy the committee advises the Minister about the design of the regulations of the different fisheries and about the capacity of and changes in the fleet.

It should be emphasized that the Minister can disregard the advise from the committees, but traditionally the Minister follows the advise.

Final and concluding remarks

In figures 5.3 and 5.4 the measures creating property rights are divided into measures regulating input and output, respectively, and the different property rights are described with respect to certain characteristics. It should

	Vessel licence	Fishing licence	Herring licence	Permits to fish	To rebuilding
Objective	limiting capacity	limiting access of persons/ companies	limiting effort in in the herring fishery	rational exploitation	controlling and limiting capacity
Issued by	Ministry	Ministry	Ministry	Ministry	Ministry
Right to	insert vessel into Danish fisheries	conduct commercial fishery	get herring rations and allowed fishing days allocated	participate in a given fishery	rebuilding
Allocated to	vessel owners	persons/ companies	vessel owners	vessel owners	vessel owners
Period	indefinite	indefinite, if active	indefinite, if active	definite	
Transferable	no, only when vessel is sold	no	no, follows the vessel	no	no
Enforcement	Ministry	Fishery inspections	Fishery inspections	Fishery inspections	Ministry

Figure 5.4 Fishing rights referring to inputs in Danish fisheries

be noted that the restrictions mentioned in figure 5.2 is not included here, because they do not explicitly refer to neither input nor output rights. The restrictions in figure 5.3 and 5.4 give the vessels in question some rights.

When looking at the fishery sector, property rights have been created on a sector level, because of the limited access to the Danish fishing industry. The participating fishermen and vessels have rights to the benefit stream from the resources and by controlling also the existing capacity the income distribution of the stream is stabilized.

On the individual level, however, only a few property rights have be establish. The herring licence is an example of this, but also the permits to fish can be applied to control to access to specific fisheries, which for the participating fishermen creates rights to the benefit stream. The instrument of permit's is not at present used to fulfill such an objective. Instead, in principle, permit's are issued to all the applicants. This implies that the rations per time period must be set so the national quota is respected, which means that certain vessel groups that can not make a profit of the rations are implicitly excluded from the fishery in question of economic reasons. The permission measure is, therefore, more an administrative measure with the purpose to monitor the fishing activity than a measure with the purpose to regulate the fishing effort. However, there are a few exceptions. Getting a permission to participate in the sprat fishery in ICES IIIa and in the fishery in ICES IIIc is depended on whether the fishermen also have had a permission in the previous years.

	Rations a)
Objective	To allocate the quota over the year and vessels
Issued by	Ministry
Right to	Catch a given amount of fish per ration period
Allocated to	Vessel owners
Period	Definite
Transferable	No
Enforcement	Fishery inspections

Figure 5.5 Fishing rights referring to outputs in Danish fisheries

a) The measure is applied to cod, haddock, saithe, hake, sole, mackerel, herring and sprat.

5.3.4 Changes in the Danish situation relating to property rights in the period 1994-1996

In a report (dated May, 1993) from a working group with participation of representatives from the fisheries association, the labour union and the ministry, it is recommended among other things:

- that the regulation of the Danish fishery for the main part of the fleet should be based on individual transferable quotas. Only the smaller vessels should be operating without national regulation, however, in a transition period the number of landings is proposed regulated;
- that the use of technical measures is given a higher priority, especially the use of measures that can improve the selectivity;
- that specific trials of different types of regulation are tested;
- that the existing quota-system is given a higher flexibility through the use of multi-annual and multi-species quotas.

These recommendations are so far not implemented in the actual regulation, but they can indicate into which direction the future regulation will evolve. However, some trials of new types of regulation have been executed. As mentioned in section 5.3.3 a days-at-sea regulation system has been tested in the sole fishery in the Kattegat in 1993. This system continued in 1994 and 1995 and it was expanded in 1994 to include Inner Danish Waters (ICES IIIc). In 1995 a trial system was conducted where the normal rations on cod were lifted for vessels operating under the days-at-sea system. Since cod is an important by-catch species in the sole fishery, discards and illegal landings of cod seem to be a problem, if cod is not included in the days-at-sea system. One of the purposes with days-at-sea regulation is to allow the fishermen to land all their catches, which is believed to be impossible under the ration system. The system has so far not created property right, because the system is open for all fishermen/vessels and because it was still possible to conduct sole fishery under the ration system.

In 1994 a trial with individual quotas in the cod fishery in the Baltic Sea has been tested. This regulation is also planned to be an alternative to the existing regulation. The system has continued in 1995 and 1996. The purpose of this system is to provide the fishermen a better opportunity to plan the fishing activity over the season. The individual quotas are allocated according to the length of the vessels (however, it is possible to adjust the quota the following year if the quota is not fulfilled). This system has the potential to develop to a property right based regulation system. However, the regulation has administrative features since all applicants can get access to an individual quota and in case the applications exceed the allocated total quota, the quota is set aside to fishery under ration.

Also in the herring and mackerel fishery in the North Sea and Skagerrak regulation by means of individual (yearly) quotas is planned for 1994. This regulation is planned to replace the existing one. The system has continued in 1995 and 1996. This system is limiting the access to the fisheries since the individual quotas are only assigned to vessels already fishing herring and mackerel. The herring and mackerel fleet fishing in the North Sea and Skagerrak consists of specialized and relatively large vessels depending to a very large extent on these species. Assignment of individual quotas seems to be a reasonable regulation measure in such a case.

All these trials are evaluated against considerations about the future regulations.

5.4 Property rights and legal framework in the Netherlands

5.4.1 Implementation of the Common Fisheries Policy in the Netherlands

For the Dutch Fishery Sector free entry to the fishing grounds ended roughly spoken, in 1976. In this year the EU Member States decided to establish the 200 miles Economic zone, following the declaration of the 200 miles exclusive economic zones in 1974 during the UN conference about the international Law of the sea.

The implementation of the Common Fisheries Policy (CFP) in 1983 was an important event for the Dutch fishery sector. Since 1976 an Individual Quota (IQ) system for flatfish had been in force which was transformed into an individual transferable quota (ITQ) system in 1985. The implementation of the CFP meant gradually a heavier enforcement for this system.

Measures of this CFP mostly affecting now Dutch fisheries are:

- the Total Allowable Catches (TACs) for sole, plaice, herring, mackerel and cod;
- the MAGPs, which should reduce the fishing effort in terms of HP by 22% (cutter fisheries) in the period 1988-1991 and by 15% in the period 1991-1996;
- the restriction of fishing in the 12 mile zone to vessels with a HP of 221 kW (300HP) at maximum.

There are more measures resulting from the CFP which importantly affect the operation of Dutch vessels, but this description refers to measures which have been the basis of more or less individualized property rights in Dutch fisheries.

It should be noted that limitations resulting from the CFP may fluctuate to a large extend. The TAC for sole is a good example of this, showing a level of 9,700 tons in 1989 and 19,500 tons in 1991. Of course this reflects the differences in size of the stock.

This makes clear that the benefit stream in the definition of Bromley (described in chapter 5) to which property rights refer, may fluctuate very strongly.

5.4.2 Limitations for the industry resulting from the Dutch fisheries policy

5.4.2.1 National quota management

For the Dutch fishing industry, the most important TACs expressed in terms of value, are the ones for sole, plaice, herring, mackerel, cod and whiting. In order to avoid overfishing of these TACs, national Dutch fishery management contained the following limiting measures in 1993:

- a) Individual transferable quota for sole and plaice. Basis of these ITQs has been the historical catch of these species of the individual fisherman, adjusted in some cases for differences in capacity.

- The flatfish ITQ is expressed yearly as a maximum quantity of kg sole and plaice to be caught for each vessel. This quantity fluctuates yearly, reflecting annual variances in the TACs.
- b) Entitlements to fish on herring and mackerel. Herring entitlements have been split between the cutter fisheries and the freezer trawler sector. For the part of cutter fisheries in the herring TAC (22,400 tons in 1993) the Commodity Board for Fish and Fishery Products has allocated, on the basis of mutual agreement, the herring entitlements to a limited number of skipper-owners. Historical rights have been the basis of this allocation. The freezer trawler section is entitled to catch the major part (58,700 tons in 1993) of the Dutch herring TAC and the full mackerel quatum has been reserved for this sector. The herring entitlements of the freezer trawlers are attached to the mackerel entitlements. These herring and mackerel fishing rights are managed by the Association of Shipowners on a private basis. This organisation represents a very limited number (four) of big fishing companies involved in fishing as well as in trading and processing activities.
 - c) Specified fishing rights for cod and whiting. These rights were not yet individualized in 1993, but allocated to three categories of fishing vessels:
 - a) vessels which used to fish the full year on these species
 - b) vessels with seasonal effort on cod and whiting and
 - c) vessels landing both species as a by-catch in beam trawl or other fisheries.
 Fishing rights for cod and whiting were, at the end of 1993, specified as the right to land a certain amount of boxes monthly. This number of boxes differed for the three categories mentioned above: category a) 600 boxes, category b) 550 and category c) 75 boxes a month. Given the category the number of boxes to land is the same for each size level of the vessel. These cod/whiting entitlements were not transferable in 1993.

5.4.2.2 National capacity management

The following measures aiming at limiting fishing capacity were in force in 1993:

- a) A licence per vessel on the basis of the HP of the vessel. Vessels fishing on quota species are obliged to have such a licence, which are transferable. The licence may be withhold from the vessel when the vessel is sold to another skipper-owner. This system of licences limits total engine power of the cutter fleet and also the engine capacity of the freezer trawler sector. The system was implemented in 1984 and aims at fulfilling the goals of the Dutch part of the MAGPs. It is allowed to own a licence without having a vessel, but only during a certain period (18 months at maximum in 1993). A HP reduction of 10% is applied when the licence is sold during this period of reservation.
- b) Maximum HP per vessel. Since 1987 maximum HP has been limited to 2,000 HP per vessel, for new vessels. Those already in operation equipped

with an engine exceeding 2,000 HP (a small number) received dispensation, but only for the current engine.

- c) Maximum length of beam trawl of 12 metres, in force since 1988.
- d) A decommissioning scheme, in force since 1988. This has resulted in removing some 90,000 HP from the fleet up to 1993. For vessels which became eligible for the decommissioning premium the engine power licence had to be sent in to the Ministry and the same applied for the cod/whiting entitlements.
- e) Entitlements to fish within the 12 miles zone for a certain number of vessels. In fact this is an EU measure (Regulation nr. 55/87) and there are two vessel files in this respect: 1) a file of vessels which are allowed to fish within the 12 miles zone, engine power not exceeding 221 kW, and a file of vessels that are allowed to use beams of over 9m when fishing on sole. Only vessels with an ITQ for flatfish and also having shrimp fisheries as an important (50% or more of earnings) activity are admitted to this latter file.

5.4.2.3 National effort management

A maximum numbers of days-at-sea applies for each cutter fishing on quoted species. This regulation, implemented in 1987, contains a basic number of days (in 1993 120) and exemptions to meet the level of individual fishing rights for flatfish and roundfish. This basic number of days has been broken down quarterly.

For the beam trawlers the days-at-sea entitlements are attached to the ITQ for flatfish, in combination with the size of the vessel. A separate number of days-at-sea has been attached to the cod/whiting entitlements. The days-at-sea are not transferable in itself.

5.4.2.4 Other national measures resulting in property rights

In addition to regulations on the basis of the CFP, there are fishery limitations for non-quota species:

- Entitlements to fish on shrimps. Two categories exist in this respect: The 'GK' entitlement, aimed at limiting the number of fishers (98) in the Wadden Sea and the 'GV' entitlement, which limits the number of shrimp vessels in the 12 miles zone (223 at the end of 1993).
- Concessions for shellfish cultures and fisheries. This sector comprises a mixture of fisheries (cockles, mussel/ oyster seed) and culture (mussels and oysters). Though these concessions are relevant for the creation of property rights, they will not be subject of further study in this respect.

5.4.3 Property rights in the Dutch fishing industry

In this section the existence of property rights will be considered from the viewpoint of the different fleet segments. The description will be focused on the situation in 1993. Five fleet segments have been distinguished in this re-

spect (figure 5.1). These numbers have been derived from the file, containing right holders, of the Ministry of LNV. This segmentation is more detailed compared with the fleet segments (3) in the Dutch MAGP.

Limitation is one aspect of the measures described in 5.2, the other aspect is the creation of rights by all these rules.

Probably the creation of these valuable rights has been a not intended result, considering the objectives of these measures 1) the allocation of the Dutch TAC to individual vessel owners and to fleet segments and 2) to limit the fishing effort.

5.4.3.1 Property rights in the cutter sector in 1993

All vessels

All vessels in the cutter sector fishing on stocks, regulated by TACs, need a licence which specifies the engine power of the vessel. In 1993 this licence system regarded a total of 504,000 HP (371,000 kW) of which a small part (28,000 HP) was 'floating'. The remainder 476,000 HP was distributed over 470 vessels. These right holders could own 2,000 HP per vessel at maximum, apart from a small group of big cutters equipped with an engine already exceeding 2,000 HP at the time when the maximum HP rule was implemented (1987).

The HP-licences are fully transferable, either as a whole or separate parts of it. Thus the skipper-owner is allowed to buy a bigger vessel if he also buys additional HP-licence(s) from others, who wish to decrease their engine capacity or wish to leave the industry.

New engine power licences are not issued; in fact total HP of the cutter fleet is diminishing, since total HP amounted to 598,000 HP in 1987.

It is allowed to hold the licences without a vessel, but only for a period of 18 months at maximum. This rule respects the practice in so far skipper-owners don't have a vessel in operation when a new cutter is being build.

The engine power licences are registered by the Fisheries Directorate of the Ministry of Agriculture, Nature Management and Fisheries (Ministry of LNV). Transfers of licences have to be reported to this Directorate.

Beam trawlers

The major part of the Dutch cutter fleet, 212 vessels in 1993, consists of beam trawlers. Total engine power of these vessels made 85% of total engine power of the Dutch cutter fleet in that year.

Measure (a) described in section 5.4.2.1, has resulted in the major part of the Dutch property rights, the *individual transferable quota for flatfish* (ITQs of sole and plaice).

Skipper-owners of beam trawlers receive annually such a flatfish ITQ by means of a document expressing a number of kilograms sole and plaice to be caught at maximum in the concerning year.

Those skipper-owners receive this document which had already a document at 31 December of the previous year. The right is formally allocated only for one year, but in practice the same skipper-owners, apart from transfers, have been owner of the flatfish rights since 1976.

The right refers to the person (or the enterprise) as well as to the vessel, but the ITQ may be withheld from the vessel. In case of individual quota overshooting in 1991 and 1992 the quantity for 1993 has been reduced with these quantities in excess.

The level of the (kilograms) rights of the individual holders is very different, even comparing vessels of the same size. These differences are the result of historical allocations, based on individual catch performances and of trade in kilograms sole and plaice afterwards.

The individual quantity of kg sole and plaice varies annually with the variances in Dutch TACs of sole and plaice. So, in fact each ITQ holder has a right on a fix part of these flatfish TACs. The holder is allowed to rent his ITQ to another skipper-owner or to hire additional kg of flatfish. This kind of agreements is allowed only during a certain period; in 1993 requests for such transfers had to be submitted before 1st March.

The flatfish ITQs are only transferable as a whole to one or more other vessel-owners. Another constraint is that only transfers are allowed referring to ITQs taken up by less than 90% in the relevant year. Enterprises owning more than one vessel are allowed to add the individual vessel quota together resulting in a quatum for the enterprise as a whole. This total quatum is controlled then and not the quota per vessel.

It is allowed to own a flatfish ITQ without a vessel, but only for a period of two years at maximum.

Since 1988 a heavy control and inspection system (some hundred inspectors) is in force to keep the individual landings of quoted species within the individual or national quota. Punishments in case of infringements became more and more severe.

Since 1 January 1993 by far most of the ITQ holders are member of a 'Group', which has a task in co-management of the quoted species.

To create a 'Group' fishermen have to send in a request to the Ministry of LNV, which has to approve the relevant 'Group'. After approval the ministry allocates a 'Group quatum' under several conditions of which most important are:

- the 'Group' consists of at least 15 and at maximum 100 vessel owners;
- all catches of 'Group' members are landed and sold via the auction;
- a fish plan has been made by the 'Group', specifying the distribution of the days-at-sea over the year;
- the fishing plan specifies the measures aiming at adjusting the fishing effort of the members to the available sole and plaice quota;
- management of the 'Group' forbids fishing on sole and plaice when total quotas of the 'Group' are taken up.

In this way each 'Group' manages a part of the Dutch quota for its members. Such 'Group' allows clearances of ITQ quantities between members in case of differences between landed and quoted quantities. It has to be stressed that ownership of the ITQs remains at the individual vessel owners. An important advantage of group membership is that lease and rent of ITQs is allowed throughout the year, instead of only in the first two months of the year.

Owners of the beam trawlers have also the *right to land a certain quantity of cod and whiting monthly*, since June 1993 75 boxes. Both species are a by-catch of the beam trawlers and, therefore, this right has been allocated to the owners of these vessels. In fact this right has been allocated to all vessels not having a roundfish entitlement, but entitled to fish on quoted species by means of a licence. It is allowed, however, not an independent right since it is not transferable in itself. It is a kind of a property right because it is a right to a stream of benefits with exclusion of those who do not have a licence it is, however, not an independent right since it is additional to flatfish ITQs or to the licence for those who do not possess such ITQs.

Maximum number of days-at-sea. This regulation (mentioned in section 5.4.2) consists of a basic number of days-at-sea (120 in 1993) and dispensations for vessels to which high ITQs have been attached. In these cases the number of days-at-sea has been linked to the level of the flatfish ITQ. Apart from these dispensations the number of days-at-sea has been increased by 10% for members of the 'Groups'.

The entitlement to fish annually a certain number of days is not transferable in itself. It is attached to the ITQ, roundfish herring, or shrimp entitlements. As such the number of days-at-sea is not an independent property right in accordance with the definition in chapter 5.

Vessels fishing on cod and whiting

Entitlements to fish on cod and whiting, measure (c) in 5.4.2.1, are the basis of the fishing possibilities for these vessels. The 'roundfish-sector' is a rather separate sector of the cutter fisheries. In 1993 this sector consisted of 52 vessels (70% or more cod and whiting earnings of total potential earnings), representing 5.2% of total licensed HP of the cutter fisheries. Entrance to this sector is not possible, apart from buying the entitlements.

Officially these rights were not transferable in itself in 1993, but the industry could exchange the 'documents' together with the vessel.

The entitlements refer to either full year or seasonal fishing on cod and whiting and were expressed as a number of kilograms cod and whiting (5,400 in the first half year of 1993) to be landed weekly. In June 1993 this quantity was changed in a monthly quatum of 600 boxes for full year documents and 550 boxes for seasonal ones. For the latter documents this quantity applies for a period of three months, for the remaining months of the year the lower by-catch quantity of 75 boxes applied for the seasonal documents. Within the different categories there is no difference in number of boxes related to capacity. Smaller and bigger vessels are entitled to land the same number of boxes.

Full year documents have been split up between two categories: 'R-documents' and 'K-documents'. This is of significance because total cod TAC is distributed annually between different categories (R, K, seasonal and by-catch quantities). From 1 January 1993 the documents are aggregable per vessel, but only within the both categories ('R' and 'K').

These entitlements to fish on cod and whiting can be considered clearly as property rights according to the definition in chapter 5.

The days-at-sea regulation for vessels fully entitled for cod/whiting fishery contained an annual number of 172 days-at-sea in 1993 and for the seasonal documents this number was 155.

Most of the vessels belonging to the roundfish sector are member of a previously mentioned 'Group' with co-management responsibilities.

Multi-purpose vessels

A number of vessels (79 in 1993) was involved in more than one fishery. The major part of the multi-purpose sector consists of vessels ranging from 300-1,100 HP (220-810 kW). Total engine power of the multi-purpose sector made 5.9% of total licensed HP of the cutter fleet by 31 December 1993.

The fishing activities of the multi-purpose vessels comprise:

- beam trawling. These skipper-owners receive annually an *ITQ* allocation for this fishery, with the same characteristics as the *ITQs* of the specialised beam trawlers;
- seasonal fishery on cod and whiting. The *seasonal entitlements for cod and whiting* apply for this fishery. These documents allow this seasonal fishing in a specified period (three months) of the year. Just like the full year documents the seasonal ones are transferable only together with the vessel;
- herring fishery. In 1993 nineteen vessels were in possession of a *herring permit*, issued by the Commodity Board for Fish and Fishery Products. These permits are transferable, but aggregation of more permits per vessel is not allowed. The herring permit contains the right to fish and land a certain quantity of herring in or from a certain area during a specified period. It is allowed to hire a quantity of herring from other skipper-owners. Skipper-owners who exceed their quantity have to pay a fine of NLG 0.50 per kg fish in excess (a sanction of the Commodity Board).
Two Producers Organisations, with permit-holders amongst their members, were in 1993 responsible for the management of the herring permits; in this respect they were bounded by the rules of the Commodity Board for Fish and Fishery Products. Allocating individual quantities of herring to permit-holders is a matter of the PO, within the context of a fish plan, to be approved by the Commodity Board for Fish and Fishery Products;
- shrimp fishery. Shrimp is not a quota species, so that the limiting measures for this fishery are not based on the CFP. Limitations in this respect concern the necessity of a *shrimp permit* to be issued by the Ministry of LNV. Most of the multi-purpose vessels are entitled to fish on shrimps by means of a 'GV' shrimp permit. This permit contains the right to fish on shrimps in the coastal zone. These shrimp permits are transferable.

Multi-purpose vessels equipped with an engine up to 300 HP ought to be registered on a special file: '*Lijst I' orland 'lijst II'*'. This gives them the exclusive right to fish within the 12-miles zone and in case of '*Lijst II'*' to fish with beams of over 9m when fishing on sole. This file registration can be transferred to

other vessel owners and can be considered as a property right according to the definition in chapter 5.

For the Dutch fleet this registration contains some 275 vessels, mainly multi-purpose and specialised shrimp vessels.

Specialised shrimp vessels

A *shrimp permit* system is in force to the 126 vessels operating in this branch of fishery in 1993. As stated before, these permits are issued by the Ministry of LNV. Two types of permits consist in this respect: a 'GV' permit, giving the right to fish on shrimps in the coastal zone and a 'GK' permit which only has been allocated to shrimp fishers operating in the Wadden sea. This 'GK' permit regards a fixed number of 98 fishermen and will be in force up to the year 2000.

However, this 'GK' permit is transferable just like the 'GV' permit.

	Cutter fisheries				Freezer trawler sector
	beam trawlers (n=212)	mixed fisheries (n=79)	cod fish sector (n=52)	shrimp fisheries (n=126)	freezer trawlers (n=13)
Engine power licence	+	+	+	+/-	+
ITQ sole/plaice	+	+/-			
Entitlement cod/whiting full year			+		
seasonal		+/-			
Mackerel permit					+
Herring permit a)	+/- b)	+/-			+
Shrimp permit		+/-		+	
EEC file					
I		+/-		+	
II		+/-			

Figure 5.6 Survey of property rights in the Dutch Fishery Industry, per fleet segment, in 1993
a) Small number (19) of cutters, mainly involved in beam trawling. The herring permits of the freezer trawlers are attached to the mackerel permits; b) +/- sign: not all the fishermen/ vessels own the right.

Not all specialised shrimp fisher are in possession of a engine licence because their target species is a non-quota species.

A registration on the EU vessel file for the coastal zone '*Lijst I*' is another kind of property right owned by the shrimp fisher, as has been stated before.

The *days-at-sea regulation* contains for the specialised shrimp vessels (over 70% of earnings in shrimp fisheries in previous year) a dispensation, on request, up to 200 days per year.

5.4.3.2 Property rights in the freezer trawler sector

The freezer trawler sector of the Dutch fisheries consists of a very small number of vessels (13 at the end of 1992), involved in pelagic fisheries (mackerel and herring). These vessels, with a GRT size ranging from 1,080-7,150, are exploited by companies which integrate fishery, processing and trading. The freezer trawlers operate mainly in EU waters, though activities outside these areas can be important. The trawlers need an *engine power licence*, which gives them the right to fish in the EU sea on quota species (herring and mackerel). These licences are transferable, just like the ones in the cutter sector.

The engine power of the freezers totalled 73,800 HP (54,300 kW) in 1993.

Beside these engine power licences the companies own *permits for the mackerel and herring fishery*. In this case the herring permits are attached to the mackerel permits. The Association of ship-owners is responsible for the management of the Dutch mackerel TAC and a part (58,700 tons) of the Dutch herring TAC.

The four companies owning the 13 trawlers (1993) cooperate in fishing and trading activities in the rather long established organisation called 'the Group'. This 'Group', not quite comparable with the 'Groups' in the cutter fisheries, carries out a kind of self-management to meet the requirements of the CFP measures for this sector.

5.4.3.3 Institutional environment

Fishing enterprises, owning property rights, don't operate in a vacuum. There are a number of institutions in the Dutch Fishery Sector which influence the policy of the individual skipper-owner. On the other hand the skipper-owners may influence more or less the policy of institutions, especially via their professional organisations. The representatives of these organisations participate in the policy and in the design of regulations of the Commodity Board for Fish and Fishery Products, the POs and the co-management Groups. Section 5.4.3.1, 'Beam trawlers' describes briefly the tasks of these co-management Groups, which are mostly connected with a PO. Figure 5.7 is a display of the institutional environment of the individual entrepreneurs in the Dutch Fishery Sector.

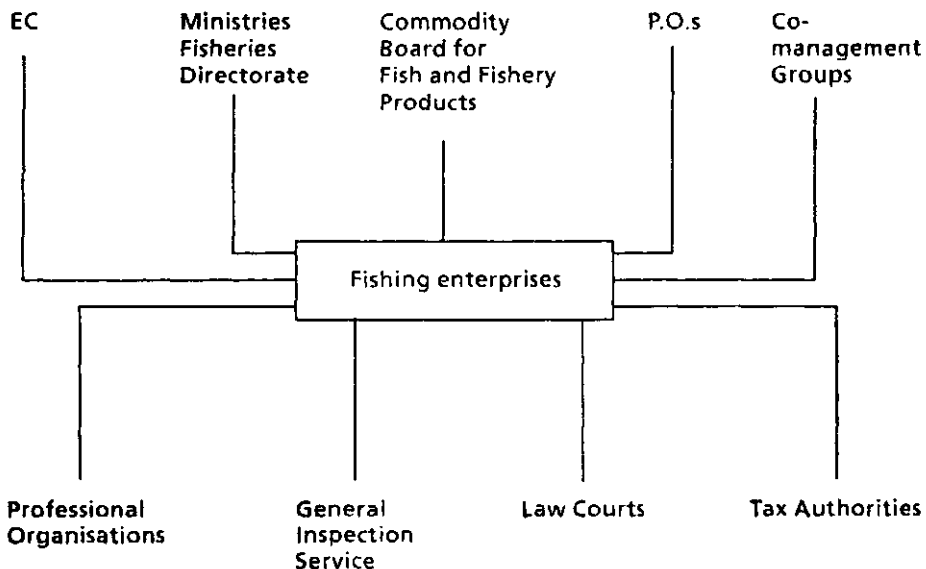


Figure 5.7 Institutional environment of Dutch fishing enterprises

5.4.3.4 Summary of property rights characteristics

Figures 5.8 and 5.9 contain the characteristics of the different property rights. Rights referring to the inputs have been distinguished in this respect from rights concerning the outputs. This distinction is relevant, because it is important for the policy of the entrepreneurs and of the Government how the rights has been defined. Rights on inputs, a kind of entrance billet to the fishery, means for the skipper-owner maximizing the outputs, given the inputs. Rights on outputs, a clearly defined right on a 'benefit stream', means minimising inputs given the outputs, assuming profit maximisation.

	Engine power licence	Herring permits a)	Shrimp permits	Permits for coastal zone
Objective	limiting capacity	limiting effort in herring fishery	limiting capacity in shrimp fisheries	limiting capacity in coastal zone
Issued by	Ministry	Fish and Fish Prod. Authority	Ministry	Ministry
Right to	fish on TAC species specif. kW	fish on herring specified period	fish on shrimps	fish in 12 miles zone with beam trawl
Allocated to	all owners vess. fish. on TAC species	all owners cutters and trawlers fishing on herring	all owners involved in shrimpfish.	all owners vessels up to 300 HP c)
Period	indefinite	indefinite	indefinite/ -year 2000	indefinite
Transferable	yes	yes b)	yes	yes
Enforcement	Gen.Insp. Service/Justice	firstly by Groups/Assoc. Ship-owners	Gen.Insp. Service/Justice	Gen. Insp. Service/ Justice

Figure 5.8 Characteristics of property rights referring to inputs in Dutch fisheries; situation in 1993

a) Attached to mackerel permits regarding the 13 freezer trawlers. Mackerel permits are owned by 4 companies involved in distant water fisheries. Their professional organisation is responsible for the management of these mackerel fishing rights; b) Not aggregable; c) Registered before 1 January 1987.

The distinction between rights on inputs and rights on outputs is also of importance for the rights issuing institution (e.g. the Government). This becomes clear in case of decommissioning schemes: the target will be the removing of input rights to diminish the pressure on the stocks, while output rights will remain untouched (the TAC remains the same). In the Dutch situation this meant that those who were granted for a decommissioning premium had to send in their engine power licence and could hold their ITQs; in fact these output rights were sold to skipper-owners who remained in business.

	ITQ sole/plaice	Entitlement cod/whiting	
		full year	seasonal
Objective	allocation sole/plaice TAC	allocation cod/whiting TAC	allocation cod/whiting TAC
Issued by	Ministry	Ministry	Ministry
Right to	land a max. quantity sole/plaice annually	land a max. quantity cod/whiting monthly	land a max. quantity cod/whiting monthly in lim. period
Allocated to	owners of vessels historic. landings sole/plaice	owners of vessels historic. landings cod/whiting	owners of vessels historic. landings cod/whiting
Period	indefin. a)	indefin. a)	indefin. a)
Transferable	yes b)	yes b)	yes b)
Enforcement	Groups Gen. Inspect. Service/Justice	Groups Gen. Inspect. Service/Justice	Groups Gen. Inspect. Service/Justice

Figure 5.9 Characteristics of property rights referring to outputs in Dutch fisheries; situation in 1993

a) In fact the right (document) has been allocated annually to a limited group of skipper-owners, having a document by 31 December of previous year; 2) b) approval by ministry needed.

5.4.4 Changes in the situation relating to property rights in the period 1993-1996

In 1994 the regulation regarding cod/whiting entitlements has been changed. These documents has been transformed into individual transferable quota, with the same characteristics as the sole/plaice ITQs. Total Dutch TAC for cod and whiting has been broken down between the four categories, mentioned in section 5.3.1: 'R'-documents, 'K'-documents, seasonal and by-catch quantities.

The individual cod/whiting quota, allocated to the right holders from 1st January 1994, are as follows: 'R'-documents 96,000/38,310 kg, 'K'-documents 126,330/64,080 kg and seasonal documents 28,320/11,200 kg. The by-catch quantities were not allocated individually, but remained the right to land a certain quantity monthly (55 boxes of cod and 50 boxes of whiting).

These individual quota are transferable with some constraints:

- the quota should be sold as a whole, to one or more other vessel-owners;
- both a quantity of cod and of whiting should be sold in case of selling to those vessel-owners which are not yet in possession of roundfish quota.

It became allowed in 1996 to sell cod/whiting ITQs in parts, in the same way as applies for flatfish ITQs (since 1994). In 1996 the herring and mackerel permits were also transferred into ITQs, with the same conditions as for the other ITQ-species. Hence, ITQs are allocated from this year for all the Dutch quota species.

5.5 Property rights and legal framework in the United Kingdom

5.5.1 Implementation of the Common Fisheries Policy in the United Kingdom

The initial members of the EC devised a policy towards fisheries which reflected their specific concerns and the general spirit of the Treaty of Rome in opening up markets to competitive forces. Thus the basic policy implies equal access in the waters controlled by the Community. The accession negotiations with Denmark, Norway, the Republic of Ireland and the UK, culminating in the entry of all except Norway in 1973, put a different focus on fishing. The UK sought to extend its territorial limits out to 50 miles and reserve the fisheries for its own industry; the outcome was somewhat more limited, exclusion of other countries from the territorial sea (out to 12 miles) apart from those having certain historic rights in the 6 to 12 mile band.

Subsequent developments saw British and other Member States' limits extend to 200 miles or median lines in 1977 and the CFP had to alter considerably. Its implementation led to considerable changes within the UK fishing industry as it responded to the new policies. The CFP had and has a range of aims and consequently the various measures cover conservation, control, industrial structure, markets and trade. Such aspects as external political influences as well as environmental, social and economic ones all affect the measures, especially those concerned with securing access to fishing in waters belonging to Third Countries.

Implementation of the CFP had a considerable impact on the structure of the UK industry. The importance of distant water fisheries and significant dependence on imports of fish had been critical in shaping both the national policy and the UK industry. The fleet had a substantial capacity that fished for cod around Iceland, Norway and elsewhere with large vessels and gear well suited to operating there. The traditional centre of the industry was in Hull and Grimsby, with the main consumer markets and the related processing and distributing facilities (including those for imports) being within easy access.

While little happened to the location of the main markets or the facilities serving them, the changes to the fleet in terms of location and structure were great. The new limits took away access in distant waters and created new opportunities around the UK, particularly towards the north and west and for pelagic stocks such as mackerel. The added sea areas were mainly around Scotland and suited different methods or smaller vessels. The UK's share of the TACs reflected some compensation for the losses in Iceland and elsewhere but the extra amounts neither made up much of the loss nor occurred in stocks readily used by the old distant water fleet. (The latter did, however, initially exploit

the pelagic stocks such as mackerel previously fished largely by Eastern European vessels. This helped to establish the track record that resulted in the UK being allocated much of the TAC for Western mackerel.) The balance on the catching side shifted in favour of the inshore fleet and pelagic vessels thereby suiting the Scottish industry. The latter's familiarity with the sea areas concerned, the appropriate technology and the relevant infrastructure was greater while nearness to the grounds made for more economical working.

In addition the structural measures of the CFP re-inforced the changes with the decommissioning grants taking out the larger but obsolete distant water vessels in England while the grants for modernisation and building helped to expand the Scottish fleet. The approach to encouraging structural change and to developing a restricted licensing system under the first MAGP (1984 to 1986) was fairly relaxed, with only vessels over 10m needing licences and licences given to all existing vessels. (Until then freely available licences had been used solely for conservation purposes identifying who could fish when, where and with what gear; they had no structural purpose and their main contribution was in closing fisheries when quotas became exhausted.) The UK Government believed that fleet structure was for the industry to decide and assumed that competitive behaviour would produce efficiency. Added opportunities were expected to allow for some expansion (as also happened in the US and Canada through moving to 200 mile limits) but natural wastage (through the scrapping of older vessels) was expected to keep the fleet from over-expansion.

Conservation

The CFP was building on a familiar system of stock assessment by ICES leading to calculations of TACs and their sharing by the members of NEAFC. Similarly other measures relating to closed areas or seasons and to type of gear or size of mesh also derived from earlier NEAFC work. The expectation was that restrictions on catches in line with scientific and other advice would secure the future of the stocks and the industry depending on them. Knowledge of how much fish was available was expected to encourage appropriate levels of investment and effort.

The development of the fisheries and the fleets exploiting them did not follow the hoped for lines of enough natural wastage and prudent investment to keep a reasonable balance between opportunity and capacity; open access and encouraging markets signals led to imbalance. Over-investment led to excess pressure on the stocks in all the grounds around the UK and resulted in very low TACs for the cod and haddock on which the industry depends for a significant part of its revenue. The situation in 1993 and 1994 suggested that fishing effort needed to be reduced by nearly a third to safeguard these stocks.

Structural matters

The measures introduced by EC Regulations 2908/83 and 4028/86 led in the UK to considerable modernisation of the fleet. The removal of many of the distant water vessels under the decommissioning scheme derived from 2908/83 resulted in a drop in tonnage and power which suggested that the initial and

subsequent MAGPs might be met. This proved untrue as the co-incidence of better markets and good fishing in the mid-80s led to what proved to be an excess of confidence in the industry. Emergence from the recession of the early 80s coupled with the availability of large EC and UK investment grants as well as easy credit led to considerable investment; this was mainly in expanding the inshore fleet but some investment went into larger vessels capable of ranging further. As licences were transferable between vessels (or else not needed for vessels under 10m), there was an upward drift in tonnage and power in the larger vessels and an increase in numbers, tonnage and power among the smaller ones. It may also have been the case that decommissioning funds flowed back into new investment. For example owners having more than one vessel could decommission a vessel and use the money to upgrade their other vessel or vessels.

Due to the earlier over-expansion, the situation in 1993 was of a fleet needing to be cut by a fifth before the end of 1996 to meet its targets under

Table 5.2 UK Fleet by segment and MAGP targets

Segment	As at 1.1.92			Proposed Reduction (%)	Objective (31.12.96)	
	No.	GRT	kW		GRT and kW	GRT
Pelagic trawl	88	25,178	80,858	0	22,633	72,060
Beam trawl	200	23,062	107,542	15	17,621	81,465
Demersal trawl	1,105	54,724	278,466	20	39,354	198,533
Nephrops trawl	648	18,140	100,142	15	13,860	75,859
Seiners	274	17,232	89,728	20	12,392	63,972
Netters	273	5,859	35,073	0	10,896	52,137
Liners, etc.	106	6,262	23,430	0		
Shellfish mobile	169	6,007	34,735	20	4,320	24,757
Shellfish fixed	137	2,636	18,397	0	2,370	16,395
Distant water	17	10,987	23,829	0	9,876	21,236
Mixed (non Trawler) <10 m.	7,538	24,438	304,630	0	21,968	271,484
Non-quota/non- active >10 m.	892	20,208	132,102	0	18,165	117,728
TOTAL (objective as at 31.12.96)	11,411	214,733	1,228,922		193,027	1,095,206
					173,455	995,627

Note: 'Liners, etc.' are grouped with 'Netters' for 1996.

Source: UK Sea Fisheries Statistics, MAFF.

the latest MAGP. This excess capacity was fairly general affecting the main sectors of demersal trawl, beam trawl, nephrops trawl and seining; only the pelagic sector with its very restrictive licensing and the static gear sector with its effective selectivity appeared not to need significant reductions. The figures are shown in table 5.1 in some detail.

Marketing

The CFP includes a variety of measures aimed at improving the market for fish. Arrangements for minimum landing sizes probably owe as much to concerns about conservation as they do to demand considerations but they, like the aid for investment in processing and related facilities, helped to strengthen prices. Perhaps the most important impact on the UK related to the development of Producer Organisations (POs). While some of the impetus to set them up was to enable the fishermen to get compensation for withdrawn fish, the subsequent benefits went wider. POs helped to run quotas, develop demand and avoid gluts by bringing demand and supply into line.

Control and enforcement

While enforcement is a matter for national agencies, the CFP provides for the control framework in such matters as recording catches in log books and checking that the national agencies exert the necessary discipline to secure compliance with the various regulations.

5.5.2 Limitations for the industry resulting from UK fishery policy

As with other Member States the UK industry is subject to some influences stemming from past history, some derived from the CFP and some which reflect the current structure of the UK industry and its political environment.

The UK has traditionally favoured open access in the widest sense because of its sea-going and trading interests. Thus its policies were for the most part in line with the 17th century Dutch lawyer Grotius (*Mare Liberum* 1609). He favoured a narrow territorial sea with the rest being international waters free to all, as opposed to the views of the contemporary English and Scottish lawyers Selden (*Mare Clausum* 1635) and Welwod (*An Abridgement of all Sea-Lawes* 1613). Their preferences for a wider exclusive area and less open sea found favour in the UK for a brief time but were superseded as the UK developed its overseas trade in the 18th century.

There was little change in the UK approach until the 70s. With a distant water fleet standing to lose its basic resource at Iceland and elsewhere the UK did not support the emerging consensus in favour of 200 mile limits at the UN Law of the Sea Conference. Like Germany, the UK took the dispute with Iceland to the International Court of Justice at The Hague but the 1974 judgement indicated that the coastal state was entitled to extend its jurisdiction and had preferential rights there. Thus the UK had to acquiesce eventually in the loss of access there. Subsequently the UK extended its limits to 200 miles through the Fishery Limits Act 1976.

The move to 200 miles followed a similar change by Peru and Chile as early as 1947 and by Iceland in a more graduated fashion thereafter. In a way this more restrictive approach not only accorded with 17th century legal thinking in England and Scotland but also with some earlier practices. These mainly related to the feudal system whereby the Crown owns the foreshore and seabed out to the territorial limits (originally three miles but now twelve as currently defined in the Territorial Sea Act 1987). Over the years gifts or other transfers from the Crown put an end to open access in a few shell fisheries and in limited areas controlled by harbour or other authorities, with the recent developments in fish farming adding to the exclusive areas. These exclusions only apply to a very small proportion of the UK coastline, apart from areas like Shetland with its salmon farms. Fresh waters and tidal rivers are not normally open to access except for navigation.

Other interference with the traditional public right to fish in the sea did exist but tended to relate to conservation matters. The measures might be bans on certain activities in certain areas and they might derive from local by-laws or national legislation, possibly reflecting wider concerns such as those of NEAFC, concerned to protect spawning or nursery grounds. These restrictions did not, however, cut across the general freedom to go fishing in the sea.

Major influences of CFP

While the past history explains some of the current situation as far as rights are concerned, the major influences in the development of fishing rights have been the CFP and the existing industry. Many of the resources which the UK industry exploits are held jointly with other Member States and third countries; exceptionally these resources may belong exclusively to third countries such as Canada or Norway and Russia. Thus the basic regulations fall within the area of competence of the EU Council and Commission. The fixing of total allowable catches, the arrangements with third countries and the devising of suitable structural, marketing, conservation and control measures rest there. National policy in these areas is mainly the process of giving effect to EU policy decisions. There will be national measures but these stem from legislative procedures in the main, with relatively few divergences from the CFP beyond some tougher approaches in areas of especial concern.

The important aspects of UK industry structure relate to the ability of much of the fleet to change method or target species and of the processing and distribution industries to cope with differing inputs and market demands. The political attitudes reflect some conflict between the desire on the one hand for control to conserve stocks, communities and employment and the desire on the other hand to let market forces and competition shape the fleet structure in terms of vessels and fishermen. The latter inclination has been perhaps stronger in the last decade than before and it explains the developments of the 80s and early 90s. Planning the structure of the fleet was felt to be inappropriate and restrictive licensing started by covering only certain sectors where the stocks were under heavy pressure. The system had, however, to be extended to all vessels as the competitive race to fish grew in the sectors initially not under pressure and thus left as open access.

The measures affecting access to fisheries are mainly derived from legislation relating to conservation and particularly to the Sea Fish (Conservation) Act 1967. This provided for various licencing schemes used to regulate fishing activity, with licences specifying the conditions applying to permitted activities and with their revocation effectively closing the fisheries when the quotas were exhausted. Other barriers to entry exist in regulations concerning the registration of fishing vessels (the Merchant Shipping Act 1988), the necessary vessel safety certificates and the required qualifications for those in charge of fishing vessels.

National quota management

After the TACs have been set for the EU and the national quotas allocated having regard both to relative stability and The Hague Preference, the UK totals for each species have to be assigned to the various sectors; subsequently their uptake has to be monitored so that closures take place when the national quotas are exhausted.

Currently the UK approach varies by species and sector with the licences giving access to the fisheries reflecting this. The main species of economic interest to the UK and under quota are cod, haddock, monks, plaice, whiting, sole, nephrops, mackerel and herring. The quotas for these species and others so controlled relate to specific areas such as the North Sea (ICES Area IV) or West of Scotland (ICES Area VI) and are managed as discrete stocks. In addition there are other stocks not under quota such as crabs, lobsters and scallops which are of considerable significance. There are as a result well over one hundred different types of licence. With multi-species fisheries and a mobile fleet able to change method and area of activity, many vessels hold more than one licence allowing them to fish in different areas and on different stocks. The sequence of starting the licence system with vessels over 10m fishing the stocks under most pressure and progressively extending the system resulted in five main classes:

- a. Vessels over 10m fishing stocks under quota and initially identified as under severe pressure (Pressure stock licences).
- b. Vessels over 10m fishing other stocks under quota and subsequently defined as under pressure (Limited pressure stock licences).
- c. Vessels over 10m fishing stocks under quota but not regarded as under pressure (Non-pressure stock licences).
- d. Vessels over 10m fishing stocks not under quota (Miscellaneous species licences).
- e. Vessels 10m and under fishing any stocks (General fishing licences).

It should be noted that quite apart from the sub-division of these five groups to cater for areas such as the North Sea, West of Scotland and Irish Sea, there are sub-divisions by method to cover beam trawlers in the demersal sector as well as pursers and freezer trawlers in the pelagic.

POs manage quota

A large part of each quota goes to the POs who then manage them on behalf of their members. POs may set a monthly allocation for each vessel, either on a uniform basis or in relation to their size or past history. Discipline may be enforced by fines or losses of rights where allocations are exceeded or other conditions disregarded. It may be, however, that the overall allocations for a particular species are sufficiently great in some individual year to allow periods of unlimited catching. Equally failure to take enough early in the year may encourage POs to have a spell of 'free fishing' so as to avoid failing to take their allocation and losing out on track record. Such unconstrained catching may have unwanted side effects in marketing terms if excess landings lead to low prices and significant withdrawals with little by way of compensation.

Other parts of the quota are managed on an individual basis by firms or persons entitled to participate in such fisheries as that for the Western mackerel. Apart from management by POs, firms and individuals, the Government may deal with some allocations directly, setting the amounts to be taken within certain periods and by certain vessels. Table 5.3 gives the division of the various quotas among the recipients.

Table 5.3 *Allocations of quotas to POs in 1993*

North Sea	Cod	Haddock	Saithe	Whiting	Sole
SFO	10,879	27,327	1,995	14,030	
Aberdeen	4,259	11,735	1,021	3,724	
NESFO	5,636	14,727		7,648	
Shetland	2,207	5,041	595	2,222	
Fife	301	1,845		332	
Ang/Scot	4,441	7,562		3,042	
YAFPO	2,121	1,109	162	377	179
Grimsby	4,873				
Fleetwood		7			
FPO	1,291	758	2,193		288
NIFPO	97	218		67	225
ANIFPO	10	6	2	2	
Cornish	4	5	1		
S West				11	
ALL PO	36,119	70,340	5,969	31,455	692
Non PO	5,570	7,222	2,071	3,324	540
10m	1,531	58	20	131	138
Total	43,220	77,620	8,060	34,910	1,370

Source: UK Sea Fisheries Statistics, MAFF.

With the exception of the allocations to individual firms or persons, as in the pelagic sector, the entitlements are not vested individually. The other allocations are to groups. It should also be recalled that the fish still belong to no-one until they are taken in a legal fashion and they are still potentially open

to the fishing industry as a whole until the quota or TAC is exhausted. Failure by a particular sector to take its share of quota can lead to some re-allocation to others eligible to take part in the fishery. Access to the various sectors of the fishing industry is more convincingly exclusive as only appropriately licensed vessels may participate, as with beam trawlers in the North Sea. Even there the free for all problem may be partly present because open access still exists though only for the members of the privileged group.

National capacity management

The UK measures for managing capacity have been and probably still are very inadequate. In the early stages of establishing the licensing system the decision was made to include only those species currently under pressure. Species like plaice were not under pressure and were not included despite the fact that they were under TAC and quota regulations. However, as all existing vessels catching cod and haddock were entitled to a licence, as were those taking such a by-catch in their prawn fisheries and those with no current activity but proof of past activity, no real restrictions on pressure stock licences arose at the initial stage. Furthermore, as transfers were allowed so that replacement vessels could enter the fleet, licences migrated to higher powered vessels. Finally the decommissioning scheme was not confined to vessels with pressure stock licences and applied to all vessels such as those pursuing shell fish with no pressure stock licence. Thus while licences still attached to decommissioned vessels were surrendered, nothing could prevent the transfer of licences followed by the decommissioning of unlicensed vessels; in consequence many of the licences associated with decommissioned vessels managed to move to active ones.

The first UK MAGP received criticisms from the Commission because licensing did not extend to vessels of 10m and under. This criticism was well founded and the gap proved significant. When the licensing system started to become more effective for larger vessels with no additional licences available, no dormant ones to re-activate and no increase allowed in capacity in terms of tonnage and power, investment went into rule beaters and the sector with vessels of 10m and under increased substantially. This loophole has been filled by the Sea Fish (Conservation) Act 1992 and all fishing vessels must now be licensed; thus expansion is no longer possible in terms of numbers, tonnage or power in kW. Only in sophistication in fish finding and other technology is there still a source of improved catching ability.

After a stop has been put to the upward drift in capacity, the need then arises to effect some reduction so as to achieve effective conservation and increased profitability as well as meeting the peculiar needs of the MAGP. The national measures in this area now deal with the need to take out more capacity (originally 110% but now 120%) than is introduced when a replacement vessel comes into the fleet or re-engining with more power takes place. The other two factors tending to decrease capacity are decommissioning grants and attrition. Decommissioning was introduced again in 1992/93 and has taken out a limited amount of capacity. As the basis was competitive tendering with low bid winning, the removed capacity tends to be older and less effective but at least the scrapping of the vessels (the only accepted form of disposal) prevents

any possibility of their return while the surrender of the attached licences prevents their migration to more efficient replacements.

After roughly one third of the £25m allocated for decommissioning had been spent in the first of the three years concerned, the Government delayed the next stages due to problems in getting other parts of their effort control programme brought into effect. The scheme was subsequently re-activated, without the element of effort control proposed (days-at-sea) and extended for an additional two years. Attrition naturally continues as older boats become ineffective, do not generate enough funds for re-investment and are removed without their owners replacing them. The relevant licences will be available for transfer, though they are unlikely to be for pressure stocks, and, apart from that, all the measures now in place take out capacity and associated licences. Whether the reductions will suffice for MAGP purposes will depend on the degree of modernisation that takes place. Having to take out 120% of the capacity introduced is of little consequence if few new vessels come into the fleet, but much more significant if confidence and low interest rates lead to substantial new building to repair the neglect of recent years. If such developments occur they will cut the fleet but may result in efficiency gains due to the new capacity being more appropriate and effective.

National effort management

Limits on days-at-sea are to be expected due to natural conditions as well as the sea-keeping qualities of the vessels concerned. In addition the exhaustion of quota before the end of the year is an inevitable consequence of the excess catching power available to the industry. Where the fisheries are managed on a monthly or some other periodic basis, laying up during the year is common. Additional laying up may help relieve temporary and transient pressure on stocks and the UK legislation giving effect to 2908/83 provided for this. The conditions were, however, not attractive to the industry; aid was only paid at a low rate, a lengthy minimum period was stipulated and it naturally applied only to those days in excess of normal days in port. Similar UK provisions were not included when giving effect to 4028/86.

The problems over the North Sea and West Coast cod and haddock fisheries in the 90s did, however, lead to the introduction of such a technical measure. In 1991 such vessels had to be tied up for 8 days each month and in 1992 for 8 days each month or 135 days in total, as alternatives on each occasion to using larger mesh sizes (deemed to have the same effect on conservation). No compensation was given for whatever earnings might have been lost as no appropriate provision was made in the regulations; in any event the conditions for the laying up payments of 2908/83 and 4028/86 (a lengthy tie-up period in addition to normal days in port) would not have been met.

The proposed introduction of individual allocations of days-at-sea is covered by the Sea Fish (Conservation) Act 1992. The provisional allocations (in half-days to increase flexibility in use) reflected the previous activity of the vessels concerned; they ranged from the minimum of 160 to a maximum of 674 half days with the average being 275. Analysis of the provisional Scottish data showed sharp differences between regions and vessel types within Scotland

and an apparently higher average than for the other constituent parts of the UK as a whole. These various differences reflected the different levels of activity normally encountered but were perceived as arbitrary and unfair. Thus, despite the existence of an appeals procedure (and 84% of vessel owners appealed against the provisional allocations), the proposals were resisted by fishermen. This resistance gave rise to litigation which led not to a decision by the appropriate court in the UK but by a reference to the ECJ. While the latter eventually ruled on the matter in favour of the UK Government, it seems unlikely that effort control will be introduced in the proposed form in the near future.

Other measures creating property rights

Regulations under shipping legislation (Merchant Shipping Act, 1988) cover aspects such as the registration of a fishing vessel thereby entitling it, subject to normal rules, to fish against UK quotas. It is an offence to fish for profit unless the vessel is registered. Provisions in this legislation, aimed at restricting registration to vessels with 75% British crews and ownership, were found to be incompetent by the ECJ, being contrary to the free movement of capital and labour as well as the rights of establishment, deriving from the Treaty of Rome and the UK Treaty of Accession. Thus the property right created may be vested in persons or firms outside the UK. The ECJ ruled, however, that the vessels must be managed from the UK to qualify as being established there; the qualifying criteria were that either 50% of landings were made in the UK or 8 trips ended there each year. As noted earlier, such vessels may not be operated without meeting the necessary safety regulations (specified equipment as well as sea worthiness) and crewing qualifications. These too must be regarded as pre-requisites to exercising rights.

Property rights also arise in coastal fisheries. Historically the Crown owned the foreshore and seabed of the territorial waters (now out to 12 miles). Under the Crown Estate Act 1961, the Crown Estate Commissioners look after the Crown Estate on behalf of the nation, including such activities as leasing coastal areas for fish or shell fish farming. These leases and earlier gifts to individuals and local authorities have created, for set periods or in perpetuity, entitlements to harvest the relevant production, whether farmed or natural as in certain oyster and mussel beds.

5.5.3 Property rights in the UK fishing industry

The existing property rights vary considerably between the sectors and it is worth considering them individually. It should be stressed that all licences are subject to Ministerial discretion and that all regulations creating rights are open to change with the passage of time or under political pressures. The most important of Scott's list of six characteristics of property rights, quality of title, is thus the one under most question. Ownership remains uncertain and open to challenge over time. The aspect of duration is also uncertain as the licenses are issued on an annual basis with only an expectation of continuity rather than a guarantee of it. A change in legislation or administrative practice may

see the rights amended or extinguished. Similarly the other attributes of transferability, flexibility, divisibility and exclusivity are all only what the enabling legislation and current interpretation allow.

Pursers and freezer trawlers in mackerel and herring fisheries

This small sector paradoxically benefited from the problems besetting the pelagic fisheries in the 70s, culminating in the 1977 ban on fishing for herring in the North Sea. It thus had a very restrictive licensing system imposed in 1980 not allowing any additional pursers (vessels using purse seines) or freezer trawlers into the fleet. Subsequent improvements in the mackerel and herring fisheries led to considerable pressures for admission to the exclusive group. This was resisted apart from a decision by Ministers to licence five additional vessels in the mid-80s. Despite the precedent of that dilution, there has been no further undermining of the rights created.

The current situation is that for all practical purposes the licensed vessels have an individual vessel quota. The two main POs involved, the Scottish Fishermen's Organisation and the Shetland Fish Producers' Organisation manage their allocations while individual firms and persons look after theirs. Any problems over transferability or divisibility of the quotas can be resolved within the POs. This is necessary since allocations depend on catches in the previous two years. Individual firms or persons are allowed to get up to 70% of their allocation taken by another vessel so that they too can maintain their track records.

Beam trawlers

Again this sector has benefited from concerns about conservation and the threats posed by a very efficient system of catching flatfish. Very tight licensing has restricted the number of beam trawlers, initially in the South West and English Channel (Area VII) but subsequently also in the North Sea (Area IV). As with the pelagic sector, pressures for admission to the sector have developed and resulted in the addition of two vessels in the South West under the provisions for Ministerial discretion. Reaction from the sector was unfavourable and there has been no subsequent dilution.

Management of the amounts allocated to the firms and POs involved allows a certain amount of flexibility and transferability but does not approach the virtually individual quotas found in the pelagic sector.

Demersal trawlers and seiners

These vessels form the most important sector in terms of economic importance. They land most of the demersal species, apart from sole and plaice where the beam trawlers are more significant. This sector is mobile not only in terms of grounds worked and species caught but also in method used. In consequence they tend either to hold a variety of licences over the year or have a very wide entitlement to enter a number of different fisheries.

The rights in this sector are to participate in a number of fisheries but the allocations are not to individuals but to POs or for those outside PO membership by the Government setting the allocation for individuals in that group.

Furthermore, the amounts are not secure against alteration as track records determine allocations.

Nephrops trawlers

This sector, though economically important, exploits a stock that is under quota but not thought to be under excess pressure. The vessels involved are mainly older and smaller with only a non-pressure stock licence in many cases. Their rights in demersal fisheries are usually limited to the by-catch provision and further restricted in many cases to Areas VI and VII due to historical activity. (Some vessels do, however, hold full pressure stock licences and may switch from nephrops to demersal species from time to time.) To the extent that the state of the stocks is correctly defined as not being under pressure, the limitation on entry probably confers only protection against future developments if technology, stocks or markets improve sufficiently to generate a demand for additional licences.

Static gear

Again this sector is characterised by smaller and older vessels, frequently catching species not under quota though often very valuable such as lobsters. Thus the licences tend to be less flexible and confer only limited rights as in Miscellaneous species or Non-pressure stock licences.

Vessels under 10 metres

This sector expanded considerably when left un-constrained under the earlier versions of the licensing system. While many of the species pursued are not covered by quotas, significant landings of species under quota, such as cod, are made. The system of allocation of species under quota is handled by the Fisheries Ministries on a monthly or other basis. The rights conferred are thus both very limited and subject to arbitrary change.

	Vessel Registration	Fishing Licence	Approval of Replacement
Objective	Allow entry to fishing industry	Limit access, catch taken and effort deployed	Reduce capacity
Issued by	Department of Transport	Fisheries Ministries	Fisheries Ministries
Right conferred	Introduce vessel	Catch fish as specified as to species, area, method and amount	Introduce replacement vessel of lower capacity
Allocated to	Vessel owners	Vessel owners	Vessel owners
Period	5 years	Annual or less	Limited and related to time to build or acquire
Transferable	Re-registered when sold	With vessel when sold	Only if with original vessel
Enforcement	Department of Transport	Fisheries Ministries	Fisheries Ministries

Figure 5.10 Property rights in the UK fisheries

Figure 5.10 shows the general position over property rights in the UK. (There is also a helpful table labelled appendix III in the paper given by Hatcher and Cunningham at the 1994 EAFE Conference showing the relationships between the various stocks and types of licence for the main part of the UK fleet.)

Institutional environment

Figure 5.11 below shows the environment in which the fishing industry operates. There are systems for detailed consultations with the industry before enacting legislation. Equally there are formal and informal arrangements to discuss and negotiate with the industry any policy initiatives either proposed or under consideration. Such discussions naturally go wider than representatives of the fishermen and Fisheries Ministries. Scientists and other professionals will be involved in stock assessments and technical measures, such as mesh sizes, while merchants, processors and retailers will be involved in consultations considering aspects of demand and distribution (including imports). Equally control and structural measures may widen the range of consultations to include other policing services and other ministries, such as transport and industries, such as boat building.

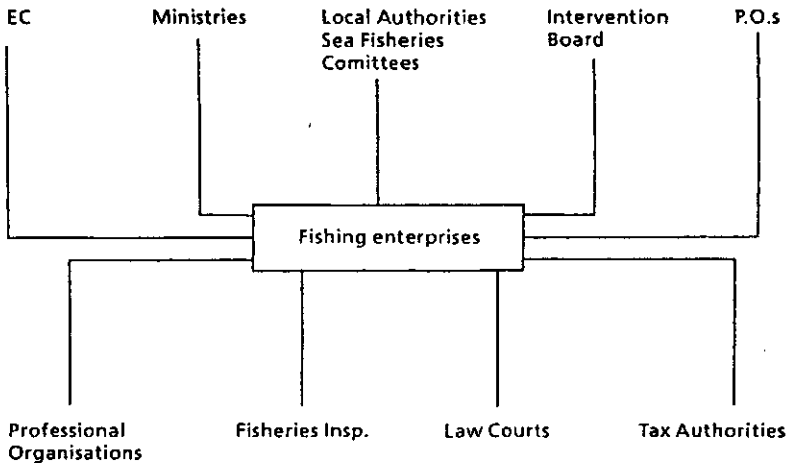


Figure 5.11 Institutional environment for fishermen

5.5.4 Changes expected in the UK situation relating to property rights

The immediate future is not expected to bring many changes. Three areas bearing on rights were identified in the 1993 report from the Agriculture Com-

mittee of the House of Commons on 'The Effects of Conservation Measures on the UK Sea Fishing Industry' and the Government's reply to it. These related to days at sea, ITQs and licence charges. On the first the Committee tended to side with the industry in its resistance to the introduction of effort control through limits on days-at-sea. In response, the Government remains of the opinion that such effort control is essential and looked to its possible introduction subject to a favourable response from the ECJ (subsequently received). This would add a property right as the intention is that days-at-sea should be freely transferable. This might necessitate the use of a standard unit in terms of capacity and days, such as VCU Days where VCU stands for Vessel Capacity Units and $VCU = \text{length} \times \text{breadth in metres} + 0.45 \times \text{power in kW}$.

As to ITQs, the report recommended their introduction backed up by enhanced technical measures such as increases in mesh sizes and landing sizes to avoid problems of discarding and remove the need for high grading. The Government's response was guardedly negative, noting the opposition of the industry and adding its own concerns about the costs and complexities of enforcement in multi-species fisheries with a large heterogeneous fleet. There were also the political problems over initial allocations and subsequent ownership patterns. The report's observation on the possibility of charging for licences met an even more careful response from the Government. The latter noted that it had taken powers under the Finance (No.2) Act 1987 to charge more than the administrative costs of issuing licences by also allowing the costs of the associated enforcement to be recovered in the licence fees. The Government did, however, indicate that it had no present plans to do so.

Other developments which may occur over time relate more to structural considerations. The system of allowing replacement only when 20% more capacity is withdrawn than is introduced may be subject to change. The indications are that this approach to re-structuring has proved more acceptable to the industry than expected and thus the possibility exists that the Government may increase the amount of additional capacity needed. (The Spanish approach in the 80s was of two for one i.e. 200% taken out for 100% introduced.) In addition the POs are now allowed to buy up track records of fish caught and the associated capacity in VCUs. The current approach by one PO is to acquire quota but not share it out to the individual vessels on a permanent basis, keeping the additional entitlement 'ring fenced' as belonging to the group as a whole. (The additional capacity is made available for any replacement vessels brought in by members of the PO.)

The communal approach has commanded the apparent public support of the industry for some time and accords with the belief that fish are for the communities that make up the industry and not to be expropriated by individuals. This may, however, not appeal to firms and individuals who may press to get individual enhancement of entitlement. In any event to the extent that decommissioning takes out vessels and other reductions occur, rights will be strengthened and their value underlined, especially if as with the pelagic sector in the 80s, stocks improve. Perceptions may accordingly alter and the undoubted resistance by the fishermen to any form of ITQs may diminish.

Effort control might have been expected when the ECJ reached its favourable conclusions or when the arrangements were made to control effort following access by Spain and Portugal to certain previously restricted areas (the 'Irish Box'). Such a development has not yet happened. Whether and how effort control would be introduced thus remains unclear. The previous allocations of days-at-sea are now out of date and would need to be changed. The system of initial distribution, even following satisfactory resolution of the appeals, remains contentious; as before it would probably relate to past history of activity while arrangements for transferability would have to take account of the size in capacity units. The precise nature of the rights conferred is perhaps less important than the fact that the necessary restrictions will prove of value to the owner. What may impede progress is the development through the buying and selling of track records of a possible alternative route to effective effort control; this process has naturally created vested interests with assets to lose if a different property right comes into being.

5.6 Property rights in other countries

5.6.1 Property rights in Iceland

Before 1976 there was open access to the Icelandic fisheries. In 1976 the extension of fisheries jurisdiction to 200 miles was implemented. A management system designed mainly for protection of juvenile fish was in force at that time and is still in force.

In 1976 the first individual vessel quotas were introduced in the herring fishery and gradually this system has developed to become a complete uniform system of transferable vessels quotas in *all the fisheries in 1990*. In 1979 the individual quotas in the herring fishery were made transferable. Individual quotas were implemented in the capelin fishery in 1980 and made transferable in 1986. In the most important fishery, the demersal fishery, individual quotas were introduced in 1984, transferable from 1988.

The objective of the ITQ-system 1) was to improve the economic efficiency of the fisheries. The fishing industry is Iceland's most important industry. The industry's total contribution to Gross Domestic Product (GDP) including the indirect effects is about 35-45%. Fish products are Iceland's most important exports. Any fishery policy has far-reaching implications for the macro-economy and an efficient policy seems therefore more necessary than in f.ex. EU, where the fishing sectors macro-economy role is very small.

The management units are shares in the TAC for every species for which there is a TAC. The shares are allocated on a permanent basis, i.e. the time period of duration of the ITQs is indefinite. The TAC-shares are completely transferable, however, some restrictions remain on transfers of annual quotas. Such

1) This draws on Arnason, R. 1993 'Iceland's ITQ System' Marine Resource Economics Vol 8(3).

transfers between regions is for example subject to certain conditions. Another restriction is that, if a vessel did not harvest 25% of its annual quota for 2 years in a row, it would loose its permanent share.

The Ministry of Fisheries is responsible for the regulation and the enforcement of the system. There is a levy on right - about 0,2% of the catch value - to cover the cost of monitoring and enforcing the regulations. In the period of introduction (1976-1990) there was no capacity regulation (i.e. a decommissioning scheme), however, in a period (1985-1990) effort quota options were in force as well, which have had ill-advised effect on the development of fishing effort. Two other exemptions from the ITQ system are present in the demersal fishery. Longline fishing during the period November to February is not under quota restrictions. Second, vessels under 10 GRT could fish freely at the outset of the system in 1984. From 1990 vessels under 6 GRT could elect to stay outside the ITQ system. Then they must use hook and line and they are regulated by a limited number of fishing days.

There is also restricted access. Every vessel must hold a *valid fishing license*. Replacement of vessel is only allowed if fishing power is not extended. The licenses are not transferable. ITQs are closely linked to fishing vessels. Only those who own fishing vessels with a valid fishing license can hold quotas.

The Icelandic ITQ-system, which includes allocation of quotas on a permanent basis, a high degree of transferability and exclusivity should according to the theory increase the efficiency in the fisheries. This has also in general been the effect of the system. However, in the demersal fisheries the gain in efficiency has been less, because of forces outside the individual quota system (the effort quota and exemptions of vessel under 10 GRT). Only since 1990 the Icelandic ITQ system has been a close shop.

Changes in the system came into force on January 1, 1996 according to a new legislation passing the Icelandic Parliament in July 1994 1). The regulation will only allow a vessel to catch twice its allocated quota equivalent of cod. This will limit the possibilities for many vessels with small quota allocations and it is expected that the legislation will result in a reduction of the fleet. It is also expected that the demand for permanent quotas will increase in the future and that the trend for quotas to collect in the hands of a few financially strong companies will be encouraged. Also in 1994 the harvest requirement that a fishing vessel should harvest at 25% of its annual quota for 2 years otherwise it could loose its permanent share was doubled to 50%. The purpose of these restrictions on transferability is to discourage speculative quota holdings.

1) Eurofish Report, August 18, 1994.

5.6.2 Property rights in Norway

In 1972 the *Government* was given the authority to introduce limited entry 1). Before 1972 the fisheries were in principle not regulated. After introduction of the extension of fisheries jurisdiction to 200 miles more national regulation was necessary. The Norwegian regulation started with licence limitation, continued with total quotas and quotas for a group of vessels. The current regulation is still based on this approach, however, it has been extended with individual vessel quotas.

The regulation is based on ecology principles, and has as the main objectives to increase economic efficiency and maintain the settlement and employment in outlying districts. These objectives are somewhat conflicting and it probably one of reasons why Norway still has a relatively centralised fishery policy. The fishing possibilities are distributed to various fleets and regions. For example vessel quotas have been used as a means of income distribution within a group of vessels.

For stocks that are shared (in the case of Norway mainly with EU, Sweden and Russia) the countries seek to coordinate the management, i.e. the conservation. Over 80% of the Norwegian catch comes from shared stocks.

The total catch in the Norwegian fisheries was 2.6 million tonnes in 1992, where in 1990 the total catch was about 1.7 million tonnes. The first-hand value of the Norwegian catches was in 1992 approximately NKr. 5.8 bln. In the 1980s the catch volume declined from a level about 2.5 million tonnes to 1.7 million tonnes in 1990. This was mainly due to reduced catches of capelin and cod. The increase in the catch volume in the 90s is mainly caused by recovery of the cod and capelin stocks.

In total 17,400 vessels were recorded as fishing vessels in 1990. The main part of the fleet consists of about 4,000 vessels. Another 4-5,000 vessels are used in part-time fishery. The fishing fleet consisted in 1990 of about 3,700 vessels with length over 8m, which conducted year-round fishery. About 2,000 of these full-time vessels is between 8 and 13m, which in the case of Norway is regarded as smaller vessels. The coastal fleet consists of vessels under 25m of which 4,600 vessels were full-time used in 1990. There are about 4,500 part-time vessels in the coastal fleet as well.

The number of registered fishermen was 27,518 in 1990, of which 20,475 full-time fishers.

About 80% of the Norwegian fishery in value is regulated today by some sort of licence limitation or vessel quotas. The *aim of the regulation* has been to prevent further expansion in the fishing effort. At the time of introduction of the regulation by limited entry, i.e., licences, in the different offshore fisher-

1) The section is based on 'Individual quota management systems in Norway' in 'The Use of Individual Quotas in Fisheries Management', OECD, 1993, 'Norsk fiskerinæring: landeanalyse' by Bjørn Hersoug in 'Fiskerinæringens hovedtrekk-landeanalyser', Nord 1992:30 and 'Regional Enterprise Share Quota Mangement System' by Torbjørn Trondsen and Jostein Angell in Proceedings of the IV Annual Conference of EAFE 1992.

ies, several resource and capacity problems were already present. There are different offshore vessels licences depending on the gear type, e.g., purse seine, cod trawl and shrimp trawl. The vessels participate in different fisheries. For example the purse seiners may participate in the capelin, the blue whiting, the herring and mackerel fishery. To participate in the different fisheries an additional licence is normally required and in many cases the licenses specify an individual yearly quota.

It is mainly the coastal fleet which uses a variety of gears i.e. hook-and-line, gillnet, longline, Danish seine and shrimp trawl that have not been regulated by these measures. These fleets, in general, have been regulated by vessel group quotas. An exception is the cod fishery, which, however, is the most important fishery for the coastal fleet, where a vessel quota system has been introduced in 1990. The allocation of these quotas is based on length of the vessel and the level of activity of the vessel in the 1987-1989 period. This system was introduced as a response to a crises in the cod fishery and supposed to be temporary. However, the system is now permanent, even now if the cod stock has recovered since 1990.

In short, most of Norwegian fishing today is regulated through licences and/or individual quotas.

According to the regulation the licences are *not transferable*. In practice the licence follows the vessel, when the vessel is sold, which all things equal leads to a higher sales price. This has, however, not caused a major reduction in the fleet. Also vessel quotas, which have been introduced parallel to licences, are *not transferable*, and it has therefore not resulted in any major adjustment of the fleet. The main instrument regarding adjustment of the fleet has been *scrapping programmes*.

The *fishery policy in the future* is planned to contain extensions and improvements of the existing system, i.e. an ITQ-system is not actual. For example it is planned to stimulate fleet adjustment by permitting merging of licences from several vessels, and withdrawal of the remaining vessel permanently from the fleet. In that case, the vessel quota attached to the licence can be kept for a certain period.

5.6.3 Property rights in Canada

Canada has probably had the longest record of all the nations seeking by detailed regulation to foster and control a large modern industry. Two background reports reveal the consistent interest of policy makers and the thoroughness of the investigations into the fishing industry. The first is *Turning The Tide, A New Policy For Canada's Pacific Fisheries*, also know as the *Pearse Commission Report* as the relevant Commissioner was Peter H. Pearse. The second is *Navigating Troubled Waters, A New Policy for the Atlantic Fisheries*, also known as the *Kirby Report* as the chairman of the relevant Task Force was Michael J.L. Kirby. Both were published in 1982. The legislation for conservation and other wider aspects rests with the *federal* Government while its laws on property are matters for the *provincial* Government. Its processes in creating rights in terms of access to fisheries through exclusive licensing and through

allocation of quantities to be caught have had to deal with a very wide range of stocks, fleet structures and dependent communities. Their experience thus indicates the various problems and solutions which have been tried. Some indication of the preeminence of the Canadian experience is given by the list of individual quota programmes in the 1992 National ITQ Study Report prepared for the US National Oceanic and Atmospheric Administration; out of 37 programmes listed, 18 are Canadian.

While Canadian experience in creating property rights in fisheries takes in everything from licensing vessels and methods to allocating quota shares to communities or individuals, the significant interest at present is in individual quotas. A brief description of some of these is given below. It draws heavily on the 1989 report by Ben Muse and Kurt Schelle of the Alaska Commercial Fisheries Entry Commission.

	Year Adopted
Atlantic Fisheries	
- offshore lobster	1977
- snow crab	1979
- offshore groundfish	1982
- gulf of St Lawrence fisheries	1989, 1991
- scotia-Fundy inshore fisheries	1991
- herring	1983
- offshore scallop	1986
- northern shrimp	1987
- offshore surf clam	1987
- offshore tuna	1987
- midshore groundfish	1988
Pacific Fisheries	
- abalone	1979
- herring	1980
- black cod	1990
- geoduck clam	1989
- halibut	1990
Freshwater Fisheries	
- Lake Winnipeg	1972
- Lake Erie	1986

Figure 5.12 Individual quota programmes in Canada

5.6.3.1 Bay of Fundy Herring 1976-1981

The problem arose from the expansion of the fishery in the 60s due to a good market for processing for meal. Vessel numbers rose from 20 to 107 between 1963 and 1968. Fish stocks collapsed and with them the boom so that the fleet shrank to some 50 vessels by 1975. These were not doing well.

The aim was to solve the problem by improving markets and conservation by setting up a co-operative, selling at sea to Polish vessels and having individual quotas subject to weekly catch limits. The fishery was already subject to limited entry licencing.

The programme was set up by the *Federal Government*, starting in 1976 and covering only vessels purse seining for herring in the Bay of Fundy. Only those vessels active in the fishery in 1975 were *eligible*.

The system of allocation changed over the period with the initial main emphasis on historical performance giving way, after a combined approach of history and vessel size, to one based on equal shares.

The shares were *temporary* and only lasted for one season. While there was *no trade* in the quotas as such, there were provisions for those who fished cooperatively to pool their weekly allowances. This may have allowed an informal leasing system which, like the administrative re-allocation of uncaught quota, possible looked after the needs of those who had taken large catches historically and still needed them to stay profitable.

Enforcement proved inadequate and difficult despite the limited number of vessels. Bulk discharge from vessels to tankers and by them to processors led to a lack of monitoring of the quantities. In addition, discharge could take place at a large number of locations. Prosecutions failed when cases were brought, either for technical reasons of official estimates not proving that underreporting had taken place or for legal ones with the courts finding the powers of the basic legislation inadequate.

The rights were conveyed to the individuals *without charge* and there was no subsequent levy related to their exercise.

The *benefits of the programme* were uncertain. Prices rose but this may have reflected improved export markets. It can be argued that the strength of the cooperative in dealing with processors and foreign buyers may have helped on prices. *Decommissioning* did not occur and what seems clear is the failure in conservation due to misreporting and a consequent failure to respect the TACs.

5.6.3.2 Bay of Fundy and Gulf of St. Lawrence Herring 1983 onwards

The problem, though it grew out of the failure of the earlier scheme, was seen in slightly different terms. The difficulty was seen as too many vessels pursuing too few opportunities. The underlying problem, however, remained that of over capacity and failures in conservation.

The aim was to use a system of *transferable individual quotas* to encourage the creation of an appropriate fleet structure by reducing the number of vessels, so that pressures on income and stocks could be alleviated.

The programme was set up by the *federal government*, starting in 1983 and covering vessels purse seining for herring in the Bay of Fundy, the Atlantic coast of Nova Scotia and the Gulf of St. Lawrence. *Eligibility* was confined to those vessels that had fished in one year during the period 1980 to 1983.

The *allocations* were made to three sectors. Sixteen vessels based on the Gulf of St Lawrence each had 6.25% of the total allowable catch for that area.

Of the 49 vessels based on the Bay of Fundy, those also participating in the winter fishery off the Atlantic coast of Nova Scotia received 2.7% of the relevant TAC with those fishing only in the Bay of Fundy getting 1.6%.

The shares were allocated for *ten years* and were fully *transferable*, subject to certain conditions. The latter included no sales of quota to processors by fishermen. Processors could only buy from other processors and there was an upper limit of 4% of the total quota for vessels in the Bay of Fundy. Quota shares had to be sold in total though they might be subdivided and acquired by several other fishermen. Sale of quota with the vessel licence to a new entrant left the structure the same but disposal of the quota share without the vessel licence saw the latter expire in the following year. This resulted in one less vessel in the fleet. Formal leasing was not allowed but the arrangements for pooling between vessels let an informal system occur.

Enforcement still proved difficult and misreporting continued. Despite added resources successful prosecutions proved elusive. Effective conservation did not occur but improvement in the stocks in relation to demand made this less significant.

As before there was *no charge* made by the authorities for the licences and allocations.

The *structural impacts* were noticeable with the Bay of Fundy fleet decreasing from 49 to 40 vessels as a result of the programme. The effect in the Gulf of St. Lawrence fleet was a fall from 16 to 14 vessels, with other influences taking out a further 3 vessels. It is understood that the programme continues after its initial ten year period.

5.6.3.3 Atlantic offshore groundfish 1982 onwards

Despite limited entry licensing in this sector, 1981 saw considerable problems develop due to *excess capacity* causing the quotas to be taken very quickly with ill effects for processing employment and product quality.

The *aim of the programme* was to allocate to the companies involved appropriate shares of the TACs so that they could plan both their catching and processing activities more effectively.

The programme was set up by the *federal Government* after consultation with the companies. The 1982 approach of involving only the 4 largest companies was dropped in favour of one with all the companies participating in 1984.

The system of *allocation* to the companies took place after the shares in the TACs for the inshore fleet and foreign operators were deducted. The allocations were the *percentage shares* of each stock based on past levels of catches with provisions for sharing *pro rata* in any declines and for making adjustments if TACs increased substantially. The latter approach was intended to deal with a perceived unfairness if the stocks recovered or improved differentially; companies depending on stocks which had not improved would have been disadvantaged otherwise. Efficiency might also have suffered with chance increases in landings falling to companies without adequate processing facilities.

The shares were initially limited in *duration* to a five year period from 1984 but subsequently continued and the arrangements for transfer were restricted to exchanges within a particular year. No provisions existed for permanent transfers.

Enforcement poses few problems in this sector, mainly because of the limited number of vessels and associated processing facilities. It is thus easier to monitor fishing activity (done by independent inspectors on the vessels) and production levels on shore. No court cases have occurred.

The rights in this programme are subject to an annual *charge* related to the level of catches.

The *benefits* of the programme occurred mainly on the processing and marketing sides. There was some reduction in effort but little evidence of substantial rationalisation of the fleet. It did, however, decline from 123 active vessels in 1982 to 98 in 1987. Economic benefits stemmed from catching in line with market demand and extending the season which allowed rationalisation in plant and employment as well as improving the quality of the product.

5.6.3.4 Newfoundland inshore cod 1984 onwards

The *problem* here was of excessive capacity leading to a very concentrated season which in turn posed problems for catchers, employment in processing and quality of product. Progressively more of the cod were taken in the winter fishery off the south west of Newfoundland, increasing the risks to fishermen and removing the opportunities for those in more northerly fishing communities.

The *aim of the programme* was to allocate individual quotas to the 108 vessels licensed to be in this sector. The expectation was that such a move would stabilise the fishery, extend the season, improve profits, reduce safety problems and avoid gluts.

The programme was set up by the *Federal Government* in 1984 for three years initially but extended thereafter.

The system of *allocation* was originally left to the fishermen in four groups defined by home port and reliance on the shrimp fishery. Subsequently their preference for uniform allocations in each specific size group resulted in a similar approach being adopted throughout the fleet with four size groups recognised.

The *individual quotas* are issued on an annual basis, reflecting the changes in the relevant TACs. They are not transferable except in association with the licensed vessels. These sales are restricted to local fishermen or operators so as to maintain regional employment apparently. Leasing is only permitted where a vessel has been lost and not yet replaced.

Enforcement runs into problems in some respects because illegal landings and mis-reporting of catches are possible and difficult to detect. The rights do not have *charges* attaching to them.

The *impacts of the programme* have been mainly in the areas sought. Safety is thought to have improved and the fishermen are pleased with the ability to fish in relation to market indications. The lengthening of the season

has brought benefits on the employment and processing side. The effects on the fleet structure have been minimal, with only a few vessels leaving the industry.

5.6.4 Property rights in the United States

5.6.4.1 General characteristics

Like Canada the United States obtained considerable new resources when the limits went out to *200 miles*; their enjoyment of the improvement in revenue was almost as short lived as that of Canada. Their investment and effort expanded to take the fish no longer caught by foreign fleets. At first the expansion left space for joint ventures with some of the displaced foreign vessels but eventually such ventures were superseded by those conducted by US vessels. In time the expected problems of open access showed in excess capacity and depleted stocks. The various programmes to deal with the current situation, like those of the past, concentrate more on *technical measures* and *limited entry* licensing than on individual quotas. The latter are mainly found in freshwater fisheries, with only a couple of West Coast roe herring fisheries and one clam fishery on the coast providing examples from sea fisheries.

US legislation is focused on *conservation* with perhaps less emphasis on the economic aspects. This may well reflect a different perception and legal tradition. For example, anti-trust legislation was used to break up what was seen as restraint of competition when the fishermen tried to organise the Gulf of Mexico shrimp fishery on a coordinated basis. With the complication of federal and state responsibilities in regulation, as well as the massive recreational interest, the different legislative approach is inevitable. The Magnuson Fishery Conservation and Management Act 1976 leaves the *ownership* of harvesting rights vested in the nation, except where allocated under a current programme but only for the duration of that programme. It is thus not the obvious vehicle for creating durable and transferable property rights, a point reinforced by the interpretation that it does not allow for selling either licences or quotas. Such values as may accrue to the owners of rights to operate in restricted fisheries are undeniable but their persistence is not secured. Attempts in the 80s to privatize the huge stock of federally owned land encountered such resistance as to leave it in public hands and this attitude may underlay the approach on fisheries. Bromley provides useful background on this in his 1991 book, *Environment and Economy*.

The list in figure 5.13 (from the previously mentioned National ITQ Study Report) indicates that most of the relevant US programmes are in freshwater fisheries.

The US experience is mainly in freshwater fisheries but these provide further examples of the varying aims, operational methods and achievements of any individual quota system. The example chosen is the longest standing one.

	Year Adopted
Wisconsin: Lake Superior lake trout	1971
San Francisco Bay herring sac roe	1982
Wisconsin: Yellow perch	1983
Wisconsin: Chub	1983
Wisconsin: Menominees	1989
Wisconsin: Whitefish	1989
Yaquina Bay, Oregon herring sac roe	1989
Mid-Atlantic surf clams and ocean quahogs	1990

Figure 5.13 Individual quota programmes in the USA

5.6.4.2 Wisconsin: lake Superior lake trout

The previous history of this fishery was of several depressed stocks which did not recover sufficiently for a commercial fishery until 1971.

The aim was to build on the limited entry licensing programme introduced for other stocks in 1968. The intention was to sustain the fishery but also to cut back on the numbers involved.

The programme was set up by the state (Wisconsin) Government and the initial allocation was to the 32 persons who held licences to fish for the various species available.

The basis for allocation was equal shares for all the licence holders. The allocations are given to those eligible but the number has been reduced over the years by initially not permitting transfers and by tightening the conditions relating to investment and effort. Transfers are allowed now but they only take place through a departing licence holder handing over his licence and quota share to his replacement. There are no provisions for subdividing quotas, for holding additional quota share or for anyone holding more than one licence and associated quota. Leasing is, however, permitted and provides some scope for transfers but the owner must remain active in some other fishery in Lake Superior to retain his licence.

Enforcement has posed problems with overfishing and under reporting threatening conservation. A satisfactory prosecution, involving a heavy input of time and expenditure, has, however, improved matters. The rights are subject to a charge.

The benefits appear to relate to improved marketing and catching economic. The cut from 32 to 21 fishermen arose because of attrition and inability to transfer licences on any basis during the initial stages of the programme.

5.6.5 Property rights in New Zealand

5.6.5.1 Implementation

A management system using Individual Transferable Quotas (ITQs) was *introduced* into New Zealand Fisheries 1) on 1 October 1986 2). The fishery for each species was divided into a number of fish stocks. In 1989 there were 169 *fish stocks* in the system. Each fish stock is composed of one or more Quota Management Areas (QMAs). Most of the species caught are taken in trawl fisheries which are multi-species fisheries.

Quotas were *allocated* on the basis of individual catch histories. Fishermen could chose their best two years out of the years 1982-1984 to form the basis for provisional maximum and guaranteed minimum ITQs for each species.

Fishermen were given the opportunity to sell part of their provisional ITQs to the Government on a competitive secret tender basis. Later in 1986 TACs of certain species were increased and were offered to the industry by competitive tender.

Fishermen were given the right to appeal to a Quota Appeal Authority (QAA). The decisions of this QAA were reviewable by the courts. Where the QAA increases an individual quota the Ministry of Agriculture and Fisheries (MAF) increased the TAC.

Allocation on the basis of catch history has led to races to create catch history where it was known that a particular fishery was to be put on ITQ in the near future.

The Government allowed deepwater quota holders to catch their quota by chartering foreign owned vessels and operating them under NZ fishery registration.

To resolve by-catch problems the following mechanisms were built into the management system:

- allowance for fishers to over-catch their ITQ by up to 10% in a given fishing year or carry over up to 10% of their ITQ to the next fishing year;
- trading of ITQ;
- fishing on behalf of another ITQ holder;
- surrender of the port price value of over caught fish to the crown;
- exchange of uncaught ITQ for over-caught ITQ (the catch/quota trade-off mechanism).

1) The information in this section stems for a large part from the article 'Management of Multi-species Fisheries in New Zealand by Individual Transferable Quotas', by John H. Annala, Keving J. Sullivan and Arthur Hore, ICES 1989 MSM Symposium/ No 41.

2) ITQs had been introduced in New Zealand fisheries in 1982.

5.6.5.2 Property rights

Quotas are freely *transferable* between New Zealand residents or companies with less than a 20% foreign ownership. However, the Government has imposed limits on ITQ ownership. No individual or company may possess more than 35% of TAC in the case of deepwater species and 20% of TAC in the case of inshore species.

Initially a specified tonnage of the TAC was *allocated* to quota holders. Fisheries legislation obliged the Government to compensate ITQ holders who take a reduction in their holding. Changes of TACs were brought about by the Government buying and selling quota. Later on, however, New Zealand has moved to a proportional quota system. Therefore, New Zealand ITQs can be stated as 'the right to harvest a specified percentage of the Total Allowable Catch (TAC) from a stock in a given Quota Management Area (QMA)'.

The legislation bringing in the ITQ-system confirms that ITQs are issued to quota holders in *perpetuity*. A representative of the New Zealand fishery industry (Robins, 1988) states that ownership in perpetuity enabled his company to plan, almost to the day, its fishing operations and to offer its customers reliable year round deliveries. He also stated that his company is under no pressure to overcapitalise.

New Zealand quota holders have to pay *resource rentals* to the Government. These rentals are paid on quotas held and not on fish caught. Government and fishing industry agree that these rentals are used to finance the management of the fishery.

Falloon (1993) reports a rapid change in the structure of *quota ownership* shortly after the introduction of the ITQ system. An interesting development was the selling of quota to processors in exchange for ongoing contracts to supply fish. Processors pooled these quota and in doing so were able to even out fluctuations in catches. Falloon concludes that quota probably resulted in closer integration of fishing and processing operations.

A development that was connected with the creation of property rights in the fishery was the claiming of fishing rights by the aboriginal people of New Zealand. Falloon expects that these claims probably never would have been developed without the advent of these property rights.

5.6.5.3 Effectiveness of the system

The main problems experienced within the new system were *by-catch problems*. Annala (1989) states that these problems were due to the fact that TACs had not been set in proportion of pre-ITQ landing level and because of natural variations in stock size.

For example in 1986-87 TAC over-runs ranged from 1.7% to 80.5%. The major causes for TAC over-runs were 10% ITQ over-runs, surrenders to the crown and catch/quota trade-offs. A total of 122 tons of quota was traded in exchange for landed catch.

The possibility of surrendering over caught fish to the crown was introduced to prevent dumping of fish. It may, however, also result in ITQ over-runs.

The mechanism of trading off under-caught ITQs for over-caught ITQs brings flexibility into the system. A disadvantage of this mechanism is that it may lead to TAC over-runs where large amounts of under-caught quota for species for which TACs are set too high can be traded-off for overcatch of another species.

5.6.6 Property rights in Australia

In 1984 ITQs were introduced in the southern bluefin tuna fishery 1). Since that time ITQs have been introduced in several other Australian fisheries. The objectives of these ITQ schemes are to prevent fish stocks from depletion and to improve the economic performance of the fleets.

ITQs were preferred above other management schemes, mainly due to bad experiences (overcapitalization) with input controls. Moreover, bio-economic analysis by modelling before the introduction had shown a higher net present value of profits under an ITQ-system compared with alternatives.

The ITQs are allocated by the *Australian Fisheries Management Authority* as a fixed percentage of the Total Allowable Catch. This percentage has been partly based on catch history (by 75%) and investment in the fishery (by 25%). The eligibility of the fishermen to receive quota was based on their dependence on and financial commitment to the fishery.

The ITQs are fully *transferable*. In the southern bluefin tuna and south east fisheries there are no restrictions on the maximum size of the individual quota holdings. However, in the south east fishery there are restrictions on who can own quota.

In Australia all Commonwealth fisheries offences are heard within the court's criminal jurisdiction. It is anticipated that special investigators, auditors and accountants will be used since the focus of ITQ *enforcement* is likely to be in the area of 'paper fraud'.

The Australian Government has applied a *cost recovery* policy to the fishing industry since 1984. Under this policy fishermen are now required to pay 90% of the 'attributable' costs incurred in managing fisheries. The levy payable by each fisherman is determined by the quantity and type of fishing rights held.

Adjustments of the fleets occurred as a result of quota transfers not from a decommissioning scheme.

1) Main source for this section: Geen G. et al., (1993) 'Australian experience with individual transferable quota systems', OECD Documents 'The use of individual quotas in fisheries management', Paris, 1993.

5.6.7 Property rights in Japan

5.6.7.1 Coastal areas

In Japan common fishery rights have been established, *for a long time*, in the coastal areas 1). These rights are granted to *fishery cooperatives* and they refer to the zone within several kilometres from the shoreline.

For this fishery-right-based fishery in the coastal area the regulations concern fishing seasons, fish species, fishing methods etc.

Though these fishery rights are considered as property rights *trade* in those rights is forbidden, but inheriting the right is allowed.

The *prefectural governor* allocates the rights for the coastal area to applicants, after consultations of the Fishery Coordination Committee. *Fishery Cooperatives* are given a priority to receive the licences, which are allocated for *different periods*: ten years for the fisheries based on common fishery rights (about 5,000 licences) five years for the demarcated fishery right (refers to aquaculture) and also five years for the set-net fishery. These licences of the Fishery Cooperatives are a kind of common property.

5.6.7.2 Governor licensed fishery

The area offshore of the fishing grounds for fishery-right-based fishery is regulated by the governor-licensed fishery. The *prefectural governor* issues these licences for a *period* of three years to *Fishery Cooperatives* 2). Fisheries involved are gillnet, longline, small-scale purse-seine, pot fishery etc. This governor-licensed fishery applies for some 160,000 vessels. Beside this fishery the 'special type of governor-licensed fishery' is distinguished with a number of about 30,000 licences. This fishery contains vessels operating in areas of different prefectures, making it necessary for the central Government to establish the upper limit of licences to be issued by the governor. Fisheries involved in this respect are medium-scale purse-seine fishery and small-scale trawl fishery.

The *prefectural governor* determines fishery adjustment regulations, which need authorization from the *Central Government*. These regulations contain prohibitions for fishing in certain areas, close periods, limitation of prohibition of certain fishing gears or methods, limitations regarding fishing vessels and minimum fish-size regulations.

Fishery Cooperatives, as a licensee of the fishery right, conduct far reaching fishery management in the case of the governor-licensed fishery. They may impose *sanctions* such as fines against violators of the regulations.

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- 1) This section draws heavily on the contribution paper for the Ad Hoc Expert Group on Fisheries of the OECD Committee for Fisheries, included in the 'Synthesis report for the study on the economic aspects of the management of marine living resources', Paris, 1996 (forthcoming).
 - 2) It is not clear if these licences are also allocated to individuals.

5.6.7.3 Ministry licensed fisheries

Fisheries based on intergovernmental arrangements and/or fisheries targeted at stocks migrating in the offshore area are licensed by the Minister of Agriculture, Forestry and Fisheries. The licence *period* is five years or one year in this respect.

This licence scheme of the Ministry of Agriculture, Forestry and Fisheries, applying for some 4,200 vessels, is based on the Fisheries Law. The regulations contain the total number of vessels by vessel size, fishing area and fishing gear control.

5.6.7.4 Institutions

Institutions at three levels are involved in Japanese fisheries management: (1) the Fishery Coordination Committee at regional level, consisting of representatives of elected fishermen, scientists and members representing the public interest. The Joint Regional Fishery Coordination Committee (2) can be established when adjustment ranging over several regions is necessary and (3) on the national level the Central Fishery Coordination Council considers matters with respect to the Minister licensed fishery and the implementation of regulations based on the Fisheries Law. This council is composed of fishermen and scientists.

5.6.7.5 Problems in practice

The OECD contribution paper mentions four outstanding issues in Japanese fisheries management:

- in the case of self-imposed fishery management by fishermen, there is a possibility that fishery management well suited to the stock status cannot be guaranteed because too much emphasis may be given to adjustment among the various fisheries concerned;
- there is a possibility that exclusive profits may arise to licences because of the limited entry. Implementation of management measures will be difficult if there is strong resistance from the fishermen concerned;
- in fishery management issues exceeding the competence of individual fishery cooperatives difficulties are involved in achieving consensus among those fishery cooperatives;
- promotion of voluntary operation regulations to ensure stock increase requires financial assistance from the central and prefectural Governments as it involves temporary income loss for fishermen.

6. ECONOMIC ASPECTS OF PROPERTY RIGHTS IN FISHING

6.1 Economic aspects of property rights in fishing in Denmark

6.1.1 Introduction

From 1984 to 1992 the total value of the Danish landings has been relatively stable measured in current prices and gently decreasing measured in fixed prices given the low inflation rate in the period, see figure 6.1. The total landings have also been relatively stable, but the composition of species in the landings has changed during the period. There was a fall in the landings of the high valued species used for human consumption, e.g. cod in the Baltic and North Sea, while the share of lower valued species (e.g. herring) has increased. Since the total value of the landings has been stable in the period the changed composition of species in the landings has been offset by increasing prices of the high valued species until 1991. In figure 6.1 the fall in prices in 1992 and 1993 is quit clear. The landings from the fisheries after industrial species fluctuate from year to year, but the overall trend during the period indicates a fall in the total value of the landings measured in fixed prices.

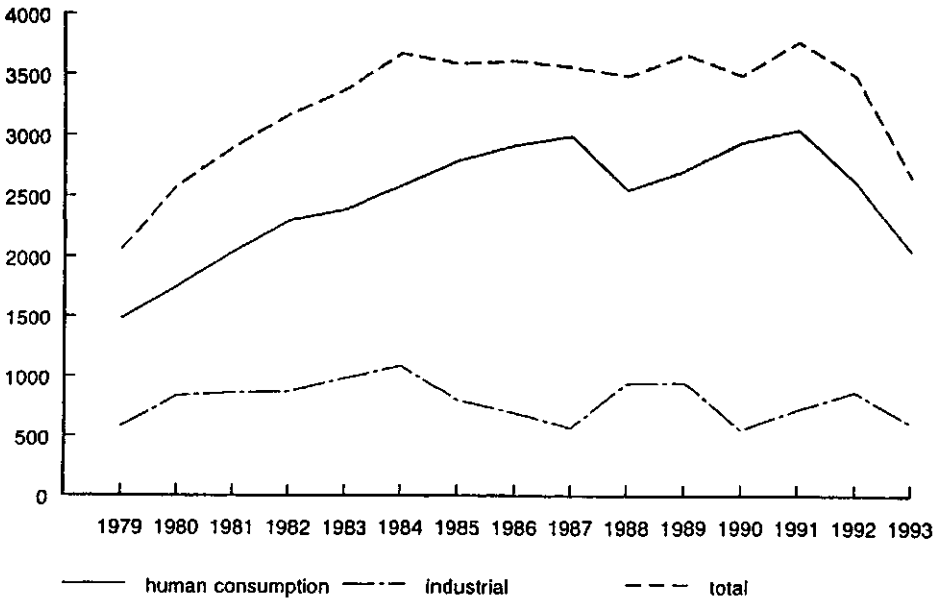


Figure 6.1 The value of landings by Danish fishermen. Current prices

Before 1984 the Danish fishery experienced increasing landings measures in both quantity and value from year to year. The transition from the situation before 1984, where the value of the landings was increasing, to the current situation, where the growth in quantity and value of the landings is very limited and in several years even decreasing, has created a situation, where the resources in general and the main species for human consumption in particular have become more scarce.

In the last part of the period (1987-1991) the Danish fleet should reduce to a given size in 1991, according to the MAGP. A new MAGP is in force for the period 1992-1996, where the size of the fleets in 1996 has to meet the objectives set up in the programme. At the end of the first programme in 1991 the Danish fleet was reduced more than required by the MAGP. The reasons for this are probably the scarce resource situation, which has induced a bad economic development in the fleet and this combined with the decommissioning scheme has led to the overshooting of the objective. However, it should be mentioned that the size of the fleet continue to increase until 1987, which indicates a general overcapacity. The decommissioning scheme is still in force in Denmark.

The 'success' of the decommissioning scheme and the MAGP is also due to the fact that the overall access to the Danish fishery has been restricted since 1987, see chapter 5. To insert a vessel a permission (or licence) is needed from the Ministry of Fishery. This permission is according to the regulation dependent on (and it is nowadays, since 1987) whether corresponding capacity leaves the fishery. Further it is not allowed without permission from the Ministry to extend the capacity of existing vessels in certain ways.

The introduction of limited access is the main new regulation initiative in response to the resource scarcity. There has also been a need for extending the use of some of the existing regulation measures, i.e. permissions and rations, because the allocation issue becomes more important when the pressure on the Danish quotas increases. For example as a reaction to the declining cod quota in the Baltic Sea, it was introduced that vessels longer than 12m needed a permit from the Ministry to enter this fishery. The use of rations has only been to set (i.e. cut) the allowed catch quantity per time-period so the Danish quota could last the whole fishing season. In general, permissions and rations have been used with the intention to distribute the fishing possibilities, it has not been the purpose to control the fisheries by restricting the access.

In Denmark the effect of the increasing herring stock and consequently the TAC for herring has been, that a system of individual quotas for herring was replaced in 1990 by a system where the vessels are assigned a maximum allowed catch within a certain time period depending on number of fishing days and length of vessel. All vessels with a herring licence can participate. This licence can be obtained if the vessel meets a given technological standard. The reason for the change in 1990 was that more vessels, given the increasing TAC of herring, could participate. As mentioned in chapter 5 the regulation has from 1994 swiftened back to both individual quotas and rations. This was mainly because the committee advising the Ministry about the regulation was split

and the Ministry decided to implement a regulation which to some extent reflected the different views in the committee.

The limitations that follows from the mentioned regulations may have created entitlements/rights for some fishermen and these rights can function as normal input of production. In the following sections these rights are described from an economic point of view. If the rights have the same characteristics as other goods (scarcity, exclusivity etc.) then the rights become valuable and can be subject for trade.

In the next section the distribution of rights on each fleet segment will be discussed. In section 6.1.3 the markets for rights are investigated and in section 6.1.4 the changes in the distribution of rights in the last decade are shown.

6.1.2 Distribution of rights in 1993

Before the description of the distribution of rights on each fleet segment, vessels licence and permissions are discussed, because both measures applies to the whole fleet.

Vessels licence

The rules of limited access give the fishermen with a licence to participate the right to the benefit stream from the resources. The value of the licence will thus in theory reflect the expectations of future rents in the fisheries. These expectations are based among other things on forecast of changes in economic parameters, e.g. prices, the development in the resource situation and in the management regime. The licence value and the (current) rent/profit could, therefore, differ if the expectations of the future development are different from the current situation.

According to the literature it is uncertain whether the economic efficiency is increased by implementation of overall limited access to the (Danish) fisheries combined with control over the individual vessels possibilities regarding extension of capacity (Clark, 1985, p. 156). The reason is that the underlying incentives leading to economic inefficiency still exists. The intuitive argument is that if the regulation of inputs is successful, i.e., creating positive profit, then the participants in the fishery have incentives to increase their capacity, because it brings the fishermen in a position to take a larger share of the total outcome of the fishery.

Effort and capacity are multidimensional variables and it is not an easy task to control these. A unit of effort is produced by applying equipment of various types (vessels with different characteristics, engine, electronic equipment, fishing gear and manpower). Input regulation can limit the use of certain inputs in production and can limit entry into the fishery. Limited entry may induce the fishermen to expand the fishing power of their vessels until the whole resource rent is dissipated, i.e. total costs equal to total revenue. Since managers find that limited entry does not create economic rent, restrictions upon input usage per vessel are often imposed. For example, given restrictions on vessel tonnage, fishermen reoptimize over the reduced set of input and they may fish longer hours and use more labour and equipment; they substi-

tute inputs for the restricted input. Regulations can introduce further restrictions and the fishermen will again respond by increasing the use of non-restricted input. The conclusion is that if the inputs can be substituted, restrictions on one input will lead to an expansion of other inputs and will increase the fishing costs and lead to resource rent dissipation.

The success of input restrictions seems to depend on whether fishermen can find substitutes for the restricted inputs or whether their creative skills are better than the manager's. Munro and Scott (1985) conclude 'that there are too many inputs for all to be controlled effectively. Hence opportunities for substitution are never entirely absent'.

Others emphasise that either vessels in general have limited possibilities to change the input proportions because of the relative fixed design of a fishing unit, or provided that the regulations are sufficiently comprehensive and enforceable and the number of licenses sufficiently limited, the incentives leading to economic inefficiency can be defeated without further regulations.

Campbell and Lindner (1990) shows in a theoretical example that success with restricting a subset of inputs is more likely if:

- it is difficult to substitute non-restricted inputs for restricted input and/or;
- the restricted input's proportion of the total factor cost is high and/or;
- the economic pressure to exploit the stock is not too high.

Empirical work shows that knowledge about the production technology offers information about the internal structure of effort and the fishermen's ability to dissipate rent (Dupont 1991). If e.g. the variable inputs (fuel, gear and labour) are complements to the controlled input, e.g. tonnage per vessel, regulation of the tonnage will increase efficiency. Regulation based on control of inputs could, therefore, (partly) be successful.

It is useful to discuss the effects in the short and long run separately. In the short run the combination of limited access and extensive control of the capacity of individual vessels will probably stabilize the economic efficiency. This does not reduce the overcapacity, but it can prevent further expansion, if the input-usage can be effectively controlled. In the long run, however, it is very difficult to control the development of the capacity, because of increasing possibilities of substitution of inputs over time. Further the technological development makes the control task a very problematic affair. Without any transferability of licenses it may be necessary to implement a vessel buy-back programme to cope with the overcapacity.

Danish case more complicated

The discussion is based on a single species approach. However, the Danish case is more complicated, because:

- the main part of the vessels perform multi-purpose (and multi-species) fishery;
- the entry and exit of the different fisheries and changes of gear are in general unregulated;
- the decision of limited access and permission to extend the capacity of single vessels can be changed by the Ministry, because the Law of fishery

gives the framework for the Ministry to implement more detailed regulation. As an example of this the regulation of the herring and mackerel fisheries was changed from individual quota to rations in 1990.

It is difficult to predict the outcome of the Danish regulation in the short run in terms of overall economic efficiency. Because of the possibilities regarding entry and exit of the different fisheries it can be argued that even in the short run the regulation will fail to increase the economic efficiency. High profit fisheries will attract more vessels and consequently erode potential gain in efficiency. Only in the least attractive fisheries where the economy just breaks even the efficiency will increase. Opposite, the regulation combined with the decommission scheme may increase the efficiency in the short run, because the programme has reduced the total capacity in terms of GRT and kW. Given the Danish share of the TACs the available quotas are divided among fewer fishermen, all things equal. But in the long run the capacity will probably tend towards the level, where the rents are depleted. However, the capacity development can slow down because of the higher cost of capital due to the requirement that corresponding capacity has to leave the fleet. Since the higher cost of capital are not covered by secure fishing possibilities because of the unrestricted entry and exit of fisheries, the investments must be based on the overall profitability in the fisheries in general and the least profitable fisheries in particular.

Based on the literature and experience from other countries/fisheries the prediction whether the Danish regulation leads to increased economic efficiency will be mainly negative. In the long run it can be expected that the capacity will tend towards a level where the rents are depleted. The capacity development will be determined by the profitability in the least profitable fisheries.

However, the licence could still have a value even if the rents/profits are small or even zero/negative because the fishermen then have the option to operate. The licence is connected to a vessel with a given capacity and it is possible to substitute the vessel with another if the capacity is maintained. The licence value is, therefore, in this case determined of the alternative employment possibilities in other sectors in the economy. If these employment possibilities are poor as normally assumed, because fishermen are typically without many or any skills and the fishing regions are often relatively isolated from the rest of the economy, then the licence represents an access ticket to the main industry for the people in these regions.

However, for some fleet segments entry of vessels are not possible. In Denmark substitution of vessels is not allowed, if it increases the number of beam trawlers or purse seiners. Therefore, the licence value in these fleet segments could be higher than in other segments, which of course also depends on the regulation of the fisheries that these fleet segments participate in.

The use of permissions is very limited, see chapter 5. In several cases the use of permissions have been only to force the fishermen to notify the ministry that they intend to participate and permissions are issued to all. This implies

that the size of the rations implicit determines who participates. This use of permissions allocates no entitlements to the vessels.

Purse seiners

The purse seiners that participate in the herring fishery need a licence. This licence is not a real barrier because as mentioned the licence can be obtained by meeting some technological standards. Nothing in the regulation in 1993 1) restricts the number of participating vessels in neither the herring nor the mackerel fishery. The assignment of rations for a certain number of fishing days used in the herring and mackerel fishery gives the participants the right (or limit the possibilities, given the open access to the fisheries) to withdraw some of the current benefit stream from the resource.

Trawlers

For the trawlers that participate in the fisheries for species regulated by TACs the main right is rations and in a few cases permissions. Other parts of the regulation have the objective to protect the stocks and this creates only (if any) very poor property rights.

The rations create a right of a relatively poor quality, because the rations do not lead to exclusivity. The vessels are only given the possibility to catch a given amount of fish within a certain period (e.g. 14 days). It is e.g. not allowed to transfer an eventual unutilized part of the ration to the next ration period. This limitation can create a right with a value, because unexploited parts of a ration can be sold, which, however, is illegal, to fishermen with catches beyond the ration. For multi-species fisheries with more than one species covered by rations unexploited parts of the rations can be subject for exchange between fishermen.

The vessels involved in the sprat fishery in ICES IIIa can only get a permission to participate in the fishery if they have had permission in the previous years. This can create a right of some value.

Danish seiners

For this fleet segment the main regulation is on the by-catch species which are regulated by rations, and to the extent that this create any rights it is the only rights allocated to this segment.

Gill-netters

Also for this segment the main restriction is rations.

1) However, from 1994/95 the regulation of the herring and mackerel fisheries is based on individual quotas (non-transferable) which are assigned to vessels with a catch record in these fisheries.

6.1.3 Market characteristics

There are no explicit market for vessel licenses. The market exists together with the market for vessels and it is difficult to separate the two markets from each other.

The supply side of the market for vessels consists of fishermen who want either to leave the fishery or to replace their vessels with others. The final decision whether to leave or to remain in the fishery depends of course of the advantages that can be obtained in the two situations, but it can be useful to separate them here.

If a fisherman wants to leave the fishery there are two options. He can apply for a subsidy from the decommissioning scheme and, as a part of the conditions for getting the subsidy, he must sell the vessel either as a fishing vessel to a fleet outside the EU fleets or to other purpose than fishing, including scrapping. The second option is to sell the vessel to another fisherman, that way the vessel remains in the Danish fishery with the licence.

If the fisherman wants to replace his vessel with another one then the vessel can be sold as a fishing vessel to other fisheries than the Danish ones or used for other purposes, including scrapping. Here the licence is transferred to the new vessel.

Decommissioning scheme sets price floor

The supply of vessels is influenced by the decommissioning scheme. The scheme sets a minimum price in the market. The subsidy from the scheme is based on objective criteria such as GRT and insurance value. The scheme is applied in Denmark by dividing the yearly grant into sub-grants which are used for vessels belonging to given regions and fleet segments. If a vessel apply for a subsidy the approval will depend on whether other vessels seek from the same sub-grant. But the grants have been relatively big for several years, so almost every vessel that has applied will be approved, at least within a few years. Therefore, the effect on the market for vessels has been to set a price floor in the market.

The demand side consists of buyers who want to achieve a vessel with a licence in order to participate in the Danish fishery, and of buyers on the international market for vessels. The Danish market is presumably a little part of the international market, i.e. the price is exogenous given. The decision of investment in a fishing licence depends highly on the expectations of the future situation in the fishery. Therefore, the total investment can be compared with an investment in a vessels and an option, whose value reflects the expectations of the future profit in the fishery.

The offer from a potential buyer of a vessel with a licence must be higher than the subsidy from the decommissioning scheme plus the price obtained by selling the vessel to a fleet outside the EU fleets or by scrapping the vessel, if the seller wants to leave the fishery. The value of a licence (i.e. the option value) is positive and in this case higher than the subsidy from the decommissioning scheme.

If the seller wants to continue in the fishery, i.e. keep the licence, then the price he can obtain for the vessel without a licence is the price in the international market. Larger offers for the vessel inclusive the licence means that the licence have a positive value, which is the difference between the market prices in the two cases. The final decision whether to stay in the fishery or to leave depends on the relationship between the fisherman's expectations to the future earnings from the fishery and the licence value.

The licence value depends on several factors. The main factors are:

- volume of catch and type of technology used;
- quality of the right, including the possibilities of new entrants;
- the availability of loans and/or credit.

There are no record of the trade with vessels, which contains information about prices etc. Therefore, the market is not transparent and the price formation is to a certain extent unclear.

Information from the participants in the market suggests that the decommissioning scheme in general sets the market price. Only in few cases the vessels are traded at a higher price.

Especially purse seiners and beam trawlers must be expected to be and have been traded at prices higher than the minimum price, because of the relatively good quota situation in their main fisheries (at least in 1993-95) and the closed access of new vessels into these fleet segments.

For trawlers that can participate in many different fisheries which always will lead to overcapacity in the most attractive fisheries, and where the quota situation is relatively poor in the main fisheries, the licence value have been small (smaller than the subsidy from the decommissioning scheme). The trade happens at the minimum price.

The participants in the market besides the buyers and the sellers are bankers, brokers, lawyers and accountants. The roles played by each of these groups are at least in the Danish case quite obvious and the roles will not be commented further here.

6.1.4 Changes in the distribution of rights

In table 6.1 is shown the number of vessels by gear and GRT classes in 1987 and 1993. The period is of interest, because since 1987 there has been limited access to the fishery.

The number of trawlers and Danish seiners fell in the period relatively more than the total number of vessels. For trawlers the fall was in particular within the GRT groups between 20 and 150 GRT, while for Danish seiners the fall is concentrated inside the GRT groups between 10 and 50 GRT.

The fall in Danish seiners can not be explained by the quota situation. The quota of plaice, the main species in the catch, has been relatively good in the period. Instead the explanation is the decommissioning scheme. The scheme was in these years directed towards old vessels (and fishermen) as the main part of the Danish seiners were.

Table 6.1 Number of vessels, 1 January 1987 and 1993

GRT	Trawlers		Purse Seiner / Multi-purpose		Danish seiners		Gill-netters etc.		Total						
	1987	1993	D	1987	1993	D	1987	1993	D	1987	1993	D			
5 - 10	91	35	-62%	1	22	2,100%	7	2	-71%	822	796	-3%	921	855	-7%
10 - 20	739	503	-32%	4	29	625%	71	43	-39%	409	383	-6%	1,223	958	-22%
20 - 50	303	170	-44%	1	5	400%	229	160	-30%	69	56	-19%	602	391	-35%
50 - 100	161	95	-41%	0	4	-	3	5	-67%	30	26	-13%	194	130	-33%
100 - 150	140	88	-37%	0	0	0%	0	0	0%	3	1	-67%	143	89	-38%
150 - 250	105	82	-22%	1	1	0%	1	1	0%	1	0	-100%	108	84	-22%
250 - 500	56	52	-7%	4	4	0%	0	0	0%	0	0	0%	60	56	-7%
> 500	8	9	13%	6	6	0%	0	0	0%	0	0	0%	14	15	7%
Total	1,603	1,034	-36%	17	71	318%	311	211	-32%	1,334	1,262	-5%	3,265	2,578	-21%

Source: Danish Ministry of Fisheries.

The fall in trawlers can to a larger extent be explained by the quota situation. The vessel groups between 20 and 150 GRT are in general dependent on the main human consumption species cod. In the period the cod fishery in both the Baltic and the North Sea has been poor. The alternative fisheries are for the larger vessels in the group industrial fisheries, which over the period has experienced an overall fall in catches. For the smaller vessels in the group the alternatives have been other human consumption species. The decommissioning scheme has also played a role, because the smaller vessels were rather old.

For the others groups, purse seiners/multi-purpose vessels and gill-netters etc., the number of vessels has been either increasing or almost unchanged. In the group of purse seiners/multi-purpose vessels the increase is due to multi-purpose vessels. However, this increase reflects only that a number of existing vessels can use different gear technology (e.g. trawl/net) and, therefore, these vessels have changed vessel category. The reason for the unchanged number of purse seiners (vessels larger than 150 GRT) is the relatively good quota situation regarding herring and mackerel. For the gill-netters the reason for the rather small decline in the number of vessels can be found in the elaboration of the regulation, where in several cases the vessels with length less than 12m are exempted and in other cases the allocated rations consider the smaller vessels. Another factor is that some of the target species of gill-netters are not regulated very hard, such as plaice and turbot.

6.1.5 Conclusions

On a small scale property rights in the form of limited access have been introduced into the Danish fishery. However, this entitlement is weak and has not up to now influenced the development of the fleet significantly.

However, in the future, regulation based on creating of rights are going to become more used. This prognosis is founded on two observations. First the actual trials with regulation based on assignment of fishing days and INTQ indicate that application of this type of regulation will increase in the future. The implementation in 1994 of INTQ in the herring and mackerel fishery, which also is in force in 1995, shows that rights based regulation are not only an experimental arrangement. Second when the main stocks for the Danish fishery recover then the fishermen will learn that their vessel licence is valuable. The tradition in Denmark has been to have free access to the sector and also to each individual fishery. This implies that when (hopefully) the stocks recover the tight regulation should be relaxed in order to following the tradition. But if the present fishermen then experience that their vessel licence becomes worthless, the fishermen will probably argue in favour of keeping the vessel licence system.

6.2 Economic aspects of property rights in fishing in the Netherlands

6.2.1 Introduction

The distribution of the Dutch property rights will be shown in this chapter on the basis of the following aspects:

- fleet segment;
- HP-group;
- region;
- percentage share of the individual transferable quota per enterprise in total national sole and plaice quotas.

6.2.2 Distribution of rights in 1993 and 1994

Fishing rights with respect to fleet segment

The Dutch property rights were distributed in 1993 over some 470 active vessels of the cutter fleet and 13 trawlers of the distant water fishery. Table 6.2 shows the part of each fleet segment in the cutter fishery 1) in these property rights.

Table 6.2 *Distribution of licences and ITQs by segment of Dutch cutter fleet, situation January 1st, 1993*

Fleet segment	Nr. of vessels	Total of licensed HP	Total of flatfish ITQs a)	
			sole (tonnes)	plaice (tonnes)
Flatfish sector	212	406,700	19,880	62,780
Roundfish sector	52	24,600	102	424
Multi-purpose vessels	79	28,100	1,209	4,624
Shrimp vessels	126	16,700	39	82
Total	469	476,700	21,230	67,910

a) ITQ: Individual Transferable Quota.

Source: Fishing rights registration of Ministry of Agriculture, Nature Management and Fisheries.

The importance of the main sector of the cutter fleet, the flatfish sector (the beam trawlers), proves from the part of the total licensed HP, owned by this sector: 85%, whereas the other three fleet segments own 5-6 and 4% respectively.

The flatfish sector became even more important in the past five years, measured by fishing effort. This effort, expressed as HP-times days-at-sea, of

1) Fleet segment defined in this respect as 70% of potential earnings at minimum from concerning fishery, based upon fishing rights.

the beam trawlers was 89% of the total effort in 1993. An increase compared with 1988 when this percentage was 84%. Especially the effort of the roundfish sector has declined during the past five years as a result of lower cod quotas and decommissioning of vessels.

The distribution of the other major fishing rights is explained in table 6.3. Roundfish entitlements refer to catching rights for cod and whiting 1). The 1993 cod quota of 11,675 tonnes was mainly distributed amongst the vessel owners by this kind of entitlements, which gave the right to land a certain quantity of cod and whiting weekly or monthly. A small number of roundfish entitlements have been bought by beam trawlers of the flatfish sector, because of their substantial by-catch of cod and whiting.

The 1993 herring quota allocated to the cutter fisheries (22,400 tonnes) was distributed individually by 'documents', giving the right to land a certain quantity annually. A small number of beam trawlers is involved in this fishery during a part of the year. There is no TAC for shrimp but entrance to this fishery needs an entitlement, which is owned by owners of shrimp vessels and multi-purpose vessels. The latter ones are mainly 300 HP vessels, involved in flatfish, roundfish and shrimp fisheries.

Table 6.3 *Distribution of entitlements by segment of Dutch cutter fleet, situation January 1st. 1993*

Fleet segment	Number of entitlements			
	roundfish		herring	shrimp
	full	seasonal		
Flatfish sector	1	10	9	1
Roundfish sector	42	7	3	5
Multi-purpose vessels	21	24	5	50
Shrimp vessels				121

Source: Fishing rights registration of Ministry of Agriculture, Nature Management and Fisheries.

A quite separate sector is the distant water fishery, which consisted of thirteen vessels by January 1st. 1993 owned by four companies. The HP-licences of these vessels totalled 73,800 HP. These freezer trawlers ranged in HP from 3,200-10,400. The companies owned also herring- and mackerel permits.

It can be added in this respect that Dutch vessel owners participate to some extent in fishing rights in other countries, namely the United Kingdom, Germany and Belgium.

1) The regulations for these and the other fishing rights are explained in section 5.3.

Property rights as to HP-group

Table 6.4 shows the distribution of flatfish ITQs by HP-group. The sole/plaice ITQs were attached to 382 vessels in 1994. In the smallest size group, up to 260 HP, some 40 vessels had rather big ITQs. In fact, these documents were 'parked' on those vessels which were in fact not active in the flatfish fisheries. The main reason for this is to avoid loss of documents which are not allocated to a vessel during a time period of two years.

The major part of the flatfish ITQs (nearly 80% for sole and 75% for plaice) are allocated to vessels equipped with an engine power of more than 1,500, which form 30% of total entitled vessels.

The cod/whiting entitlements are mainly allocated (84% of total national quota) to the vessels ranging from 300-1,100 HP, as table 6.5 shows.

Table 6.4 Distribution of flatfish ITQs by HP-group of Dutch cutter fleet, situation 1 January 1994

HP-group	Nr. of vessels	Total of flatfish ITQs	
		sole (tonnes)	plaice (tonnes)
- 260	67	318	1,014
261- 300	99	1,855	6,194
301-1100	25	342	1,348
1101-1500	33	2,162	7,310
1501-2000	86	8,656	25,306
>2000	72	8,708	24,811
Total	382	22,042	65,982

Source: Fishing rights registration of Ministry of Agriculture, Nature Management and Fisheries.

Table 6.5 Distribution of cod and whiting permits by HP-group of Dutch cutter fleet, situation 1 January 1994

HP-group	Number of permits		Total of roundfish ITQs	
	full year	season	cod (tonnes)	whiting (tonnes)
- 260	5	5	622	248
261- 300	26	40	3,780	1,573
301-1100	30	1	3,090	1,315
1101-1500	3	6	458	182
1501-2000	1		96	38
>2000	1		96	38
Total	66	52	8,142	3,428

Source: Fishing rights registration of Ministry of Agriculture, Nature Management and Fisheries.

Regional distribution of property rights

The regional distribution of property rights by 1 January 1994 is shown in appendix 2. Vessels from Urk have the biggest part (36%) of the flatfish ITQs, followed by Den Helder and Goedereede. Together fishermen from these three ports own nearly 80% of the national quotas of sole and plaice whereas their part of the fleet amounted to 48%.

Urk is also the main port of ownership of cod/whiting entitlements whereas Wieringen and IJmuiden take the second and third place. Fishermen of these three ports together own some 64% of the national cod and whiting quotas.

Distribution with respect to size of the ITQ

The size of the ITQ per right holder is mostly between 0.005 and 0.5% of total Dutch sole and plaice quota as table 6.6 shows. On average, the size of an ITQ in 1994 amounted to 76,250 kg sole and 228,300 kg of plaice.

Table 6.6 *Distribution of ITQ holders as to the percentage share in total allocated flatfish quotas (1994)*

Share in total flatfish quotas	Percentage of right holders a)	
	ITQ sole	ITQ plaice
0	31.7	31.7
0.005 ('mini' ITQ)	11.8	11.8
0.005-0.5	39.4	39.5
0.5 -1.0	11.6	11.6
1.0 -1.5	3.1	4.5
1.5 -2.5	2.4	0.9
	100.0	100.0

a) Holders of ITQs and other fishing rights owning one or more vessels in the Dutch cutter fisheries by 1 January 1994. Holders are synonym with enterprises (total of 423) in this respect. Source: Fishing rights registration of Ministry of Agriculture, Nature Management and Fisheries.

6.2.3 Market characteristics

Market structure

The market for fishing rights has developed gradually in the Netherlands since 1976. In this year documents were handed out to vessel-owners specifying the number of kg sole and plaice the document holder was entitled to catch. All the subsequent limiting measures from the Dutch Government have resulted in more or less tradable fishing rights. The industry has created possibilities to trade even when this trade was not allowed officially. Roundfish entitlements were sold for instance together with the vessel and the buyer could sell the vessel alone to acquire the desired entitlement.

Transferability of rights was officially allowed in 1985 for sole and plaice ITQs and in 1994 the roundfish entitlements were transformed into fully transferable individual quotas.

A limiting measure from Government means that a certain group of fishermen is created which is entitled to operate within these limitations and those outside this group are excluded. This creates at the same time a scarcity for these entitlements and, therefore, a value is attached to the concerning documents. Those who need (extra) rights are able to find those vessel-owners who want to sell their rights, a price is agreed and a market is established. This has been favoured by the relative small number of vessel-owners (some 700) in the cutter fisheries knowing each other rather well and having good communication facilities i.e. on board of the vessels. Thus information about quantities and prices circulates rather quickly, which is an important condition for a market process.

Nevertheless, the market is not very transparent especially for outsiders. A part of the market process is visible in the Dutch fishing magazine 'Visserijnieuws', which is shown in table 6.7. These offers and demands are far from complete, but the tables give a good overview of tradable fishing rights in the Netherlands in 1992 and 1993.

Table 6.7 Offers and demands of fishing rights in advertisements in 1992 and 1993

	Engine power licence	Shrimp permits	EU file registr.	ITQ sole/plaice	Entitl. cod/whiting
Year 1992					
Number of offers	12	2	10	31	9
Number of demands	2	-	-	14	6
Year 1993					
Number of offers	13	6	13	13	9
Number of demands	7	5	2	1	5

Source: Visserijnieuws 1992 and 1993.

Table 6.8 Offers and demands of licences and Individual Transferable Quota, quantities concerned

	Engine power licence (HP)	ITQ sole/plaice (tonnes)
Offers, total quantity in 1992	8,070	264/1790
Offers, total quantity in 1993	9,050	525/1480

Source: Visserijnieuws 1992 and 1993.

The following persons/institutions play a role in the market for property rights:

- vessel-owners, who want to buy property rights. Demand may come from vessel-owners who have ordered a new (bigger) vessel and, therefore, have a shortage in licensed HP and sole/plaice quotas. In cases a smaller vessel is bought a demand may arise to a shrimp permit, a EU vessel file registration for the coastal zone and an entitlement for cod/whiting fishery;
- vessel-owners, who want to sell property rights, all their available rights or part of them. These offers may be induced by replacement by a smaller vessel, by specialization to one fishery (e.g. selling of flatfish ITQs by cod/whiting fishermen) and by decommissioning. In the latter case all property rights can be sold except the HP-licence; this document has to be sent in to the ministry as a condition to receive the decommissioning payment. Only then a real decline in HP capacity occurs;
- ship-brokers, who may bring offer and demand together, sometimes by advertising in 'Visserijnieuws';
- shipyards, who may act as an intermediate between sellers and buyers. Yards may also own property rights for sale to those who order a new boat;
- PO, as an intermediate between sellers and buyers, not only for their members. This refers especially to transactions of flatfish ITQs. These are hampered by the rule that an ITQ should be sold as a whole document whereas buying of parts of ITQs is allowed. A PO may buy an ITQ and sell it in smaller quantities to its members, thus facilitating the transactions. A PO does not own ITQs usually, in fact they act as a broker;
- Banks, having a good insight in the needs of their clients may also facilitate and finance transactions (of ITQs). Moreover, when financing a vessel it is usually agreed that sale of the property right by the vessel-owner requires approval of the bank;
- accountancy firms, which may incidentally act as an intermediate between sellers and buyers;
- the Ministry of Agriculture, Nature Management and Fisheries, which has to approve and register the transactions of the property rights in fishing.

Ownership of property rights is concentrated on the vessel-owners. Intermediary organisations may own rights but this will be only temporary. In the Dutch fishery sector processing companies do not own fishing rights, like in other individual quota schemes may be the case. Furthermore, there are no observations of buying of Dutch property rights by foreigners.

Parallel to this market for buying and selling of property rights, a lease market has developed. Especially, lease of sole- and plaice ITQs became important in recent years.

These lease contracts only refer to the relevant quota year.

Prices of property rights

Information about prices of property rights is only available incidentally, because of the lack of transparency of the market.

Prices in table 6.9 are only indicative, based upon LEI-DLO costs and earnings investigations and talks with representatives of the industry.

Up to 1987 prices of flatfish ITQs remained rather low; in fact, only a price was paid for sole in this period and the plaice quantity was given free in addition to the sole quantity. When prices rose in 1987/1988 the quantity of plaice was paid separately at a maximum level of some NLG 12/kg. In 1994 this price had dropped till some NLG 5-6/kg.

Table 6.9 Price indications of property rights

Year	Flatfish ITQ	
	sole/plaice (NLG/kg)	sole only (NLG/kg)
1985	13.50	13.50
1986	10-15	10-15
1987	70-85	.
1988	100-120	70-80
1989	100-120	70-80
1990	100-120	70-80
1991	130-150	90-95
1992	130-150	90-95
1993	70-95	55-75
1994	65-90	50-70
1995	. a)	60-80
1996	. a)	75-85

a) Plaice was traded more and more separately, at higher prices: NLG 8-10 in 1995 and NLG 10-12 per kg in 1996.

Source: LEI-DLO costs and earnings studies.

Rather high prices were also paid for other entitlements: cod/whiting documents NLG 500,000-700,000 in 1993 and herring permits some NLG 600,000-900,000. Furthermore, HP- licences were priced at NLG 100-300 in 1993 and subsequent years.

Prices of flatfish ITQs increased sharply in 1987/1988. This reflects the fact that control measures became very stringent in 1988. In this year systematic control of landings was implemented, carried out by some hundred inspectors. In 1993/1994 these prices of sole and plaice quotas dropped, due to the high level of the national sole quota and diminished catches of plaice. These catches were low in many cases compared with the available plaice quota so that there was no need, generally spoken, to buy plaice quota.

Summarising, with respect to price developments of Dutch ITQs the following major influencing factors can be distinguished:

- enforcement of quotas. A major improvement of this enforcement in 1988 caused a sharp price increase;

- profitability of the fishery. A better profitability in 1991 also caused higher quota prices. Formerly, investments in fishing vessels used to increase sharply in such a situation but in 1991 investments in vessels were replaced by investments in flatfish ITQs to a certain extent;
- catchability of the fish related to the quota level. In 1993/1994 the national plaice quota was rather high in view of the catch possibilities for this species. This contributed to a downward price development for the plaice quotas. In 1995 the opposite occurred as a consequence of the major decrease in the plaice TAC. This caused a substantial increase in the price of plaice rights.

Trade in flatfish ITQs

Trade in fishing rights is not registered separately by the ministry of Agriculture, Nature management and Fisheries. By analysing the annual changes in the allocated sole and plaice quantities in the files of fishing rights an estimation of this trade has been made. Table 6.10 contains a rather rough estimate of this trade 1). It seems to be a minimum estimate because the offers of flatfish ITQs in table 6.8 suggest higher traded quantities. But these latter quantities may be too high because of repeated advertising.

The volume of the trade in ITQs shows the same pattern for sole and plaice: relatively high traded quantities in 1988 and 1991 and less trade in 1992. Trade in 1988 was induced by much stronger enforcement in this year. A number of skipper-owners adjusted their individual quotas to their vessel capacity to escape from penalties imposed on poaching. The increase in trade in 1990 and 1991 could be explained by the improvements of the net profit in these years. As has been stated before, in former years skipper-owners used to invest in new vessels in years of high profitability. In these two years these investments were limited because of the HP-licences so that the investments were more directed into the rights. It is assumable that in 1992 and subsequent years trade in ITQs will take place on a lower scale because the ITQs are, from that year, better adjusted to the vessel capacity (apart from quota changes). It has to be emphasized that the major part of the transfers concerns buying of a part of the ITQ from those who have leaved the industry e.g. by decommissioning their vessel. In fact, the decommissioning scheme, in force in the period 1987-1994, has stimulated the trade in ITQs. In this period some 120 vessels were decommissioned and the owners sold their available ITQs to the remaining skipper-owners. It must be added that in general, no big ITQs were attached to the decommissioned vessels.

In view of the prices of flatfish ITQs in table 6.9 it will be clear that total of investments in ITQs had high values in the period 1988-1992. Investments in 1990 and 1991 were highest, amounting to NLG 91 million and 115 million respectively. This means that in both these years investments in ITQs exceeded

1) Rough because changes in ITQs resulting from trade can not be seperated sharply from other changes in ITQ levels e.g. enterprises owning more vessels are allowed to shift parts of their ITQ from one vessel to another.

the investments in vessels and equipment; the latter investments amounted to NLG 64 million and NLG 31 million for the cutter fishery as a whole in 1990 and 1991.

The volume of trade in ITQs in the period 1988-1992 means that some 18% of the 1988 national sole and plaice quotas changed of ownership in these five years.

A disadvantage of this trade in ITQs is that money leaves the industry together with those skipper-owners who sell their vessel with the rights. The remaining enterprises are able (on average) to land a some what higher quantity at much higher costs. In the long run enterprises have to be taken over by the next generation. In the Netherlands there are (fiscal) allowances for transfers within the family. Nevertheless, next generations of skipper-owners will have to produce at higher costs, due to the necessity of acquiring the rights of their fathers and other family members participating in the value of the rights.

Against this disadvantage of higher costs there is the advantage of protection of the right holders, the closed shop situation, which could result in a 'rent' for them.

Table 6.10 Trade in sole and plaice ITQs

	1988	1989	1990	1991	1992
Traded quantity (tonnes)					
- sole	489	335	827	818	188
- plaice	4,745	3,898	3,895	3,730	616
Trade in % of national quota					
- sole	4.8	3.5	4.6	4.2	0.9
- plaice	5.9	4.1	4.4	4.4	0.8

Source: Fishing rights registration of Ministry of Agriculture, Nature Management and Fisheries.

6.2.4 Changes in the distribution of ITQs

Trade in ITQs has changed the distribution of the rights as table 6.11 shows with respect to the part of each HP-group in the national quotas. The share of the medium size cutters (300-1,500 HP) has fallen dramatically in the period from some 40% in 1988 to 12% in the national sole and plaice quotas in 1994. This reflects the changes in the cutter fleet in this period, because the number of this medium size vessels dropped from 216 in 1988 to 72 in 1994 to an important extent as a result of the decommissioning scheme. As has been stated earlier, the ITQs of the decommissioned cutters were bought by owners of remaining vessels thus increasing the relative importance of the share of bigger and smaller (261-300 HP) beam trawlers. It has to be added that the decommissioned vessels were fishing mainly on roundfish (cod and whiting).

Table 6.11 Percentage distribution of flatfish individual quotas in 1988 and 1994

HP-group	1988		1994	
	sole	plaice	sole	plaice
- 260	1.0	0.8	1.5	1.5
261- 300	4.7	6.5	8.4	9.4
301-1100	10.5	12.2	1.6	2.0
1101-1500	28.0	28.2	9.8	11.1
1501-2000	28.4	27.0	39.3	38.4
>2000	27.4	25.3	39.4	37.6
Total	100.0	100.0	100.0	100.0

Source: Fishing rights registration of Ministry of Agriculture, Nature Management and Fisheries.

The question arises to which extent the decommissioning and trade in ITQs have increased the average flatfish ITQ of the remaining vessels. Table 6.12 shows this increase of the average sole and plaice ITQ by HP-group in the period 1988-1994. These quantities are quite comparable because the general change in the national quota of sole and plaice has been removed i.e. the quantities of 1988 has been adjusted to the 1994 national quota level. Thus, the changes are a result of trade.

The remaining medium size cutters ranging from 301-1,100 HP show a sharp decrease of the average ITQ due to selling and more specialisation on the cod/whiting fishery.

Table 6.12 Average flatfish ITQ per vessel by HP-group in 1988 and 1994 (tonnes)

HP-group	1988 a)		1994	
	sole	plaice	sole	plaice
- 260	1.56	3.70	2.65	8.45
261- 300	8.14	34.01	14.96	49.95
301-1100	20.40	70.56	9.78	38.51
1101-1500	60.59	182.73	58.44	197.51
1501-2000	97.98	277.91	103.05	301.26
>2000	91.64	252.52	117.68	335.28

a) The 1988 ITQs are adjusted to the 1994 level of national quotas by multiplying the sole ITQs by 2.46 and the plaice quantities by 1.03

Source: Fishing rights registration of Ministry of Agriculture, Nature Management and Fisheries.

In terms of potential earnings from the flatfish ITQs (average quantity times price of sole and plaice) especially the smaller cutters (261-300 HP) and the biggest ones (>2,000 HP) show a substantial increase (64% and 30% respectively). This increase is the result of buying of ITQs, shift of ITQs within a com-

pany from smaller to bigger vessels and replacing a vessel by a smaller one; the latter development may partly explain the increase of the average ITQ of the 261-300 HP-vessels.

6.2.5 ITQ per vessel in 1995 and 1996

The Dutch part of the plaice TAC was dramatically lowered in 1995 and 1996 (by 28% and 32% respectively). Furthermore, the sole quota came at a 26% lower vessel in 1996 compared with 1994. The consequences for the two main size groups, 261-300 and 1501-2,000, are shown in table 6.13.

Table 6.13 Estimates of average flatfish ITQs per vessel in 1995 and 1996 (tonnes) a)

HP-group	1994	1995	1996
261-300			
- sole	15.0	14.1	11.1
- plaice	50.0	36.2	24.6
1501-2000			
- sole	103.1	96.9	76.2
- plaice	301.3	217.9	148.3

a) Estimates since trade of ITQs in these years is not included.

These major decreases of ITQ levels were partly compensated by increase of the sole and plaice prices in 1995 and 1996. An adequate management of the quota by the co-management groups in both years caused these price improvements to an important extent.

Chapter 10 explores which part of the fleet may run into financial troubles because of quota shortages.

6.2.6 Summary and conclusions

Flatfish ITQs are the most important type of property rights in the Netherlands. They distribute the TAC of sole and plaice amongst some 380 vessels (1994). The biggest part of the ITQs (85% of the total 1994 sole and plaice quotas) is held by the owners of the beam trawlers. From the viewpoint of vessel size the main part (75-80% in 1994) of the ITQs is attached to the vessels exceeding 1,500 HP.

Urk is the most important port for these vessels, followed by Den Helder/ Texel and Goedereede in the southern part of the country. Together, fishermen of these three ports own nearly 80% of the national quotas of sole and plaice.

In spite of this concentration with respect to vessel size and region, the flatfish ITQs are rather widespread; there were some 290 holders (enterprises) of the documents in 1994 and most of them (58%) own 0.5% or less of the

national sole and plaice quotas. This size of the ITQ means an annual catch of 110 tonnes of sole and 330 tonnes of plaice on the basis of the 1994 quotas.

The Dutch cod and whiting TACs, 11,500 and 5,000 tonnes in 1993 and 1994, were distributed by entitlements amongst some 120 vessels of the roundfish sector. These vessels were entitled to land a certain quantity of cod and whiting weekly or monthly. These quantities were transformed into ITQs for cod/whiting in 1995. This has led to selling of these ITQs to owners of beam trawlers who use to land high quantities of cod and sole as a by-catch. The regional distribution of cod/whiting entitlements shows high proportions for Urk (23%), Wieringen (23%) and IJmuiden/Katwijk (18% of the national cod quota).

All kinds of fishing rights are traded in the Netherlands. Advertisements in the fishing magazine 'Visserijnieuws' show offers and demands for sole/plaice ITQs, entitlements and in 1995 ITQs for cod/whiting, shrimp permits, herring documents, engine power licences and EU vessel file registrations. Investments in rights are important, considering the high prices that are usually paid. The price of a sole/plaice ITQ was at maximum in 1991/1992 (NLG 130-150/kg of sole) and decreased to a level of NLG 65-90 in 1994. Factors that influenced this ITQ price in the period 1988-1994 were: the degree of enforcement, the profitability level and the catchability of sole and plaice in relationship with the quota level.

The volume of trade in ITQs in the period 1988-1992 means that some 18% of the national sole and plaice quotas changed of ownership. The 'close shop' situation, i.e. the HP ceiling in the cutter fisheries, results in a shift from investments in vessels towards investments in fishing rights.

In years of good profitability, 1990 and 1991, investments in ITQs (NLG 91 and 115 million) exceeded those in new vessels (NLG 64 and 31 million). In fact, property rights were a production factor that was most scarce in these years.

Major decreases of the TAC for sole and plaice in 1995 and 1996 resulted in a 25% lower sole and a 50% lower plaice ITQ in 1996 compared with 1994. Price increases and cost savings (caused by decrease of fishing effort) have partly compensated the quota lowerings.

6.3 Economic aspects of property rights in fishing in the UK

6.3.1 Introduction

Chapter 5 covered the legal basis for property rights in fishing and indicated what this implied in practical terms for the UK industry and the various identifiable sectors. It also sketched in lightly what the economic implications of these rights might be. These economic interests need more detailed consideration and this is provided in the sections below. It may, however, be helpful to provide some general background on the economic dimension.

The usual idea of competition implies freedom for individuals to enter or leave an industry; this means open access in securing or disposing of resources and in seeking markets for them as well as the resultant product. Normally such

an approach ensures economic efficiency but depends on the action of an individual being insufficient to affect the whole market. Such lack of disturbance (due to 'externalities') does not apply in fisheries for the reasons adduced in chapter 5. The other qualities which transform things into goods and services clearly apply to fishing rights; they are scarce, they have alternative values in different uses and they can be transferred. In short, where rights have been created and enforced, they provide an essential factor in production.

Limited access to a potentially profitable business, whether in fishing or not, means that a price must be paid for entry. (Other regulated UK industries like those which provide gambling, alcohol or taxicabs show similar characteristics as do certain jobs like head waiters.) The form of price will depend on the political process. If settled by an untrammelled market, the price will be positive and reflect the conditions of supply and demand; these in their turn will be determined by technology and the prices of other inputs as well as the quantities and prices of fish and competing products offered to the consumers. If not set by normal market processes, the price will reflect the administrative arrangements. There may be no money price where central management controls the issue, re-issue and revocation of access rights; the only reckoning or 'price' might be the political cost of losing power if the results were unfair. This would occur only where fishermen's dissatisfaction recruited support from the rest of the electorate.

The following more detailed description covers the main aspects of economic structure and performance. The structural aspects include the distribution of rights indicating the economic scale of the businesses making up the industry and the processes whereby this distribution changes. It links to the sectoral description in chapter 5. The performance really relates to the market or transfer mechanism which allow the rights to move to those most able to use them. There is, however, a structural dimension here in that the performance of the market will depend on the people and institutions involved. Lawyers, accountants and brokers, as well as their clients (the fishermen and fishing companies) figure prominently in addition to Government departments, POs and financial services. It should, however, be emphasised that the market is somewhat unlike other markets; it is not as transparent as an auction or other channel for open sales in quantity would be. The few deals that are struck are private and 'one-off' so that the usual information underpinning the market is absent or deficient.

6.3.2 Distribution of rights

In the UK there are two significant features in fishing rights. The first is the entitlement to operate a vessel. This process of registration as a fishing vessel with the Department of Transport is a prerequisite and is freely available for any eligible vessel. (There may be occasional problems over the registration process as it is assumed that eligible applicants will already have access to some form of licence.) It, like other prerequisites such as acquiring the necessary qualifications for personnel and safety certificates for vessels, does not really serve as a substantial barrier to entry. The real barriers are those relating to the

species that may be caught. Such entitlements to take species under quota derive from historical catching records; these relate to what happened under the owner in past years or under a previous owner on registering a transfer of a licensed vessel or to what a vessel being replaced actually had achieved before such a change occurred. The different types of restrictive licences came into existence in the way noted in chapter 5 as a progressively increasing number of species and fleet sectors came under pressure; depending on their type, they allow access to the quotas either on an allocated or sharing basis. As might be expected the predominance of the larger vessels, historically in the catches under open access and currently under restricted access, is very marked with vessels over 10m catching 95% of the total quantity landed. The proportion of value of the catch landed by the smaller vessels is slightly greater but this does not alter the fact that medium and large vessels account for most of the landings though numbering only a third of the total of vessels. This reflects the catching power or capacity of the larger vessels, as is seen subsequently in table 6.17 giving the distribution of vessels by VCU and length groups.

6.3.3 Market characteristics and performance

It is necessary initially to consider the roles played by the various people involved in the market for licences and the processes informing their actions. The outline indicated below shows that all the parties involved in buying and selling vessels figure in the list though their relative importance may change. In particular, specialist brokers or middlemen appear to have a larger part to play in transferring licences.

- a. Sellers-fishermen, firms and other owners. The licence is issued to a named person in respect of a named vessel but ownership of the licence or licences effectively rests with the people who own the vessel. This may be an individual fisherman or a fishing company but more frequently involves shares held by fishermen, fishing companies and others, such as relatives of the fishermen. Borrowings by fishermen from banks and institutions like the Ship Finance Mortgage Company affect the net worth and may be crucial in deciding whether or not to sell a boat but such sources of credit do not have a direct interest in the licence.
- b. Buyers-as above
- c. Transport and fisheries departments. The former registers the current ownership of the vessel and deals with any subsequent changes while the latter performs a similar task in relation to the entitlement to licences.
- d. Lawyers. They have to perform their normal professional role in dealing formally with the legal aspects of transfer of ownership of vessels so as to secure all implicit rights, including the entitlements to appropriate licences. These entitlements are given out annually and are thus less certain than other rights of ownership.
- e. Bankers. They too have to perform their usual roles in assessing credit worthiness and providing loans, for normal operation as well as when vessels are transferred. Licences can not be used as security due to their

short term and uncertain nature, though their existence affects assessments and leads to special arrangements to prevent their unauthorised disposal.

- f. Accountants. Their customary processes of formally recording the financial structure and performance of the business tend not to include such uncertain elements as the value of licences, though aware of their essential significance. The exceptions arise when the costs of acquiring a licensed vessel naturally reflect the value of the associated licence.
- g. Fish salesmen or vessel agents. They have a central role in vessels' business activities in marketing the fish and in handling the proceeds, as well as providing short term credit. These activities, as well as their investment in many boats, make them critical in certain aspects of dealing with licences.
- h. Boat builders. Their interest stems from the need to ensure that where any order for a replacement vessel will depend on additional licences to cover any increase in vessel size or power, those additional licences are in hand.
- i. Specialist brokers or middlemen. The difficulty in matching the demand and supply for licences, as well as coping with what is not an ordinary open market situation, has created the need for such dealers.
- j. Producers' organisations. Their interest in securing adequate quotas for their membership means that POs get involved in the market for vessels and their associated entitlements. In some cases the POs will sell on or scrap the vessels and use the acquired track records to provide a reserve for the members but not necessarily allocated to them individually on a permanent basis. The capacity units of the scrapped vessels may also be used to allow the entry of slightly larger replacement vessels.

As the industry's original concerns were to allow new blood and new technology into the industry without interfering significantly with the fishing community's rights of open access, the initial administrative processes allowed licences only to move in association with the appropriate vessels. No separate movement of licences was envisaged and the intention was to avoid the creation of any value in the licences. The latter could not be achieved and the value of being allowed into the industry, therefore, was capitalised in the sale price of licensed vessels with something like a market evolving as licences were moved to replacement vessels.

The market in licences is both unofficial and informal, with little clear evidence of its characteristics or effects. The transactions resemble the market in housing in a particular location in that individual bargains may not be very numerous; they thus reflect the peculiar circumstances of the contracting parties and of the economy at a particular point in time. A further complication arises from the fact that, though the prices may be given in relation to capacity, two further elements come into play. The first is the track record in terms of species and quantity of fish caught while the second relates to the effort in terms of days at sea. The latter is significant because of the likelihood of future policies controlling effort directly. It takes little thought to realise that the ab-

sence of a system of Individual Transferable Quotas (ITQs), uncertainties about future Total Allowable Catches (TACs) and the threat of individual limits on days-at-sea leads to other property rights being compounded in the value expressed in conventional prices per unit of vessel capacity (VCU). (There may also be different planning perspectives as an existing business needing to expand is likely to value marginal VCUs higher than a new entrant paying the average value for VCUs embodied in an existing second-hand vessel.) It should be stressed that the capacity unit combines the vessel's physical size and its engine power to give an abstract number serving as a proxy for its ability to catch fish. This should be kept in mind when considering the figures given below.

Previous estimates suggested that the cost of a licence was initially quite low apart from those for pelagic pursers or freezer trawlers and for beamers. Ordinary pressure stock licences for demersal vessels were thought to be worth around £10,000 to £20,000 in the mid-80s as against perhaps £0.5m for the large pelagic vessels and £0.25m for the beamers. As the licensing system tightened up in the other sectors so did the prices increase there. The 1993 estimates given in table 6.14 show that the various sectors and types of licence (other than pelagic and beaming) record different values.

Table 6.14 Price of full pressure stock licence in 1993

	Price per VCU a)
Demersal vessels	
- over 17m	£90 to £130
- 17m and under	£75 to £85
Limited Licence (10m and under)	
- larger vessels	£25 to £35
- smaller vessels	£50 to £75
Nephrops Licence	£40
Miscellaneous Species Licence	£25 to £30

a) Vessel Capacity Unit.

Source: Sea Fisheries Inspectorate, DAFS.

It is understood that the above figures will be adjusted upwards by the equivalent of a broker's commission of the order of 20% for someone buying a licence through a middleman. Apart from that the main interest in the table centres on the graduation of prices reflecting the value in use of the licence. The largest vessels with full licences tend to generate the most income, while the sectors whose catches are limited to nephrops or miscellaneous species, typically with older vessels, are less productive. For a demersal trawler around 25m (which would usually have something like 450 VCUs) the licence would have cost approximately £40,000 to £60,000 in 1993, with maybe a further £10,000 to the broker. Clearly the variation mentioned is mainly explained by the track record in the fish caught but perhaps with some reflection of the level

of effort. It may be, however, that days-at-sea and quantity caught will be positively and highly correlated, at least within sectors; clearly the difference between short high yielding seasonal pelagic fisheries and more year-round demersal activity would invalidate such an association in any comparison across all vessels. The interesting anomaly in the higher priced VCUs for smaller vessels in the 10m and under group indicates the very strong demand for less expensive boats with lower capacity. This probably reflects the pressure from new entrants with limited capital, as well as the high cost and limited opportunities of the larger 'rule beaters', just below the 10m mark.

Factors affecting the value of rights

The value of the various licences is determined by several factors - value of catch, security of the entitlement, profitability of the relevant technology, availability of capital and pressure for entry to the industry (reflecting employment opportunities elsewhere and general economic conditions). Thus the pelagic vessels have the most highly valued licences due to the good and stable (sometimes even growing) mackerel and herring quotas as well as the very efficient technology involved. This situation applied from the start and the growth in value over the last decade is nothing like the increase in licence prices in the demersal and shellfish sectors. Similarly beam trawlers have had the benefit of efficient technology and reasonably stable quotas of highly priced flat fish species over the years and their highly valued licences have not increased in price at the same rate as the initially undervalued other demersal licences. One element creating variability in the value of licences is track record and combining the quota allocations partly given in table 5.3 with the numbers of vessels in membership shows the wide scatter of average entitlement. The memberships in 1993 numbered from under 20 to over 500 while those outside the POs were nearly 2,000. North sea average quotas of cod for individual POs go as high as nearly 60 tonnes and as low as zero, though the latter may reflect POs concentrating on other grounds and species to some extent to offset this. Similar reservations apply to the averages for sole being as high as 6 tonnes and as low as zero. While it did not prove possible to get the actual value of landings to set against the numbers in table 6.15 below, a rough estimate of the value of catches under quota shows the different levels of activity in the sectors.

Table 6.15 Number of vessels over 10m in PO membership in 1993

SFO	533	Grimsby	101
Aberdeen	71	Fleetwood	48
NESFO	112	FPO	48
Shetland	54	NIFPO	221
Fife	19	ANIFPO	63
Anglo/Scot	181	Cornish	151
YAFPO	47	South West	135

Source: UK Sea Fisheries Statistics, MAFF.

The average value per vessel for most of the main species, other than pelagic, under quota (sole, cod, haddock, saithe, whiting, monks and nephrops) apparently ranges from something over £50,000 for some POs to three times that amount for others. When consideration is given to the variation in vessel performance within each PO, it becomes clearer that some licences will be worth much more than others.

Developments in the period 1994-1996

The developments since 1993 have tended to focus the attention more on the track records of the vessel with VCUs taking an important second place. There is less attention paid to days-at-sea due either to a lack of belief in their introduction or a recognition that track records will remain central to future policy. Whatever the reason the 1996 estimates of licence values are usually given in prices per tonne of fish. With few fisheries yielding only one species, the prices reflect various combinations of cod, haddock, whiting, monks, saithe and other species. The indications are of prices rising from around £500 at the beginning of the year to around £600 at the end of 1996. These figures suggest that while the licences for pelagic and beam trawl vessels may have risen about four fold since the mid 80s, those for the main demersal sector have risen ten-fold. The typical range of licence values is now of the order of £100,000 to £200,000 per vessel. The importance attached to the VCUs depends on whether or not they are needed to meet the penalties on bringing in a replacement vessel.

There is no clear evidence to allow an examination of the various processes underlying price formation in this market. As in any other private market, the deals will be struck on the basis of haggling and agreement with a binding contract completed and the transfer registered with the appropriate departments. The obvious assumptions that the offer price will depend on calculations about the expected evolution of quotas, markets and technology, as well as current costs of operation and value of current entitlements, appear unproven in the absence of detailed surveys. The research indication that under conditions of uncertainty fishermen discount future expected earnings heavily seems confirmed in the relatively low value attached to a demersal or shellfish licence. The value may, however, be more strongly influenced by the degree of confidence about the security of title and doubts about future availability of stocks and markets. In this respect, the longer existence and more restrictive conditions of pelagic licensing, allied to effective conservation and competitive marketing, may explain the very high values there. The likelihood of revised legislative or administrative arrangements destroying current levels of entitlement seems small while the remedy of a judicial review (to secure existing rights in the face of proposed change) is available and has been used successfully in the past in this sector. It is noticeable that the Government in its proposals (August 1994) to simplify licensing procedures did not propose any such severe dilution of existing rights. The eventual outcome of the consultations in November 1994 confirmed this initial impression by deciding that even a very limited upgrading of certain licences would not take place.

The role of the financial sector in the fishing industry is reflected in the activities of bankers and others in funding investment. The existence of the necessary licences is taken by them as a pre-requisite in allowing loans or overdraft facilities but the values of the licences are not regarded as part of the capital structure by them or the accountants and consequently by the tax authorities. (This disregard applies to figures in the balance sheet as opposed to liability for capital taxation on disposal where the value of the licence will enhance that of the vessel if sold.) The bankers are guided in this respect by the fact that the licences are issued on an annual basis to the operators of the vessels and may not be assigned to the banks as security against loans. For all practical purposes the only clear manifestation of the value of licences occurs on the occasion of their transfer with the associated vessels. Then any profit would show up in the accountants' figures and attract the attention of the tax authorities.

What is even less clear is what lies behind the acquisition of licences. On some occasions this is straightforward. New entrants need them to get started; boat builders need them to sell vessels of increased power or size; individual fishermen, fishing firms and producers' organisations need them to make their scale of business and operating technology appropriate and efficient. Against this was the evidence initially of a significant number of 'hip pocket' licences (those which exist but are currently un-attached to operating vessels). These suggested that there might be an element of speculative activity, a worrying feature to some fishermen who fear concentration of economic activity undermining remote fishing communities. The indications from North America do not provide a consistent picture. In some cases concentration has ensued, while in others it has not. The economic benefits of transferable fishing rights may not be realised by reducing the number of operators as individuals search for economies of scale but rather by marrying catching operations to the needs of the markets so that loss-making gluts and poor quality are avoided and employment becomes more secure rather than less plentiful.

It is difficult to describe the market fully. The various groups involved and functions discharged are recognisable but the number of transfers and price levels can only be estimated very roughly. The changes in numbers of fishing vessels can not be estimated accurately due to the existence of different statistical series from fisheries departments on the one hand and the Department of Transport's Vessel Register on the other. The age structure of the fleet and the introduction of new and second-hand replacements suggest nonetheless that over the years, transfers may be of the order of several hundred vessels.

6.3.4 Changes in the distribution 1983 to 1993

The statistics for the period of the first UK MAGP (table 6.16) show the initial transformation in the distribution of rights. It should be stressed that the numbers in both 1983 and 1986 related to active fishing vessels and are much smaller than the current numbers on the fishing vessel register which includes the inactive as well as the active. In particular the number of small vessels was under-stated. The initial licensing scheme did not call for the inclusion of ves-

sels under 40 feet (later under 10m) and there was no incentive to show activity to be allowed to go fishing in the future. The obligation to show activity applied to some extent to the bigger vessels. Even with these vessels, the availability of licences more than covered all vessels.

Table 6.16 Active UK fishing vessels by length groups

	End 1983		End 1986	
	no.	GRT	no.	GRT
Under 40 feet	4,806	27,592	6,158	30,533
40 to 80 feet	1,976	81,103	1,656	72,650
80 to 110 feet	124	19,634	120	18,364
Over 110 feet	106	49,855	90	26,856

Source: UK Sea Fisheries Statistics, MAFF.

The distant water vessels all held or were eligible to hold pressure stock licences. The lack of appropriate opportunities for economic operation led to their departure and that of some of the associated companies. At the end of 1983 there were 230 larger vessels accounting for over 69,000 out of a total of some 178,000 tonnes. By the end of 1986, though the number declined by only some twenty vessels, their share of the tonnage was down to 45,000 out of 148,000. The balance of the fleet and the share of rights thus moved in favour of the inshore fleet. Subsequently the development of the fleet resulted in the current MAGP number by sector, given in chapter 5. While there has been an increase in the size and power of vessels with some reduction in the number of smaller sized vessels among those over 10m, the changes have been more gradual than that evoked by the loss of distant water opportunities and the subsequent decommissioning of 1984 to 1986. Table 6.17 gives the numbers of vessels by length and VCU groups.

Table 6.17 Number of vessels by length and VCU size group in 1994

VCU group	-50	50-100	100-150	150-250	250-500	500-	Total
Length (metres)							
Under 8	4,920	320	15	7	0	0	5,262
8-10	732	1,717	388	73	0	0	2,910
10-15	21	695	422	153	4	0	1,295
15-21	0	1	109	582	209	0	901
21-33	0	0	0	33	455	69	557
Over 33	0	0	0	0	1	146	147
Total	5,673	2,733	934	848	669	215	11,072

Source: Seafish analysis of data from UK Fisheries Departments.

It is clear from the table that over five thousand of the vessels on the 1994 register account for only a trivial amount of capacity. It also indicates that the VCU measurement is an imperfect proxy for actual catching performance as vessels over 10m account for significantly more of the catch than they do of the VCUs.

The outcome of the 1994 consultations on changing the licensing system indicated that the Government's intentions were to simplify the procedures rather than dilute the restrictive nature of licencing. The extension of the arrangements in 1993 to the previously unlicensed smaller vessels (those 10m and under) removed the last gap in the system. The recognition of the dangers to economic objectives as well as those in conservation from having any degree of open access now seems to have arrived. While controversy still continues about how access will be rationed, a trend towards more rational economic behaviour seems likely. Individual transferable quotas do not appear acceptable to the industry at present but the situation may change as individual fishermen, fishing firms and producers' organisations use the current system to make their operations more profitable and their communities more secure. (The pelagic sector have virtually arrived at a system of individual quotas which can be transferred to a large extent. Something similar also applies in the very small distant water sector.)

Reducing the number of licences and the size of the fleet happens in two ways; the Government does this through the decommissioning scheme while the industry does so through the statutory reductions in capacity when replacement vessels are introduced. This naturally leads to further diminutions in access. An industry with fewer vessels (with their operators more certain of their share of quotas) seems the certain outcome. If this allows the producers' organisations to improve their performance in marketing, rationalisation may carry fewer unwelcome social implications. The type of employment may change with more activity in the processing sector but loss of jobs and capital invested seems less likely. The Shetlands provide an example of this kind of flexible approach with concentration and reduction on the sea-going side being offset by acquisition of added quotas and expansion in fish farming and processing.

Lack of transparency in the market

The lack of transparency in the market in licences suggests that some evolution is both necessary and likely. The Government's consultation document mentions the need to make the transfer mechanism less cumbersome. This may lead to some simplifying of the paperwork but is unlikely to lead to say an open system of auctioning alienated licences. What is likely to develop, whether formally or informally is a clearer way of dealing with each of the property rights of economic significance. Size and power are relevant dimensions to new entrants to the industry who must acquire a vessel and a licence to go fishing. They are even more important to those already operating who wish to change or upgrade their vessels and the boat builders seeking to supply them. The completely different component of track records in terms of quota entitlements (and to some extent the relative allowable effort in days-at-sea)

is currently the dominant element in the prices paid for units of fish, with that for capacity not separately identified. Time will no doubt see some refining of the ways in which the two values are assessed with the attraction of some form of transferable units of power and of quota becoming more obvious. It may be that some rule of thumb will lead to a system combining the value attaching to the capacity and a series of values attaching to the amounts of each species that the vessel licence allows to be landed.

Currently the main economic barriers to entry rest on the basic cost of the vessel, gear and operating capital. The indications of the value of a licence, which after all seems likely in some form or other to outlast the associated vessel, do not suggest its cost to a new entrant to the main demersal and shellfish sectors will prove a major deterrent. If, however, reductions in capacity and improvements in conservation make a licence into 'a licence to print money' which tends to be the view in some quarters of the pelagic and beamer licences, things would change. A demersal vessel around 25m probably costs around £1m, which makes the cost of a licence of lesser consequence as say an addition of 15%. If this rose to the proportions found in the pelagic or beaming sectors of perhaps an additional 50%, the economic barrier to entry would be significant.

6.3.5 Conclusions

The economic dimensions of fishing rights embodied in restrictive licensing are considerable. They form a significant barrier to entry in some sectors and may be expected to affect increasing numbers of sectors in this way in the future. While they may not dictate the evolution of the industry, as technical, social and political influences will also play their parts, fishing rights will have a substantial role. What is clear is the fact that rights which can be transferred and aggregated do allow more profitable enterprises to evolve. The knowledge of the scale of entitlement leads to better matching of vessel investment to fishing operations, often by reducing overall capacity and to improvement of marketing processes. Certain forms of industrial organisations such as POs and companies appear well suited to cope with developments and likely to grow in power. Again much will depend on the extent to which political and social pressures legitimise individual fishing rights. This balance impinges on wider economic considerations as the cost of enforcement, if very heavy due to a lack of political support in the relevant communities, may well erode the gains in rationalisation.

Other aspects which need considered include the apparent excess of parties involved in the market and the lack of detailed information on its operation. It seems to need fewer middlemen and more transparency. Additional information about the market would also throw light on what goals acquirers have. Evidence from fisheries elsewhere, as with ITQs in New Zealand, and in various sectors of agriculture throughout the world, suggests that speculative interest can occasionally develop wastefully leading to excessive transactions and extra marketing costs. What is undeniable is the added cost caused by licences having a value. They become yet another factor of production needing

their share of the product which they gain only at the expense of the return to other factors due to the higher costs incurred in production. It seems less likely that better returns from the market due to better timing, selection and presentation of product will effectively transfer the costs to the consumer.

6.4 Economic aspects of property rights in other countries

6.4.1 Economic aspects of property rights in Iceland

The evolution of the management system in Iceland shows an interesting development. Until the extension of the fisheries jurisdiction to 200 miles in 1976 the Icelandic fisheries were international and had an open access. The initial management measures taken in 1976 in the demersal fisheries, which count for 75-80% of the total catch value, were inadequate and didn't change the open access nature of the fishery. The development in the Icelandic fisheries followed the path predicted for these kind of fisheries, with excessive capital compared to the reproductive capacity of the fish stocks. Hence, the economic results were bad. As a consequence in 1984 an system of individual vessels quotas was introduced. In 1985 vessels were allowed to opt for effort restrictions instead of catch quotas. However, in 1990 a general ITQ system for all Icelandic fisheries was introduced, and the effort option was abolished.

The evolution of the ITQ system in Iceland has been based on trial and error 1). Also the steps in the evolution of ITQs have been taken in response to the crises in the fisheries. This feature seems to be common, only when interest groups are faced with reductions in catches or income, they are willing to discuss changes in the management framework. However, in 1990 there were no such crises, but the industry has in the period before 1990 experienced the economic benefits of the vessel quota system and therefore the industry supported the implementation of the general ITQ system.

Economic and biological impact of ITQs

In the herring fishery, where ITQs have been in force since 1976, the catches have increased threefold since 1987 and the effort has declined by 20%, i.e. the efficiency is about 4 times higher than it was at the outset of the ITQ system. In 1993 there were 30 vessels in the fishery. The biomass of the summer-spawning herring stock has increased from 300,000 tonnes in 1984 to nearly 700,000 tonnes in 1993.

In the capelin fishery, the mean catches have been roughly unchanged. Capelin is a short living species and the fishery is therefore very volatile. The total tonnage of the fleet has been reduced by about 25% from 1979 to 1993 and the efficiency in the fishery has thus increased since the introduction of

1) This section is more or less based on Arnason 1993 'The Icelandic Transferable Quota System: A Descriptive Account' *Marine Resource Economics*, Vol. 8, nr. 3.

ITQs. Given the nature of the capelin stock the biomass has not been significantly affected by the ITQ system.

In the demersal fishery the evidence is not so definite as in the herring and capelin fishery. The level of the catches seems to be unaffected by the ITQ system. However, since 1984 the catches of particular cod have persistently exceeded the TACs set by the Government, i.e., the political TAC. This TAC has furthermore been set over the recommended TACs, which in many cases suggested a substantial reduction in catches. As a consequence of this short term policy the stock size of the importance species has declined considerably.

The capital employed in the fishery has increased in the period from 1983 to 1992, while the fishing effort have declined only slightly. However, the capital has only increased in the period 1985-1990, probably because the ITQ system was supplemented by another system based on effort. Since 1990, when the effort option was abolished, the invested capital has declined. The development of effort shows the same pattern. Evidence that the considerable resource rent is generated is shown from various indicators, e.g. quota prices. The annual lease price of e.g. cod has been rather high in the recent years, about 80-90% of the landing price, which indicates a serious shortage of cod quota. A contributory cause has probably been that the trade in quota often takes place if it turns out that the catch is beyond the original quota and thus trade is necessary. The quota price is in this case more depending on the fine of catching over the quota than on the marginal return of extra quota and catch alone.

Lessons to learn

The lessons from the Icelandic ITQ system show that success of an ITQ system among other things will depend on permanency of the assignment of quotas, that the quotas are stipulated as shares in the TAC rather than fixed quantities, that the ITQ system is as complete as possible, that the market for quotas is working as perfect as possible and finally that distribution of the entire rents to the initial receivers of the quotas may undermine the social support for ITQs. Only since 1990 the ITQ system in Iceland can be said to be a complete system with only minor exemptions. The effects of these exemptions seem to have been quite serious in the demersal fishery.

In Iceland two issues have been discussed recently. Firstly and most intensively, the distribution of the rents from the fisheries, i.e. the equity aspect. The high quota prices are seen as an indicator of very valuable property rights and the critics argue that the shares should be reallocated or taxes should be imposed on quota holdings. Secondly the regional implications of the ITQ system have been discussed. By restricting the transferability of the quotas the regional reallocation can be minimised. These issues deal with adjustments of the ITQ system and are not about fundamentals in the system. The ITQ system seems to have wide support in Iceland. The annual lease price of quotas is about 10-25% of the price of permanent quotas given an implicit rate of discounting of 10-25%. This fairly high rate may indicate that the fishermen do not believe that the current system will continue in the long run.

6.4.2 Economic aspects of property rights in Norway 1)

As mentioned in section 5.6.2 the regulation of the Norwegian fisheries is more or less based on licenses and/or individual vessel quotas. These rights are not transferable in themselves, but the rights can follow the vessels when a vessel is traded. The value of licenses and quotas has therefore been capitalised in the value of the traded vessels.

The present value of these rights is mainly influenced by two factors 1). The uncertainty about the regulation all things equal reduce the value of the licences/quotas compared to a situation where the duration of the licences/individual quotas would be perpetual 2). The considerable subsidies to the sector have increased the value of the rights. In the present literature no value of the rights is given or estimated, but it is, however, believed that the economic rent in the fisheries is substantial and that in certain fisheries the value of the rights has been included in the price of second hand vessels. Flaaten et.al. (1995) investigate whether the profitability of purse seiners which have received the license for free are higher than the profitability of purse seiners, has bought with a license. They conclude that the profitability was higher because the capital cost for vessels with a 'free' licence was lower, indicating higher capital cost of vessels with a purchased license.

As mentioned in section 5.6.2, the reduction in capacity has been realized mainly through a scrapping programme. The policy was not consistent, because at the same time considerable subsidies were provided, in 1988 548 million NKr. (excluding investment support). The aim of the subsidies was to secure the profitability of the fleet. In 1992 the subsidies have declined to 425 million NKr. because of the improved profitability of the fleet and the Government had the objective to reduce this kind of support. The main part of the support (over 50%) is given to social schemes, which covers a minimum weekly income for fishermen guaranteed in case the fishing fails. A part of the unemployment benefits to fishermen and vacation support is also financed by these schemes.

The regional aspect of the regulation is relative important in Norway and there have been some changes in the 80s. In the period 1977-89 the fleet from the northern part of Norway reduced its share of the total Norwegian catches from 37% to 23%. The main reason was that the fleet from the western and southern part of Norway had better resource conditions. The biomass of cod stock in the Barents Sea was very low, which influences the fleet in the north more than the fleet from south. In 1990 quota limitations were introduced for the coastal fleet based on historical catch and nearly the whole fleet becomes regulated by licences and/or quotas. As a consequence, regions that had re-

1) The section is based on 'Individual quota management systems in Norway' in 'The Use of Individual Quotas in Fisheries Management', OECD, 1993, 'Norsk fiskerinæring: landeanalyse' by Bjørn Hersoug in 'Fiskerinæringens hovedtrekk-landeanalyser', Nord 1992:30 and 'Regional Enterprise Share Quota Management System' by Torbjørn Trondsen and Jostein Angell in Proceedings of the IV Annual Conference of EAFE 1992.

duced their fleet temporarily, due to low catch rates, also lost the future legal rights to the resources.

The biological effects of the regulation seem to have been quite successful, especially since the late 1980'ties, despite the inefficient regulation and overcapacity of the fleet. One can speculate whether this is due to regularly consultations between the Ministry and the fishermen's representatives which can provide a high degree of legitimacy for management decisions (Hannesson, 1996).

6.4.3 Economic aspects of property rights in North America

The different institutional structures in Canada and the United States reflect the different political frameworks which have evolved in those societies. (For example, unfettered capitalism in the US led to excessive use of market power by monopolies and oligopolies; this necessitated such legislation as the Sherman Act 1890 which outlawed certain anti-competitive actions. The Clayton and the Federal Trade Commission Acts are also relevant in this area of regulating business behaviour. Equally both the United States and Canada tend to regard certain natural resources, whether in national parks or in fisheries as belonging to the nation rather than individuals.) These in turn have determined the economic environment within which the fishing industrial structure has developed and the degree to which social objectives may obscure or inhibit the working of economic forces. The experience there, as in Western Europe, is of adjustment to policy measures and to their economic impacts as technology changes and political pressures develop. With much greater sea areas and fishery resources, as well as politically significant but remote communities dependent on fisheries (in places like Newfoundland or Alaska), the working out of the economic influences is in some ways clearer than in Western Europe and provides useful insights into the adjustment process needed to reconcile technical progress and social goals.

Restricted licensing creates an economic good. Thus economic forces will, if allowed to do so, tend to move licences, like other resources, to their best users to manage in best combinations with other resources to produce the most appropriate outputs. As with other essential inputs, a shortage of or high prices for licences leads to the employment of economic substitutes. Depending on the restrictions in force, these may include use of additional technical inputs, such as horsepower, or of labour by multiple crewing. The restrictions on transfers will also determine whether the market in licences operates freely and the resultant industrial structure reflects the appropriate range of firm sizes and the optimal levels of employment and investment. The examples given below show both the occasions where political pressures have led to waste and where improved policy measures have allowed greater efficiency.

While the main interest is in economic efficiency at the firm and industry level, there are economic concerns at the national level as well. Property rights are created politically in appropriate legislation but secured only by legal processes, legitimised by the support of the community and enforced by Government or other agencies. Lack of support, high costs of the legal process and

intrinsic problems in policing can lead to costly and ineffective efforts to secure conservation and a prosperous industry. Some US studies have suggested that costs of conservation, administration and enforcement may exceed the profit of the sector involved. As the sting operation to detect illegal landings from the Wisconsin Lake Superior trout fishery involved the States of Wisconsin, Illinois, Michigan and Indiana as well as the federal authorities in setting up a firm in Chicago, the costs were understandably high on that occasion. With only 21 eligible fishermen and an overall quota of around 15,000 fish the benefits looked to be relatively small.

6.4.3.1 Canada

The Bay of Fundy herring fishery

This fishery provides an interesting sequence of profit in the 60s leading to overcapacity followed by a limited licensing scheme which did not solve the various problems identified. Setting up a marketing co-operative and having annual individual vessel quotas and weekly catch rates did little for conservation (due to illegal landings and consequent mis-reporting) or for rationalisation of the fleet. Some improvement in bargaining power vis a vis the processors and foreign (state) buyers may have led to firmer prices but this is uncertain, as is the possibility that having an apparently definite share may have led to some cost savings and product improvements. A market in licences did not develop as no real system of transferability was allowed for, other than the informal one providing for vessels pooling their individual quotas; the relevance of market-type transfers was further eroded by the process of administrative re-allocation of any quotas which were not being fully used. In effect with the property right lacking real exclusivity, permanence and enforceability, rational economic behaviour largely remained a competitive race to fish with capital stuffing and disregard for conservation being the natural outcome.

The wider programme which began in 1983, covering the Gulf of St. Lawrence as well (16 vessels there in addition to 49 in the Bay of Fundy fleet), added transferable quotas to the vessel licensing scheme with the aim of restructuring the fleet. Furthermore, these individual quota shares were fixed and of ten year duration as opposed to the previous variable ones lasting only a year. Again the ability of economic forces to work directly on the structure and performance of the industry was constrained by the political and social objectives and environments. Transfers were subject to considerable restrictions. No vessel operating in the Bay of Fundy could accumulate more than 4% of the TAC which implied at least 25 vessels after 10 years compared with 49 at the outset. Furthermore, while fishermen could buy quota share from other fishermen and processors, the latter could only buy from other processors. This may have been to avoid excessive concentration but it put rigidities into the market for quota share, as did the obligation to sell all, as opposed to part, of the quota and the absence of provision for leasing. Pooling arrangements, as before, allowed an informal system of leasing. Again the inflexibilities seem aimed at avoiding fluctuations in individual quotas causing added enforcement problems as well as creating the chance for speculation. The swift initial depar-

ture of 5 Fundy vessel and one from the Gulf suggested confidence that a valuable property right had been created. Subsequently the rate slowed down and only 4 more Fundy vessels went and one other from the Gulf. This diminution in fleet size will undoubtedly have reduced the economic waste associated with excess capacity. The reduced costs of harvesting were thought to have improved profit but not to the extent initially envisaged. This failure to achieve the expected re-structuring stemmed from the difficulties in enforcement which persisted. The possibility of making illegal landings meant that buying additional quota became less attractive than under-reporting. It is likely that the smaller fleet, with its secure individual allocations, has taken its catch more effectively in terms of lower operating costs and more appropriate timing for higher priced marketing and processing outlets. This may have made for better conservation but probably this arose as much from strengthening stocks allied to weakening demand.

Atlantic offshore groundfish fishery

The offshore fleet is defined as the fleet of vessels over 100 feet and it shares its grounds with vessels from the mid-water and inshore fleets to a certain extent. What distinguishes this sector is the predominance of two large firms owning fleets of trawlers delivering to their shore based processing plants. Limited entry licensing and Canada's post-1977 acquisition of added fishing opportunities did not prevent this sector showing all the problems of open access fisheries. Economic inefficiencies showed up on land and at sea. The race to catch fish led to early closures and idle capacity while the compressed catching season led to overloaded processing facilities and inevitably poorer quality output. The economic waste on shore also extended to unemployment and idle plant when the closures cut off the supply of raw material. The Government introduced enterprise allocations which gave roughly half of the TACs to the company sector and allocated the individual shares to the companies on the basis of past catching records. While the allocations were neither permanent nor transferable they had a considerable economic impact, partly because of the dominance of the two main firms. The allocations resulted in changes on the harvesting side with catching being geared to the needs of the market. This in turn extended the season and allowed a reduction in vessel numbers of some 20% with associated lower operating costs. On shore the impacts were if anything greater since planned harvesting meant extended effective employment of the labour and plant as well as better quality product. There were no provisions for transferring shares with the exception of exchanges between firms within the year. Thus no market in quota shares could develop. The decision to prevent such a market reflected political and social consideration (in particular a desire to maintain regional balance in employment) as did subsequent pressure by the rest of the fleet (mid-water and inshore vessels) for similar allocations and failing that a greater share of the overall TACs. Enforcement problems prevented extension of the system to the more numerous smaller vessels but political considerations resulted in a declining share to the company sector, which if anything means an increase in the waste associated with open access.

Newfoundland inshore cod fishery

Developments in otter trawling in this fishery had led to considerable over-capacity and unbalanced exploitation of the allowable catch. Limited entry licensing had not been sufficiently restrictive and had to accommodate political pressures by allowing a substantial influx of additional vessels. Economic waste was apparent in the rush to fish which increased the costs and decreased the value of the catch by glutting the market. Further dislocation appeared in the concentration of activity on the winter fishery off the south west of Newfoundland; this meant under-employed fishermen and processing facilities in the northern areas and inadequate capacity in the south. The move to individual quotas for vessels allowed some re-dress of certain economic problems but not others due to political and social considerations. Quotas and vessel licence went with the vessel and transferability was limited to moving them from one fisherman to another or from a boat to its replacement. Leasing was only possible where a vessel was lost or unable to go to sea. The rigidity may have been intended to keep the regional balance intact and to minimise enforcement problems but the absence of ability to aggregate quota prevented significant re-structuring and impeded cost cutting. It is, however, clear that the programme did have considerable economic benefits. Labour in catching and processing as well as the related capital was more effectively used. Gluts and the need to incur extra costs in hauling fish from the over-stretched processing facilities in the south west was avoided. Better quality produce as well as lower cost and safer catching operations resulted as the season was extended. As the only effects on structure were those stemming from departures where replacement did not occur, there was only a very slight decline in the number of vessels.

6.4.3.2 United States

Wisconsin: Lake Superior lake trout

The aims of the measures used to regulate this fishery were initially to revive the severely depressed stocks and to sustain it by cutting back on the number of licence holders. Thus in the early stages, the emphasis was on not permitting transfers and tightening the conditions of investment and effort. Subsequently the transfer of licence and quota is allowed but only to a replacement fisherman. Aggregation or sub-division is not permitted and leasing is only accepted under very restrictive rules. Thus economic improvement has been noticeable only in reduced operating costs and improved marketing returns. Enforcement has posed problems which appear to have been improved by considerable expenditure; over-fishing and mis-reporting do, however, occur and undermine both the economic and conservation benefits.

6.4.5 Economic characteristics of property rights in New Zealand

As has been said in section 5.6.5, an ITQ system was implemented in the New Zealand fisheries in 1986. Since the introduction of the system some 80%

of quota has changed hands in permanent trades of quotas (Clark, 1992) 1). This has led to some concentration of quota ownership (Falloon, 1993). In June 1987, the three largest consortiums owned 43% of the quota by tonnage, whereas in March 1992 they owned 50%. However, in specific fisheries (e.g. abalone) ownership of quota has become more widespread.

Total production of the New Zealand fisheries remained rather stable after the introduction of the ITQ scheme (table 6.18). The total number of vessels increased from 2,331 in 1986 up to 3,216 in 1991; the majority of this fleet (79% in 1986 and 71% in 1990/91) consists of small vessels (up to 12m). The number of bigger vessels (more than 33m) increased from 2.7% in 1986 up to 8.9% 1990/91. The publications of Clark and Falloon do not give insight in the background of these developments.

An interesting feature of the NZ ITQ system is a Quota Trading Exchange (QTE) that was in operation during the first two years of scheme. However, this proved to be unnecessary when the quotas became concentrated in fewer hands. Another reason of abolition of the QTE has been that quota holders had the opinion that the system revealed too much information to the Government in view of implementing resource rentals based on market prices.

Market prices of quotas are not included in the publications of Clark and Falloon. Falloon does mention the level of the lease price: 11% of the fully capitalised valuation of the quotas (NZ\$ 1.32 bln). The rate of capitalization of 11% is close to the required return on capital for fishing businesses in New Zealand.

An important lesson from the New Zealand ITQ case is that there are many factors influencing and affecting the price of the quota (Clark, 1992 p. 522). The unpredictability and lack of correlation with any economic criteria makes the quota price unusable as an indicator in a fishery.

There has been much discussion about the security character of ITQs for loans. The NZ Government has decided to implement a registration system for quota ownership that guaranteed a clear title to quota. Therefore, lenders are reluctant to provide loans on the basis of the value of the quota alone. The industry prefers a quota registration system, operated by the fisheries management administering authority, so that quotas may serve as a security for loans.

The issue of resource rentals has probably been the one that has caused the greatest conflict between the industry and the NZ Government. The Government has the opinion that rents are created by the implementation of the ITQ system and that these rents should accrue to the Government. On the other hand, the industry argues that with the move to proportional quotas all the risks of TAC changes have been transferred to the industry and therefore all of any rent should accrue to the industry. Moreover, any rents that may have ex-

1) Sources of information about the New Zealand fishing industry in this section are: 'New Zealand's Individual Transferable Quota System for Fisheries Management', by Ian Clark, in *International Perspectives of Fisheries Management*, Tokyo, 1992 and the second source is 'Individual Transferable Quotas, The New Zealand Case' by Roger Falloon in *The Use of Individual Quotas in Fisheries Management*, OECD, 1993.

isted have been capitalised into the value of quota and have been captured in the transfer by sale of that quota. Nevertheless, resource rental have been introduced and they accounted for around 15% of the estimated annual value of the fishery in 1992.

The tendering of new rights has been very successful. Deepwater quota was tendered to the highest bidders during 1987 and 1988 to raise about NZ\$ 100 million. The move to a proportional quota system means that extra quota can no longer be tendered; it must be allocated on a pro-rata basis.

The costs of management have increased somewhat since the implementation of the ITQ system. Staff has increased by about 10%, mainly in the area of administration of the paper-flows; enforcement staff has remained relatively constant, though there has been a move to the use of investigating accountants.

Table 6.18 Production and employment in the Fishing Industry of New Zealand

	1984	1987	1989	1990
Production (1,000 MT)	430	485	458	450
Value of production (\$NZ mln)	541	812	900	950
Employment	8,000	10,000	12,000	15,000

Source: 'New Zealand's Individual Transferable Quota System for Fisheries Management'; Ian Clark in *International Perspectives on Fisheries Management*; Tokyo, 1992.

6.4.6 Economic characteristics of property rights in Australia

Two different types of individual property rights were introduced in Australia in 1984: An ITQ program for the Southern Bluefin Tuna (SBT) and input rights ('Class A' and 'Class B' units) were allocated to fishermen in the Northern Prawn Fishery (NPF).

The SBT ITQ program started in October 1984¹⁾. The TAC for this tuna species was fixed at 14,500 tonnes for the first year of the program, which meant a decrease by 30% compared with the preceding year. This TAC was lowered further and amounted to 11,500 tonnes in 1987. Initial allocations of ITQs were insufficient for a number of fishermen to allow a viable exploitation in the tuna fishery. Therefore, many fishermen chose to sell their small quota holdings and left the fishery. This resulted in an adjustment of the fleet, whereby the number of ITQ holders diminished from 136 in 1984 to 63 in 1987. The speed of this fleet adjustment was facilitated by the compensation payments for ITQs sold by those who left the industry.

1) Information about the results of the Australian fishing rights has been derived from: 'Applied Fisheries Management Plans', David Wesney, in 'Rights Based Fishing', 1989 and from the Australian contribution to the OECD study on management techniques, 1994.

A shift in the proportion of individual to company operations holding quotas, from 74%: 26% in 1984 to 55%: 45% in 1987 shows a concentration of ownership amongst bigger enterprises. The larger operators in South Australia have purchased quota from fishermen in Western Australia and New South Wales. This concentration tendency led to the situation that in 1992-93 over 62% of the total southern bluefin tuna quota was held by 5% of the quota holders.

The value of the quota reflects the increase in catch value: the per tonne quota value has increased from the initial level of about \$ 1,000 to over \$ 5,000 in 1987. The increase in catch value could be realised by exporting more tuna to Japan, for the high-priced sashimi market.

Despite the reductions in catches the industry remained profitable, with the cost of catching a tonne of tuna falling by 25% and a resource rent of \$6-\$7 million being earned in 1986-87 (Geen and Nayar, 1989). Gains have also been made from improved fishing techniques encouraged by the introduction of ITQs. For example, long line fishing methods were more used to catch more valuable tuna for the Japanese sashimi market.

For the Northern Prawn Fishery (NPF) a management plan regulating the inputs of the fishery was implemented in 1984. The reason for this plan was a more economic one i.e. improvement of the profitability of the vessels by reducing the pressure on the stocks. Moreover, this fleet was more scattered over a vast area so that an ITQ system would be more costly and difficult to control compared with input controls. A voluntary adjustment scheme (VAS) aimed to reduce the capacity by some 40% up to 1993. Due to this scheme, the boat capacity decreased by 13% in the period 1985-1988 which suggests that the progress towards achieving a 40% reduction in fishing capacity in 1993 was well on target.

Fishermen paid a levy to support the VAS, which meant an annual amount of \$18,000 for an average-sized trawler. The capacity of the boats is expressed in 'Class A' units which are tradable. In 1989 market prices of these units ranged from \$450 to \$650 which meant a value of \$220,000 for a trawler of average capacity. At the start of the scheme the units were priced at \$120, hence an increase in value of some 400% occurred in four years.

The south east fishery, a multi-species fishery, is the third Australian fishery where fishing rights were introduced (in 1985). Transferable endorsements were issued to fishermen for one or more of three management zones. This kind of input control did not succeed because of the continuing increase in effort, in spite of adaptations of the input regulations. In 1992 the TAC for sixteen species (orange roughy, blue grenadier, gemfish etc.) was 31,680 tonnes, of which some 29,000 tonnes was allocated to two types of trawl fisheries (Danish seine and otter trawl). The vessels in each sector were allocated a portion of the respective number of quota units available to each sector. So, there has been a move from input rights to an ITQ scheme in the south east fishery.

A lack of an effective market for quota occurred in this fishery which was ascertained to dissatisfaction with the initial allocations of quota. This absence of quota trade has made the adjustment of the fishery much slower compared

with the southern bluefin tuna fishery. This adjustment process has also been hampered by the limitations in other fisheries (a move to other fisheries was not allowed) and bad employment prospects in coastal communities.

Profitability improved for the south east fishery as a whole, after the implementation of the ITQ system. This was mainly due to the increase of the return on capital of one sector, the offshore boats, in 1991-92 (42% return to capital in that year). Amalgamation of ITQs by operators who owned more than one vessel and an increase of prices for orange roughly mainly explain this increase in the average return on capital.

Evaluation of the Australian property rights

The quota-based system of SBT enabled an immediate and substantial reduction in the TAC from a 21,000 tonnes national quota in 1983-84 to 14,500 tonnes in the following year and further to 11,500 tonnes. The number of quota holders was reduced by 54% between 1984 and 1987 due to selling of ITQs from those who left the industry.

The average size of the fish landed has increased and the value of the catch has increased significantly due to a rise in exports to Japan.

The concluding comments of Wesley are somewhat preliminary but he states clearly that one of the major advantages of this ITQ system is its direct control on catch and incentives for a more efficient fishery. Government intervention is minimal and in the case of SBT surveillance and enforcement have not been a major problem.

The Australian contribution to the OECD study on management techniques assesses the effectiveness of the SBT ITQ system in terms of: 1) gains in economic efficiency 2) the cost effectiveness of its implementation 3) the ability to meet the conservation objective of fisheries management and 4) income distribution effects that may occur.

With respect to points one and four the conclusions are positive: there has been an improvement in economic efficiency, because the catching costs have decreased and fishing techniques have been improved and, regarding the fourth point, rationalisation has taken place because the ownership of quota is acquired by those that are the most efficient operators.

Regarding point 2, cost effectiveness, the Australian study mentions that the costs of surveillance and compliance (\$310,000 in 1991-92) were about 64% of the SBT fishery management budget. There have been some problems with monitoring and enforcing the program so that dumping of fish, caught in excess of the quota, may have occurred. It is not sure whether the conservation objective (point 3) has been met because the southern bluefin tuna stock responses only slowly to changes in fishing mortality.

In the end the OECD study concludes that in the medium to longer term a system of ITQs in the southern bluefin tuna fishery is thought to have a number of advantages over other management systems.

The other management plan, the one for the NPF fishery, is more complex and involves considerable Government intervention. Moreover, constraints such as gear restrictions, seasonal closures etc. impose additional costs on individual fishermen. Subjective information from fishermen about profitability of

their operations ('good' in 1987) suggest that substantial resource rents have been accruing to the industry, in spite of costs of the VAS and management fees. According to the OECD study, positive results of the NPF plan are that most of the potential capacity (i.e. units that were not assigned to boats) has now been removed from the fishery, as well as some operational boats. Wesley states in his previously mentioned article that there are signs that the managements measures for the NPF fishery had desirable effects because of the decrease in boat capacity by 13% in the period 1985-1988.

Both plans, the SBT ITQ scheme and the NPF input management plan, have the capability of being quickly amended in response to changing circumstances in the fishery.

The effectiveness of the ITQ scheme in the south east fishery is not very clear. The economic performance of the trawlers improved after the introduction of the ITQs in 1992, but there were also other factors that have influenced this improvement. The cost effectiveness of the ITQ implementation has been doubtful, due to inadequately defined user rights and the problems that are caused by implementing ITQs in a multi-species fishery. Moreover, there is a multiple jurisdiction in that apart from the Commonwealth Government four other states have jurisdiction about the fishing grounds. This situation creates enforcement problems.

Whether ITQs in the south east fishery are successful in meeting the conservation objective is too early to assess, according to the previously mentioned study for the OECD. Estimation of the TAC is difficult for some species due to lack of information about the stock structure for a number of species such as orange roughly.

Income distribution effects, the fourth measure for effectiveness in the OECD study, differed widely from those in the southern bluefin tuna fishery. The lack of an effective market for quota, due to restrictions and dissatisfaction with initial quota allocations, resulted in a slow rate of adjustment of the fleet.

The Australian contribution to the OECD study on management techniques gives also an overview of key management problems and issues. One of the points is that there has been a trend towards increased industry involvement in the management of the Australian fisheries. Especially in South Australia, where Integrated Management Committees operate which are composed of representatives from all areas, including commercial and recreative fishers, scientists and fishery managers. Another point is that there has been some questions regarding the appropriateness of the Australian Fisheries Management Authority's objective of maximising economic efficiency in the exploitation of the fisheries resources. It has been argued that it is only the task of AFMA to get sustainability in the fishery by setting biological reference points whereas the industry should strive for economic efficiency in his own way.

6.4.7 Economic characteristics of property rights in Japan

In Japan the property rights for fishing can be distinguished between fishing rights for coastal areas, prefectural fishing licences and licences issued by the ministry, as has been described in section 5.6.7.

The fishing rights for the coastal zone, managed by the Fishery Cooperative Associations (FCAs), have a validity of five or ten years. Generally spoken, the rights are granted to the FCAs. Fishermen who want to fish in the coastal zone should be a member of an FCA. It is a system of community based fisheries management by highly cohesive units of fishermen. The rights of the FCAs are property rights but they can not be sold or leased.

Products from the coastal zone such as urchins, shellfish, spiny lobsters, abalones, clams and marine algae have a relatively high value. The exclusive common rights system allows fishermen to stabilize and maximize harvest of these valuable species. Thus in many cases fisheries conducted under the exclusive common rights tend to be among the most profitable operations engaged in by coastal fishermen 1). The owners of the coastal fishing rights have a very strong position, because the rights are inalienable and are guaranteed under both the Fisheries Law and as livelihood rights under Japanese Civil Law. Furthermore, a party applying for a permit to reclaim a particular sea area must first obtain permission of the owners of fishing rights existing in that area. This has led to very high compensation payments, demanded by FCAs, for loss of rights due to coastal development projects.

Table 6.19 Economic structure of Japanese Marine Fisheries, 1991

	Coastal Fishery			Offshore	Distant
	total	capture	aquacult.	fishery	water fishery
Number of fishing establishments	175,444	128,903	36,951	9,298	212
Number of fishing boats	277,949	253,149	22,235	2,565	
Number of fishermen	370,300	300,300	70,000		
Production (1,000 MT)	10,843	1,992	1,273	6,081	1,496

Source: 'Development of a Community-Based Fishery Management System in Japan', Tadashi Yamamoto in *Marine Resource Economics*, Spring 1995.

The fishing licenses granted by the prefecture and the ministry restrict the number of fishing units for offshore fisheries. Fishing effort is controlled by the number of licenses issued, limitation on vessel size and gear and through the opening and closing of seasons and areas. Fishing licenses are normally valid for five years with possible renewal. The licence is transferable under certain conditions (Yamamoto, 1995).

1) 'The Japanese Coastal Fisheries Management System Based on Exclusive Fishing Rights', Kevin Short, *International Perspectives on Fisheries Management*, Tokyo 1991.

Tanaka (1993) 1) states that, as a result of transfers, the price of a fishery right (e.g. per ton) will be generated for each type of fishery, whereby financial institutions accept these valuable rights as a collateral. From the viewpoint of business management licence-based fishery in Japan has many problems such as deterioration of profitability because of excessive investment, adverse effect of excessive exploitation arising out of efficient fishery methods, emphasis on large volume catch because of competitive catch and scanty attention given to enhancing added value of the catch.

The available literature does not provide information about markets of fishing rights, prices and effects on the structure of the industry.

1) 'Comparative Study of Fishery Management Systems in Japan and New Zealand', Katsunory Tanaka in 'the Use of Individual Quotas in Fisheries Management', OECD 1993.

7. PROPERTY RIGHTS IN AGRICULTURE

7.1 The EU milk quota system

The situation before implementation of milk quotas in 1984 was dominated by a level of production resulting in a considerable level of inventories and increasing expenses for the support of the prices. This was a consequence of the conducted price policy. By keeping a price guarantee larger than the market clearing price, adjustment of supply and demand has been prevented. The overproduction of milk has been a reality since the early 70s. In the late 70s and early 80s the imbalance between supply and demand deteriorated (in 1979 the overproduction was 11%). In 1977 a co-responsibility levy was introduced corresponding to 1,5% of the indicative price. In 1982 it was introduced that production over a given level would lead to a corresponding reduction in prices, measured in percentage. All these measures didn't have any great effect on the milk production, e.g. the overproduction in 1983 was 25%. It can therefore be concluded that in this period, given the price policy, the overproduction was permanent and structural determined.

In summer 1983 the overproduction had reached a level which would have meant a reduction in prices at 12% in 1984/85. The quota system was then introduced in order to avoid the reduction in price, which the Council evaluated would give the farmers too serious income problems.

The quota system was supplemented by a two-price system. A guaranteed minimum price is given for the production within the quota. Production beyond the quota is imposed with a levy, which since 1990/91 has been 115% of the price. Before 1986 the levy was either 75% or 100% depending on the choice of quota-system, while in 1986-1990/91 the levy percentage was 100%.

There were two ways in 1984/85 in which the quota-system could be introduced on the national level: either a system where each farmer pays the levy for production beyond his(hers) assigned quantity/quota (formula A), or a system where each dairy/buyer of milk pays the levy for production beyond the assigned quantity/quota (formula B).

The total quota in EU was determined from the total production in EU in 1981 added by 1% and some minor quantities as reserve of EU. The total quota was distributed to each Member State based on their share of the production in 1981. Compared to the total EU production in 1983 the total production in 1984/85 was 3,9% lower.

The production was still significant over the consumption and the quotas were, therefore, currently reduced, however, slightly, in the 80s by cessation and suspension schemes. Since 1989/90 the total quota has been almost stable. The level of overproduction was in 1990 15%, a quite significant overproduction.

In 1986 the rules for the Member States payment of the levy changed such that the rules now are (nearly) independent of choice of formula, which means that only production beyond the national quota is subject to the levy. However, it was still possible to impose a levy of 75% on the overproduction of each farmer (in force in Holland and Germany). The extra money in these countries from individual overrun of quota have mainly been used to finance purchase of quota.

The duration of the EU milk quota system was first decided to be 5 years, then the period was extended 3 years, then 1 year. The system was extended in 1993 another seven years to 2000. So *de jure* the duration has been relatively uncertain. But given the capitalization of the milk quota in the prices, changes of the system have become very difficult. Therefore, the duration of the system is probably not *de facto* enclosed with a great deal of uncertainty.

7.2 Property rights in the Danish agriculture

7.2.1 The Danish implementation of the milk quota system

Denmark chose in 1984 formula B and with the purpose to utilize the national quota as much as possible only one milk collecting agency was established. The agency buys the milk from the farmers and sells it to the dairies. The superlevy applies, therefore, only to production beyond the national quota. For the individual farmer the implication is that the levy system is only applied to the extent the national quota is exceeded. If the national quota is exceeded, the levy is charged on those farmers who exceeded their quota most.

The central agency is also responsible for reallocation of quotas between farmers. Only the agency can reallocate quotas either directly through the different schemes or indirectly by approving sale and lease of quotas. The activities of the agency are financed by selling the milk to the dairies at a higher price than the purchase price.

The quota follows in principle the farm, and the quotas are, therefore, only transferable along with land in cases of sale, inheritance or tenancy. Besides a certain amount of land has to follow the each sold quota unit, the quota can only be transferred to other farmers within a distance of 10 km. These requirements have effectively limited the direct transferability of quotas between farmers. The transfer of quotas has to be approved by the agency.

The Danish farmers were assigned at the outset in 1984/85 a quota 6,7% lower than their production in 1983. Because the national quota was only reduced by 5,6%, a reserve was created, from which quota could be distributed to 'special cases', including new investments. The natural inflow to the national reserve come from ordinary cessation, where farmers ceasing milk production of their own will, i.e. without any compensation.

In order to increase the amount of quotas for redistributing several schemes have been applied in Denmark, especially with the purpose to help farmers out of the sector. The main schemes have been the EU cessation scheme and the Danish buy and sale scheme.

The EU cessation scheme was first applied in Denmark in 1986-1988. By opting a lower rate of compensation (12.4 DKK per 100 kg milk in seven years) than intended by the Commission (about 51 DKK per 100 kg milk in seven years) Denmark was able to release extra quotas. Out of a total amount of 608 million kg only 146 million kg were transferred to EU. The EU cessation scheme has also been in force in 1991/92 and 1993/94, where 277 and 10,1 million kg were purchased, respectively. Of the 277 million kg were 107,8 million kg reverted to EU (suspension), while the rest were reallocated in Denmark. All 10,1 million kg from the scheme in 1993/94 enter the national reserve for 1994/95.

The Danish buy and sale scheme has been applied since 1989/90. The aim of the scheme was to make the reallocation of quota more flexible by helping less productive farmers to leave the sector. This promotes also the structure development. The price of quota was in 1989/90 political determined to a no-taxable amount of 0,86 DKK per kg. Later the price has been increased to 1,25 DKK per kg, the same amount as in the EU cessation scheme. In the quota years 1989/90, 1990/91 and 1991/92 a total amount of 137,4 million kg was brought via the scheme. In 1992/93 and 1993/94 the purchased amount was 62,8 million kg and 66,1 million kg, respectively.

The purchased and the released quotas have been reallocated via other schemes to other producers on basis of applications (this applies to new as well as existing producers) or as general allocation, either free of charge or subject to a price. In the first 8 years with the quota system 1545,7 million kg have been reallocated via the central agency or more than one third of the present national quota.

7.2.2 Effects of milk rights on the Danish agricultural industry

When trying to assess the effects of the quota system it is very important to consider the choice of reference situation, e.g. the situation the development is compared to. The reference situation could be the situation just before the quota system was implemented or a situation which is forecasted based on the assumption that the management system in 1984 was continued or a situation simulated based on the assumption that another management system was introduced in 1984.

The last two possibilities are more or less speculative, but, however, the most relevant. One way to overcome the speculative element to some extent could be to compare the development in a given period (e.g. 3-5 years) before the quota system with the development in a period of the same length after implementation of the quota system. However, the most common method is to use the situation in 1) as the reference situation. On the other hand if it is an analysis of whether the political objective with the quota system have been achieved, the relevant reference situation may be the situation in 1984, i.e. 1).

We will here describe the present situation in relation to the situation in 1984, but we will also refer to a rapport from 1988 (Langfrits and Walter-Jørgensen, 1988), in which the changes in the sector just before and after implementation of the quota system are compared.

Production and quotation

The development in the Danish production of milk and quota is shown in table 7.1.

Table 7.1 Production and the Danish national quota

	Production	Quota	Difference
1984/85	4,913	4,932	-0.39%
1985/86	4,884	4,882	0.04%
1986/87	4,882	4,882	-0.01%
1987/88	4,603	4,580	0.59%
1988/89	4,514	4,458	1.25%
1989/90	4,550	4,515	0.80%
1990/91	4,546	4,513	0.75%
1991/92	4,434	4,419	0.35%
1992/93	4,457	4,420	0.03%
1993/94	4,465	4,454	0.24%
1994/95		4,454	

Source: Milk Committee of the Danish dairy industry.

The Danish quota has decreased in the period by 9,7%, so compared to the production in 1983 the quota is 15.4% lower. The utilization of the national quota has been, as intended, about 100% and also the amount paid as superlevy has been relatively small, indicating mainly that it has been possible for the agency to equalize overproduction from some of farmers with underproduction from other farmers. Compared to other countries the enforcement and control of the system has functioned well in Denmark, e.g. Denmark has not be asked to pay extra amount as levy.

Effects on the structure

As expected the number of herds and the number of cows have decreased considerable since the introduction of the quota system, see table 7.2. In 1984/85 there were 32,679 farmers, while in 1994/95 the number of farmers is 15348, i.e. the number of farmers has more than halved in the period. The number of cows decreased in the same period by 28%. The average size of quota per herd/farmer has increased in period by 90.8%. The output per cow has in the period increased by 21,2% and the number of cows per herd has increased by 50%, see again table 7.2.

This development is also reflected in the number of farmers grouped by size of quota. Small scale farmers, i.e. farmers with quota less than 100,000 kg, constituted in 1985/86 about 40% (12,000) of the total number of farmers and had about 14% of the total quota, while in 1991/92 they constituted only about 20% (3,750) of number of farmers and had about 6% of the total quota. Large scale farmers, i.e. farmers with quota over 300,000 kg, constituted in 1985/86 about 12% (3,650) of the total number of farmers and had about 31%

Table 7.2 Indicators of the structure development (indices in blanket)

	1984/85	1994/95
Number of farmers	32,679 (100)	15,348 (47.0)
Average quota per farmers	152,000 kg (100)	290,000 kg (190.8)
Output per cow	5,559 kg (100)	6,737 kg (121.2)
Number of cows per herd	29,0 (100)	43,5 (150.0)
Number of cows	951,000 (100)	685,000 (72.0)

Source: Milk Committee of the Danish dairy industry.

of the total quota, while in 1991/92 they constituted about 24% (4,750) of the number of farmers and had about 46% of the total quota.

In the first years with the quota system occurred the adjustment to the quota mainly through reduction in the number of cows (about 5% per year), while the size of the herds stagnated, which implies a reduction in number of herds equal to the reduction in the number of cows, i.e. 5% per year. Later, due to the different schemes, there have been an increase in the number of cows per herd. As the size of the herds increased the farming tends to be more specialized, so the number of farms with herds of both pigs and cows has decreased. In the whole period the output per cow has increased 2-3% per year. In the first years the milk production fell by about 2% per year.

In the years just before the implementation of quota system the number of cows was declining about 1% per year and the number of herds by about 5% per year. The average size of herds increased consequently by about 4% per year. Given the current increase in output per cow the total milk production was increasing in this period by 0.5-1% per year.

Table 7.3 Changes in the size of herds before and after implementation of the quota system

Size of herd	Larger	Un- changed	Smaller	Exit	Newcom- ers a)
Share of all herds in percent					
1983 (compared to 1981)	8.3	69.6	5.2	16.9	5.0
1985 (compared to 1983)	3.9	71.4	10.1	14.7	4.7

a) In percent of all the herds in 1983 and 1985, respectively.

Source: Langfrits and Walter-Jørgensen (1988).

The quota system seems in the first years to have slowed down the speed of adjustment in the sector. The structure of the sector have been more stable

in the period. Both the number of herds that increased in size and the number of newcomers were decreasing in the period after the quota system compared to the period before the quota system. The number of herds that decreased in size was more than doubled. This development in the first years after the implementation of the quota system is very different from the development later, as reflected in the table 7.3. One explanation could be that the first period after a new regulation system, the reaction is more or less expectant and the farmers have mainly adjusted their individual production to the system. An explanation for the later increased speed of adjustment in the sector may be the different schemes that have been applied.

It can, therefore, be concluded that the implementation of the quota system did not change the structure of the farming sector, in fact compared to the period just before the quota system, the speed of adjustments in the structure decreased.

For the dairy industry the stagnated production did not course large problems, because the industry had begun the adjustment in the structure in the years before the quota system. The Danish production of milk only increased by about 0.5% per year in the period just before the quota system.

Reallocation of quotas

As mentioned more than one third of the national quota has been reallocated in the first 8 years of the system, i.e. until 1991/92.

About half of the reallocation is due to the EU cessation scheme and the Danish buy and sale scheme. The released quantity from the EU cessation scheme in 1986-88 was for free assigned to the remaining farmers, partly by 10,537 kg to each farmer and partly by limitation in each farmers reduction of quota due to the quota system. The released quantity from the buy and sale scheme was mainly sold by political determined criteria. The released quantity from the EU cessation scheme in 1991/92 was assigned for free to about 85% of the farmers. The assignment was based on a equal percentage of each farmers quota.

Over 2/3 of the farmers that left the sector due to these schemes were elder than 55 years and over 7/8 of the farmers had a quota lower than 200,000 kg. Age, sickness and environmental requirements were the main reasons for leaving the sector.

About 20% of the reallocation happens through direct buy and inheritance. This relatively minor importance in redistribution of quotas might to some extent be explained by crowding out effects of the different schemes. For instance the level of transferred quota fell from 80.6 million kg in 1989/90 to 24.6 million kg in 1990/91 probably due to the buy and sale scheme. Another explanation may be the special rule (in force 1989-92) requiring 33% of the transferred quota to be handed over to the agency in case of addition of quotas.

The rest of the reallocation, about 30%, has happened through ordinary leaving.

The agency have been allocating some of the released quotas (quotas which were not allocated general to all the farmers) to producers on basis of

applications. It has not been possible to meet all the applicants. Only, on average, about 2/3 of the applicants were approved in the 80'ties, while in the 90s only 1/3 have been approved. The selection of applicants has been based on priority rules set by the Ministry of Agriculture. The critical rules have been the age of the applicants. Before 1989 a maximum limit of 27 years have been applied in case of establishment, while after 1989 a minimum limit of 26 years have also been in force. For example in 1991/92 the maximal age of new established farmers was 29 years and 3 month.

In the period 1984/85 to 1991/92 576.3 million kg of quotas were reallocated in case of establishment and extensions, where additional quotas were needed. The reallocated quotas were free of charge.

Because of increasing problems of getting quotas available to establishment, only a part of the applied quantity has been free of charge since 1992/93. In 1992/93 it was 55% and in 1993/94 25%. The remaining quantity should be brought via the buy and sales scheme.

Economic performance

The reduction in number of farmers have mainly been in the group of small farmers (quota <150,000 kg), over 3/4 of the reduction occurred within this group. These farmers have a low economic return to production. An economic investigation have shown that there are economics of scale up to herd sizes of 100-150 cows.

It has been possible the keep the production for the remaining farmers on the same level or even on a higher level compared with the level of production in 1983. The individual quota has been reduced in the period, but during the quota year it is possible due to current updating of the production of each farmer to assign so-called 'free quantity' to each farmer as a percentage of the quota of each farmer. Therefore, the economic results of the individual farmers are not as in some of other EU countries charged with lower output.

Since the implementation of the quota system the prices of milk products have in periods increased perceptibly, which have improved on average the income of the Danish dairy farmers. This has put extra pressure on the quota system and a considerable increase in number of direct sale of quotas (which have to be approved by the agency) have taken place the last years. In 1993/94 quotas of 89.4 million kg were transferred, against only 36.6 million kg in 1991/92. It has also increased the tendency to capitalization of the quotas. In the Danish buy and sale scheme the price at present is 1.6 DKK/kg. In case of permanent sale of quotas between farmers the price between 2 and 3 DKK, while the leasing price is 0.4-0.6 DKK per year. These prices are considerable lower than prices in other EU countries, which mainly is due to the limited transferability of quotas. In Denmark the milk quotas are not, in general, a part of the mortgage on real property, it has been clarified after a decision of Court in 1992. However, the prices of farms with quota are considerable higher than prices on farms without quotas and the quotas are often used as security for loans. This means that *de facto* the quotas have been capitalized. The investment in quotas can not be subject to depreciation and the trade of quotas are, therefore, not subject to any taxes.

7.3 Property rights in the Dutch agriculture

7.3.1 The Dutch implementation of the milk quota system

The milk quota is a right of an individual farmer to deliver a certain amount of milk levy-free, but a member state is due to pay a levy to the community if the total guaranteed quantity for the member state is exceeded. There are two levels at which differences between allowed and real deliveries are balanced. The first level is between milk factories and the second level is between farmers who deliver milk to the same factory. However, the Member States are due to collect the levy from farmers who deliver more milk than their quota.

The trade organization of dairy produce in Rijswijk has been charged with the execution of the regulation of the superlevy. They have to fix the amount of the superlevy and to collect it. This institution also records the changes of the ownership and the size of the quota.

The way the regulation of the superlevy has been executed in the Netherlands can be seen as a successful policy in a sense that the goal of reducing the milk supply has been realised. The milk production was not much more than the milk quota (table 7.4). The amounts of superlevy are mainly caused by exceeding of the fat content and by quantities of not allocated milk. Main causes for this success are the strong organization of dairy production in the Netherlands (the trade organization) and the fact that almost all the milk of the farmers is delivered to milk factories.

Table 7.4 Milk production and milk quota in the Netherlands

Measure	1984	1987	1990	1993
National quota a) 1000 ton	12,174	11,404	11,111	10,983
Milk production b) 1000 ton	12,195	11,398	11,212	11,030
Superlevy million NLG	79.3	101.0	81.8	22.3
Milk price change compared with previous year	0.7	0.9	-10.0	-1.0

a) National quota of the amount of levy-free milk; 1984 = 1984/85 etc; b) Computed national production, from 1986 corrected for fat content.

Source: Commodity Board for Dairy Produce.

Transferability rules

Milk quotas can only be transferred permanently when they are connected with land. The maximum amount is 20,000 kg per hectare except for transactions of complete dairy farms including the complete milk quota of that farm. Since 1989, many transfers of milk quota take place by means of a tenancy construction. The buyer buys the milk quota and rents the connected land for one year (or more if he wants). After the tenancy period the buyer remains

the owner of the milk rights and the seller remains the owner of the land. In this way, land and milk are formally connected but actually disconnected. This moves the price of milk quota in an upwards direction because less or even no investment is needed in land; only for the tenancy period the tenancy has to be paid.

A lessor can lease his total milk quota or a part of it to one or more lessees. The smallest allowed amount is 10,000 kg per transaction. The lessee can lease from one or more lessors up till a total amount of 75,000 kg. The lease period is one year. As a consequence, if lessor and lessee want to continue the lease for more years they nevertheless have to sign a new lease contract for every year they want to go on.

7.3.2 Effects of milk rights on the Dutch agricultural industry

Structure of the sector

The number of farms with milk cows decreased from 60,233 in 1984 to 43,039 in 1992. The national milk quota during the same period has been decreased by almost 10% (table 7.5).

Table 7.5 Development of the Dutch dairy sector in the period 1989-1992

Year	National milk quota * mln kg	Number of farms with cows	Average milk-quota per farm * 1000 kg	Average number of cows	Milk-prod. per cow per farm (kg)
1984	12,174	60,233	202	42	4,776
1985	12,158	57,995	210	41	5,136
1986	12,177	55,122	221	42	5,322
1987	11,404	52,802	216	40	5,430
1988	10,954	50,247	218	39	5,558
1989	11,104	48,826	227	39	5,803
1990	11,111	46,977	237	40	5,916
1991	10,874	45,037	241	41	5,871
1992	10,994	43,039	255	41	6,193

Source: Central Statistical Office; Commodity Board for Dairy Produce.

The average milk quota per farm increased till 255,000 kg per farm in 1992. The increase of the average milk production per cow made that the average number of cows stayed constant around 40 cows per farm. Krijger (1990) states that the competition strength of Dutch dairy sector got worse after introduction of the milk quotation. In the Netherlands, he states, the enlargement of dairy farms is less than in other (important) EU Member States. For the short term this is compensated by an increase of the milk production per cow, but in the long term there will be a limit to this growth. The Government has not been active in buying quota and reallocate it and also there were more limitations to quota transfers than in especially the United Kingdom. Also van Bruchem (1991) states that especially farms with 30 till 70 milk cows did not

succeed to compensate their quota cuts by buying or leasing quota. The conclusion is that the enlargement of the scale of milk production has been diminished by the introduction of the milk quotation. It is not clear whether or not this consequence is wanted by the Dutch Government. They may also have other targets than production of milk at a price as low as possible. An important aim of EU agricultural policy from the beginning has been to ensure a fair standard of living for dairy farmers.

The question can be asked whether the Dutch choice in 1984 for a free market system has been the best choice for milk quota transfer. Administrative redistribution of the milk quota from stopping dairy farmers (combined with buying-ups, but that is not absolutely necessary) in France and Denmark resulted in more enlargement of dairy farms with no or little money value for the milk quota.

The price that will be paid for one kg of milk quota mainly depends on the margin between the returns of one more kg of milk production and the costs to produce that one more kg of milk. This nearly always means that dairy farmers, when buying or leasing milk quota from others, don't take into account fixed costs. The amounts bought or leased are relatively small compared with the quota they already own so changes in labour, land, cow-housing and machinery are not necessary (moreover there is the 'disconnection' of land and quota). Many of these fixed assets are not fully utilized because of the reductions of the milk quota and an increase in the milk production per cow.

Of course the margin between returns and variable costs is much higher than the margin between returns and total costs. In the last four or five years this margin reached levels of f 0,50 till f 0,60 per kg of milk (in individual cases sometimes around f 0,70). The price for leasing one kg of milk fluctuated between f 0,40 and f 0,50 per kg.

In the case of buying milk quota price calculation is more complex. You have to pay now for buying but the returns will come during a number of years (as long as the milk quota system exists). Calculations must be made with net present values under influences of the interest level and the duration of the milk quota system. Another complicating factor is the depreciation of the bought milk quota allowed by tax regulation. In 1995 and 1996 the depreciation period in tax regulation was eight years. The fiscal advantages of these depreciations are also part of the net present value calculation. A tax level of 60%, an interest level of 7%, a duration of the milk quota system of ten years and returns minus variable costs of f 0,55 per kg of milk per year result in a price of f 4,50. This was the current level 1993 and 1994. Lower margins occurred in later years and this has decreased the price to levels under f 4,00 per kg.

Reasons for the high prices for milk quota in the Netherlands, compared with other countries in the EU are:

- no free trade of milk quota but an administrative redistribution of milk quota from farmers who stop or diminish milk production (France, Denmark);
- this administrative redistribution often has been combined with large buying-ups of milk quota by the Government (France, Germany);

- creaming off and administrative redistribution of the parts that are creamed off; smaller, less financially strong farms are benefitted which decreases the price (Belgium);
- strong land/milk quota connection (Germany);
- lower margins (UK);
- smaller increase in milk production per cow which causes less unutilized production capacity (UK);
- more rather equally profitable alternatives within agriculture for milk production (UK, Denmark);
- more favourable fiscal aspects concerning the purchase of milk quota in the Netherlands than in any other EU country.

The free market for milk quota is rather successful in the UK. Important reasons are the smaller margins in milk production and more rather equal alternatives within agriculture than in the Netherlands. In the UK the price for one kg of milk quota is about one third of the price in the Netherlands which causes smaller capital needs for purchase of milk quota in the UK.

Adjustments, taken by the dairy farmers under influence of the milk quota system

Especially the big reductions of the milk quota in 1984, 1987 and 1988 pressed the Dutch dairy farmers to reduce their milk production strongly. Nearly all dairy farmers carried out a strong selection under their dairy cows and sold the dairy cows with the lowest milk production. The number of dairy cows per farm and per hectare decreased. Other consequences were decreases in the purchase of concentrates (less cows, heifers and calves) per farm (not per cow because the cows with the highest productions remained on the farms). Instead of a shortage of roughage, many farms got a surplus of roughage. This caused lower levels in the use of nitrogen fertilizer to prevent from a surplus of roughage. Also the number of beef cattle and sheep increased.

Markets for tradable property rights (e.g. milk quota)

Table 7.6 shows the division of dairy farms in classes of milk quota per dairy farm at the beginning of the (quota)year (=basic quota). Also the distribution of the total Dutch milk quota and the amounts sold, bought and leased are given as percentages.

Fifty percent of the dairy farms with milk quota has less than 200,000 kg of milk quota. These farms own less than one quarter of the total amount in the Netherlands (10,874,000 tonnes in 1991). The smaller dairy farms sell more milk quota than they buy and they lease more to other dairy farms than they lease from. The dairy farms with the biggest milk quota are not much involved in leasing; also sale and purchase are rather in equilibrium on these farms. The 4% biggest dairy farms own 12% of the Dutch milk quota.

The dairy farms with milk quota between 200,000 and 600,000 kg are the most active traders in milk quota, especially in leasing from other, in majority small, dairy farms. Many small dairy farmers use to stop the milk production but still continue their farm with, in most cases, a form of extensive beef cattle

Table 7.6 Distribution of the number of dairy farms, basic quota, lease and trade in milk quotas as to size of the basic quota, period 1988-1991

Basic quota per farm in 1,000 kg	Percentage of total					
	dairy farms	basic quota	purchase	sale	leased from	leased to
0-100	23	6	11	3	35	5
100-200	27	17	22	13	38	22
200-300	21	22	22	27	13	28
300-400	14	21	18	23	7	22
400-500	7	14	11	14	2	11
500-600	4	8	6	9	2	6
600-700	2	5	3	4	1	3
700 and more	2	7	7	7	2	3
	100	100	100	100	100	100

Source: Commodity Board for Dairy Produce.

farming. Their income mainly consists of the lease payments or the interest on money, obtained from the sale of milk quota.

Table 7.7 shows the basic quota and the change in 1,000 tonnes by sale/purchase and leasing for the year 1991. The trends are the same as in table 7.6.

Table 7.7 Basic quotas and change by sale/purchase and leasing in 1991 in 1,000 tonnes

Basis quota in 1,000 kg per farm	Total basic	Change quotas
0-100	652	-54
100-200	1,849	-43
200-300	2,392	+30
300-400	2,284	+30
400-500	1,522	+18
500-600	870	+13
600-700	544	+5
700 and more	761	+1
Total	10,874	0

Source: Commodity Board for Dairy Produce.

Production cost of milk

The production cost of milk have been almost on the same level during the period 1983-1993 (figure 7.1). The number of milk cows per hectare decreased by 25-30% during this period. This caused a decrease in the price of roughage and the amount of roughage the farmer had to buy.

The price of concentrated feed also decreased, but less than the price of roughage. The fixed cost per kg milk increased a lot in the last years.

Table 7.8 Cost price per 100 kg milk of the average dairy farm a)

Bookkeeping year	1983/84	1986/87	1989/90	1992/93
Direct variable cost	40.49	33.23	26.61	25.03
Labour and contractors	30.03	30.65	32.53	38.20
Land, buildings and machinery	21.14	24.10	29.46	30.31
Quota cost	0	0.32	2.78	6.19
Other nonspecific cost	9.45	8.73	9.97	10.28
Total cost	101.1	97.03	101.34	110.00
Other output	14.61	12.60	19.83	17.10
Cost price milk	86.49	84.43	81.50	92.90
Milk price	76.11	76.50	82.72	79.26

a) Dairy farms bigger than 157 standard size units.
Source: Farm accountancy data network of LEI-DLO.

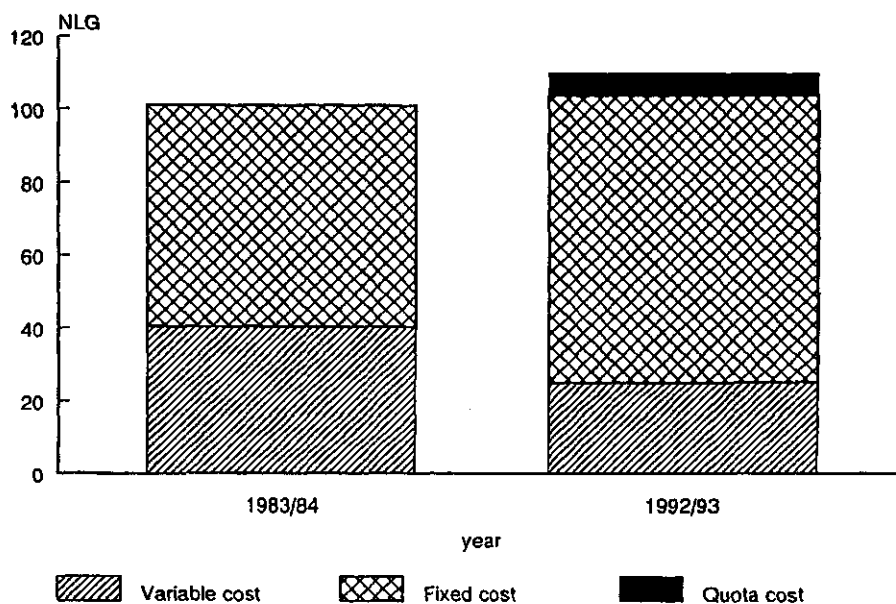


Figure 7.1 Cost price per 100 kg milk of the average dairy farm

Total fixed cost increased by f 24.36 per 100 kg milk, of which f 8.17 for labour and contractors - f 9.17 for land, buildings and machinery - f 0.83 for non specific cost and f 6.19 for quota cost (table 7.8). So 25% of the increase of total fixed cost is caused by the quota cost. This amount contains the cost of depreciation as well as the cost of leasing quota. There is a danger that the fixed cost will increase in the future caused by the value of quota that will be transferred (whether between farmers or even within a family. The conclusion is that up to 1989/90 an increase of the fixed cost, of which quota cost became a important part was compensated by a decrease of direct cost. In 1995 fixed cost still increased and the direct cost remained constant.

Effects of milk quota on individual farm holdings

1. Fiscal aspects of purchase and sale

In the Dutch fiscal system milk quota are seen as an asset. It is necessary for running a dairy farm. The purchased quota, so not the allocated quota by the Government in 1983, will have a value till the quota-system will be ended, so depreciation is possible. As a consequence, from a fiscal point of view the quota is rather seen in the same way as 'goodwill'.

The purchase price is the basis to determine the value of bought quota. Before 1-1-1994 it was possible to take a depreciation period of four or five years (in 1983 it was supposed that the milk quota system would end in 1992). From the beginning of 1994 farmers can depreciate the purchased quota within 8 years, also on a linear basis (yearly 12,5%) with a rest-value of zero. When the new fiscal system is favourable for the farmer he can also choose the new system for investments in quota before 1-1-1994. The Farm Accountancy Data Network of the Agricultural Economics Research Institute (LEI-DLO) maintains a depreciation period of 15 years for bought quota for purposes of income calculation.

Besides this, paid superlevy is seen as cost for income tax; the levy system works prohibitive so that this cost deduction seldom occurs. For the property-tax, milk quota are valued on the same basis as for the income tax.

2. Transfer to next generation of farmers

Tax regulation allows transfer of milk quota to the next generation without any value for the milk quota (Venema et al., 1994). This is only possible in combination with complete transfer of the dairy farm and only in parents/children transactions. The consequence of this method is that all fiscal claims are put on the shoulders of the successor (e.g. to pay income tax over the hidden reserves, when quota is sold. In the absence of parents/children transactions the seller has to pay tax over the difference between the value on the balance sheet (in most cases zero) and the sale value of the milk quota. On the other hand the buyers of milk quota can reduce their tax income by depreciation of the milk quota.

A take-over in which the value of the milk quota is included results in a lot higher need for capital. On an average dairy farm, the market value of quota is almost 1 million NLG. For instance: the market value of the other assets on a dairy farm is about 1.5 million NLG. The take-over of quota will led to a growing appeal on non-family capital. Rising interest

and redemptions must be generated by the yearly cash flow. The margins for financing a take-over are getting smaller. Rising environmental costs, lesser growing capabilities and a decreasing role of the Government put extra pressure on the future cash flows. A take-over of a dairy farm by non-family members is nowadays almost impossible.

The fiscal system has had an influence on the demand of quota. The depreciation has decreased the good incomes of many dairy farmers during the period 1989-1995. So lesser income-tax has been paid.

Depreciation on quota (costs) has a negative effect on the savings. Because the annual cash flow of a farm consists of savings and depreciations, the effect of an investment in quota on the cashflow remains limited. The cash flow is the financial basis for paying interest and redemptions over the borrowed capital. When an investment in quota is financed with loans, this will lead to lesser capacity for financing other investments. The share of investments in land and breeding livestock on the dairy farms has decreased since the end of the eighties.

Effects on policy

In view of low prices for beef cattle and sheep (which will decrease further in future) dairy farmers now (1995) are looking for possibilities to sell heifers of a high breeding quality. This is rather successful because of a high export demand. Possible future environmental rules and laws make farmers to look forward for a more extensive way of dairy farming. Thus, breeding remains focused on a high milk production per cow. The fixed or nearly fixed milk production per hectare, because of the milk quota system, combined with this increase in milk production per cow have been a good help to achieve levels resulting from the future environmental rules and laws. Possibly the number of rearing dairy cattle will then be minimized. A side effect of the quotation of milk has been a decrease of the stocking rate. Trade liberalisation tends to decrease milk prices so there remains pressure to decrease the cost price.

When milk production is free, a reduction of the milk price for the dairy farmer of around 30% seems to be needed to reach equilibrium between demand and supply of milk. Assumptions for this are:

- a price elasticity (short-term) in the demand of milk of -0,3;
- a price elasticity (short-term) in the supply of milk of 0,5;
- an unutilized milk production capacity of 25%.

A 30% lower price of milk increases the demand with 9%. The supply of milk firstly increases with 25% but the lower price decreases this 25% to 10%, nearly equal to the 9% increase in demand. Such a decrease in the price of milk is absolutely unacceptable in the whole EU but also in regions favourable for milk production as Wales, England, Ireland, Bretagne, the Netherlands and Denmark. The 10% increase in production is also not favourable in the Netherlands when looking at environmental constraints.

Manunza (1993) discusses three alternative policies: A basic scenario, 'free trade', and a proposal of a study group 'better dairy produce policy'. This proposal includes:

- no free trade of milk quota;
- redistribution of production;
- reduction of milk production to a level closer to EU consumption;
- continuation of current price support.

The model outcomes show a higher income for the farmers in case of the last alternative and also especially in the first years a slower decrease of the number of farmers than in the free trade scenario. It must be added that expenses of EU as a consequence of the proposal will be highest of the three alternatives. But expenses for unemployed farmers are not taken into account in the free trade scenario. The expenses for the basic scenario don't contain the extra needed expenses to carry out the new ways of income support. The consumer pays in the scenario 'better dairy produce' the highest price. Environmental effects, obvious most favourable in the scenario 'better dairy produce', because of a lower stocking rate, are not taken into account in the comparison of the EU budget consequences of the proposals.

Problems of the milk quota transfer system as carried out in the Netherlands are the high capital need for the purchase of milk quota ('money leaves agriculture') and the increase of the cost price of milk caused by the milk quota transfers. This can weaken the competition position of the Dutch dairy farmers. Administrative redistribution (France, Denmark) causes less or even no costs for dairy farmers to obtain more milk quota while the quota increase is more than in the Netherlands.

Theoretically a free market should cause allocation of transferable milk quota to the most efficient dairy farms so the choice for a free market system is understandable. In practice the solvability rate (because of the high capital need) and the fact that an important part of the costs only is calculated (not paid out) disturb this allocation assumption. Many dairy farmers are not acting rationally in economical terms which is one of the conditions for a real free market.

Still the duration of the milk quota system is uncertain. At the moment (1995) it will be continued till the year 2000. Claims because of a huge loss of value when the milk quota system would be ended, are not expected. For the main part of the milk quota nothing has been paid because the owners of today got it by the allocation of 1984 or out of parents/children transactions, with no value as mentioned before. In future, a greater part will have been paid but the interesting fiscal depreciation possibilities are compensation for this. Thus, claims will be small or none. Moreover, the farmers themselves expect a limited period of the quota system, because the pay-out period of the quota investments is seven years, as has been stated earlier.

Juridical characteristics of a milk quota

Property rights such as a milk quota represent a bundle of rights that have different characteristics. Section 5.1 of this report describes the six characteristics of property rights which Antony Scott has shown in a star. The following part evaluates the milk quota in view of these characteristics.

- Flexibility: The flexibility of the milk quota is high in the sense that the owner is free to deliver the milk quantity whenever he wants and the quota can be leased out or sold without major restrictions.
- Exclusivity: Farmers who have a right to deliver a certain amount of milk free of superlevy to the milk factory have a very exclusive right. Others are strongly excluded.
- Quality of the title: The high price of milk quota taken into account, it is clear that the quality of the title is high. This high price is related to the high price of the milk itself.
- Transferability: In practice there are more possibilities of quota transfer than formal. Especially the tenancy construction has disconnected the formal relation between quota and agricultural land.
- Divisibility: The divisibility of milk quota is high. Also amounts of less than 20,000 kg are involved in transactions.
- Duration: The duration of the milk quotation system is certain till the year 2000 and uncertain after that year. So, the duration is certain till next relevant decision.

7.4 Property rights in UK agriculture

7.4.1 The UK implementation of the milk quota system

In the UK milk provided the most sophisticated demonstration of supply management because product differentiation and market demand allowed the boards to behave like discriminating monopolies. The market was complicated by milk products such as butter and cheese coming from abroad, especially the Commonwealth, at low world prices. Supplies of liquid milk for direct human consumption were in effect kept down to the level where high prices were maintained. The system was of course much more complex in that there were Government guaranteed producer prices, seasonal prices set by the boards, milk distributors margins and control over retail prices for much of the period. Less valuable uses in making cheese, butter and milk powder in particular were employed to dispose of the rest of the milk. Such price differentials were much less noticeable in New Zealand and Ireland where manufacturing milk was the main disposal; that for human consumption could only retain a premium reflecting the added costs of meeting additional public health standards and of distribution. On sugar the United States went even further with quotas allocated not just between domestic producers of beet and of cane but also between various foreign suppliers to its market.

The work on milk quotas by Burrell and others in the publication edited by her, 'Milk Quotas in the EC' (1989), provides a useful review of the situation and its economic implications. As indicated earlier the milk industry in the UK was dominated by the various milk marketing boards over the past fifty years. They were in effect the sole buyers of raw milk from farmers (producer retailers did exist but only had a very small share of production and markets) and supplied the distributors who looked after retail sales of liquid milk in its various

forms. The boards also competed with other dairy processors in the production of cream, cheese, yoghurt, butter and milk powder. The moves towards quotas for producers and ending the monopoly powers of the boards, as EU policy evolved, caused considerable changes in the UK dairy industry.

The paper by Kirke in the volume edited by Burrell looks at 'The Influence of Milk Supply Quotas on Dairy Farm Performance in Northern Ireland'. Of particular interest is the confirmation of expected results from earlier modelling work, in that incomes were maintained. Less production and higher milk prices, allied to reduced costs were responsible for both the modelled and actual outcome. As might be expected the longer term trend towards fewer and bigger herds achieving higher yields was modified. Departures were delayed as it was clear that quotas would have a future value. Some small part of the adjustment came from those who had delayed departure finally leaving the industry and selling off their quotas; the purchasers thereby reduced their need to cut production or defer expansion. In general, however, the management approach to cutting production in line with overall quotas took two lines. The first was to reduce feeding levels with beneficial effects on total costs and the second was to cull cows. Initially this led to a decline in yields and herd size. The subsequent developments saw the return to an upward trend in both, as quota moved with acreage either on a permanent or leased basis. The figures in table

Table 7.9 Distribution of UK dairy cows and herds by herd size

	1973	1983	1993
Dairy Cows in Herds of			
1- 10 cows	82,209	22,579	12,695
10- 29	585,761	226,422	142,015
30- 49	763,438	472,492	356,206
50- 69	652,430	555,662	417,439
70- 99	623,782	740,092	598,081
100-199	536,472	974,589	881,206
200 and over	192,182	335,722	257,618
Total	3,436,274	3,327,558	2,665,260
(Percent)	(100.00)	(96.84)	(77.56)
Number of Herds having			
1- 10 cows	19,127	6,778	3,230
10- 29	31,278	11,454	7,126
30- 49	19,899	12,146	9,084
50- 69	11,201	9,489	7,109
70- 99	7,674	8,962	7,231
100-199	4,198	7,579	6,765
200 and over	672	1,189	937
Total	94,049	57,597	41,482
(Percent)	(100.00)	(61.24)	(44.11)

Source: UK Agricultural Departments.

7.9 show the longer term developments in UK structure. As expected, the rationalisation in terms of reduced number of farms with larger herd sizes proceeded in much the same way in both decades. This contrasts with the sharp decline in the total number of cows only occurring during the second decade as quotas started to influence events.

The UK approach of allocating individual quotas but managing the quota regime on a national basis through the board areas (or their equivalents) softened the impact of over-production on individual producers; those responsible for over quota supplies were spared the full impact of the levy as their surpluses were partly or fully offset by under supply by others. Thus the costs and benefits of an approach of penalising individuals for their over-production (the alternative provided under the rules) were not realised. As quota limits became tighter and dairy farm management improved in attempts to hit individual targets, the partial indemnifying of over quota producers by under production elsewhere effectively declined with the penalties now more directly affecting those responsible.

7.4.2 Effects of property rights on UK agriculture

The evolution from near overall matching of quota to recent over supply may only reflect the normal variations in milk production stemming from weather and other ephemeral conditions. Whether the future will bring further overshoots is uncertain. Be that as it may, undiluted application of levies on those directly causing the surplus resulted in a strengthening of the market for quotas. Clearly the rights in question are more certain and durable than before, while the degree of rigidity in the transfer process declined as fewer obstacles were placed in the way of sales or leases. Those remaining reflect the need to secure supplies under special circumstances, as in the island communities off Scotland. Thus the current market is estimated to involve 1,200m litres leased at around 11p per litre and over 300m litres sold at around 60p per litre. The expanded value and turnover in traded quotas have resulted in a reduction in the brokers' charges which now are around 4% for leasing and 2% for sales. These, however, amount to around £10m with the cost of leasing quota around £130m and the expenditure on purchases nearly £200m.

These figures should be compared with UK milk output of around 14,000m litres worth over £3,000m. Apparently over 8% of total quota is leased and some 2% sold. The commission paid is an added cost which reduces either the profit or the return to other factors of production. Equally the market price of quota indicates a total value of some £8,000m for the industry. At the farm level this suggests an additional charge for newcomers, compared with pre-quota days, of some £300,000 for acquiring a fifty cow herd producing 500,000 litres. This represents a considerable barrier to entry. It may, however, be that market prices reflect marginal purchases where overheads are already met and additional quota justifies a high price. Furthermore, the value of land without quota will have fallen to some extent to reflect its more restricted use (other grazing livestock such as beef cattle or sheep yield lower returns and are subject forms of quotas as well), thereby offsetting the additional cost to some

extent. If, however, the value is correct for all farms, this would imply, given a target investment return of 10%, a need for £800m in added revenue or reductions in returns to other factors.

The difference between the lease price and sale price appears to show a considerable amount of discounting of the value of the asset. The ratio of prices suggests a discount of around 20%. It may be even higher for many acquirers if the value of 60p averages the value in two different markets - a higher level for those wishing to cover marginal increases in production or marginal overshoots and a lower level for normal entries or expansion. Leasing avoids the paying of levy and allows a margin between cost and return of perhaps 12p per litre towards variable costs such as feed. Purchases at 60p against a milk price of around 23p would imply looking for a return of 10% if the profit margin is 6p per litre. Even the latter looks high against normal returns to land which may be half that. The discrepancy will be even greater if the normal as opposed to the marginal market trades below 60p. This may indicate uncertainty about the durability of quota rights.

What is perhaps less surprising in the material edited by Burrell is evidence on structural changes in dairying. There is a continuing migration of quotas away from farms with better ways of using their land to those whose qualities do not allow alternatives. The trend towards concentration in the west of Great Britain where soil and rainfall make cows and grass the obvious system is matched in Northern Ireland by a move from the less productive rougher grazings of the west to the better grassland of the east. The developments on the eastern side of the UK where crops are potentially profitable alternatives or the set aside aspects are relevant, is equally unsurprising. The paper by Smith explores 'Land Use Changes and the Effect on Other Enterprises' for England and Wales while that by Hollingham, 'The NIEMP Quota Effect Research Project' touches among other things on regional relocation of dairying.

Burrell's own paper on 'The Microeconomics of Quota Transfer' looks at the developments possible under completely transferable quotas. She concludes that the system can be made self sustaining using an arrangement to divert part of the individual quotas to be sold to cover the costs of running a quota programme. Such an arrangement in effect levies part of the quotas to generate the income needed to sustain the system. She also concludes that unrestricted transferability leads to overall efficiency.

7.4.3 Conclusions

It is perhaps worth emphasising the difference between fishing quota licences and agricultural quotas like milk. It will be clear that fishing rights such as licences or ITQs really relate to safeguarding the raw material of the fishing industry - in effect securing an essential input to combine with labour and capital in producing an output. The quota system is not really a supply restriction on production to avoid market collapse or the costs of surplus disposal although there may be occasions on which fish output is withdrawn for marketing reasons. It is, therefore, essential to keep in mind the distinction of fish in

the sea being an input or raw material and fish in the market being the output or what the industry produces. It is the input that is covered by fishing quotas and the objective is to secure or conserve the essential resource exploited. Output restriction on the pattern of farm quotas may be an objective subsequently if fish propagation and cultivation (or changes on the demand side) lead to over supply. It is not a current aim in fisheries policy.

The lessons to be learned from quotas in the agricultural sector relate mainly to the mechanisms for transferring entitlements and the resulting effects on structure and other economic aspects. The only really close parallels to the situation in fisheries occur in common grazing and water rights. These relate to inputs and the resources there can also be damaged by open access leading to excessive exploitation and degradation. Furthermore, individual activity to improve the resource does not bring commensurate benefit to the individual concerned but rather to all the exploiters. The solutions where the rights are common or vested in some larger organisation such as the state, frequently do not rely on the open market but on some socially legitimised distribution depending on value systems rather than market prices.

What is clear about agricultural quotas is that they, like licences in fishing, acquire a value wherever they occur. This may be expressed positively with people in the US paying a substantial premium for land with a tobacco allocation or negatively as in the UK with people having to pay penalty charges for excess plantings of potatoes or sugar beet. They thus lead to higher cost structures due to the added factor or input needing its return: where the ensuing market price does not meet the higher costs resulting, this involves taking part of the return earned previously by other factors.

7.5 Property rights in Agriculture and Fisheries: some similarities and differences

7.5.1 General remarks

In the agricultural and fisheries sector of the EU the production capacity is too big, in agriculture with respect to the consumers' demand and in fisheries with respect to the available fish stocks. Since 1984 national (levy free) milk quotas and national fish quotas have been agreed by the Council of Ministers and implemented by the Commission of the EU to solve these problems of overcapacity. In the following part similarities and differences between milk and fish quotas 1) will be described from the viewpoint of fisheries management, the industry and the individual firms. This could lead too a sharper view on the characteristics of fish quotas and there could be lessons for the fishery sector from the situation in agriculture.

1) Milk quotas are not the only kind of property right in agriculture, but they are most important ones and best comparable with fish quotas.

7.5.2 Similarities between milk quotas and fish quotas

Viewpoint of management

1. There is one common European policy with respect to agriculture (CAP) and one for the fishery sector (CFP) but the national regulations resulting from these common policies differ, both in agriculture and in fisheries. The Dutch and UK dairy farmers e.g. own milk quotas which are transferable as a contrast to the non-transferable quota of the Danish farmers, allocated by a central agency. In fact these quotas follow the farm. In the fishery sector some countries have introduced individual transferable fish quotas (the Netherlands and the UK to some extent) and others (Denmark) not.
2. The quotas have been more or less allocated on the basis of historical performance, on national and on firm level (as far as they are applied), both in agriculture and in fisheries. Annual differences in national and individual quotas are in line with the total allowable milk production and total allowable catches per fish species.
3. In the agricultural and fisheries sector cessation- or decommissioning schemes have been implemented by the EU and by the national Governments to diminish the tension between quotas and capacity. This has resulted in larger quotas for those firms which remained in the industry, either by reallocating quotas (e.g. the central Danish agency for milk production) or buying of quotas (e.g. Dutch individual flatfish quotas).
4. In the Netherlands and the UK regulations for transferability and lease of quotas have been implemented in the dairy sector and in (parts) of the fishing industry. Thus, enterprises are more flexible in adjusting their quota to the available capacity. In some cases (in the UK) this transferability is limited to protect communities for social reasons; this has resulted in restrictions being placed on transfer of milk quotas away from such regions (e.g. from certain Scottish islands) and in the fishing industry some POs retain track records for its group fishing quota rather than individual vessels.

The industry

5. Quotation has contributed to structural changes in the agricultural and fishing industry. The number of enterprises has diminished and an important production increase of individual firms has taken place, especially in the Danish dairy sector. It has to be emphasized that more factors have influenced this concentration tendency, i.e. the above mentioned cessation/decommissioning schemes and also technical improvements which always tend to increase the scale of production in agriculture and in fisheries as well. Quotation may have stimulated the implementation of technological improvements because this enables cost minimizing. The average production increase per farm has been remarkable big in the Danish dairy sector were the average milk quota per farm more than doubled in the period 1984/85-1994/95. In the Dutch dairy sector the quota increase per farm amounted to 40% on average (1984-1992) and in the Dutch

beam trawl sector the average flatfish quota increased by 34% in the period 1984-1994 (apart from the general quota changes). This comparison may be interesting because individual transferable quota systems (in the two latter cases) have resulted in lower increases of production per firm than in the case of reallocating the individual quotas for free (the Danish milk quotation system).

6. Prices of individual milk- and fish quotas increased importantly in the Dutch and UK dairy- and fishing industry since the implementation of transferability. The majority of transfers consisted of additional buying to adjust the quota to the available capacity. Prices could be high because only the marginal costs had to be matched against the extra revenue.

Individual firms

7. An increase in production costs has occurred for enterprises which had to acquire quotas such as in the Dutch and UK dairy and fishery sector. The initial allocation of quotas has resulted in substantial profits for firms which have received these quotas for free, but in future transfer of rights will permanently lead to higher costs in cases individual milk- or fish quotas are applied. On the other hand the value of other input factors (land and vessels without quotas) depressed when a new, scarce production factor like a quota has been introduced. The higher costs connected with quotas consist of interest costs and also costs of depreciation in cases that abrogation of the quota system is to be expected. It is interesting in this respect that the Danish system of milk quotation, by reallocating the quotas for free via a central agency, did not result in higher production costs for individual farmers. However, these Danish milk quotas are not allocated for free now so that also the Danish farmers are confronted with an increase of milk production costs due to costs of acquiring quotas.
8. Protection by quotation favours the profitability of individual dairy farms and fishing enterprises. The milk price is higher compared with a situation of no production limitations and in the fishing industry fish quotas should result in higher fish stocks in the long run. Both, in the dairy and fishing sector quotation creates a rent for individual enterprises. Cost increases mentioned in point 7 make clear that owners of farms and fishing enterprises have to pay for this rent.
9. Quotation causes problems in that transferring the enterprise to the next generation may be very difficult in the dairy and fishing sector. Investments will be too high when young farmers and fishermen have to pay the full market price of the milk- and fish quotas. A low market price in these cases may lead to taxation of grants. For the Dutch agricultural sector solutions have been made in this respect by introducing special fiscal allowances for quota transactions within the family and thanks to efforts of fiscal specialists and representatives of fishermen these allowances now also apply for the Dutch fishing sector. As a result of this, the vessel owner is able to sell his enterprise to his son whereby the valuable fishing rights are transferred against the balance value (which can be

zero). In Denmark the central agency for milk quotation has met this problem by creating reserves of milk quotas on behalf of young farmers.

7.5.3 Differences between milk quotas and fish quotas

There are important differences between the milk- and fish quotation which mean that regulations and solutions of problems for the milk sector may not be applicable for the fishing sector.

Viewpoint of management

1. Milk quotation meant to have a limited duration: initially five years, but in 1993 the system was extended for another seven years to 2000. There are no such limits in duration for fish quotas and, though the Common Fisheries Policy may be revised in 2002, it is to be expected that the 'closed shop' situation will remain. This may lead to different developments in rents and values of milk- and fish quotas on firm level and to the need to depreciate on milk quotas. However, in view of the investments in individual milk quotas, abrogation of the milk quota system is questionable because this will probably meet heavy resistance of farmers and their representatives.
2. The nature of milk quotation (i.e. to prevent over-supply on the market) differs from the reasons for fish quotation which means that alternative strategies and policies have different effects. For instance, added effort leads to surplus supplies in farming but reduced supplies in fishing in the longer run. Lower prices in farming would lead to a more efficient industry whereas such an approach would not have the same effect in fishing.
3. Milk production is a well controllable production process, whilst management of fish stocks meets far more uncertainties. This may explain why the objectives of the Common Agricultural Policy with respect to the milk production are met rather well in the past ten years (e.g. milk production in Denmark and the Netherlands decreased by nearly 10% in this period) and why the results of the Common Fisheries Policy are not so clear. Another effect of this difference in controllability is that the milk production shows only minor annual changes (1.5% at maximum) in total and on firm level, whilst annual changes in fish quotas amounted to up to 85%.
4. Costs of control and enforcement will be less for milk quotation because the marketing process lead to bottlenecks which allow easier and less costly monitoring of compliance. The peculiar properties of fishing, with small scale operations and ease of landing abroad make for unusual difficulties in enforcement.

The industry

5. Milk quotation has another shape (superlevy and quantity of levy-free milk) than fish quotation and this may have consequences for the behaviour of individual producers. In particular, dairy farmers have the security that they can produce their annual quantity of levy-free milk whereas fishermen do not have a similar security in cases of individual quotation.

They meet the risk that their colleagues over-fish their individual quantity so that the fishery has to be closed, whilst some fishermen have a part of their individual quota left. This means that the competition amongst fishermen remains to some extent and it needs additional management measures to remove the race for fish.

6. There seems to be less effort and also fewer possibilities to acquire production rights for individual enterprises abroad in farming than in fishing. However, the principle of relative stability between countries will remain a major guideline for the CAP and for the CFP as well.

Individual firms

7. Points 3 and 5 also have different consequences for management on firm level. Dairy farmers will not have much difficulties in keeping their actual milk production on their quota level, whilst fishermen may have big difficulties in matching the catches with their quota, due to the unpredictability of catches. The insecurity with respect to the right to land the quota quantity, mentioned in point 5, may hamper a rational business management for fishing enterprises. Fishermen may feel that they are compelled to participate in a race for fish, whereas dairy farmers have more opportunities to minimise cost, given the quota level.

7.5.4 Conclusions

Considering lessons to be drawn from the farming industry, the exclusivity, divisibility, transferability and flexibility attainable in farming quotas could be an example for the fishery sector, especially in Denmark and the UK. Furthermore, an organisation like the Danish central agency for milk quotation seems to be an option which is worth considering (also in Denmark and the UK), because of low quota costs for individual producers and the possibility to create chances for new entrants. The Dutch fish ITQ-system seems to have a more or less definite shape now which means that a kind of central agency to reallocate quotas is not suitable. However, the problems for new entrants are not solved in the Dutch fishing industry, except for a limited group of family members of the vessel/quota owner.

The special fiscal allowances for the Dutch agricultural sector, to facilitate transfer of the enterprise to the next generation, could be an example for the fishery sector in other countries were similar problems may occur.

8. STRUCTURAL IMPLICATIONS OF PROPERTY RIGHTS

8.1 Structural implications of property rights in the Danish fishing industry

8.1.1 Introduction

In this chapter the effects of property rights, i.e. the regulation, on the structure of the Danish fishing fleet are described and analyzed. The main focus is put on the changes in fleet segments of different size groups with respect to regions and type of gear.

As shown in chapters 5 and 6 the Danish fisheries are in principle open access fisheries, where the resource removals are regulated by quotas, and/or rations for a given time period (fishery related measures), while the access to the sector as a whole is regulated by vessels license and authorization of commercial fishermen (fishing sector related measures). The fishery related measures regulate indirectly the access to the resource. This kind of regulation with allocation of the resource (for Denmark the available resources for the most important species are determined as a fix share of the TACs for EU) amongst different fleet segments is more or less political determined. The regulation directly allocates the resource to the fishermen (or group of fishermen).

A condition for the necessity to allocate directly the resource is overcapacity of the fleet. Direct allocation of resource amongst different fleet segments also requires that these segments can be distinguished.

Acceptance of the allocation mechanism of the fishermen is also important, because the process creates winners and losers. The losers might even be bankruptcy and squeezed out. An open process can here be central, because it can ensure compliance. It is also central that the outcome is perceived as equitable and fair. A central element in the Danish regulation has been open access to the different fisheries. Hereby everyone can participate in the different fisheries. By the use of rations available for a limited period the allowable catch is directly allocated to the participating fishermen. This allocation system seems to be perceived by the Danish fishermen as a fair system.

Another element in the allocative process is the objective of the regulation. In the Danish case the objective is to ensure a better exploitation of the resources compared to the outcome of a free fishery. A better exploitation is defined in relation to

- the conservation of the resources;
- efficient, including seasonal good, exploitation;
- the relation between the resource and the capacity;
- economic and employment consideration in general and in different regions.

These objectives or considerations include both efficiency and social factors as well as resource conservation in the allocative process. In any actual allocation the final outcome is based on a mixture or compromise of these objectives.

In the Danish fisheries there have since the late 1980s been a substantial overcapacity. The Danish regulation of the fisheries and the capacity has created winners and losers. In this chapter we will investigate for the period 1985-1992 which fleet segments that have the largest reduction in capacity. In Chapter 10 we will compare the results with the outcome of a regime based on more well defined ITQs for the main species in the North Sea and Skagerrak.

8.1.2 Structural changes in the fishing industry

In this section the development in the structure of the fleet is investigated for the period 1986-1992. In the next section some explanation for the development will be given, stressing the importance of the regulation.

The overall development in the total fleet is given in figure 8.1. While the number of fleets have been decreasing in the period by 687 (21%), the total GRT and total kW have declined by 29859 (22%) and 112601 (20%) respectively.

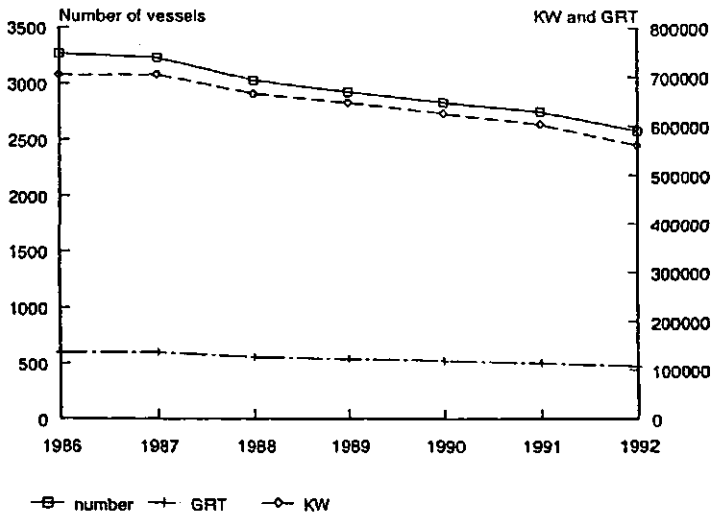


Figure 8.1 Development in the Danish fleet, 1986-1992

Because of lack of better indicators the number of vessels and the GRT-measure are used in the following as proxy for capacity. The reduction in GRT for each relevant fleet segment is calculated and compared with the mean reduction in total GRT. Hereby fleet segments with relatively larger reduction in GRT than on average are identified. Having identified these fleet segments we will look at the regulation, the catches and stocks, and the decommissioning scheme with the purpose to find some of the factors that can explain the development in the fleet segments.

As trawlers, Danish seiners and gill-netters are the main gear-types, the description is concentrated on these. In 1992 the number 1) and total GRT for these three gear-types were about 1,025 and 75,000 GRT for trawlers, 210 and 8,000 GRT for Danish seine and 1,250 and 17,000 GRT for gill-netters. While the total GRT of gill-netters have declined by 10%, the total GRT of trawlers and Danish seiners have decreased by 26% and 28% respectively, more than the fleet average in the period (22%).

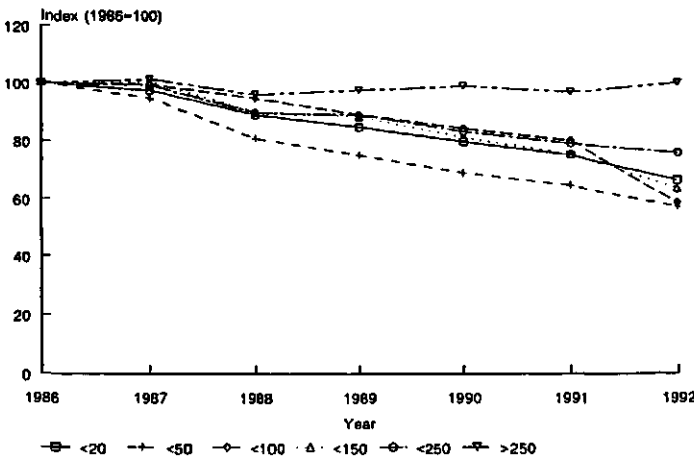


Figure 8.2 Development in total GRT of different trawler fleet segments

Within the trawlers the largest reduction in total GRT has been within the middle size-groups, i.e. 20-100 GRT, but also the groups <20 GRT and 100-150 GRT have declined more than the average for trawlers and the whole fleet, see figure 8.2. The group 150-250 GRT has declined about the average for both the trawlers and the whole fleet. For the group >250 GRT the total GRT has been almost unchanged in the period.

1) Over 5 GRT.

Danish seiners and gill-netters

The main size-group in the Danish seine fleet is 20-50 GRT and the development for this group follows the overall trend for the Danish seine fleet, i.e. a decrease in total GRT at 28%. The total GRT for the group < 20 GRT has declined by 40%, see figure 8.3.

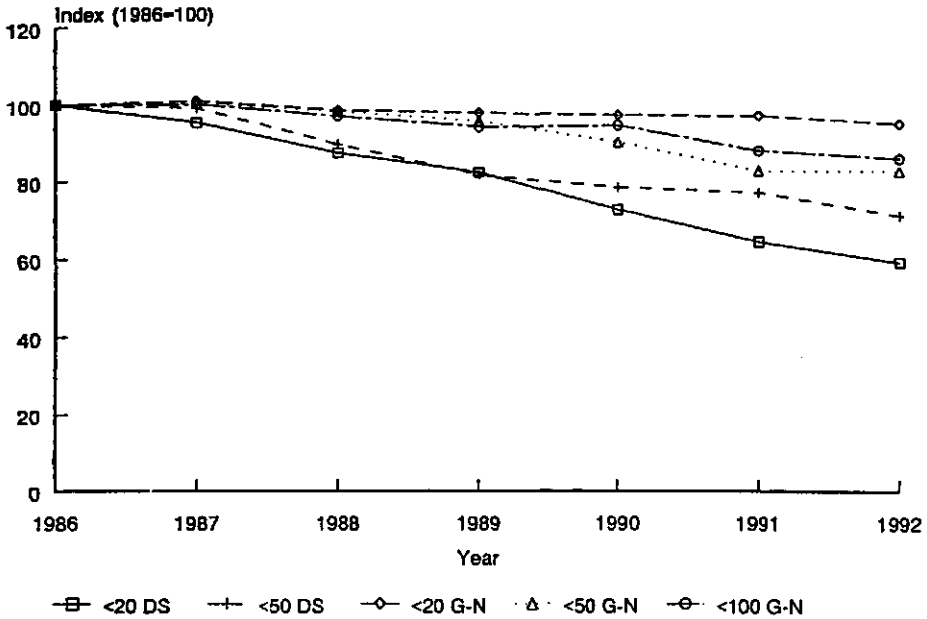


Figure 8.3 Development in total GRT of different Danish seine and gill-net fleet segments

For the gill-netters the reduction in total GRT in the main group <20 GRT has been 5% (i.e. less than on average for gill-netters, 10%), while for the groups 20-50 and 50-100 GRT the reduction have been about 15%, which is more than on average for the gill-netters, but less than on average for the whole fleet (22%), see figure 8.3.

The conclusion is that the relatively largest reductions in the fleet, i.e. over the fleet average, have been within the trawlers less than 150 GRT and the Danish seiners less than 50 GRT.

Regional development

The distribution of the fleet in different regions is shown in figure 8.4. West and North Jutland are the regions, which in terms of total GRT count most, about 75% of the total fleet GRT belongs to these regions. Bornholm is

the region with the smallest fleet in terms of GRT, but as this region is more dependant on fishery than the other regions, the fishery is more important from a regional economic point of view.

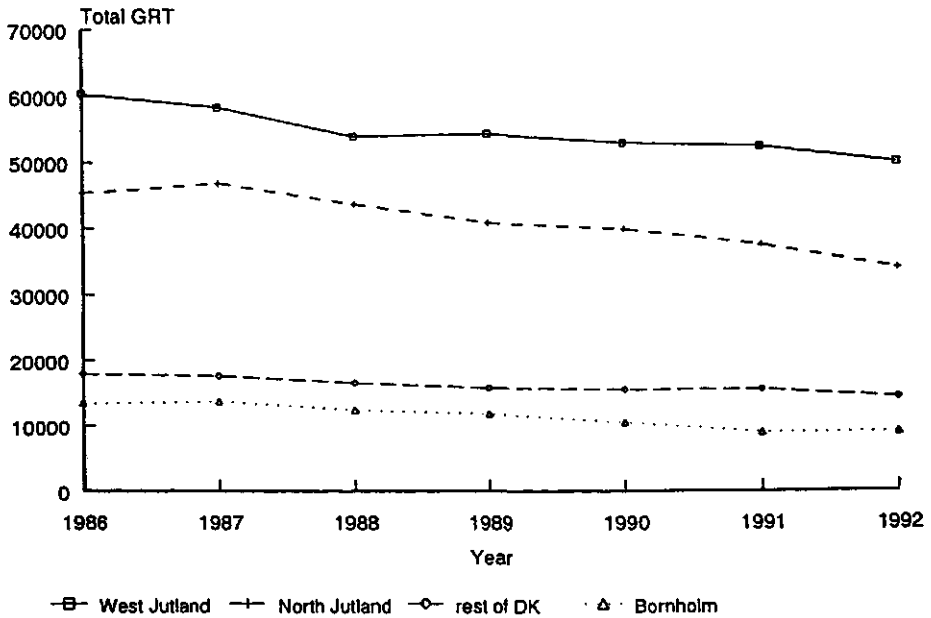


Figure 8.4 Total GRT by regions

Bornholm and North Jutland have experienced the largest reduction in total GRT 33% and 25% respectively, while total GRT in West Jutland and in 'the rest of Denmark' have declined by 17% and 21% respectively. The region 'the rest of Denmark' consists of fleets from ports located out to the inner Danish waters.

For Bornholm trawlers and gill-netters are the main gear-types and it has been within the trawlers the fall in the fleet has taken place. The group 100-150 GRT has almost disappeared from the fleet, 17 vessels in 1986 and 1 left in 1992. The two other large vessel-groups, <20 GRT and 20-60 GRT, for the fleet of Bornholm have declined by 26% and 36% measured in total GRT, respectively, see table 8.1. The group 20-60 GRT consists mainly of trawlers, while the group < 20 GRT consists of both gill-netters and trawlers. Since the fall in number of Gill-netters have only been 14%, the fall in the fleet is due to the fall within the trawlers.

The fleet of North Jutland consists of mainly trawlers, purse seiners, gill-netters and to a small extent of Danish seiners. The number of purse seiners are small 11, but the total GRT of the purse seiner fleet make up over 20% of the

total GRT of the fleet of North Jutland. The purse seiner fleet has remained constant in the period. The decline has first of all been within the vessel-groups less than 150 GRT, particularly within the groups 20-60 GRT and 100-150 GRT the fall have in total GRT been large, over 40%. These vessel-groups consist mainly of trawlers.

For West Jutland the fleet consists of trawlers, Danish seiners and gill-netters. The decline in the fleet has taken place within the trawlers and Danish seiners. The largest fall in total GRT have been within the groups 20-60 GRT and 60-100 GRT, 44% and 27%, respectively, which is over the average for both the region and the whole country. The groups 100-150 GRT and >150 GRT have declined about 12%, while the group 5-20 GRT in fact has increased by 9% in total GRT in the period. Both trawlers and Danish seiners are located in the group 20-60 GRT, while the large decline within the group 60-100 GRT is only due to decline in number of trawlers. The number of gill-netters, which mainly are small vessels, increased in the period by 9%, corresponding to the increase in total GRT for the small vessel-group 5-20 GRT.

The fleet in the region 'the rest of Denmark' consists of gill-netters and trawlers with over 75% of total GRT located in the group of small vessels 5-20 GRT. There are no vessels over 150 GRT. The fall in this fleet has take place first of all within the trawlers (31%), but also the group of gill-netters has decreased(16%).

Table 8.1 Total GRT by fleet size and regions (1 January 1987 and 1993)

GRT	West Jutland			North Jutland			Bornholm			Rest of Denmark		
	1987	1993	D (%)	1987	1993	D (%)	1987	1993	D (%)	1987	1993	D (%)
5-20	3,351	3,633	8	7,101	5,746	-19	3,284	2,095	-36	13,653	10,916	-20
20-60	14,534	10,580	-27	7,886	4,435	-44	2,568	1,391	-46	2,194	1,791	-18
60-100	5,144	2,856	-44	3,815	2,803	-27	339	306	-23	780	572	-27
100-150	6,163	5,386	-13	9,734	5,774	-41	2,267	132	-94	1,259	945	-25
>150	31,122	27,501	-12	16,849	15,184	-10	4,920	5,112	4	0	0	-
Total	60,314	49,956	-17	45,385	33,942	-25	13,438	9,036	-33	17,886	14,224	-20

8.1.3 Explanations for the structural changes

In this section the principal elements explaining the changes in the fleet structure described in the last section are found. The analysis is concentrated on the vessels-groups which have experienced the largest decline, i.e. trawlers less than 150 GRT and Danish seiners less than 50 GRT.

The crucial problem is to determine the different fisheries the vessels participate in and to add these fisheries together to sensible fishery patterns. The fishery patterns form the basis of the balance sheet of the vessels and the calcu-

lation of the profit. There are no information of the fishery patterns, but there are information of different typical fisheries the vessels-groups can and normally do participate in. Based on this information the overall economic development in each fishery is described in the period. Hereafter the overall change in the fleet structure should be explainable.

Table 8.2 Main fisheries for selected fleet segments

GRT size group	Trawl					Danish seine
	<20	20-40	40-60	60-100	100-150	
Fisheries						
Cod Baltic Sea	+	+	+	+	+	
Mixed hc a) North Sea	+	+	+	+	+	(+)
Lobster Kattegat/Skagerrak	+	+	(+)			
Sandell North Sea		+	+	+	+	
Prawn Skagerrak	+	+	+			
Prawn North Sea				+	+	
Sprat Kattegat/Skagerrak	(+)		(+)	+		
Sprat North Sea				+	+	
Plaice North Sea	+	+	+			+

a) hc is an abbreviation for human consumption.

Typical fisheries for trawlers between 100-150 GRT have in the period been: Sprat in the North Sea, Sandell in the North Sea, Shrimp and lobster in the North Sea and Skagerrak, Cod in the Baltic and mixed human consumption in the North Sea and Skagerrak.

For trawlers between 60-100 GRT the main fisheries in period have been: Sprat in Skagerrak and Kattegat, Sandell in the North Sea, Shrimp and lobster in the North Sea and Skagerrak, Cod in the Baltic and mixed human consumption in the North Sea and Skagerrak.

Typical fisheries for trawlers between 40-60 GRT have in period been: Sprat in Skagerrak and Kattegat, Sandell in the North Sea, Shrimp in Skagerrak, lobster in Skagerrak and Kattegat, Cod in the Baltic and mixed human consumption in the North Sea and Skagerrak.

Typical fisheries for trawlers between 20-40 GRT have in period been: Sprat in Skagerrak and Kattegat, Sandell in the North Sea, Shrimp in Skagerrak, lobster in Skagerrak and Kattegat, Cod in the Baltic and mixed human consumption in the North Sea and Skagerrak.

Typical fisheries for trawlers less than 20 GRT have in period been: Sprat in Skagerrak and Kattegat, Shrimp in Skagerrak, lobster in Skagerrak and Kattegat, Cod in the Baltic and mixed human consumption in the North Sea and Skagerrak.

The Danish seiners participate in the mixed human consumption fishery in the North Sea and the Skagerrak, where the target species is plaice and important by-catch species are cod, haddock, saithe.

Cod fishery in the Baltic

In the 1980s vessels from all the trawler-groups less than 150 GRT participated in the cod fishery in the Baltic. The Danish catches were in 1983-1986 about 100,000 to 120,000 tonnes per year, and since late in the 1970s the catches have been over 75,000 per year on average. But since 1983 the catches have declined every year and in 1993 the catches reach the bottom so far, about 10,000 tonnes. The decline in catches was in 1989 to 1991 to a certain extent offset by increasing prices, however, from 1986 to 1989 the price was stable. Since 1991 the price has been declining. The total revenue in this fishery has declined in the period by 40-50%.

Cod fishery in the North Sea

Also the Danish catches of cod in the North Sea have been declining, from a level about 45-50,000 tonnes in 1983-1985 to a level about 35,000 in 1986-1988 and since then the catches have declining every year. From 1991 the catches have been about 35-40% of the catch level in 1983, i.e. less than 20,000 tonnes pr. year. The total revenue in this fishery has declined 20-30% in the period.

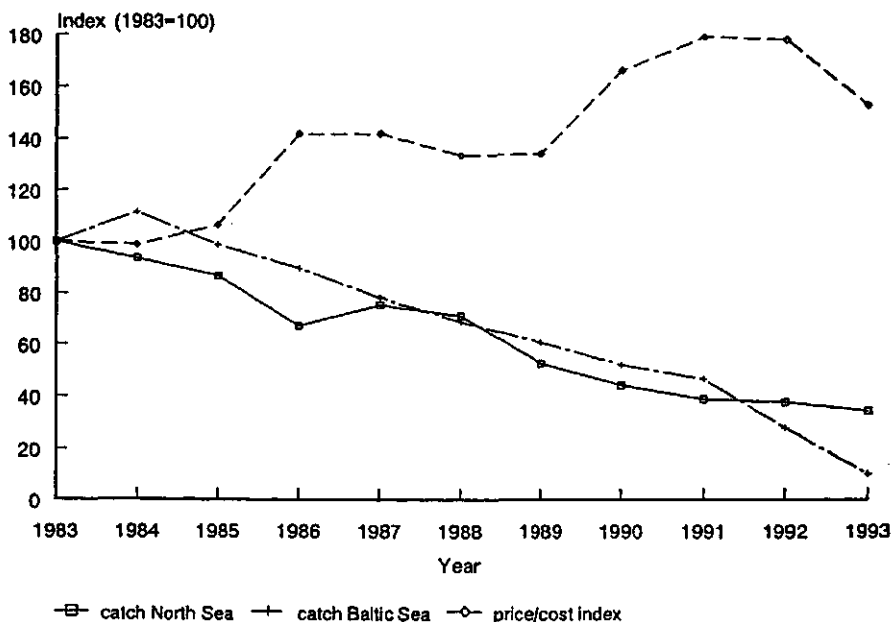


Figure 8.5 Catch and price/cost index for the cod fishery 1)

- 1) The price/cost index is formed by dividing a price index of the relevant species by an index of the cost.

Sandell in the North Sea

The Danish catches have fluctuated within 600,000 and 900,000 tonnes since 1985, with catches about 600,000 tonnes in 1987, 1990 and 1993. The prices fluctuate, with a tendency to a minor fall in the trend. In the years with low catches the price has been low too, indicating that the price of meal and oil is a world market price and that low prices make the fishery unprofitable for a part of the fleet. Since 1990 the price has been about 70% of the level in 1983. The revenue in this fishery is in the years with both low prices and catches, e.g. 1987, 1990 and 1993, lesser than the level in 1983, and in the years with high catches larger than the level in 1983.

No regulation is carried out for this fishery, however, in the Norwegian zone a TAC is set.

Prawn in the North Sea

Apart from a windfall high catch level in 1987 the Danish catches have been falling in the period from a level about 4,500 tons before 1987 to 2,000 tonnes since 1990, with the lowest catch in 1991 (750 tons). The prices have been stable until 1993, fluctuate within 20% of the 1993-price and since 1986 over the 1983-price. In 1993 the prices declined about 30%. In the Norwegian zone a TAC is set and regulation by ration per time period is carried out if necessary. Overall revenue in this fishery is 40-50% of the revenue in 1983.

Prawn in Skagerrak

The catches have since 1985 been between 2,200 and 4,500 tonnes with high catches (3,500-4,500) in 1985-87 and 1991-92. In 1988-90 and 1993 the catches have been about 2,500 tonnes. The revenue has in the period fluctuated together with the catches given the relatively stable prices, except for 1993, where the prices fall 30%. Since 1985-87 the revenue has been 60%-90% of the level in 1985-87.

If the Danish quota is exploited by more than 70% before a certain date, then ration pr. trip is imposed.

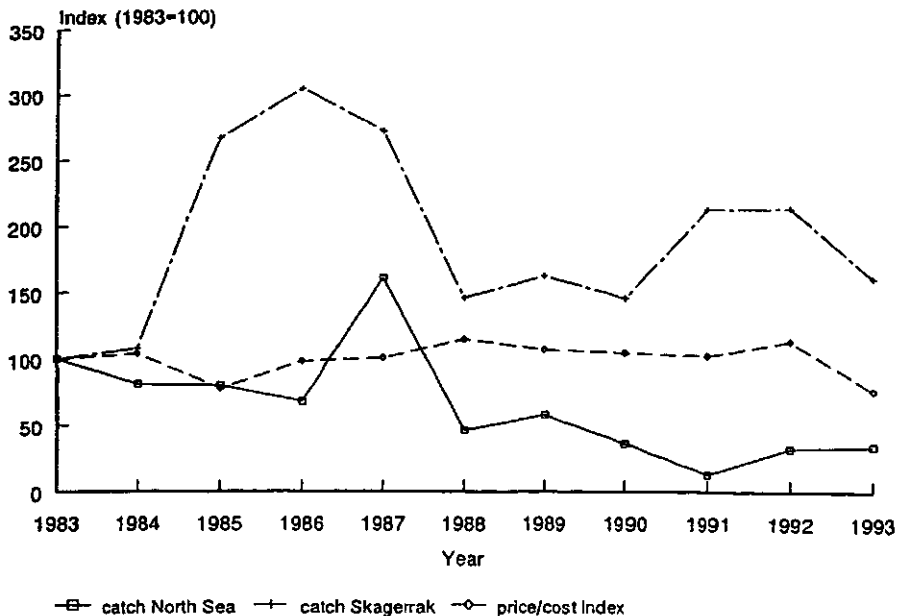


Figure 8.6 Catches and price/cost index in the prawn fishery

Lobster in Skagerrak and Kattegat

The catches have been stable until 1991 on a level about 3,000 tonnes, but in 1992 and 1993 the catches fall to a level about 2,000 tonnes.

The prices increased relatively fast between 1983 and 1987 from about 42 DKK/kg to about 65 DKK/kg (60%). Until 1992 the price was between 60 and 70 DKK/kg, but in 1993 the price fell by 30%.

Because of relatively high prices the earnings from this species/fishery have been over the level in 1983. In the period 1987-1991 over 30% higher earnings, but in 1992 and 1993 the earnings have been lower than in 1983.

There are no quota regulation carried out for this species, but the fishery is limited by the regulation of the by-catches of cod and sole.

Sprat in Skagerrak and Kattegat

Catches 1986-1989 between 50,000 and 60,000 tonnes, while catches 1990-1993 between 35,000 and 30,000 tonnes.

The level of the earnings from this fishery in 1990-1993 were only about half the earnings 1986-1989.

In this fishery there are vessel-restrictions, only vessels less than a given length are allowed to participate. The fishery is regulated by rations, specifying maximum catch pr. week. In order to increase the length of the season monthly or quarterly Danish quotas are specified. The fishery close, if the quota is upfished before the end of the month.

Sprat in the North Sea

The catches from this species have been very fluctuating. From the very high catch levels in 1983-84 (over 100,000 tonnes) the catch fall to 42,000 in 1985 and grew in the following period to 80,000 in 1988. In 1989 and 1990 the catches were between 40,000 and 45,000 tonnes. In 1992 the catches were the lowest in the period about 30,000 tonnes, but then in 1993 the catches increased to about 77,000 tonnes.

These fluctuation seems to indicate that this fishery has been some kind of 'fishery of last resort'. If the other fisheries turns out to be bad, then the sprat fishery in the North Sea is always a possibility. The reason for the very dramatic fall in catches from 1983 to 1985 is the sprat-box along the west coast of Jutland.

The vessels participating are given a ration pr. trip. The maximum catch depends on the length of the vessel. Also here is the Danish quota divide into time periods, here 3 periods.

The prices for sprat are the industrial prices, e.g. the same as for sandeel.

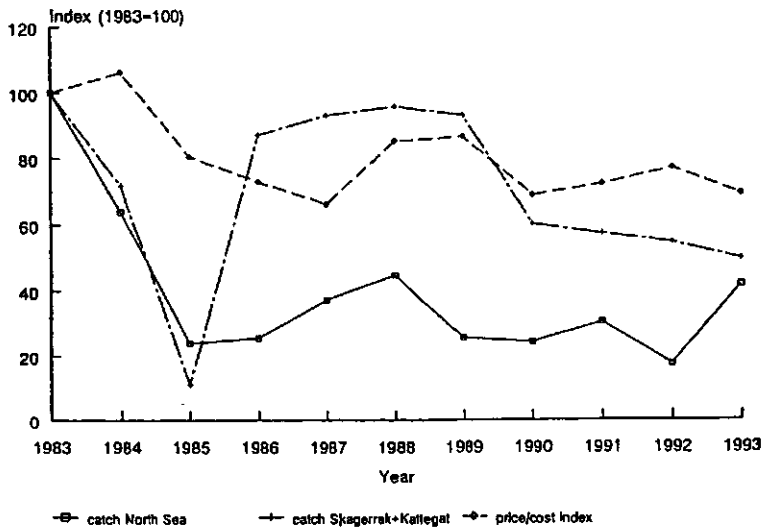


Figure 8.7 Catch and price/cost index in the sprat fishery

Plaice in the North Sea

This fishery which has important bycatches of especially cod, haddock and saithe is mainly conducted by Danish seiners, small trawlers and gill-netters. From 1983 to 1990 the annual Danish catches of plaice were fluctuating between 20,000 and 30,000 tonnes, but since 1990 the annual catches have declined every year and the catch in 1993 - 15,500 tonnes - was the lowest in the considered period.

The prices have been relatively stable. The fluctuations have been between 20% of the level in 1983, except for a peak in 1991, with very high prices (an increase of almost 50% in 1 year). In 1993 the prices increased, where the prices of cod declined. Before 1993 the overall revenue in this fishery was over the 1983-level, but in 1993 the total revenue was about 90% of the 1983-level.

There have not been any effective quota regulation of the plaice. A TAC is determined every year, but no Danish regulation has been necessary to secure landings less than the Danish quota.

Conclusions

For trawlers less than 40 GRT the decline in the mixed fishery after species for human consumption in the North Sea and Skagerrak (mainly cod) and in the cod fishery in the Baltic Sea had had the most important influence on the earnings in this fleet segment, since cod and other species for human consumption account for a share in revenue about 68% in 1987 and 66% in 1992, see table 8.3. The total revenue for the whole fleet segment declined in this period by 21%. The only important substitutions between species has been towards a higher share of industrial species, from a share about 5% in 1987 to about 15% in 1992 and a lower share of lobster and prawn (from 26% to 19%).

The total revenue for trawlers between 40 and 100 GRT fell from 1987 to 1992 by 21.4%. The share of cod fell substantial (from 41% to 23%) and the share of human consumption species fell from 70% to 52%, while the share of industrial species increased from 9% to 31%. The share of lobster and prawn

Table 8.3 Revenue shares of species for selected fleet segments, 1987 and 1992 (percent)

	Trawlers <40 GRT		Trawlers 40-100 GRT		Trawlers >100 GRT		Danish seiners	
	1987	1992	1987	1992	1987	1992	1987	1992
Cod	35.4	34.3	40.9	22.7	26.1	5.3	40.4	5.3
Other cod fish	2.8	3.9	10.3	8.5	6.3	5.0	4.9	7.4
Plaice	9.2	6.5	7.8	5.5	0.7	4.0	44.1	45.6
Other flat fish	10.2	12.6	4.7	7.2	1.2	2.2	8.4	12.3
Lobster/prawn	26.6	19.2	21.3	17.5	14.7	8.5	0.3	0.0
Industrial	5.1	14.6	9.0	31.0	38.9	53.4	0.0	0.0
Herring	2.7	4.2	0.9	1.9	5.9	13.1	0.0	0.0
Other hc a) spec.	8.0	4.6	5.2	8.3	6.3	8.5	2.0	4.3

a) hc is an abbreviation for human consumption.

is unchanged. This fleet segment has also substituted towards industrial species, but at the expenses of cod and other species for human consumption.

The share of cod fell from 26% to 5% for trawlers larger than 100 GRT, but despite this the total revenue increased in the period by 18%. This is mainly due to higher shares of industrial species (from 39% to 53%) and of herring (from 6% to 13%). To a minor extent the share of flat fish species has increased, from 2% to 6%. This group of vessels are, however, heterogeneous. The vessels less than 150 GRT are more depending on the cod fishery than larger vessels. The largest fall in this fleet segment had exactly taken place within vessels between 100 and 150 GRT.

For Danish seiners the effect of decreasing cod fishery (from a share of 40% in 1987 to 30% in 1992) has been substitution towards other species, i.e. the share of other cod fish and flat fish has increased. However, since the total revenue has fallen by 24% the increased share of other species than cod had not been enough to compensate for the decreasing cod fishery.

8.1.4 The regulation

Two main points can be extracted from table 8.4. The first point regards the development of the regulation in the main Danish fishery, the cod fishery. From almost no regulation in the first part of the 1980'ties, the regulation has since 1986 gradually evolved to be more detailed and tightened as the stocks and consequently the TAC deteriorated. The second point is that the regulation through different rations to separate length-groups implicit determines the distribution of the fishing possibilities or fishing rights.

Examples of other fisheries regulated by rations depending on vessel length are the sole and herring fishery, while the haddock and saithe fisheries are regulated by general rations.

The rations in the cod fishery in both the North Sea and the Baltic have from 1987 to 1991 been more than halved and from 1991 to 1993 the rations were halved again.

The regulation by rations in both the cod fishery in the Baltic and the North Sea also indicates that as the regulation gets tightened over the years the rations have been changed from more general and identical rations for several length-groups to different rations for separate length-groups. The exception is the cod fishery in the Baltic, where in 1993 the rations were very low and only two different rations were set. It is easy to see that these rations discriminate in favour of the shortest length-group.

Vessels from the length-group < 12m consist mainly of vessels less than 11 GRT. The main part of these vessels belongs to the group of gill-netters, only a very small part is trawlers. The main part of the gill-netters has a length between 6m and 9m. It is not possible on the existing economic data to assess quantitative whether the rations in general have discriminated in favour of the shortest length-group. But the development in the fleet structure indicates that the regulation in fact to a certain extent has favour the shortest length-group. Studies have shown that the catch capacity of vessels with length between 12m and 16m and vessels with length between 16m and 22m are four and five times

the catchcapacity of vessels with length between 6m and 9m. Only the rations in 1993 for the cod fishery in the North Sea seems to reflect this relationship. The other rations have on the contrary favour the shortest length-group.

	1987	1991	1993
Cod Baltic Sea	Rations per 2 weeks depending on vessel length. 12-22m: 28 tonnes 22-26m: 32 tonnes >26m: 34 tonnes From May rations per week independent of vessel length. (5 tonnes)	Rations per month depending on vessel length. <12m: 20 tonnes 12-16m: 28 tonnes 16-22m: 34 tonnes >22m: 40 tonnes	Weekly rations depending on vessel length <12m: 2½ tonnes >12m: 3½ tonnes
Cod North Sea	Monthly rations: 20 tonnes August: 15 tonnes Stop from November	Monthly rations depending on vessel length <12m: 7 tonnes 12-16: 10 tonnes 16-22: 11.5 tonnes >22m: 13 tonnes Rations reduced over year	Quarterly rations depending on vessel length <9m: 4½ tonnes 9-12m: 9 tonnes 12-16m: 17 tonnes 16-22m: 19 tonnes >22m: 21½ tonnes Rations reduced over the year and fishery closed from November
Sprat Skagerak/ Kattegat	Max 30 tonnes per trip	Max 75 tonnes per trip	Max 50 tonnes per trip License depending on fishery in 1991/1992
Sprat North Sea		Rations per trip depending on vessel length	Rations per trip depending on vessel length

Figure 8.8 Examples of regulation of selected fisheries

8.1.5 The decommissioning scheme 1)

In the period 1987-1992 the reduction in the fleet by the decommissioning scheme was about 30,000 GRT which closely corresponds to the change in the fleet.

The decommissioning scheme was managed, so it was possible for a large number of vessels to qualify for subsidies. The target vessels have in general been older vessels fishing for protected species, but also trawlers fishing for

1) This section is based on Frost et.al. (1995) 'An Appraisal of the Effects of the Decommissioning Scheme in the Case of Denmark and the Netherlands'.

reduction purpose were given a high priority in 1988 (and 1993). In 1991, for example, the vessels in the cod fishery in the Baltic were given a very high priority. Two vessel categories have, in particular, been subject to decommissioning, the Danish seiners and the trawlers. The decommissioning grant was associated with the size of the vessel in GRT and not the debt. Only vessels with a low debt relative to the size of the vessels were therefore able to benefit from the system. Mainly older vessels will fulfil this and the reduction has mainly been within the oldest part of the fleet. This is the reason for the large reduction in the Danish seiners, which typically did not perform particular bad in economic terms, but were old. Many of the trawlers did on the contrary beside being old perform economic bad with high debt rates and were in many cases forced to use the system of the creditors implying a loss for the owner and some of the creditors.

8.1.6 Conclusions

In this chapter the effects of the fishery policy on the structure of the fleet have been described and analyzed. The changes in the fleet have in the considered period been dramatic, with a reduction in the total GRT of the fleet of over 20%. This reduction have mainly been explained by two factors. First of all the outcome from a large part of the traditional main fisheries deteriorated during the period. Secondly the decommissioning scheme was implemented in the period and the scheme had contributed to the substantial reduction.

The regulation becomes in response to the aggravated resource situation more tight, e.g. rations, but the overall principle with open access to the different fisheries was maintained. Therefore the reduction is mainly within groups who were either favoured of the decommissioning scheme or had a bad economic situation and could not survived in the game of 'race for the fish'.

The reduction in the Danish seiners is not due to a poor economic development in the main fishery, e.g. plaice, of this fleet. Instead this fleet which consists on average of old vessels with a relatively small debt was reduced by the decommissioning scheme.

The middle size trawlers, e.g. the group 60-100 GRT and 100-150 GRT were reduced because of a poor economic development in their main fisheries. The reduction was not equal distributed through the country. In Bornholm and North Jutland the group 100-150 GRT declined more than in the other regions, because the vessels in this group were very dependent on the cod fishery in the Baltic. In West Jutland the group 60-100 GRT were reduced more than in the other regions, because the economic outcome from mainly the sandell and the mixed human consumption fishery in the North Sea declined. The group 20-60 GRT has in all regions except 'rest of Denmark' been cut back over the overall average. The reason is the poor economic outcome from the cod fishery in the Baltic and the North Sea.

It is an open question whether the Danish regulation has lead to the required or wanted structure. The regulation carried out for the human consumption fishery seems to have favoured the smallest vessel size on the ex-

penses of the larger vessels. The purpose of the decommissioning scheme seems to have been to take out older vessels fishing for protected species. However, the decommissioning scheme has in the recent years give more attention to reduction in the younger part of the fleet. In chapter 10 a situation with more well defined rights is analyzed and compared to findings of this chapter.

8.2 Structural implications of property rights in the Dutch fishing industry

8.2.1 Introduction

Section 8.2.2 describes changes in the structure of the Dutch cutter fishery with respect to the following structure components:

- The scope of the industry represented by the number of enterprises and vessels.
- The fleet structure.
- The level of employment.
- The fisheries the vessels are involved in.
- The external organisation of the enterprises.
- The internal structure of the enterprises.

The causes of these changes in the structure of the sector are explained in section 8.2.3, whereas 8.2.4 describes the role that property rights have played in the whole of these explaining factors.

Section 8.2.5 focuses on a major structural change i.e. flatfish ITQs and considers if there has been a concentration tendency with respect to the ITQ ownership.

8.2.2 Changes in the structure of the Dutch cutter fishery

To describe the changes in the structure of the Dutch cutter fishery the development of the industry will be considered for the period 1983-1995, thus from the start of the CFP.

Scope of the industry

The number of enterprises decreased substantially (by 26%) in this period (table 8.4), mainly as a result of decommissioning.

A small, but increasing part of the cutter enterprises (16% in 1995) owns more than on vessel (mostly two). These 'multi-vessel' enterprises generally exploit bigger vessels so that their part in the capacity of the fleet, expressed in terms of HP, is far more important (some 50% in 1995). A substantial part of these bigger enterprises has also decreased the number of vessels in order to get higher flatfish ITQs per vessel. This is indicated by their constant part (50%) in the total HP of the fleet in the period 1988-1995, whereas their share in the number of enterprises increased from 13.5% to 16%.

The average number of vessels per enterprise remained rather constant (1.2) in the period 1983-1995.

The scope of the industry declined importantly in terms of number of vessels: from 594 in 1983 to 457 at the end of 1995.

Table 8.4 Number of enterprises in the Dutch cutter fisheries, situation by December 31st

	1983	1988	1993	1995
Total number of enterprises	511	500	396	377
Of which owning more vessels a)	57	67	64	59
Number of vessels	594	603	474	457

a) Mostly two.

Source: 'Fisheries in Figures', LEI-DLO; Registry of fishing vessels, Ministry of Agriculture, Nature Management and Fisheries.

Fleet structure

Table 8.5 shows that the composition of the cutter fleet as to size group changed dramatically in the period 1983-1995: the number of medium size vessels (301-1,500 HP) decreased from 295 to only 43, whereas the number of bigger vessels (> 1,500 HP) more than doubled in this period (from 81 to 171).

The size category up to 300 HP increased in number, which means a major extent in the total number of vessels (from 37% in 183 to 53% in 1995).

As a result of the developments, the fleet structure in 1995 is characterised by a domination of two size groups: 300 HP and above 1,500 HP, which together account for 52% of the total number of vessels. In fact, there is a concentration tendency into two HP levels i.e. 300 and 2,000 HP, both resulting from HP maximums: 300 for the coastal zone and 2000 for beam trawlers.

Table 8.5 Number of vessels in the cutter fisheries by HP-group, situation 31 December

HP-group	1983	1988	1993	1995
- 260	140	145	120	109
261- 300	78	122	124	134
301-1100	173	97	35	23
1101-1500	122	90	37	20
1501-2000	53	64	84	102
>2000	28	85	74	69
	594	603	474	457

Source: 'Fisheries in Figures', LEI-DLO.

The fleet reduction occurred in the same way in the two main regions, 'North' (fishing ports north of Scheveningen, like Urk, Den Helder and Texel) and 'South' (Goedereede/Stellendam and Vlissingen as main ports). Hence, the distribution North-South remained about 76%-24% during the period 1983-1995.

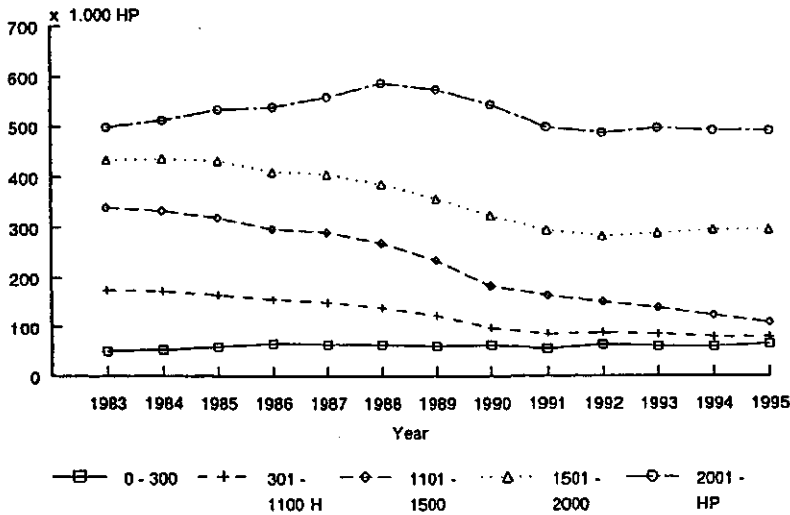


Figure 8.9 Development of total HP and of HP per size-group of the Dutch cutter fisheries in the period 1983-1995

The fleet reduction is hardly reflected in the total HP of the cutter fleet (figure 8.9), resulting in a fleet capacity in 1995 somewhat below (2%) the level in 1983, when the CFP started. In view of the decreased number of vessels this means an increase of the average HP per vessel from 840 in 1983 up to 1,070 HP in 1995.

Compared with the highest HP level of 598,000 HP at the end of 1988, this total was 18% lower at the end of 1995.

Figure 8.9 also shows the dramatic changes in the HP composition of the cutter fleet in the period 1983-1995. The part of the mid-size vessels (301-1,500 HP) decreased from 58% to 9%, whereas this share of the bigger ones (>1,500 HP) increased from 32 to 78%.

Employment

A number of 2,100 fishermen was employed on the cutters by the end of 1995. This is a 23% lower level compared with 1983. This employment had the about the same development as the number of vessels, which means that the average crew stabilized at 4.6 members (figure 8.10).

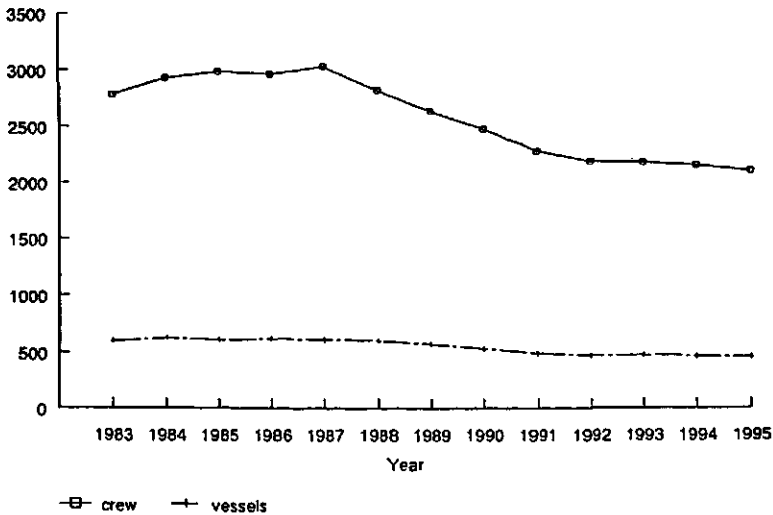


Figure 8.10 Number of crew members and vessels in the Dutch cutter fishery

Different fisheries

The kind of fishery of the vessels i.e. the gears used, are another aspect of the industry's structure. In this respect, the beam trawl sub-sector became far more important since 1983. This can be expressed by the increase in share (from 77% to 89%) of the total fishing effort of the cutter fleet, measured by 'HP-days' (totalling 90.6 million in 1995). On the other hand, the share of the otter trawl and pair fishery decreased from 19% to 3.5% in this period, mainly as a result of decommissioning.

External organisation

The formation of 'Management Groups', closely connected to the POs, in 1993 means an important change in the external organisation of the enterprises. In 1995 eight of these groups carried out a kind of co-management of the flatfish and cod/whiting quotas by monitoring the landings, and acting as an intermediate for trade and lease of ITQs. Each of these groups is responsible for fishing within the totals of the individual quotas of their members 1).

Structure of enterprises

The internal structure of most enterprises has changed, in particular since 1988:

1. Apart from the vessel, the fishing rights are now an important (intangible) asset. When the rights e.g. flatfish ITQs have been bought the value

1) The OECD Issue paper 'Experiences in Dutch co-management of marine resources', 1996 forthcoming, contains detailed information about these groups.

of them appears on the balance sheet, with in most cases a corresponding rise of the amounts of debts. The rights that have been allocated for free represent an important hidden financial reserve for most enterprises in the cutter sector. Should these rights, i.e. the flatfish ITQs, be valued against the market price the value would equal the price of a newbuild vessel. This means an ITQ value of some NLG 7.5-8 million on average for a cutter equipped with an engine exceeding 1,500 HP.

2. The policy of the vessel owners has changed more or less in that they are more managers of quotas than hunters for fish. This may lead to decisions to stop fishing for a certain week and save the individual quota for periods with better fish price expectations 1).
3. A number of vessel owners decided to take over a foreign company with all the fishing rights, to 'reflag' one or more vessels, resulting in an enlargement of the economic opportunities. Hence, the ownership of foreign daughter companies has changed the internal structure of some Dutch cutter enterprises.
4. High prices of fishing rights (ITQs) have become a barrier for new entrants. Sons of vessel owners, who used to start a firm for their own, remain more frequently in their father's firm so that the number of (potential) owners in an enterprise tends to increase.

8.2.3 Causes of changes in the structure of the cutter sector

The structural changes in the cutter sector are caused by a chain of several factors which are described below, more or less following this chain. It has to be kept in mind that there are no simple cause-effect relationships. Causes may be effects from other points of view.

Common Fisheries Policy

The establishment of the CFP in 1983 is the first and main influencing factor, through the implementation of TACs in the framework of the conservation policy and the through the introduction of MAGPs resulting from the structural policy. The CFP has led to several national measures which have caused major changes in the structure of the cutter fishery.

TAC limitations

The national quota levels for sole (before 1990), plaice, cod and whiting caused a big disproportion between the capacity of many cutters and their fishing rights. A study of LEI-DLO in 1988 2) pointed out that 70,000-100,000

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- 1) This appeared clearly during a number of interviews with vessel owners in the period November 1995-October 1996. More information has been included in 'Strategic responses of Dutch fishermen to limiting measures and property rights', Sevilla 1996.
 - 2) Pavel Salz et al. 'Prospects for the Dutch flatfish and roundfish sector in the short and long run', LEI-DLO report nr 5.79, August 1988.

HP of the operating fleet would come into liquidity problems in the next 2-4 years, due to this disproportion.

The parts of the EU TACs allocated to the Netherlands forced the Government to implement a number of measures, such as distribution of them through ITQs, decommissioning and heavy enforcement.

HP-licence system

To fulfill the obligations resulting from the first MAGP the Dutch ministry of Agriculture, Nature management and Fisheries implemented in 1984 a licence scheme which led to a HP ceiling for the cutter fleet, as has been described in chapter 5. The total HP of the active fleet could increase until 1988, due to orders for newbuildings which were in the pipeline when the licence scheme came into force in 1984. The stabilisation of this total HP in the period 1991-1995 (figure 8.9) demonstrates the effectiveness of the licence scheme, since it prevented an expansion after the profitable years 1991/1992.

Decommissioning scheme

The first scheme started in 1988 and this was followed by subsequent programs so that decommissioning grants could be obtained nearly throughout the whole period 1988-1995.

Quota limitations for cod and whiting have forced most of the owners of otter- and pair trawlers to apply for decommissioning. This has been the main cause of the decline of the cutter fleet after 1988, more in particular of the dramatic decrease of the number of mid-size vessels. Totally 124,000 HP of 133 vessels 1) was withdrawn from the fleet in the period 1988-1994. The majority of the decommissioned vessels (100) belonged to the medium size group (301-1,500 HP).

Heavy enforcement

The major intensification of enforcement in 1988, which meant systematic control of landings, carried out by some hundred inspectors, made the overcapacity of the fleet visible and sensible. This contributed importantly to the effectiveness of the decommissioning schemes.

Limitations for the coastal zone

A maximum number of vessels is entitled to fish within the 12-mile limit. This is a EU measure (Regulation nr. 55/87) whereby the concerning vessels are registered in two separate files. These entitlements have been the main cause of the relative increase of the vessels up to 300 HP, mentioned in section 8.2.2.

1) Hans Frost et al. 'An Appraisal of the Effects of the Decommissioning Scheme in the Case of Denmark and the Netherlands', draft final report to the Commission of the EU, April 1995.

High prices of property rights

Heavy enforcement led to a sharp rise of prices of flatfish ITQs in 1988. The rather good profitability of the cutters in 1991 and 1992 kept these prices on a high level and even resulted in new price increases. The decommissioning process contributed importantly to the trade in ITQs in the period 1988-1995, as has been pointed out in chapter 6. This enabled those who remained in the industry to adjust the rights to the available capacity of the vessel by buying additional ITQs. This process of price increases and trade in ITQs has been responsible for, or has contributed to:

- the changes in the structure of the enterprises mentioned in section 8.2.2;
- withdrawals from the fleet, apart from decommissioning. Table 8.6 shows the importance of this contribution to the fleet reduction;
- concentration of rights amongst the owners of the bigger beam trawlers, which has contributed to the dominating part of these vessels in the total HP of the fleet.
- the absence of a high level of newbuildings in the nineties after profitable years. Investments in ITQs exceeded those in vessels in some years. This will also have consequences for the near future since the investments in ITQs have absorbed more or less the depreciation funds and this will hamper future newbuildings.

Fiscal investment allowances

A special Law for investment stimulation (for all industries) was introduced in 1978. This allowed a deduction of a certain percentage (12 at minimum) of the investment amount from the fiscal income. In fact, it meant a diminishing of the income or corporate Tax amount and this has stimulated newbuildings of fishing vessels in the period 1979-1988. This has contributed to the increase of total HP and to the larger part of this total of the >1,500 HP beamers, shown in figure 8.9.

Economic performances

A good profitability level in the years 1985-1987 and 1991/1992 induced newbuildings of vessels, in combination (in the first period) with the investment allowances mentioned before. The existence of a second hand market for vessels abroad enabled the investors in new vessels to get rid of their 'old' one at a rather high price and to transfer the HP licence from the vessel sold to the new one. In case of expansion additional HP could be bought from those who withdraw their vessel from the Dutch fleet, apart from decommissioning. However, this mechanism stopped nearly completely in the early nineties, mainly due to the tightening of the licence schemes in the UK. This caused a major fall in the demand for second hand vessels.

Table 8.6 summarises the different factors that have caused an important decline in the number of cutters.

Table 8.6 Causes of the reduction of the cutter fleet in the period 1988-1994

	Number of vessels
Cutter fleet by December 31st 1987	611
Period 1988-1994:	
Newbuildings	92
Second-hand bought abroad	15
Decommissioned	133
Withdrawn from the Dutch fleet a)	121
Cutter fleet by December 31st 1994	464

a) Mainly sold to other EU countries or 'reflagged', whereas the decommissioned vessels have been sold to Third countries, if they were not scrapped.

Source: 'Fisheries in Figures', LEI-DLO.

Policy of decentralisation

The management and enforcement of the national quotas became a very heavy burden for the ministry of Agriculture, Nature management and Fisheries and also for the judicature in the early nineties. Moreover, the relationship with the industry was disturbed at that time. In this situation plans for co-management of the quotas by the industry were made and this resulted in the establishment of the eight Management Groups in the beginning of 1993 mentioned in 8.2.2 under 'external organisation'.

8.2.4 Effects of property rights on the structure of the cutter fishery

It is difficult to assess the separate effect of property rights 1) on the structure of the cutter sector. There are a lot of explaining factors (section 8.2.3) and the establishment of property rights are a part of them. In fact limitations and property rights are two sides of the same coin: Measures may create limitations on the one hand but rights on the other hand, depending on the viewpoint one takes. The rights' aspect may be more on the foreground for the vessel-owner in that he has a right to a benefit stream. In this respect, the property rights have added a complete new element to the structure of the Dutch cutter fishery i.e. the distribution of flat- and roundfish ITQs. The property rights have become a quite new, separate production factor for vessel-owners.

Focusing on the rights' aspect of the limiting measures the following role of the property rights in the whole of explaining factors (summarised in section 8.2.3) comes into sight:

- The fleet reduction by decommissioning and by withdrawals due to other reasons has been stimulated by the existence of valuable rights, i.e. ITQs. Vessel-owners could sell these rights and leave the fishery under more or

1) Defined as (briefly stated) a right to a benefit stream, see chapter 5 for the full definition.

less favourable conditions, mainly depending on the amounts of their debts and tax payments;

- The HP rights have prevented a fleet expansion in the nineties. Individual vessel owners could expand their fishing capacity but only if they acquired additional rights from another owner, who had to resign or to reduce his capacity.
- Renewal of the remaining fleet is hampered due to high investments in (flatfish) ITQs, which may have absorbed the depreciation for newbuildings;
- Entitlements for the coastal zone and high-priced ITQs have been explicitly mentioned in section 8.2.3 as separate explaining factors with respect to expansion of the capacity in the coastal zone and to changes in the internal structure of enterprises.

8.2.5 Concentration of ITQ ownership

Property rights i.e. ITQs have become a new aspect of the structure of the cutter fishery as has been stated in 8.2.4. Much attention has been paid to concentration of ITQ ownership in the fisheries economics literature. The OECD report on individual quotas 1) contains some statements on concentration of rights:

- Per Mickwitz et al., describe proposals for ITQs in the Finnish salmon fishery and they state that 'The possibility that the quotas would be in the hands of only a few is an issue that has been discussed a great deal';
- Roger Falloon states about the situation in New Zealand that 'There has been some concentration of quota ownership';
- G. Geen et. al. remark about the southern bluefin tuna fishery: '...a relatively small number of South Australian corporate operators gained the vast majority of the quota';
- Stephen Cunningham summarises the different country contributions and concludes: 'However, taking a political economy perspective, IQS may lead to problems since the incentive would probably towards monopolization of fishing rights';
- Gísli Pálsson and Agnar Helgason conclude, after an analysis of the Icelandic ITQ distribution 2) that 'fishing rights have been increasingly concentrated in the hands of the biggest companies'.

Thus, the concentration issue is important enough to devote a separate section on possible concentration of ITQ ownership amongst a limited number of bigger enterprises in the Dutch cutter sector. Therefore, the distribution of

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- 1) 'The use of individual quotas in fisheries management', OECD Documents, Paris 1993.
 - 2) 'Property rights and practical knowledge: The Icelandic quota system', in: 'Fisheries Management in crisis', edited by Kevin Crean and David Symes, Fishing News Books, 1996.

individual sole and plaice quota as to the size of the ITQ is considered. This size is expressed as a percentage of the total national sole and plaice quotas. Table 8.7 shows this distribution for the sole ITQs. The level ranges from the 'mini' ITQs, representing 0.005% of the total sole quota (an annual landing of 1.18 tonnes of sole on the basis of the 1994 quota) to 1.5-2.5% (354-590 tonnes) for the biggest ITQs.

Table 8.7 Distribution of ITQ holders as to size of the ITQ, expressed as percentage share in total allocated Dutch sole quotas in 1988, 1994 and 1997

Share of ITQ in total sole quota	Percentage of ITQ holders		
	1988 (n=387)	1994 (n=289)	1997 (n=276)
0.005 ('mini' ITQ)	20.2	17.3	14.9
0.005-0.5	65.4	57.7	59.7
0.5 -1.0	9.8	17.0	17.8
1.0 -1.5	3.9	4.5	3.6
1.5 -2.5	0.8	3.5	3.6
>2.5	0.0	0.0	0.4
	100.0	100.0	100.0

Source: Ministry of Agriculture, Nature Management and Fisheries; LEI-DLO.

Table 8.7 shows that some concentration of sole ITQs occurred in the period 1988-1994. Holders of bigger sole ITQs, owning 1% or more of the national sole quota, had a higher share in the total number of ITQ holders in 1994 (8%) compared with 1988 (4.7%). On the other hand, the percentage of holders owning smaller ITQs (up to 0.5%) decreased since 1988. The ownership distribution with respect to the plaice ITQs shows the same development, though holders of the biggest plaice ITQs (1.5-2.5%) were somewhat less in number compared with the sole ITQs.

Table 8.7 also contains the ITQ distribution as to size for the 1997 allocations. This shows that the concentration tendency did not continue clearly in the period 1994-1997. The number of holders of the smallest ITQs decreased on the one hand, but on the other hand, also the number of bigger (category >1%) ITQ holders decreased somewhat. The underlying factor seems to be less trade in ITQs, since the number of holders remained rather constant in the periode 1994-1997.

The total number of flatfish ITQ holders decreased importantly (by 25%) in the period 1988-1994, due to the selling of sole/plaice ITQs in combination with decommissioning, stopping the enterprise for other reasons, or only stopping with beam trawling.

The share in the total Dutch sole/plaice quotas of the holders of the 20% biggest ITQs is another measure for the level of concentration. In 1994 this group owned nearly 60% of total Dutch sole quota and 56% of the plaice

quota. This share of the holders of the biggest ITQs was somewhat lower in 1997: 58% and 56% respectively. Nearly all of these ITQ holders are companies owning more than one vessel. Table 8.8 gives the shares of these companies in fleet number, engine capacity and flatfish rights. The ITQ concentration proves from their increased share in the total Dutch sole/plaice quotas, mostly for sole: from 43% in 1988 to 62% in 1993. These figures show also that the concentration tendency did not continue clearly in the period 1994-1997.

Table 8.8 Share of enterprises owning more than one vessel, in fleet and fishing rights (percentages)

	1988	1993	1997
Share of enterprises owning more than one vessel, in:			
Total number of vessels	24	25	28
Total engine power of the cutter fleet	48	50	49
Total Dutch sole quota	43	62	53
Total Dutch plaice quota	38	44	51

Source: Ministry of Agriculture, Nature Management and Fisheries; LEI-DLO.

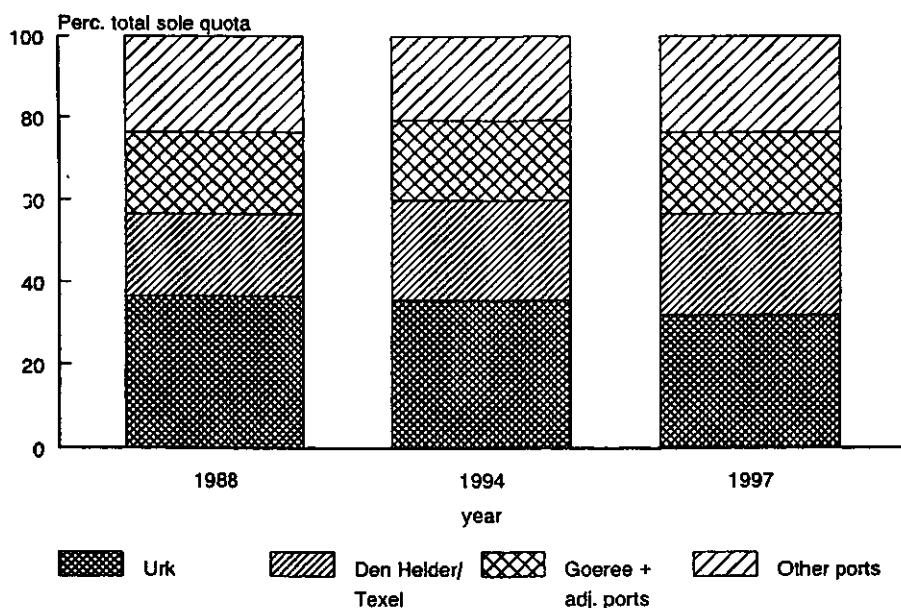


Figure 8.11 Regional distribution of sole ITQs

It can also be questioned if there is a concentration tendency with respect to the regional distribution of ITQs. Figure 8.11 shows the development in this respect in the period 1988-1997. The share of the main port, Urk, decreased from 36.6-32%, whereas Den Helder/Texel increased their share in the national sole quota (from 19.9-24.5%). This is probably explained by the relatively high number of 'multi-vessel' enterprises in these latter ports. There was not a major concentration of flatfish ITQs 1) towards a limited number of regions in the period 1988-1997, since the other nineteen ports kept their share rather constant.

ITQ ownership in other countries

ITQs became concentrated in fewer hands in Iceland, concluded Pálsson et al., (1996). They found that the 'giants', owning more than 1% of the total quota, increased their share in the total quota to 47.2% in 1994. These holders of big ITQs have a share of only 3% in the total number of ITQ holders.

Table 8.9 shows that this concentration level is much higher than in the Dutch situation.

Table 8.9 Concentration of ITQ ownership in the Netherlands and Iceland (1994) (percentage)

	The Netherlands (sole quota)	Iceland (cod equivalents)
Share of 3% biggest ITQ holders in total quota	17.4	47.2

Source: Ministry of Agriculture, Nature Management and Fisheries; LEI-DLO; Pálsson et al., (1996).

It has to be noted that the ownership structure differs in both countries. Processing companies are most important amongst the 'giants' of the owners in Iceland, where in the Dutch cutter fishery ownership is limited to the harvesting sector.

Also in New Zealand ITQs are more concentrated than in the Dutch situation. Falloon (1993) mentions a part of 50% of the total quotas for the three largest consortiums in 1992.

8.2.6 Concluding remarks

Finally, it can be concluded that the trade in flatfish ITQs in the period 1988-1997 did not lead to a major concentration of ITQ ownership amongst a small number of big companies. Some concentration of ITQs occurred, how-

1) Plaice ITQs are closely connected to the sole ITQs and they show the same development with respect to the (regional) distribution.

ever, and the following circumstances are relevant for a better understanding of this process:

- Decommissioning has induced the trade in ITQs, as has been mentioned before and such a process always tends towards concentration of vessels amongst bigger enterprises;
- The major intensification of enforcement in 1988 forced the remaining enterprises to adjust the fishing rights to the available capacity of the vessel. This process is reflected in table 8.5 which points out that for the 'multi-vessel' enterprises, the share of the flatfish ITQs was below their share in the HP capacity in 1988, whereas these shares came more together in 1997. So, this means rather an adjustment process than an expansion of these enterprises by buying additional ITQs;
- A concentration process should not be ascertained to the existence of ITQs alone. Already before the flatfish ITQs became effective some concentration took place in the cutter fishery: the 'multi-vessel' enterprises increased their share in the total HP of the fleet from 30% in 1983 to nearly 50% in 1988, apart from trade in ITQs;
- A further concentration of ITQs amongst the bigger enterprises will be hampered through the high prices of ITQs. The amount of debts of the 'multi-vessel' enterprises increased on average from NLG 4.25 million up to NLG 4.4 million in the period 1988-1994 (Fisheries in Figures, 1994) and the liquidity situation did not allow (on average) for an increase of financial obligations resulting from new investments. It has to be kept in mind that these bigger enterprises in the cutter fishery are real family enterprises which limits the financial possibilities to aggregate property rights;
- The level of concentration of property rights is somewhat higher when foreign fishing rights are taken into account. An unknown number of (mainly bigger) enterprises has acquired fishing rights in the UK, Belgium and Germany, as has been stated before. The high price of rights in the years 1996/1997 in the Netherlands makes it assumable that this phenomenon of quota hopping will continue in future, whereby the high transaction costs may cause important barriers.
- ITQs were in the Netherlands less concentrated amongst bigger enterprises compared with the situation in Iceland and New Zealand.

8.3 Structural implications of property rights in the UK fishing industry

8.3.1 Introduction

The processes of concentration and specialisation are common to most industries. Fishing in the UK is no exception. Most improvements in technology and markets tend to increase output per person; they thus reduce the need for as many people and as many firms as in the past. There may also be aspects peculiar to fisheries which strengthen the trend; these include the stagnant or declining resource base, the comparative attractions of other proteins and the

deterrent effects of a very arduous working environment. More general factors such as the effects of education and the availability of well paid employment elsewhere also influence developments.

Some of the manifestations of structural change have been covered in chapter 6; the significant features are increasing power and reducing numbers in the main inshore fleet. This followed a period when two substantial changes occurred; the existing and increasingly obsolete distant water fleet was effectively de-commissioned with a decline in tonnage and power, both in total and on average. In contrast subsequent profitability and access to capital saw an increase in numbers and power of the inshore fleet (usually regarded as vessels of 40 feet and over, roughly 12.2m, though the current dividing line for many purposes is 10m) until licensing became more restrictive. Table 8.10 provides the information with the dividing line at 40 feet as the statistics were not then presented in metric terms.

Table 8.10 *Number and Tonnage of Active Fishing Vessels in the UK*

	Number			Tonnage
	total	under 40ft	40ft and over	40ft and over
1978	7,067	4,732	2,335	206,057
1980	6,895	4,512	2,383	179,557
1982	6,797	4,485	2,312	159,714
1984	7,584	5,433	2,151	130,380
1986	8,166	6,305	1,861	116,556
1988	8,132	6,128	2,004	145,377

Source: UK Sea Fisheries Statistics MAFF.

The contradictory increase in the number of smaller vessels during this period and subsequently reflects the lack of restrictions over entry to this sector until very recently. The capital needed for such vessels was not much of a barrier and this enabled fishermen to get started in the industry. This aspect of entry is also reflected in the nature of much of the employment concerned being part-time or casual. Open access to the fisheries and the system of regulating the quotas may have encouraged the race to fish and to invest in vessels. Even here the growth in power has been a feature but with licensing and limits on replacement now in place, declining numbers seem inevitable in the future. Indeed they are apparent in the 1995 figures, where the increase in numbers and tonnage between 1990 and 1993 has been succeeded by a marked decline. Table 8.11 resents the relevant data.

The 90s saw an increase in the average power of small vessels; it amounted to over 20% in the first five years of the decade. This increase for individual vessels was accompanied by an increase in the sector's share of the total power of the UK fleet from around 23% to roughly 26%. The 1995 figures are slightly down from the peak levels for share and absolute total in 1993.

Table 8.11 Fishing Vessels 10 metres and under in the UK

	1991	1992	1993	1994	1995
Number of vessels	7,121	7,376	7,666	7,195	6,320
Tonnage	23,326	24,622	25,363	23,956	21,411

Source: UK Sea Fisheries Statistics MAFF.

8.3.2 Structural changes in the UK fishing industry

Two aspects seem especially interesting in the structural developments in the UK. The first is the regional re-distribution of activity. This flowed partly from the loss of grounds in distant waters and partly from growth in the sectors initially left free to expand. This showed in the change in the value and volume of landings in the different parts of the UK. England and Wales moved from its historic dominance (with two thirds to three quarters of the total value in the 50s and 60s) to second place as the post 1977 conditions favoured the Scottish industry. The extension to 200 miles resulted in expanded grounds around Scotland where the local industry had the type of vessels and experience to exploit the new opportunities. Even now after the necessary adjustments to the fleet structure in England and Wales, landings into Scotland accounted in 1995 for 56% of the value with England and Wales at 39% and Northern Ireland at 4%. The impact locally was considerable with regions like the North West of England, Fleetwood in particular with its deep sea trawlers, declining substantially while others such as the North East of Scotland and Shetland expanded. The latter development was helped by the expanding

Table 8.12 Fishing Vessels over 10 metres in certain UK Ports

	Number		Engine power (HP)	
	1993	1995	1993	1995
Fleetwood	109	83	18,694	13,914
Grimsby	234	183	84,442	72,386
Milford Haven	132	128	38,845	44,852
Newlyn	214	198	54,258	58,667
England and Wales	1,563	1,332	357,172	328,843
Peterhead	97	116	56,965	70,551
Shetland	68	82	32,187	36,583
Scotland	1,314	1,195	406,126	384,958
UK total	3,442	2,855	882,750	800,658

Source: UK Sea Fisheries Statistics MAFF.

mackerel fishery of the late 70s. Special features such as Spanish and Dutch investment in UK vessels complicate the interpretation of developments in places like Milford Haven and East Anglia. (There may be increased numbers of certain types of vessel while the overall numbers decline due to sharper decreases in other types.) Table 8.12 shows the current position.

The second and more relevant aspect in this context is the impact of restrictive licensing on the profitability of the sectors. This in turn determines whether funds will be available not just for new vessels but also for investment in licences leading to some increase in concentration. The obvious example is the pelagic sector where limited entry and high earnings allowed modernisation. The purse seine vessels (roughly 50 in number) which dominated this sector in the 80s generated high profits and their licences were then worth around £0.5m each. The balance in the fleet has altered in the mid-90s with large pelagic trawlers replacing some of the pursers. This recent change is not fully reflected in table 8.13 which gives some data about costs and earnings by pelagic vessels in 1993. While the sample is not random it is large enough (18 vessels) to indicate what some vessels were capable of earning and the degree to which differing cost structures influenced profits. Poor performance seems to be linked to the quality of the vessel and the combined cash flow of crew share and profit amounts to only around 13% of the vessel value and 25% of the earnings. Top performance also reflects the quality of the vessel and the comparable figures are 19% and 48%. What is surprising is the ratio between earnings and insured value with the poorer performers showing higher turnover per £ invested (over 50% compared with under 40% for the top performers).

Table 8.13 *Financial results for pelagic vessels (£ per vessel 1993)*

	Total earnings	Profit *)	Crew share	Insured value
Average	821,188	104,046	239,658	1,841,667
Upper quartile	1,131,715	14,451	332,989	2,912,500
Lower quartile	699,221	-24,928	199,498	1,293,750

*) Profit before deducting interest and depreciation.

Source: SeaFish Costs and Earnings Survey.

While there is no change in the main location of the vessels in North East Scotland and Shetland, technology and markets have changed. Three larger vessels capable of trawling and of presenting a better quality of product had already entered the sector by 1996 with three more due to arrive in the near future; they replace existing capacity but they ensure the removal of additional capacity to accommodate the increase in size and power of the vessels. While the developments reflect both the improvements in pelagic prices and vessel design, they have undoubtedly been facilitated by the relatively secure rights in the fisheries. The outcome has been both a reduction in the number of ves-

sels involved and a sharp rise in the licence value now thought to be worth more than £2m. Whether the assumption of secure rights, possibly based on the tighter and longer established licensing system, justifies this value or the investment of around £50m in the six new vessels, must remain open to question.

Events in the pelagic sector do not necessarily carry through to the much more important demersal and shellfish ones. Demersal landings accounted in 1995 for over 60% of total value as against over 25% for shellfish and just over 10% for pelagic species. Table 8.14 provides some information on costs and earnings. The figures relate to 1994 for the beam trawlers and 1995 for the others. Again the sample can not be seen as random and exactly representative of the sector but the figures do provide a range of actually occurring results to inform the discussion. As with the results for pelagic vessels, the profit is before deducting charges for depreciation and interest.

Table 8.14 Financial results for demersal and nephrops vessels (£ per vessel)

	1994 For beam trawlers and 1995 for others			
	total earnings	profit	crew share	insured value
Beam trawlers				
- medium	327,232	19,077	85,274	592,857
- large	575,292	55,802	149,706	1,427,273
Demersal trawlers				
- small	190,975	33,640	60,973	189,333
- medium	329,237	45,102	97,545	421,375
- large	467,640	58,411	142,075	642,214
Demersal seiners				
- small	313,934	27,080	104,100	276,250
- medium	464,239	62,772	145,142	476,400
- large	462,127	70,161	146,087	607,300
Nephrops trawlers				
- small	273,988	57,100	86,436	188,800
- medium	282,629	66,384	86,872	368,600

Source: SeaFish Costs and Earnings Survey.

As with the pelagic vessels the range of results and the differences between the best 25% and the worst 25% are considerable. Table 8.15 provides a couple of examples.

Quite a number of vessels in the demersal and shellfish sectors generate considerable cash flows in relation to the value both of the landings and the vessel. This feature perhaps partly explains why increases in value of licences have been observed in these sectors as well, and at a proportionately greater

Table 8.15 Financial results for certain demersal vessels (£ per vessel)

	1994 For beam trawlers and 1995 for others			
	total earnings	profit	crew share	insured value
Medium trawlers				
- average	329,237	45,102	97,545	421,375
- upper quartile	400,015	89,482	116,775	488,000
- lower quartile	247,551	5,126	81,087	339,167
Small seiners				
- average	313,934	27,080	104,100	276,250
- upper quartile	400,138	67,988	133,230	333,333
- lower quartile	241,060	-13,052	90,670	218,333

Source: SeaFish Costs and Earnings Survey.

rate. However, the combination of decommissioning and the reduction in capacity imposed when replacement vessels enter the fleet provides most of the explanation for the increases. Decommissioning under the scheme introduced in 1993 removed some 4.5% of capacity at a cost of £16.6m in the first two years and 2% at £9.6m in the third. There are still two years of the programme to run and around £24m still available but the cost per unit of capacity removed has risen and the amount to depart will probably be a further 4% at best. This does imply, however, that the quotas will be shared by fewer vessels (with fleet capacity reduced by 10% or more) and suggests higher returns for those remaining and upward pressure on licence prices.

What is perhaps surprising is the heavier capital to earning ratio in the most exclusive sectors. Beam trawlers and pelagic vessels have ratios of 2:1 or worse while most of the others run at a level between 1:1 and 1.5:1 with the small vessels showing insured values below the value of earnings. A similar disparity arises with the value of licences where the ratio of earnings to licence price seems less favourable for the pelagic and beam trawl vessels. This suggests that 'capital stuffing' or perhaps a willingness to 'buy jobs' for the future erodes the benefits conferred by securer and more exclusive rights. Alternatively there may be certain underlying positive assumptions about the reliability of future TACs and prices for the species involved which make the main pelagic and flat fish sectors more willing to invest. A further possible explanation may lie in the historical situation where other demersal and shellfish stocks were initially under much less pressure (with no problems equivalent to those which led to the cessation of herring fishing in the North Sea). As a result licences (other than pelagic and beam trawl) were both more numerous and less difficult to acquire. This situation is, however, changing and the recent sharper increase in licence values in these sectors may well lead to levels equivalent to those in the pelagic and beam trawl sectors.

Increasing strength of POs

Another feature in the structure of the UK fishing fleet which is associated with property rights has been the increasing strength of the POs.

While much of the initial impetus to form these organisations stemmed from concerns to recover compensation for withdrawn fish, subsequent development has expanded their role in managing the fisheries. Table 8.16 records recent developments. In effect this reflects the ability of the POs to manage quotas in relation to the track records and current activity of their membership; they can smooth out supplies coping with vessels being laid up or taking a temporary excess as well as providing the discipline needed to do so. In addition they can provide guidance on marketing (and on occasion markets) to improve earnings. The increasing proportions of the vessels in membership is reflected in the share of the important quotas managed by the POs. Table 5.3 in an earlier chapter gave the relevant quantities for the North Sea (Area IV) for the main demersal species in 1993. It was clear then that only for sole did those not in PO membership have anything near 50% of the quotas. POs had over 80% for cod, over 70% for saithe and over 90% for haddock and whiting. Since then the shares have increased and the 1995 figures for the North Sea show cod, haddock, saithe and whiting over 90% and sole over 75%. The share of the most valuable shell fish quota, nephrops, is just over 80%. The indications for the future are of this trend continuing with the vessels outside the POs and those under 10m having insignificant shares.

Table 8.16 Vessels over 10 metres by PO Membership (Percent of total)

	1994	1995	1996
Scottish Fishermen's Organisation	14.2	14.6	15.6
Cornish Fish Producers' Organisation	4.5	5.4	5.5
Northern Ireland Fish Producers' Organisation	5.3	4.8	4.9
Anglo Scottish Fish Producers' Organisation	4.6	4.9	4.7
South Western Fish Producers' Organisation	3.4	3.8	3.9
North East of Scotland Fishermen's Organisation	3.5	4.0	3.8
Anglo Northern Irish Fish Producers' Organisation	1.7	2.1	2.4
Grimsby Fish Producers' Organisation	2.6	2.7	2.4
Aberdeen Fish Producers' Organisation	2.1	2.4	2.3
Shetland Fish Producers' Organisation	1.6	2.0	2.1
West of Scotland Fish Producers' Organisation	-	-	1.9
Wales and West Coast Producers' Organisation	1.2	1.5	1.6
The Fish Producers' Organisation Ltd.	1.3	1.4	1.5
North Sea Fish Producers' Organisation	0.5	1.0	1.4
Fife Fish Producers' Organisation	1.7	1.0	1.3
Yorkshire & Anglia Fish Producers' Organisation	1.6	1.4	1.2
Fleetwood Fish Producers' Organisation	1.3	1.0	1.1
Lowestoft Fish Producers' Organisation	0.7	0.7	0.4
Northern Fish Producers' Organisation	-	-	0.4
Non-PO vessels	49.2	45.3	41.3

Source: UK Sea Fisheries Statistics MAFF.

While there have been some measures to secure a guaranteed quantity for those not in membership this has not stopped the flow of vessels and track records taking more of the entitlement to the POs. In some instances, the entitlement to quota share has been retained by the PO and the vessels sold, leading to further concentration on the catching side. Shetland is estimated to have improved its shares of both demersal and pelagic species in this way; demersal from something over 4% to nearer 7%, herring from 12% to 15% and mackerel from 18% to 24%. In addition, new POs have been set up to look after special interests, whether for the re-flagged vessels or for areas previously not adequately covered. There are for example POs looking after the interests of the Anglo-Spanish vessels (Wales and West Coast PO) and Anglo-Dutch ones (North Sea Fish PO) as well as one covering the West of Scotland and one incorporating Icelandic interests (Northern Fish PO).

8.3.3 Structural implications of property rights

The UK experience seems to indicate property rights having relatively little influence so far on structural developments. The relevant factors appear to be technical changes, profitability and decommissioning payments. The loss of distant waters and the extension of limits made much of the fleet of the 70s redundant and subsequent investment encouraged by Government and FEOGA funds changed both the structure and location of the fleet. The inshore sector grew and the location moved northwards in the UK. Decommissioning payments went initially to those vessels which had lost their grounds and could not work profitably under the new regime. Subsequently the departure of vessels, either under the renewed decommissioning scheme or where removed to allow replacements to enter the fleet, has continued the technical adjustment of the fleet.

Where property rights do influence matters is in providing the security to justify the investment, though the UK form of rights may induce an excess of investment ('capital stuffing'). There may be a lack of confidence in the current situation which explains the over-investment with owners eager to improve their technology and quota share as insurance against harder times to come. This bids up the price of licences. The UK capacity is still well in excess of its MAGP targets and thus no investment aid is available for new vessel construction. Fishermen and banks have to depend on the safeguards provided by entitlements under licences to ensure the cash flow to pay for the investment and related borrowings. Tables 8.13, 8.14 and 8.15 do not indicate exceptionally high levels of cash flow on average, though the better performers (upper quartiles) clearly do reasonably well. As many of the licences are still in the initial hands and may have no formal value (beyond inflating the second hand value of licensed vessels when such vessels change hands) even the expected additional problems of succession may not arise to any great extent. Uncertainty about the future existence of the licence rights in the same form, even without the impending review for 2002, limits the influences on structural developments.

One feature which does derive from UK property rights has been the re-flagging of foreign vessels through their owners acquiring UK licences and registrations. The original incomers were mainly Spanish seeking to secure established fisheries in Western waters only partly (if at all) exploited by British fishermen in the past, and their licences were mainly acquired at little or no cost; the more recent arrivals have been mainly from the Netherlands paying significant amounts to acquire entitlement to take sole and plaice. The relative costs of acquiring entitlements in the Netherlands and the UK have encouraged this, though the licences can not be regarded as being as secure as the Dutch ITQs (which look certain at least until 2002). The Icelandic interests connected with the vessels in the Northern Fish PO may be the next development in this particular phenomenon.

8.3.4 Conclusions

It is thus too early to detect significant impacts arising from property rights. It is reasonable to expect them in the future. The change in the value of a pelagic licence from £0.5m to £2m and similar or proportionately greater increases for various other licences will constrain investment decisions and erect barriers to entry. Whether they will also facilitate the adjustments to fleet structure will depend on the flexibility, transferability and divisibility of the rights. Whether their influence will displace that of technical developments in vessels, changes in fishing grounds or their productivity and alterations in market preferences remains to be seen. A critical factor will be the extent to which trade in track records provides the necessary building blocks for marginal adjustments of varying size (as some ITQ systems allow). The Shetland PO has shown how the acquisition of track record and associated vessel licences can be used to effect structural change. Whether the Shetland approach to regional protection, introduction of new technology, fisheries management and integrated marketing will be copied more widely depends on developing UK and EU policies. The most important PO in terms of vessels and quotas, the SFO, also has processing facilities but its membership is more diverse; it would have greater difficulty in reconciling the varied interests of its differing sectors in acquiring and allocating additional entitlements.

The trade in licences may be regarded as easing change or stopping it. For some with capital, expansion becomes easier while for others it becomes harder, as for new entrants with limited resources. A further factor may be the expectations about growth in the value of licences. Owners may retain them on a speculative basis and cause a period of structural freeze as happened in the dairying sector when milk quotas were introduced. What is clear from the extent of re-flagging and purchase of entitlement to fish UK quotas is that rights will generally flow from those with poorer technology and funding to those with better, as has happened with Anglo-Dutch vessels. They may to a lesser extent flow to those whose opportunity costs are lowest; this would be where the resale value of the vessel is less than its value in use and lack of alternative employment puts a zero value on labour, as with some of the Anglo-Spanish vessels.

9. EFFECTS OF PROPERTY RIGHTS AT ENTERPRISE LEVEL

9.1 Danish fishing enterprises

The analysis so far has concentrated on the effects of the Danish regulation. From a property right point of view poor entitlements have been created by this regulation. Since the fisheries related regulation is based on open access regulation, i.e. regulation of where, when and how much to catch and not limiting the number of participating fishermen, the effect of the sector related regulation, i.e. vessels and fishermen licences, on the profitability is assumed to be minor. There are two effects that contribute to this conclusion. Because the vessels are flexible they will still participate in the most profitable fisheries and these fisheries will therefore still be under pressure. Only the least profitable fisheries will benefit from the limited access, because of reduced fishing effort. Secondly over a longer period an eventual profit will be invested in fishing capacity because of the 'race for the fish' element in the regulation.

Therefore, the analysis so far points toward a break even economy of the vessels. The purpose of this chapter is to investigate this hypothesis based on cost and earning figures. The cost and earning figures are samples from vessels from the port of Thyboron at the west coast of Jutland, belonging to the region of West Jutland.

9.1.1 Profitability of selected fleet segments

The sample shown in table 9.1 is for the fleet segments of main interest, i.e. the fleet segments identified in chapters 6 and 8. It must be remarked that the information provided in table 9.1. is hardly representative, since it is only based on data from one port, but given the size of the fleet in that port the information can be considered as indicative for the development in the period.

Two indicators can be formed from the figures in the table to show the profitability of the fleet, the operating return on capital and the ratio between profit and total earnings. The operating (or gross) return on capital is measured as profit (before interest and depreciation) as a percent of insurance value of the vessel and it is a measure of the return on investment. The ratio between profit and total earnings, the operating profit ratio, is an indicator for the operational profitability.

The operating return on capital fluctuates for trawler segments over the period 1987-1995 between -2.0 - 15.6% (average for the period: 8.0%), 7.5 - 12.6% (average 9.3%), 4.3 - 14.4% (average 10.3%) and 3.4 - 15.6% (average 10.4%), respectively and for the Danish seiner segments 10.6 - 21.7% (average 15.8%) and 8.5 - 14.1% (average 16.7%), respectively. A detailed evaluation of these return rates requires a determination of relevant interest and deprecia-

tion rates, but in order to obtain just a minimum return the sum of the rates must in all years be over 10% and rates over 15% will normally be required 1). Therefore, the trawler fleet segments are all in a range of returns where the economy at best just break even and in many years the result indicates a loss. For the Danish seiners the economic situation seems to be more positive, but the returns are not that high.

Table 9.1 Financial results of selected fleet segments from Thyboron. Per vessel. Current prices (1,000 DKK)

	1987	1988	1989	1990	1991	1992	1993	1994	1995
<i>Trawlers 0-50 GRT</i>									
Total earnings	1,312	1,484	1,484	1,482	2,284	1,259	1,363	1,250	1,250
Profit a)	167	38	-38	163	328	134	221	264	198
Crew share	517	595	728	581	977	520	537	445	472
Insurance value	2,028	2,168	1,800	2,212	2,580	2,151	1,876	1,686	1,980
<i>Trawlers 50-120 GRT</i>									
Total earnings	1,812	1,261	1,409	1,632	1,801	1,005	1,185	993	1,167
Profit	300	291	312	252	381	317	348	571	330
Crew share	172	195	266	254	305	213	217	199	205
Insurance value	3,152	3,496	3,820	3,369	3,650	3,493	3,750	4,438	4,214
<i>Trawlers 120-200 GRT</i>									
Total earnings	2,950	4,011	4,011	3,571	5,075	4,811	4,270	5,328	5,753
Profit	506	847	562	339	1,066	870	715	1,131	1,302
Crew share	864	1,162	1,324	1,062	1,589	1,448	1,256	1,573	1,716
insurance value	5,395	5,875	7,219	7,923	8,381	8,527	9,190	9,185	9,578
<i>Trawlers >200 GRT</i>									
Total earnings	7,164	7,933	7,633	6,604	9,197	8,936	7,175	8,065	9,241
Profit	1,650	1,965	1,221	532	2,018	2,063	1,300	1,735	2,099
Crew share	2,062	2,318	2,319	1,945	2,702	2,605	2,005	2,287	2,608
Insurance value	12,966	12,581	15,748	15,820	15,436	16,379	17,280	17,174	17,435
<i>Danish seiners 0-30 GRT</i>									
Total earnings	1,217	1,055	1,277	1,293	1,216	1,166	960	1,157	973
Profit	211	138	172	263	226	236	152	227	131
Crew share	511	425	548	526	517	482	413	500	411
Insurance value	1,017	1,136	1,359	1,207	1,277	1,288	1,228	1,345	1,239
<i>Danish seiners >30 GRT</i>									
Total earnings	1,586	1,545	1,606	1,693	1,709	1,667	1,491	1,861	1,619
Profit	276	244	231	310	299	308	241	341	211
Crew share	659	633	693	700	752	716	635	789	684
Insurance value	2,004	2,116	2,088	2,203	2,345	2,411	2,559	2,636	2,479

a) Profit is defined before interest and depreciation.

- 1) The rate of depreciation based on the insurance value of the vessel ('= the value of capital) is for these vessels, which are old and therefore have a shorter expected lifetime left, relatively high 8-15%.

The operating profit ratio fluctuates also significantly in the period. However, the average for the period is between 10-15% for the trawler fleet segment 0-50 GRT, between 15-20% for the Danish seiner fleet segments and the trawler fleet segments 120-200 GRT and 200- GRT and between 20-25% for trawler fleet segment 50-120 GRT. Since fishery by trawl is capital intensive the operating profit ratio must be relatively high, i.e. over 15%. Only smaller trawlers have on average a smaller operating profit ratio (11%). The Danish seiners are not as capital intensive as the trawlers and a lower operating profit ratio is therefore acceptable.

The low operating return on capital for the trawlers despite the relatively high operating profit ratio is as mentioned due to the capital intensity of the sector. The total earnings are well below the insured value and for the trawler fleet segment 50-120 GRT only 37% of the insurance value. So despite the relatively high operating profit ratio the resulting operating return on capital is low. The other fleet segments have a ratio between 0.55 and 0.75. This could indicate overcapacity in the fleet.

The development in the insurance value in the period shows that for the trawler fleet segments, 50-120 GRT, 120-200 GRT and 200- GRT the insurance value per vessel has increased more than expected 1) (the insurance value is measured in current prices). However, the insurance value for the segment 120-200 GRT has increased by 75%, while the increase for the two other segments is about 34%. The insurance value of the other segments has more or less followed the price development in the period except the trawler fleet segment 0-50 GRT. For this segment the insurance value has been fluctuating in the period (within a range of 25% of the insurance value in 1987) and is in 1995 at the same level as in 1987. These figures can, however, be biased, because the sample of vessels in each segment change from year to year and a change in insurance value can therefore be due to change in the sample of vessels.

Since the total earnings per vessel only have increased beyond the increase due to inflation for the trawler fleet segment 120-200 GRT the increase in insurance value for this segment can be explained by increasing possibilities for higher total earnings. For the segments 50-120 GRT the total earnings per vessel since 1991 has been at a level of 60% of the level in 1987-91 indicating serious problems for this segment, while for the segment 200- the total earnings per vessel have increased, but the increase is lesser than the increase in insurance value. The material shows that the increase of total earnings per vessel in the segments 120-200 GRT and 200- GRT has been within the industrial fisheries, while the earnings from the fisheries after human consumption have been relatively stable.

1) Given a price development around 2-3% per year, the insurance value measured in current value must increase by 17-26% in order to maintain the level of capital measured in fixed prices.

9.1.2 Conclusion

Information from interviews with accountants confirms the figures. Vessels within the trawler fleet segments 120-200 GRT and 200- GRT have invested to increase the earnings from the industrial fisheries, mainly in the hold conditions and in engines to increase the effectiveness, e.g. by a new gearing. These investments are in general not limited by the regulation of extension of capacity. The investments will tend to improve both the quality of the landed fish and the cost structure of the vessels.

According to the accountants, the restrictions in the fisheries after human consumption species and the relative low prices of these species are some of the factors that in the medium-term will determine the return on capital of vessels depending on the human consumption fisheries. These factors will in many cases lead to the conclusion that larger investments in the human consumption species fleet are not profitable.

The restrictions on extensions of capacity, where extensions are only allowed if equal capacity leaves the fleet, add an extra cost to consider in the investment process. This extra investment cost can, in general, not be expected to be covered by the earnings from the fisheries, because the future fishing possibilities are not secure, i.e. no fishing rights are defined by the Danish fishery related regulation. From this point of view the decommissioning scheme has also been a real barrier for new investments, since the compensation paid sets up a minimum payment for capacity:

9.2 Effects of property rights at enterprise level in the Dutch cutter fishery

The effects of property rights on firm level is the subject of this chapter. Section 9.2.1 considers if substantial investments in Dutch flatfish quotas can be covered by future earnings from sole and plaice landings. The significance of the rights as intangible assets on the balance sheet is described in section 9.2.2 and 9.2.3 gives estimates of the capitalised value of the flatfish ITQs. Valuable rights have consequences for the profit level, as is explained in 9.2.4 and finally, section 9.2.5 focuses on the consequences of the property rights for succession of ownership.

9.2.1 Effects of quota investments on the profitability of fishing enterprises

Investments in marginal quotas

The Dutch market for ITQs mainly regards the transfer of small quantities sole, plaice, cod and whiting. The transactions contain buying of additional quantities of these species by vessel-owners who intend to adjust their rights to the available capacity of the vessel, as has been explained in chapter 8. Suppliers of ITQs use to split up their quantities in smaller parts so that high prices can be earned. Prices are expressed in NLG per kg of sole and plaice quota and amount to three or four times the auction price per kg of sole and plaice. Buy-

ers are allowed to add these 'ITQ-parts' to their available ITQ and in this way they increase their 'permanent' share in the total quota, allocated to the Netherlands. The acquired right remains for an indefinite number of years. Thus, additional earnings can be obtained that only need to cover the marginal (variable) costs so that a high balance remains to cover the quota investment.

Table 9.2 shows the effect on the cash-flow of an additional sole/plaice quota, bought by an owner of a 1,800 HP beam trawler. The majority of quota transfers in the period 1988-1994 referred to this type of beam trawlers. The table starts with the average costs and earnings of a 1501-2,000 HP beam trawlers based upon the 1993 figures from the LEI-DLO sample of fishing enterprises accounts. The calculation 1) has been based upon the following assumptions:

- marginal quantity bought of 6,740 kg of sole and 15,200 kg of plaice (average quantities bought for this type of vessels);
- prices paid for this ITQ-part: sole quantity NLG 60 per kg and plaice quantity NLG 7 per kg;
- these quantities and prices result in an investment of NLG 510,800 for sole and plaice together;
- auction price of sole NLG 13.12 per kg, plaice NLG 3.23 per kg (average auction prices in 1994);
- variable costs such as fuel increase proportionally with the landings.

Table 9.2 shows an extra cash-flow of NLG 66,600 that is available for covering the investment costs of the quota. It seems a rather good investment, since the return is 13% before taxation.

The quota situation was rather different in 1996 and 1997, in that the plaice quota was much (50-55%) lower compared with 1994. Furthermore, the sole ITQs were 25-40% lower in these two years.

The effect of quota decreases is that the kg price of an ITQ tends to increase. This means a longer pay-back period for purchased marginal ITQs, assuming that the gross margin (earnings-variable costs) remains constant.

Table 9.2 Increase in cash-flow in 1994 as a result of buying of an additional ITQ by an owner of a beam trawler, 1501-2000 HP class (average figures in NLG)

	Year 1994, original quota	Year 1994, inclusive of additional quota	Additional quota alone
Gross earnings	2,367,900	2,528,900	161,000
Expenses, excl. of wages	1,186,500	1,238,300	51,800
Wages (shares) incl. of skipper-owner	583,500	626,100	42,600
Gross cash-flow	597,900	664,500	66,600

Source: Fisheries accountancy data network of LEI-DLO.

- 1) An important part of these calculations has been carried out by G.H. Beyert, for her final essay for the Business school in Alkmaar.

A separate remark has to be made about taxation of quotas for the Income or Company taxation. For fiscal purposes a depreciation period of eight years 1) is allowed for quota investments. This means a depreciation amount of $\text{NLG } 510,800/5 = \text{NLG } 102,160$ in the case of the beam trawler in table 9.2. Thus, a fiscal loss ($66,600$ minus $102,160$) results during the first five years after buying the ITQ. This loss might be even higher when an interest amount has to be paid for an additional loan. These losses can be compensated when profits occur, thus reducing the future tax amount that has to be paid. This may explain the attractiveness of buying ITQs by Dutch vessel-owners in cases that high amounts of taxes have to be paid.

Investments in full quotas

The investment in a 'full' flatfish quota is considered in table 9.3. The (theoretical) case is that a starting fishing enterprise has taken over a second handed beam trawler with the rights, i.e. a sole/plaice ITQ consisting of 103,050 kg of sole and 310,250 kg of plaice (the average quota level for this type of beam trawlers in 1993 and 1994). This means an investment of NLG 8.3 million for the quota alone, on the basis of actual quota prices, and for the vessel NLG 2.5 million.

The resulting cash-flow in table 9.3 is too low to cover repayments and interest for a loan. Assuming that the bank would consider a loan of NLG 6.5 million, to pay off in eight years (usual for second handed vessels) and 7.5% interest this would require an annual cash flow of at least NLG 1.1 million.

The conclusion is that taking over a second handed vessel with all the rights will not lead to a profitable investment. Therefore, a financial institution will not be prepared to provide the finance for such an investment.

This conclusion is based on average circumstances. The question can be posed if 'highliners' could meet such high cash-flow requirements. Highliners in this respect are the quota owners who take up their ITQ most efficiently. An analysis of the LEI-DLO costs and earnings database turns out that these operators have a 20% better gross margin (gross cash-flow as a percentage of the gross earnings). This would result in a gross cash-flow of NLG 1,025,000 in the example of table 9.2. Thus, it seems that even (potential) highliners cannot enter the fishery by buying a vessel with all the necessary rights.

This example makes clear that very high barriers for new entrants in the Dutch cutter fisheries exist. The Dutch Government has contributed to a solution of this problem by implementing fiscal allowances, only for quota transactions within the family. These are the same allowances as already existed for agriculture, i.e. transfers of milkquotas, as is pointed out more in detail in section 9.2.5.

1) Fish quotas may be depreciated for fiscal purposes in eight years. This regards quota investments from April 1st 1994, but this period may also be applied to quotas purchased before this date.

Table 9.3 *Estimated cash-flow in 1994 of a beam trawler, size group 1501-2000 HP, resulting from the investment in a second handed vessel and a full ITQ (amounts in NLG)*

Gross earnings a)	2,722,100
Expenses, excl. of wages	1,153,500
Wages (shares) incl. of skipper-owner	715,400
Cash-flow	853,200

a) This amount exceeds the one in table 9.2 since it is assumed that the ITQ is taken up fully, contrary to the average outcomes in 1994.

Source: Fisheries accountancy data network of LEI-DLO.

9.2.2 Effects of investments in property rights on the financial position of fishing enterprises

This section deals with financial issues with respect to property rights, such as:

- financial conditions for investments in rights;
- the financing of (additional) quota investments;
- the value of the rights on balance sheets.

9.2.2.1 Financial conditions for investments in rights

High amounts were invested in property rights, i.e. flatfish ITQs in the period 1988-1995. Chapter 6 shows that in investments in these rights exceeded those in vessels in the years 1990 and 1991. It will be clear that financial institutions has played a role in financing the investments in rights. The amounts were, generally spoken, too high for the individual buyers to provide the money from their own resources. Financing with debts has been usual and this posed, from the beginning, the question to the banks as to the nature of the rights (i.e. the flatfish ITQs).

In case of financing the investments in rights, the vessel is taken into account in most cases. The actual debt situation of the enterprise is considered by the bank and additional finance for the investment in rights depends on the level of debts with respect to the vessel. A low level enables an additional loan for the buying of e.g. a flatfish ITQ. Since 1994 there is a tendency to consider flatfish ITQs as a kind of security, a collateral, for a loan. Banks have observed that, in case of bankruptcy of a fishing enterprise, the ITQs can generate a high proceed by public auctioning of the rights. This gives them a certain perception of security of the rights.

When the rights are concerned in case of financing, banks always stipulate the condition that the rights should not be sold without the approval of the bank. In such cases, the bank informs the ministry of Agriculture, Nature management and Fisheries that the rights serve as a security for a loan. When a transfer of rights has to be registered by the ministry, it is checked if the necessary approval from the bank is obtained.

The banks require different periods of repayment for loans. For new vessels this period uses to be ten (mostly) up to fifteen years. Loans for second handed vessels have to be repaid in eight years and the same period was taken in 1994 for rights (i.e. ITQs), be it or not in combination with the vessel. The possible change in the Common Fishery Policy in 2002 leads to uncertainty in the perception of the banks. This leads to shortening of the repayment periods in case of financing the rights after 1994 so that no financial burdens on the rights will remain beyond 2002.

9.2.2.2 The financing of quota investments

The question is if the extra returns, generated by investments in ITQs, will be high enough to allow repayment of loans. This section only considers the flatfish ITQs, since they represent by far the most important issue regarding financing of fishing rights.

The situation from section 9.2.1, a purchase of 6.7 tonnes of sole and 15.2 tonnes of plaice quota, will be taken as an example again. Such an investment is based on the average quantities bought by owners of beam trawlers in 1993. Also in this case a 1800 HP beamer is considered and the average earnings and expenses are shown in table 9.3.

Furthermore, the assumption is that the quota investment is financed with a loan of 60% of the investment amount, to pay off in eight years.

Table 9.4 Estimation of the average net-cash flow in 1994 for an additional flatfish ITQ, bought by the owner of a beam trawler in the 1501-2000 HP class (amounts in NLG)

	Year 1994, original quota	Year 1994, inclusive of additional quota	Additional quota alone
Gross earnings	2,367,900	2,528,900	161,000
Expenses, excl. of wages	1,186,500	1,238,300	51,800
Wages (shares) incl. of skipper-owner	583,500	626,100	42,600
Repayment+interest loan	590,800	642,100	51,300
Total expenses	2,360,800	2,506,500	145,700
Net cash-flow	7,100	22,400	15,300

Source: Fisheries accountancy data network of LEI-DLO.

The net cash-flow in table 9.3 shows that, on average, the extra returns from the quota investment were high enough to pay the extra costs of fuel, wages etc. and to cover the additional financial burdens resulting from this quota investment. In fact, the extra return will be higher since the quota investment may save tax payments. The purchase of an ITQ allows an annual fiscal

depreciation (since 1994 12.5% of the investment amount) so that the fiscal profit can be reduced by the quota investment. This reduction of tax payments has been an extra incentive for skipper-owners to acquire flatfish ITQs.

9.2.2.3 Property rights as an asset on the balance sheet

Property rights that contain a right to fish for more years can be considered as an asset on the balance sheet of an enterprise, in particular when the rights have been purchased. These valuable rights meet the requirements for recognition as an intangible asset according to the International Accounting Standards Committee (IASC). Therefore, the requirements are: 1)

- it is probable that future economic benefits associated with the asset will flow to the enterprise;
- the cost or value of the asset to the enterprise can be measured reliably.

The International Accounting Standard (IAS) 22 defines intangibles as: 'identifiable, non-monetary assets without physical substance that are controlled by an enterprise for use in the production or supply of goods or services, for rental to others, or for administrative purposes, and are expected to be used during more than one period'.

The question is how to value these property rights on the balance sheet?

There are some regulations by Law concerning the valuation and depreciation of intangible assets in the Netherlands. The Civil Law, part 2, art. 365, distinguishes five categories of intangible assets. One of them is 'purchase costs regarding concessions, permits and rights of intellectual property'. Property rights in fishing belong to this category. The value of the intangibles should not exceed the purchase costs minus the applied depreciation, according to the Civil Law. Value against zero has a preference because of the high uncertainty of the intangibles. As a consequence, concessions and permits that have been allocated for free by Government should keep a value of zero (Krens, 1991) 2).

The International Accounting Standard (IAS) 22 also gives guidelines for the valuation of intangibles. This regards in particular 'goodwill' and IAS 22, therefore, recommends the 'fair value' at the moment of taking over an enterprise.

The requirement that costs have to be measured reliably means in fact that rights that have been allocated for free cannot be valued on the balance sheet. Exposure Draft E50 of the IASC allows an alternative valuation of intangibles, but only for the ones that had already a value (Bak, 1996).

Property rights have become a rather important intangible asset for a substantial number of Dutch fishing enterprises, due to the purchase of ITQs in the period 1988-1993 (table 9.5). It has to be kept in mind that, in accor-

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- 1) Exposure draft E50, issued in June 1995. Quotation from the Dutch business magazine 'Maandblad voor Accountancy en Bedrijfsadministratie', September 1996, article from Bak, G.G.M. 'Merken en uitgavenrechten in de jaarrekening'.
 - 2) F. Krens, 'Intangible fix assets', chapter 3 and 7, Delwel, 1991.

dance with the rules described before, only purchased rights are included on these average balance sheets. Rights that have been allocated freely are not valued and mean in fact an important hidden reserve.

The item 'intangible assets' in table 9.5 consists almost completely of the value of the rights, i.e. the purchase value minus the allowable fiscal depreciation. Flatfish ITQs are the main component of this value, but purchased HP licences, codfish ITQs, shrimp- and herring permits may also be part of the intangible assets.

Enterprises owning more vessels show by far the highest amounts of rights (16% of total assets), reflecting the important part in the trade of fishing rights of these enterprises, as has been mentioned in chapter 6.

The bookvalue of the 'intangible assets' in table 9.5 changes as a result of purchases on the one hand and fiscal depreciations on the other hand. This bookvalue decreased for the enterprises owning more vessels from NLG 1.58 million by the end of 1991 to NLG 1.36 by December 31st, 1993, indicating that investments in rights decreased since 1991. The other size groups show a more or less fluctuating pattern in this period.

Table 9.5 Property rights as intangible assets on the balance sheets of enterprises in the Dutch cutter fisheries. Average amounts in NLG by 31 December 31st, 1993

	Enterprises owning one vessel			Enterprises owning more vessels
	up to 300 HP	301-1100 HP	>1100 HP	
Intangible assets	57,400	17,500	451,700	1,351,900
Vessel(s) a)	571,700	1,545,200	2,523,900	5,545,800
Other assets	180,200	179,500	663,000	2,038,500
Total of assets	809,300	1,742,200	3,638,600	8,936,200
Total number of enterprises in the cutter fishery	213	26	88	64

a) Bookvalue, based upon the replacement value of the vessel.
Source: Fisheries accountancy data network of LEI-DLO.

9.2.3 The capitalised values of ITQs

Section 9.2.1 concludes that investments in marginal ITQ quantities may result in a fiscal loss, taking into account a depreciation period of eight years. The question is how long the duration of the rights should be to cover the investment amount from the earnings. Table 9.6 shows the capitalised value (the present value) of the marginal flatfish ITQs for different duration periods. This value results from a discounted cash-flow analysis whereby the extra cash-flows generated by the investments in marginal quantities are discounted against an interest rate of 8% and 12%. The lower rate is an approach for the firms cost

of capital and the higher one takes into account a higher risk with respect to future quota developments.

Table 9.6 Estimated capitalised values in 1994 of an additional sole/plaice ITQ for a beam trawler, size group 1501-2000, amounts in NLG

	Discount rate	
	8%	12%
Investment, 6.7 t. of sole and 15.2 t. of plaice	510,800	510,800
Capitalised Value pay-out period:		
8 years, final ITQ value zero	476,400	412,300
20 years, final ITQ value zero	733,700	567,900
20 years, final ITQ value equal to investment amnt	828,100	618,600
perpetual	1,011,700	726,400

It is rather clear that the investment costs for the purchases in 1993 and 1994 (NLG 510,800 on average) can not be covered before 2002, the year of a possible change in the Common Fisheries Policy. On the other hand, the purchase of an additional ITQ would be a very profitable investment when the right would remain in perpetuity. In this case, an ITQ would have the same character as the land of a farmer.

The following assumptions, based on average quantities and prices, has been used for this discounted cash-flow analysis:

- the owner of a beam trawler in the 1501-2,000 HP class bought in 1993 an ITQ consisting of 6,700 kg of sole and 15,200 kg of plaice in addition to his existing flatfish ITQ (roughly 100 tonnes of sole and 300 tonnes of plaice);
- purchase price of these additional quantities is NLG 510,800 (sole and plaice together), which means a price per kg of NLG 75.90 on the basis of sole;
- the same annual gross cash-flow of NLG 66,600 (table 9.2) is generated by the extra purchased quantity of sole and plaice. This cash-flow has been adjusted for tax effects;
- the discount rate is basically 8%. This is a rather low rate, adjusted to the usual (accepted) low remuneration for the owners' capital in the firm. The alternative of 12% takes into account a much higher risk for future quota developments.

Table 9.7 shows the capitalised value of a 'full' flatfish ITQ, consisting of 103 tonnes of sole and 301 tonnes of plaice. In this case also the full costs of the vessel have been included. This means a difference with the marginal approach in table 9.6, where depreciation and interest of the vessel have been excluded. The value (investment amount) against market prices in 1994 of the ITQ is also

shown (about NLG 8.3 million). This shows the (theoretical) situation for a starting fisherman who intends to invest in a beam trawler and considers to purchase the necessary rights. The situation before taxes in table 9.7 will apply to him since the investment amount can be depreciated for tax purposes, which results in big losses in the first (may be eight) years. Tax payments will not be obliged for a rather long period, since fiscal losses can be 'carried forward'. It is clear that the NLG 8.3 million investment can not be covered by future earnings since the capitalised value is far below the investment amount. Thus, it is impossible to start an enterprise for beam trawl fishery when the 1993/1994 market prices for sole and plaice quantities have to be paid. This is the same situation as has been shown in table 9.3, where it proves that an investment in a second handed vessel and the necessary ITQ can not be financed.

The situation 'after taxes' in table 9.7 applies to the owner of the fishing rights. He could consider if the future earnings of his flatfish ITQ will exceed the present value. If not, selling of the ITQ could be better than continuation of the enterprise. In this case, however, income tax has to be paid about the profit that will be realized by selling the ITQ. This fiscal profit can be the full proceed of 8.3 million when the rights have been allocated for free. A special tax rate of 45% applies for such a profit so that some NLG 4.5 million may remain after selling the ITQ and paying the obliged tax amount. This still exceeds the capitalized value of the future earnings so that the owner of the rights would be better off by selling the ITQ, (assuming that the vessel can be sold without a loss).

The interest income from the net proceed of the sold ITQ could be some NLG 200-250,000 and this would exceed the missing income from fishing (NLG 113,000 in 1993) substantially 1).

Table 9.7 *Estimated capitalised values by December 31st, 1994 of a full soleplaice ITQ for a beam trawler, size group 1501-2000 (amounts in NLG)*

Discount rate	Capitalised value		
	before taxes 8%	after taxes 8%	after taxes 12%
Pay-out period:			
8 years	1,040,300	494,400	427,400
20 years, final ITQ value zero	1,771,600	927,000	717,300
20 years, final ITQ value equal to investment amount	3,553,500	2,451,400	1,826,500
Perpetual	2,461,700	1,390,500	998,100

Note: The value against market price, after taxes, was approx. NLG 4.5 million in 1994.

- 1) This income from fishing consists of profit + imputed labour share + interest on the owners' capital in the vessel.

From this example, it seems rather curious that no more vessel-owners stop fishing and sell their rights. But they usually have important considerations to continue the enterprise, such as:

- to keep the enterprise for the next generation;
- to remain fully involved in fishing, above living of his interest.

The example in table 9.7 makes clear that fishermen are willing to pay a high price to remain in the fishery sector.

It must be emphasized that the estimated long term value is very arbitrary. It depends on the developments of the stocks, the conservation policy and other fisheries management measures.

The assumptions for the values in table 9.7 have been:

- the flatfish ITQ contains 103 tonnes of sole and 310 tonnes of plaice (averages in 1994);
- fish price and cost level of 1994;
- fish price and cost level of 1994 represent an 'average year' in the long run. The actual economic performances in this year were between 'good' and 'bad' years;
- the discount rate is basically 8% (5.6% after taxes). An alternative of 12% is shown to take into account a much higher risk of quota decreases.

Duration of rights

Calculating a present value requires a time horizon beyond 2002, when the CFP be possibly reviewed. This lead to the question how long the duration of individual Dutch rights will be.

At this moment (spring 1996) it is most likely that individual property rights will remain, in one way or another, after 2002.

There is evidence that no essential changes will be implemented in 2002:

- EU Commissioner Bonino has stated that 'relative stability will protect the livelihoods of UK fishermen up to and beyond 2002' (during the exhibition FISHING 96 in Aberdeen, March 1996);
- Alain Laurec, who heads the Conservation, Research and Monitoring Division of the EU Fisheries Directorate, stated in April 1995 1) that entry (to the fishery) must be limited to get management on a sound footing and most fishermen now accept that 'the open entry idea is over'. Decisions about which fishermen should have fishing rights must remain in the hands of the member states, according to him;
- The Commission of the EU has formulated some guidelines for the CFP during the period 1993-2002 in the 'Mid-term Review of the Common Fisheries Policy' (December 1991) 2). The Commission states that this pe-

1) During the conference 'Fisheries in the Future: Sustainability or Extinction?', London, April 24, 1995.

2) 'Report 1991 from the Commission to the Council and the European Parliament on the Common Fisheries Policy'.

riod must be considered as a preparation of the years after 2002 (page 63). Under '8. Improvements of the Common Fisheries Policy' the Commission states: '...the Commission considers it necessary to strengthen and adapt the present instruments, with particular emphasis on the regulation of access to the resources. This is especially necessary in the run-up to 2003,...'. In this respect the Commission pledges for a licensing system, that would supplement, rather than replace the TAC and quota arrangements. Under '8.2.2 Management of output' the Commission mentions as one of (nine) adjustments that could be considered: 'a study of the possibility of applying a system of individual quotas, with reference to the post-2002 situation.'

- The European Commission has called for cuts of up to 40% in fishing fleets for certain fish species in the period 1997-2002, as part of its fourth MAGP 1). These intended fleet reductions make it assumable that access to the fishery after 2002 will be limited to a specified group of right holders. This means probability of the continuation of individual property rights, i.e. 'rights to a benefit stream', in a sense defined by Bromley (chapter 5).

9.2.4 Property rights and profit calculations

Property rights have become an important production factor for fishing enterprises in the Netherlands, as has been made clear in section 9.2.3. Since they are in fact the most limiting production factor their value is high since 1988. Trade in rights has resulted in important investments for a substantial number of enterprises in the period 1988-1995. The question in this respect is which consequences the rights have for profit calculations?

To answer this question different kinds of profit calculations have to be distinguished. The next three sections discuss the way in which property rights in fishing should or can be treated for three types of profit calculations.

9.2.4.1 Consequences of property rights for fiscal profits

The Dutch Tax system contains a depreciation allowance for fish quotas, just as for the milk- and manure quotas of farm holdings. Investments in ITQs can be depreciated in eight years since 1994, according to Resolutions from the Income Tax Law. Before that year this period was five years. The reason for this depreciation is that Tax Authorities have accepted that investments in these fishing rights may become worthless in 2002, when the Common Fisheries Policy will be reviewed. The fiscal depreciation period for milk quotas is also eight years.

The depreciation allowance for fish quotas has stimulated ITQ investments (section 9.2.1), since vessel-owners could reduce their tax obligations by these purchases. This tax reduction seems to make the ITQs cheaper for the

1) World Fish report, June 6, 1996.

buyer. However, the advantage may be temporarily, since a capital gain tax has to be paid in case of selling the quota at a higher price compared with the bookvalue. This capital gain tax amounts to 45% of the realized gain, but can be transferred to the future, under certain conditions, when replacement of rights or the vessel is foreseen. In that case the profit resulting from selling the quota can be added to a replacement reserve, for a certain time. When the quota and/or the vessel are actually replaced this reserve should be deducted from a purchase price of the investment. This results in lower depreciations and higher tax amounts in future.

The other consequence of ITQ investments for the level of the fiscal profit may be the interest costs that result from a loan to finance these purchases.

In the example of the beamer in the 1501-2000 HP class from table 9.2 the consequences of the ITQ purchase for the fiscal profit are as follow:

Table 9.8 Estimated tax reduction from a purchase of a flatfish ITQ by an owner of a beam trawler, 1501-2000 HP (average figures in NLG)

	Year 1994, original quota	Year 1994, inclusive of additional quota
Gross earnings	2,367,900	2,528,900
Expenses, excl. of wages	1,186,500	1,238,300
Wages, excl. of skipper-owner	493,100	529,600
Fiscal depreciation vessel	218,200	218,200
Fiscal depreciation ITQ	0	63,800
Interest	142,300	165,300
Fiscal profit	327,800	313,700
Income Tax amount	141,800	134,700

Source: LEI-DLO fisheries accountancy data network.

The NLG 510,800 quota investment causes an additional depreciation of NLG 63,900 and additional interest costs of (assumed) NLG 23,000. Though this investments adds NLG 161,000 to the gross earnings a net loss results from the fiscal point of view, also caused by higher expenses (fuel and labour). After all, the tax payment may be reduced by NLG 7,100 which results in an extra improvement of the cash-flow, apart from the contribution from the additional quota.

ITQs that have been allocated for free have no consequences for the level of the annual fiscal profit, unless they are sold at a certain price. In that case the resulting profit is subject to the capital gain tax of 45%, unless replacement is foreseen. In that case transfer of tax payments to a future period can be applied, as mentioned above.

Apart from ITQs for flatfish and cod/whiting there are other types of rights in the Netherlands: HP licences, shrimp permits and permits for the coastal zone. The general fiscal rules for depreciation on purchased 'goodwill' and permits will apply for these kinds of rights. These rules stipulate that it must be assumable that the value of the goodwill or permit decreases systematically during the period of use. A depreciation period of five years is most usual for these intangible assets. This is in accordance with the recommendation in the International Accountancy Standard IAS 22 to depreciate acquired goodwill in five years at maximum, unless a longer period (no more than twenty years) can be justified.

A depreciation period of five years could also be applied for fishing licences and permits if a sustainable decrease of value is to be expected. In practice, the accountants of the fishermen seem to apply different depreciation periods for the fishing permits, whereas for the HP licences the general line is that they will keep their value so that no depreciation is applied on them.

Finally, it has to be added that the rights not only result in extra costs (of depreciation) but on the other side determine, fully or partly, the gross earnings and thus the level of the fiscal profit.

9.2.4.2 Consequences of property rights for economic or commercial profits

The accountant of the vessel owner presents a 'commercial' profit, apart from the fiscal one, in a number of cases. Such a profit (or loss) does not contain influences of fiscal regulations that have nothing to do with the economic results of the enterprise. The intention of the commercial profit is to show an amount that can be distracted from the enterprise without threatening the continuity of it. This amount is the surplus above the reward of all production factors, including an imputed amount for the labour of the owner(s).

As has been said in section 9.2.2.3 there are some regulations by Law concerning the valuation and depreciation of intangible assets in the Netherlands. In spite of these guidelines depreciation on quota for a certain enterprise remains very arbitrary from a business economics point of view. The depreciation period will depend on the period that the catch limitations will remain in force. Accountants of the fishermen seem to apply a precautionary principle in this respect by following the fiscal approach. This takes into account that the current regulations will end in 2002, due to revision of the Common Fisheries Policy. As a consequence, the accountants seem to keep a depreciation period for fishing rights (i.e. ITQs) until this year. Thus, for example in 1994 a depreciation period of eight years will be mostly taken. In case of sale of rights a capital gain (or loss) will be shown, i.e. the difference between the proceed and the book-value.

Other rights than ITQs will also be depreciated according to the fiscal practice, which means for HP licences that a depreciation of zero will be applied in most cases.

Rights that have been allocated for free are not shown under 'intangible assets' on the balance sheets of the fishermen's accountants and, as a consequence, no (imputed) costs are incurred. The same applies for transfer of rights

within the family against zero-value, which has been accepted by the Treasury (under certain conditions). Section 9.2.5 pays more attention to these transfers from the viewpoint of succession.

The calculation of the commercial net profit is shown in table 9.10 for a beam trawler in the 1501-2,000 HP class, as an example. This profit differs from the fiscal one because of the inclusion of an imputed labour amount for the skipper-owner and higher depreciation costs. The latter is caused by the removal of situations such as deduction of capital gains from the purchase price of the vessel.

Only for the purchased rights a depreciation amount has been included in table 9.10 (second column). Earnings from the purchased additional flatfish ITQ are too low (on an average basis) to cover this investment, when a depreciation period of eight years is taken into account.

Similar analyses for beam trawlers of other size groups have also pointed out that quota investments in 1993 and 1994 cannot be earned back in eight years, thus not before 2002 (Davidse, W.P. and Beyert, G., 1995).

Table 9.9 The commercial profit of a beam trawler, 1501-2000 HP, before and after the investment in a flatfish ITQ (average figures in NLG)

	Year 1994, original quota	Year 1994, in- clusive of ad- ditional quota	Additional quota alone
Gross earnings	2,367,900	2,528,900	161,000
Expenses, excl. of wages	1,186,500	1,238,300	51,800
Wages, incl. of skipper-owner	583,500	626,100	42,600
Commercial depreciation	319,300	383,200	63,900
Interest	142,300	165,300	23,000
Commercial profit	136,300	116,000	-20,300

9.2.4.3 How to deal with property rights in costs and earnings studies

A special type of profit calculation occurs in costs and earnings studies. This concerns the methodology of costs and earnings calculation for a group of enterprises, farms or vessels. One of the purposes is to show the average costs, earnings, profit or loss and income per type of enterprise, farm or vessel. The Farm Accountancy Data Network (FADN, or RICA in French) of the EU is an important survey in this respect and several more or less comparable studies have been undertaken 1) or are going on in the fishery sector.

1) See 'Costs and earnings of fishing vessels in four EC countries', Davidse W.P. et al., 1993. Another example is the EU wide costs and earnings study in the fisheries sector, carried out by Cooper & Lybrand, Quimper, 1996.

- The most important aims of these types of profit calculations are:
- to give insight in the economic performance of certain types of farms and vessels;
- to assess the economic strength of farms and vessels and the possibilities for continuation of the enterprise;
- to identify the most profitable or efficient type of farm, vessel or activity (fishery);
- to assess the economic consequences of national or EU measures.

A uniform methodology of profit calculation for a sample of enterprises is one of the main requirements of these costs and earnings studies. The resulting profit should be the amount that can be distracted from the enterprise without threatening its continuity. Again, a profit that is a real surplus after taking into account 'normal' rewards for all the production factors. It must be added that 'income' (globally consisting of profit plus imputed labour costs of the family members) is a more important indicator for agricultural holdings, than for fishing enterprises.

The question is how to deal with property rights, that are a separate intangible asset, for profit calculations?

Some solutions has been applied to include these rights in profit calculations in the framework of costs and earnings studies:

- purchased milk quotas are depreciated in 14 years in the Dutch FADN, carried out by the Dutch Agricultural Economic Research Institute (LEI-DLO). An imputed interest is calculated on the basis of the bookvalue of the (purchased) milk quotas. Milk quotas that have been allocated for free are not taken into account;
- costs of milk quotas are not taken into account in other countries, participating in FADN, as far as known. In the United Kingdom the quotas appear on the balance sheet, without depreciation.

Property rights are not taken into account yet in the Dutch annual costs and earnings investigations 1), nor in other, similar studies 2). It is somewhat unsatisfactory that high investments in rights don't affect the costs of the fishing enterprises. Therefore, it is recommendable to treat fishing rights in accordance with the guidelines for intangible assets included in Exposure Draft E50 of the International Accountancy Standard IAS 22 (described in section 9.2.2.3). This E50 guideline contains a depreciation period for purchased intangible

1) Results are published in the annual LEI-DLO publication 'Fisheries in Figures'.
 2) i.e. 'Costs and earnings of fishing vessels in the United Kingdom, 1992/1993' and 'Uitkomsten van de Belgische Zeevisserij, 1994'.

assets of no more than five years, unless a longer period can be justified. However, this period should be shorter than twenty years 1).

The foreseeable development of the Common Fisheries Policy, in particular the continuation of the closed shop situation for the fishery sector after 2002 (section 9.2.3), makes a duration of individual rights of more than five years most probable.

Two considerations are important for the fixation of the depreciation period for property rights in the Dutch situation:

1. the general approach 2) is to depreciate intangible assets in a rather short period because of uncertainties in regulations etc. A kind of precautionary principle is applied in this respect;
2. a period of eight years is mostly applied (in 1994) to depreciate Dutch ITQs for commercial profit & loss accounts. This is in fact in accordance with the fiscal practice.

This results in the conclusion that it is most preferable to depreciate the Dutch rights with respect to quota species, mainly the ITQs, also in eight years in the framework of costs and earnings studies. This period may also be applied to Dutch rights for non-quota species like shrimp permits. The consequence of this is that rights, purchased in 1995 and subsequent years will have a value beyond year 2002. The 'impairment test', mentioned in this section (in a footnote) can be applied to consider if this is correct. This test evaluates if the current bookvalue can be covered by future earnings from the concerning fixed asset.

This methodology of depreciation on property rights could also be applied to costs and earnings studies in other EU countries. The condition is that the rights should be identifiable and that they can be measured reliably. The choice of the depreciation period is arbitrary. In case of frequently changing regulations the period may be shorter than for the Dutch case. For instance, for British Pressure Stock Licences the period might be no longer than the IAS recommendation of five years. It is remarkable in this respect that in the USA purchased ITQs should be amortized in fifteen years for Tax purposes, according to the rules for the 'section 197 intangibles' 3).

Apart from depreciation costs interest costs result from purchased rights. Therefore, an imputed interest amount, based upon the bookvalue of the

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- 1) The Board of the International Accountancy Standard Committee (IASC) considers the acceptance of a longer period than twenty years, under the condition that the remaining bookvalue will be subject annually to an 'impairment test', according to IASC Update of April 1996. Quoted from Bak G.G.M., MAB, September 1996; 'Merken en uitgavenrechten in de jaarrekening'.
 - 2) In the Dutch Civil Law and also in the International Accountancy Standards.
 - 3) USA Department of Treasury, Publication 535, Business Expenses, 1994, Section 197 Intangibles: a.o. 'License, permit, etc. granted by government'.

rights could be included. This means application of the same method as for the other fixed assets, e.g. the vessel 1).

Table 9.11 shows the consequences of inclusion costs of rights (a purchased ITQ) on the profitability. The assumption thereby is that the ITQ (an average quantity) has been bought in the beginning of 1993. The interest costs will decrease in subsequent years, following the declining bookvalue of the right.

Costs and earnings studies use to show average figures for certain size groups. Property rights will have been bought only for a part of the investigated vessels so that the impact on the average net profit will be less, compared with the example in table 9.11.

Table 9.10 Impact of costs of a flatfish ITQ on the profitability of a beam trawler in the 1,501-2,000 HP class (based upon average figures for 1993, in NLG)

	Method	
	neglect ITQs for profit calculations	depreciation and interest of purchased ITQs
Gross earnings	2,528,900	2,528,900
Costs excl. depr./interest	1,864,400	1,864,400
Depreciation vessel a)	466,200	466,200
Interest vessel	206,300	206,300
Depreciation ITQ	0	63,900
Interest ITQ	0	28,200
Net profit	-8,000	-100,100

a) Based upon the replacement value.

Source: LEI-DLO fisheries accountancy data network.

Finally, ITQs affect the profitability of fishing vessels through leasing and renting of the rights. This kind of transactions occurs frequently in the Dutch cutter fishery, facilitated by the co-management groups mentioned before. Some 70% of the cutters with engine power exceeding 1,100 HP had leased a flatfish rights in 1993. Bigger vessels use to have a balance of lease costs, whereas the smaller ones the receipts from rentals of ITQ rights dominate. The vessels of the size group 1,501-2,000 from table 9.11 showed on average the highest amount of lease costs in 1993, i.e. some NLG 46,000, which is about 2% of the gross earnings.

1) According to the method described in 'Costs and earnings of fishing fleets in four EC countries', Davidse W.P. et al., 1993, chapter 7.

9.2.5 Property rights and succession of ownership

Public companies use to exist apart from their owners. Their equity is divided amongst a big number of shareholders, who retire and enter the ownership by share transactions. Fishing enterprises use to be family enterprises 1) which means that changes in ownership have major consequences for the conditions for continuation. Property rights in fishing use to complicate this change in ownership since valuable rights are concerned.

This section deals with the constraints that the property rights have in the Netherlands in case of transferring the enterprise or a part of the equity to successors, mostly to people within the family, i.e. the son(s). Regulations that intend to remove these constraints will be presented and considered.

9.2.5.1 Financial problems connected with transfer of rights

The major part of the problem concerns rights that have been allocated for free. The problems concentrate on the ITQs, the most valuable rights, which are subject to taxation when they are sold against market prices. Profits may be very high in these cases and they are subject to income taxation according to a special tariff of 45%.

Selling the rights against market prices to e.g. the next generation, will also cause a finance problem in that the future earnings from the enterprise can not cover the high investments costs (as has been made clear in section 9.2.1).

Rights could be transferred at very low prices or even at a zero price in case of transactions within the family, to solve the above mentioned problems. However, this is a gift from fiscal viewpoint and, therefore, subject to 'grant taxation' that is based upon the difference between the market price and the actual price agreed between the family members. This kind of taxation has the same (progressive) tariff as succession duties and amounts to 20% or more for 'gifts' that may result from low priced ITQ transactions.

Transfer of the enterprise can also take place by inheritance. In that case succession duties have to be paid about the equity of the firm, the value of the rights included.

9.2.5.2 Regulations and solutions to facilitate transfer of rights

A general regulation in the Income Tax Law (article 17) facilitates the transfer of the enterprise within the family. This contains that transfer without paying an income tax on capital gains is allowed. Consequently, the hidden reserves (e.g. in rights) can be transferred 'smoothly' to the next generation or to other family members. This is possible in the following circumstances:

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- 1) A substantial number of enterprises in the Dutch cutter fishery have the form of a Private Limited Company, mainly for fiscal reasons, but they are in fact real family enterprises.

- transfer to the spouse or partner of the owner. The condition thereby is that the spouse or partner is younger than 55 years;
- the owner is 55 years or older, or disabled and the enterprise will be transferred to a (foster) child, grandchild or to their spouse.

A special decree has been implemented for agriculture to allow a tax free transfer of milk quotas within the family (Decree of the Finance Department December 14th, 1987). This means an extension of the application of the regulation in art. 17 of the Income Tax, mentioned before. The Decree of December 14th 1987 rules also that people who inherit parts of the assets of an agricultural enterprise, e.g. a milk quota, can also obtain these properties free from income tax when the market price exceeds the transfer value, provided that the assets are used to continue the enterprise. These fiscal rules for milk quotas were applied to fish quotas by Decree of September 12th, 1988 1).

A special tariff of 45% income tax about the gain on fish quota, realized by selling, has to be paid when the above rules are not applicable.

Though these rules facilitate the transfers of rights within the family there are still some bottlenecks now (June 1996) that may threaten the continuation of fishing enterprises when valuable rights are concerned. Transfers of fish quotas within the family may occur apart from the above mentioned circle of relatives. For example, the enterprise may be owned by two brothers and when one of them intends to retire big (fiscal) problems may rise with respect to the valuable flatfish ITQs.

Extension of the circle of relatives is pledged for by the fiscal experts of the industry because of this bottleneck. Another request to the Finance Department is the application of special allowances regarding grant- and succession duties that are in force for agriculture, i.e. milk quotas. The reason for this is that transfer of fish quotas against a low or zero price may result in payment of grant duties for the difference between the current market price and the lower agreed price. The special allowances for agriculture (Decree of October 1992) prevent these grant- and succession duties by accepting lower transfer prices. A resolution in the Parliament in 1994 pledges for the application of these allowances also for the fishery sector, but so far (June 1996) this resolution has not been carried out.

The regulations described above make clear that succession of ownership is a complicated matter when valuable rights are involved. This needs the advice of an expert to get solutions that meet the special circumstances of the enterprise. In particular when other relatives than the son(s) of the owner are involved an expert has to be consulted to apply the most suitable fiscal constructions. Some fiscal experts promote the change of the legal form of the enterprise into a private limited company where shares are traded in stead of the enterprise or parts (assets) of it. This may have the advantage that these

1) Bakker, J.C. (1996), 'Bedrijfsopvolging in de visserij'; paper presented in Goeree (a major fishing port) during a seminar organized by Cooper & Lybrand and the local Fishermen's Association of the 'Nederlandse Vissers Bond'.

shares are valued against the earning capacity which means that fish quotas may be valued below the market price. But such a change of legal form of the enterprise may have fiscal disadvantages in other respect so that the balance might be negative in fiscal terms.

The conclusion of this is that some special fiscal regulations have removed barriers for succession of ownership that result from valuable property rights. However, these rights may still complicate transfer of the enterprise to the next generation of fishermen which is sometimes indicated by structural adjustments of the enterprise (change of legal form) on the basis of advices of fiscal and juridical experts.

9.3 Effects of property rights at enterprise level in the UK

9.3.1 Introduction

There are a number of ways in which property rights affect the financial structure and performance of the business. The first and most obvious is the cost involved. This affects the capital position in terms of the source and costs of the investment. Equally it results in an annual charge affecting the level of profitability. The tables of costs and returns in Chapter 8 gave some idea of what may be involved. The profits indicated are really net cash flow as the costs of depreciation and interest repayments are not deducted. To get a truer picture of the economic situation, charges for the capital involved need to be included. A charge of 10% of the insured value of the vessels and of the estimated value of licences allows the calculation of something nearer the actual net profit or loss. It will not necessarily reflect the tax position; the latter impact will naturally also affect business decisions.

9.3.2 Effects of property rights on costs and profits

What is surprising about the results is the inability of the sectors with apparently the most secure rights (such as pelagic and beam trawl) to secure adequate earnings to cover all costs. This may indicate unrepresentative samples, either in terms of the vessels covered or the particular years included. The latter does not seem likely as other years show similar figures but even if the vessels are atypical, the results still show a considerable number of vessels experiencing problems. They are not making enough to cover capital costs (either in terms of past investment or future replacement). The table below gives the data.

Table 9.11 *Effects of capital costs on profit of UK fishing vessels (£ per vessel)*

Type of vessel	Profit	Depreciation	Licence	Net Profit
Pelagic	104,046	176,944	50,000	-122,898
Beam trawl				
medium	19,077	59,286	25,000	-65,209
large	55,802	142,727	25,000	-111,925
Demersal trawl				
small	33,640	18,933	2,000	12,707
medium	45,102	42,137	4,000	-1,005
large	58,411	64,221	6,000	-40,883
Demersal seine				
small	27,080	27,625	2,000	-2,545
medium	62,772	47,640	4,000	11,132
large	70,161	60,730	6,000	3,429
Nephrops trawl				
small	57,100	18,880	1,000	32,220
medium	66,384	36,860	2,000	27,524

Sources: SeaFish Survey of Costs and Earnings.

Estimates of value of licences from the industry (1994 levels)

The indications of the costs of licences during the recent past had been roughly £0.5m for pelagic vessels and £0.25m for beam trawlers. These have currently risen to around £2m for the former and around £0.5m for the latter. Depreciation on the vessel is currently the more significant capital charge, as table 9.12 shows, but using an annual charge of 10% of the licence value results in even greater potential losses. The explanation for the apparently unprofitable operations may lie in the fact that almost no owners of vessels in these sectors will have to consider such charges in the short or even medium term. They may well have virtually written off the capital asset of a 10 to 20 year old vessel or it may be that their equity in a newer vessel will be such as to make interest payments small, as when trading up from an older but wholly paid off vessel; and in most cases the historical acquisition of the licence will have been at no cost. Only where a move out of the industry is a realistic option will the owner consider the opportunity cost of the asset and the potential yield of the capital invested elsewhere. This situation arises where there is no one in the next generation seeking to succeed.

The lower costs of other demersal and nephrops licences, both in acquisition at around £10,000 to £60,000 in this period and in the implicit annual charge, were more easily borne. The situation has, however, changed and at the end of 1996, licences were traded at around £600 per tonne of demersal track record. Where the sector exploits stocks subject to less pressure with 20 to 30 year old vessels as with nephrops, even the annual charges over a ten year life from acquiring a licensed vessel look supportable. Where they are not,

the explanation may lie, as with the pelagic and beam trawl sectors, in the source of investment which may be crew and their families whose interests lie in the crew share earnings. The investment is in buying reasonably remunerative jobs for those involved.

Discussions with the industry throw little light on the reasons for current very high prices for licences. The extremes of second hand pelagic vessels selling at prices which indicate a licence value of £2m or more can not be explained in terms of track record and pelagic prices. To pay this for the entitlement to take perhaps 5,000 to 6,000 tonnes of mackerel and herring worth around £200 per tonne on average seems inexplicable. Apart from the explanations mentioned earlier that most licences did not cost anything, investment comes from family sources and the concern is not for return in terms of interest but rather in terms of secured future wages, it has been argued that at least three other factors come into play in the pelagic sector.

- The first concerns the trend in licence values and the fact that the very few historical acquisitions at what were thought to be high prices have proved very worthwhile in terms of current value. This encourages a belief that the trend will continue upwards. To the extent that effective conservation and structural adjustment occurs, this belief may be justified.
- The second turns on recent improvement in fish prices for certain species which continues that of the past; UK herring, mackerel (and whiting) prices were originally so low that lower regional prices (there and in Ireland) were set under the EC regime to avoid excessive withdrawals and compensation payments. Improving markets led to better prices and the ending of this provision for the UK and Ireland. Current worldwide scarcity of mackerel in particular has led to sharp rises in prices to more than double those of a year earlier.
- The third factor is the effect of the marginal nature of the market. There are not many licences and exceedingly few become available - rather like Dutch sole ITQs - so that the prices tend to reflect what existing producers can pay at the margin or possibly what an individual desperate to enter the sector or eager to speculate on future developments is willing to pay.

Additional factors are thought to come into play in the demersal and shellfish sectors. Perhaps the most obvious is the increasing coverage of the licensing scheme so that now there is no sector still operating under open access, as there was in the recent past. This has changed the perception of the value of a licence. This learning process has been underlined both by the decommissioning scheme removing capacity and by the PO's and others acquiring track record to boost earning power. It takes little thought to realise that cutting back capacity by 10 to 15%, as decommissioning and penalties on replacement come into play, increases the share of each vessel remaining. Whatever the reason, the value of track record (entitlement to take a tonne of demersal fish) is now around £600 to £700. This figure is only slightly below the average value per tonne of a typical mixed demersal catch. (The track record element is augmented by that relating to the vessel's capacity especially where it has a

large number of VCU's and can provide the capacity needed to meet the penalties on introducing replacement vessels.)

What was perhaps encouraging initially was that the value of a licence and track record for most demersal or shellfish vessels looked more reasonable than that for a pelagic or beam trawl vessel in relation to potential earnings and profit. This is less so now with the average having increased more sharply in percentage terms than for pelagic and beam trawl vessels. The ratio of earnings to licence value is only 1:2 or more for the pelagic vessels compared with roughly 1:1 for the demersal and shellfish vessels. This slightly more comfortable position may be eroded if the perception of the property rights as secure leads to developments in over investment matching those in the pelagic sector.

It has already been noted that the costs and earnings survey suggests a wide range of profitability. The performance of vessels in the upper quartile indicates the availability of cash flows substantially above the average. The owners and operators of such vessels may well find the rising costs of licences and track records acceptable. This development will imply the departure of loss makers and others in the lower quartile. Possible results of this process are examined in a rough fashion in the chapter on modelling.

9.3.3 Effects on investment and funding aspects

Investment in licences depends on the same sources as that in vessels. These include retained profits, private savings, banks and companies such as those selling fish. In addition POs may get involved. Each source has different characteristics but similar aims - to secure the asset and get a return on it. All are, however, affected by the fact that a new element has been added to the capital cost and that more capital is needed in the short and medium term. While the expectation for the long term is that other factors of production will get lower returns to accommodate the return to licences, a decline in the cost of vessels and other operating capital in the near future is unlikely.

The additional funding is only needed when the licence changes hands and only occurs infrequently but is cumulative. Over a period of years the change from the original owners who did not pay for the licences to an industry where most have been bought will result in a virtual doubling of the capital involved. The value of the vessels in the fleet is probably around £500m on the assumption that the offer price in the decommissioning scheme reflects the current market. The combined estimates of pelagic, beam trawl and other licences runs at around £300m but the price of track record continues to increase.

Funding by banks

It seems unlikely that the retention of profit will provide the basis for much of the extra funding needed. Dividing the landings between fewer vessels will clearly increase the returns more than the costs, but not sufficiently. The main sources would look to be private saving and banks, with agents and POs contributing to some extent. Thus the importance of security becomes more important. This presents peculiar difficulties for the banks to let them

know they are not exposed to potential losses. The approach has generally been to have the licence as well as the vessel listed among the assets owned by the company borrowing from the bank. It thus can not be disposed of by the vessel owners separately. Equally the parties involved may have a legal agreement achieving the same purpose. In many cases the problem does not arise because the bank's exposure to risk is reduced by the large element of net worth resting with the owners. Re-possession and sale even without the licence would often cover the bank's position.

Bank and companies investing in vessels and licences look for normal commercial rates of returns. The position with private savings seems to be like farmers investing in land. The return is in being able to continue in the chosen vocation. There may even be an element of expectation of some appreciation in the value of the licence as in the land. Recent rises in the prices of licences suggest this to be the case and the Shetland PO includes its 'ring fenced' track record (that belonging to the POs as opposed to those relating to individual member vessels) as a balance sheet item, currently appreciating in value.

Future developments

Whether such appreciation can continue into the future seems uncertain. The assumptions about future prices and TACs that underly recent investments depend on retention of something like current EU policy after 2002. It may be that prices will rise but helpful developments in consumer preference are perhaps less likely than in the recent past. Despite the benefits flowing from continuing problems with demand for meat, prices early in 1997 reacted unfavourably to unexpectedly higher levels of supply reflecting unusually favourable weather. More quota per vessel seems likely as capacity is cut but further improvement in landings will depend in the short term on currently unexploited species rather than higher TACs. In the long term there may be some improvement as capacity declines and conservation becomes more effective.

While there is a cost of acquisition relating to rights, there is no certainty as to the value of the asset involved. It may increase as it has in the recent past due to decreasing availability of licences and some expectation of higher returns, either from improving stocks or markets. There may even be a decrease to vanishing point if de-regulation occurs and the access implied translates into fewer or no fish to catch. The latter extreme is unlikely, given the commitment of all concerned to effective conservation. Nor does it seem likely that governments in 2002 or any other time will cancel existing entitlements to share of TACs and the derived quota allocations. Such an approach to remove existing rights would be certainly subject to legal challenge in the UK; reverting to a free-for-all would render valueless much of the investment made by the fishermen. This would lead to successful calls by the industry and individual fishermen affected for a judicial review of the inequitable aspects of the policy change.

9.3.4 Property rights and profit calculations

The earlier paragraphs indicated the possible effects of including estimated charges for property rights on costs and earnings. The expected losses for most sectors resulted from using a fixed rate of 10% for the return on capital whether in the value of the vessel or its licence. This may be appropriate for the longer term and on the assumption that all the capital is borrowed and that fishing risks are above the industrial norm. While the added risks are undeniable, the total dependence on outside capital is not for the reasons mentioned earlier.

Quite apart from the aspects of private sources of finance and the interest in crew employment, tax considerations can be highly significant. The depreciation allowance on vessels are high (25%) and until the mid 80's were potentially 100%. This allowed charges against profit which exceeded the actual diminution of the vessel's value. The actual realisation price on disposal resulted in an extra element of profit which was only assessed for tax if not rolled over into a replacement vessel. This concession enabled fishermen to increase and upgrade their investment at little cost. A further concession to fishermen allowed the changing of partnerships to bring in new blood without having to dissolve the existing structure and pay tax on its undervalued assets.

Similarly the tax treatment of the value of property rights varies according to the circumstances and affects the profitability accordingly. One extreme relates to the acquisition of a licensed vessel where tax allowances will be given in relation to the cost. This will result in an undervalued asset over time and an enhanced cash flow to the operator. The correction for tax purposes naturally occurs when the assets are finally sold. The other extreme is where the property right has not changed hands and cost nothing. There are no tax benefits to enhance the cash flow and only when disposal occurs will the owners realise their 'asset' and the tax authorities get their share of the 'profit'. Somewhere in between is the case where track record has been bought and qualifies for tax allowance at historic cost and its value is kept up to date as an appreciating asset in the balance sheet. Again the 'true' reckoning only occurs when the business or those assets are sold.

9.3.5 Property rights and succession of ownership

There are three main different situations to consider. All reflect the additional cost introduced by licences having values. The most important one relates to vessels jointly owned by several persons; the second covers the vessels owned by firms; and the third with those owned by individuals. Joint ownership is usually by current or retired crew members and their relatives. Outside investment within such a situation is usually by the boat's agent and confined to a minority share holding. Banks and other financial services tend to limit their involvement to loans as opposed to equity. This limited degree of financial involvement may also apply to vessels owned by firms or by individuals.

The first group obviously depends on introducing new blood to replace those retiring. The barrier will be least where the investors remain the same;

the departing fishermen retains his investment and the incomer initially takes only earnings (crew share). It will be higher where the individual entrant buys out his predecessor. The value at which the share of the licence is transferred will depend on the circumstances. A low price will ease entry and minimise tax liability for the outgoer. As there is little transparency in the market the tax authorities are not well placed to set a higher price. Family finance may well enter the process, with the facility for making limited annual tax-free gifts being a relevant consideration.

The firm has continuity and thus the problem only arises when the firm is sold away. Otherwise, succession in the shape of new company directors is assured and the position of the investors remains the same. Even when the firm is sold, the provisions for rolling over the realised funds into another business minimise the tax liabilities of the investors concerned.

The most difficult case is one owner being succeeded, on retiral or death, by a single individual. In retiral the incomer may be the sole heir and be given the assets, subject only to tax charges if the person retiring does not survive for a long enough period (seven years). Otherwise the incomer will have to pay the outgoer or the rest of those dependent on the distribution of the outgoer's income. The typical situation may involve the rest of the family and necessitate the borrowing of funds to pay off those affected. Similar considerations apply when family succession follows a death. Problems are less extensive where the sale is to someone completely unrelated to the person departing and outside the current group involved. The main difficulty remains the increased cost.

9.3.6 Conclusions

The most obvious effects of property rights at the enterprise level are in increasing the costs to new entrants and those expanding their businesses by increasing their scale. The returns from such investment would appear to be negative at current costs of licences. Equally they introduce a new economic dimension for those wishing to leave the industry. Previously their assets consisted of the vessel and the other related investment. Now they are augmented by the value of the licence. This value has increased over the years as tighter licensing rules and decommissioning have improved the balance between capacity and catches available. Thus for those acquiring their licences historically at no cost, there may be an additional benefit of improved stocks allowing higher earnings. However, for them as for all other licence holders there is now an higher opportunity cost of remaining in the industry.

As to succession, there are clearly additional difficulties. Something more valuable than the vessel must now be transferred to the next generation. This added cost is simply a higher hurdle for those coming into the industry from outside. It contains much more complicated effects for transfers where families or other close knit groups are involved. Such partnerships mean that conflicts as to values at which assets are transferred and as to whether assets should be realised or not, become inevitable. Tax considerations also become more complex.

10. PROPERTY RIGHTS EXPLORED IN MODELS

10.1 Possible consequences of implementation of Individual Transferable Quotas in the Danish Fishery

10.1.1 Introduction

In Denmark an Individual Transferable Quota system (ITQ-system) has been discussed several times and suggested, latest in a report by the ministry of fisheries (Anon, 1993). The uncertainty about the effects of ITQs can be one of the reasons why ITQs have not been implemented yet in the Danish fisheries. An investigation of these sources to uncertainty can improve the planning of an future ITQ system and therefore be a valuable input in a new proposal about ITQs.

Thus the purpose of this chapter is to analysis the effects of a potential ITQ-system implemented in the Danish multi-species fisheries in the North Sea and Skagerrak.

ITQs have in the recent years been implemented in several fisheries. ITQs are in the literature shown to be a cost-effective regulation system, however, a number of factors can adversely affect the performance of ITQs (Squires et.al. 1995), e.g. thin quota markets, multiple quotas in multi-species fisheries, limited alternative possibilities of vessels leading to a slow exit of the industry, and the degree of monitoring and enforcement. Whether these effects are significant will depend on an examination of the actual fishery, i.e. case by case study is required. We will incorporate alternative fishing possibilities as a part of the fishermen decision problem and not only look at the effects in a given fishery. The method we suggest here can be used in assessing the gains of an potential ITQ system compared to the regulation system in force. However, the analysis is still partial and the results obtained can be used as inputs in a complete cost-benefit analysis of ITQs.

On three points the analysis will differ from former analysis of ITQ-systems. The analysis will compare the politics of the command and control type of regulation, in the fishery literature called open-access regulation, which were in force in 1993, with the market-based instrument of ITQs 1). Former analysis of ITQs have traditional compared an open-access or non-regulated situation with regulation by ITQs, e.g. Squires and Kirkley (1996). Secondly the analysis will use mathematical programming to construct/estimate the production technology for each fisher/vessel given the command and control regula-

1) ITQs can be considered as a limited access regulation measure, where the access indirectly is restricted, because quota is needed if a fisher want to participate.

tion. Based on the estimated production technology the potential effects of an ITQ system can be accessed by using Mathematical Programming. Former analysis have been using econometric analysis to estimate the production technology. Thirdly the analysis will assess the total short term gains from ITQs including the gains obtained moving from open access regulation to Individual Non-Transferable Quotas (INTQ), i.e. gains from allocation of effort to periods with higher profit and the gains from making the individual quotas transferable, i.e. gains from trade.

10.1.2 Policy analysis and models

The choice of model design for policy analysis depends not only of purely theoretical considerations, but also more practical issues like f.ex. what are the policy questions and purpose of the analysis, data availability, the appropriate level of aggregation and size of the model has to be addressed.

The purpose of the analysis is to investigate the effects of a potential ITQ-system implemented in the Danish multi-species fisheries for round- and flatfish in the North Sea and Skagerrak. The analysis will among other things assess:

1. The short and long run effects on the fleet structure.
2. Determination and stability of quota prices and resource rent.
3. Advantages and disadvantages in relation to other regulation regimes, i.e. INTQ and the current regulation system.
4. Gains in efficiency from allocation of Individual Quotas (IQs) and quota-trades.

Policy fishery models are often designed to assess how production and effort will respond to changes in regulation and economic conditions. For example, the purpose of programming models is to analyze the impact of quantitative policy scenarios which take form of changes in prices, technology or policy constraints on the system. In fisheries it is often important that the models can assess response to conditions that maybe are very different from the past. Therefore the models should describe the underlining physical and behavior rules.

Models used for policy analysis are often required to be disaggregated by region, species/output and input use. Level of disaggregation depends on the policy, but for analysis of the interaction between regulation and outcomes, the model requirements exceed often the capacity of the data base for direct estimation. Modellers may face the added difficulty of a severely restricted data set which requires a compromise between the specification complexity of the model and the degree of disaggregation or size. This f.ex. forced to use linear relationships instead of convex relationships.

When using aggregate sector models the diversity between firms and regional differences can disappear. Aggregation allows for some degrees of freedom so econometric models can be used, but may mask important, e.g. regional, differences with resulting distortions in predicted policy response. The ability to disaggregate from a nation/sector level has the advantages that the impact of policy changes can be assess on the regional and fleet level. A further

problem with aggregate or sector level LP-models is that using data on average catch and costs to predict marginal reactions from the fishers to policy changes can only be appropriate when small changes in policy are analyzed, assuming average and marginal conditions equal.

A policy model includes implicit two decision problems on two different levels. The effects of a given policy are assessed by the model and the decision-makers have to decide whether or not they will implement the policy change (if not the decisionmaker may come back and ask for analysis of other politics which the model maybe can handle - depending on the formulation of the model). In our case the purpose is to discuss the impacts of a given new policy compared to the current policy, and not to find the optimal and ideal best policy over a large range of policy options 1).

Analysis of the impacts of policy changes requires, however, also a part where the fishers responses are reflected. Fishers are heterogeneous, because fishers differ widely in their resources and economic opportunities, and since the impacts from regulation also differ from fisher to fisher, a proper analysis requires at least models of several of representative fishers (often called sub-fleets).

The fishers response

Prediction of the fishers response to property rights based regulation is difficult because a market for rights is established and interacts with the production decision. Basically two different approaches have been used, an econometric (parametric) and a mathematical programming (non-parametric) approach.

The econometric approach estimates the production technology using either a cost function, a profit function or a revenue function and given the technology at work the likely consequences of f.ex. ITQs are addressed, see f.ex. Squires and Kirkley (1991) and Salvanes and Squires (1995).

A branch of this approach finds, using virtual prices from the technology, the firms inverse derived function for quota which indicates how much the firms valuation of quota must change to induce the firms to hold one more unit of quota, see Squires and Kirkley (1995) and (1996). Having derived the firms demand for quota they simulate a quota market, where the market demand curve for quota is found by summing the firms demand curve and the supply curve is fixed given by the total quota, e.g. TAC.

This parametric approach has been used when an ITQ system is considered to be implemented in an open access fishery, i.e. an unregulated fishery. This is convenient, because then data series can be established that are so long

1) ITQs is, however, a theoretically ideal solution to the fishery management problem. However, there are shortcomings with ITQ as well (f.ex. when the assumptions made - like no enforcement costs - do not hold), which may lead to rejection of ITQs. The point here is that comparing a new policy with the ideal policy where all problems are solved is not fruitful, the proper comparison is between the current policy and the proposed new policy, bearing in main the shortcomings of both systems, see Stavins 1995 for a discussion.

that econometrics can be used. The authors have overcome the data problem connected to vessel level cost information by estimating a revenue function assuming that all the inputs (and consequently the costs), for a fishing trip is fixed. Hereby costs data are not necessary, the vessels size is used as a proxy for the costs. As noted by Larson et.al. (1996) this approach requires a somewhat ad hoc grouping of vessels of similar type.

The mathematical approach has been used by Lanfersieck and Squires (1992) and Squires, Alauddin and Kirkley (1994) to analysis the effect of ITQs on one species in a multi-species open access fishery. This approach has also the aim setting up a quota market. They use vessel level linear programming models to derive the marginal valuation of quota. They overcome the (linear) problem with staircase structure of the inverse derived demand functions (Paris 1991) by estimating the demand functions using the (pseudo) data (shadow prices for given quota level) from the LP-problems.

The calibration problem associated with LP-models did they partly overcome by restricting the amount of effort in each timeperiod to the observed, implicitly assuming that the observed effortpattern is the optimal open access effortpattern. However, when reducing the quota the activity in timeperiods with lowest gross margin was first reduced to zero and next the activity with the nextlowest gross margin was reduced and so on, i.e. the vessels will in reaction to quota reductions give up fishing in whole timeperiods. A expected reaction is more gradual, i.e. fishermen reduce the activities with lower gross margin but with diminishing returns the marginal gross margin will increase with reduced effort leading to a positive activity level, because it becomes optimal to reduce other activities as well before the activity level is reduced to zero.

The social planners problem

Overall the social planners problem is to allocate public resources under goals and constraints, given predictions about responses from the fishers to each allocation. It is often very difficult to set up detailed policy goals because they are not available and in economic analysis it is common to look at the changes in the sectors overall efficiency, e.g. gain in producer and consumer surplus. In analysis of sectors operating under market conditions maximizing consumer and producer surplus can be shown to give a solution corresponding to the competitive equilibrium outcome (Hazell and Norton, 1986). The point is that the formulation of the model gives solutions which ex ante can predict the outcome, i.e. the issue is not whether the model is a maximization or simulation model (ref.). In our case the problem is to assess the effects of property right based regulation compared to the current command and control regulation (i.e. of the type 'what if').

Some of the political concerns are about the distributional effects. We will therefore, given predictions about the responses of the fishers to the policy, assess the consequences in terms of efficiency and distributional aspects, see section 10.1.3.

10.1.3 Measures of effects

A main objective of economic analysis consists in the derivation of demand and supply functions for the purpose of establishing market equilibria and predicting their response in relation to the displacement of some parameters, i.e. comparative statics analysis. In our case the comparative statics analysis is conducted using the quota market, i.e. the derived market demand for quota and the exogenous given supply of quota (the TAC).

The framework for the analysis is the neoclassical model assuming profit-maximizing and competitive firms (i.e. fixed exogenous output and input prices) and the purpose is to measure the change in producer/firm welfare, if ITQs were replacing the current open-access regulation. The change in welfare can be measured using the concept of producer surplus or quasi-rent, see Just et. al., 1982, which is given by:

$$\Pi = TR - VC \tag{3.1}$$

where

TR is total revenue

VC is (total) variable costs

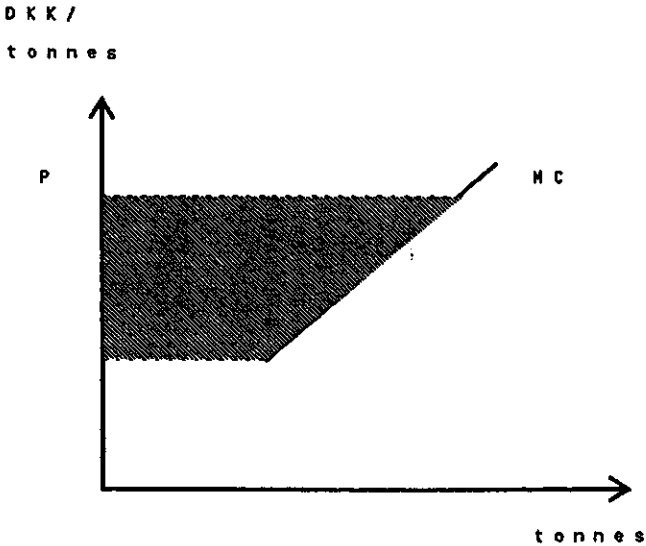


Figure 10.1 Quasi-rent and producer surplus

Quasi-rent is a return to the fixed factors in the short run, but it may not persist over a long period of time since all factors are variable in the long run. Quasi-rent is also equal to gross margin. The quasi-rent for a single output/species is the area under the exogenous price p and above the MC-curve, see figure 10.1.

Using this welfare measure which is equal to the short run profit where some inputs are fixed, the effects of changes in regulation can be assessed at the firmlevel. Given fixed exogenous prices the measure also forms the basis for the analysis on the sector-, fleet- and regionlevel. The measure forms also the basis for analysis of the long run effects.

The analysis of introducing ITQ in the Danish cod fishery can be separated in two parts:

1. Moving from command and control regulation to INTQs.
2. From INTQs to ITQs.

10.1.3.1 The effects of allowing trade in an individual quota system

We will first look at the effects from allowing trade, i.e. moving from INTQs to ITQs. The INTQs will to the extent that they are a limiting factor have a positive (shadow) value which is derived from the firms production technology. The firms derived inverse demand curve for quota is shown in figure 10.2 for two different firms, D_1 and D_2 . These curves can be derived from the firm level demand and supply of fish from figure 10.1. It is inverse because on the margin the firms adjust the marginal value of quota instead of the exogenous given quota, see Squires 1995.

The two firms are assumed to have the same allocation of quota under INTQ, T and the implicit marginal quota value for the firms are τ_1 and τ_2 respectively. The area under each demand curve up to T is the economic rent or the total producer surplus (TPS) 1). The total producer surplus can be divided into (implicit) rental/quota income (QI) and harvest income (HI). The quota income for firm 1 is the rectangle $\tau_1 * T$. Harvest income is the triangle under D_1 and above τ_1 .

The market demand curve for quota D_{ITQ} is obtained by horizontal summation of the firms demands curves. Given the fixed supply of quota $2T$ a market equilibrium with quota price τ_{ITQ} is established. The production of firm 1 is reduced by $T - q_1$ (unit quota rent increases), while production of firm 2 is increased (unit quota rent decrease) by $q_2 - T (=T - q_1)$. The marginal quota values are equalized across firms.

1) In the literature this area is called total producer surplus, or total willingness to pay.

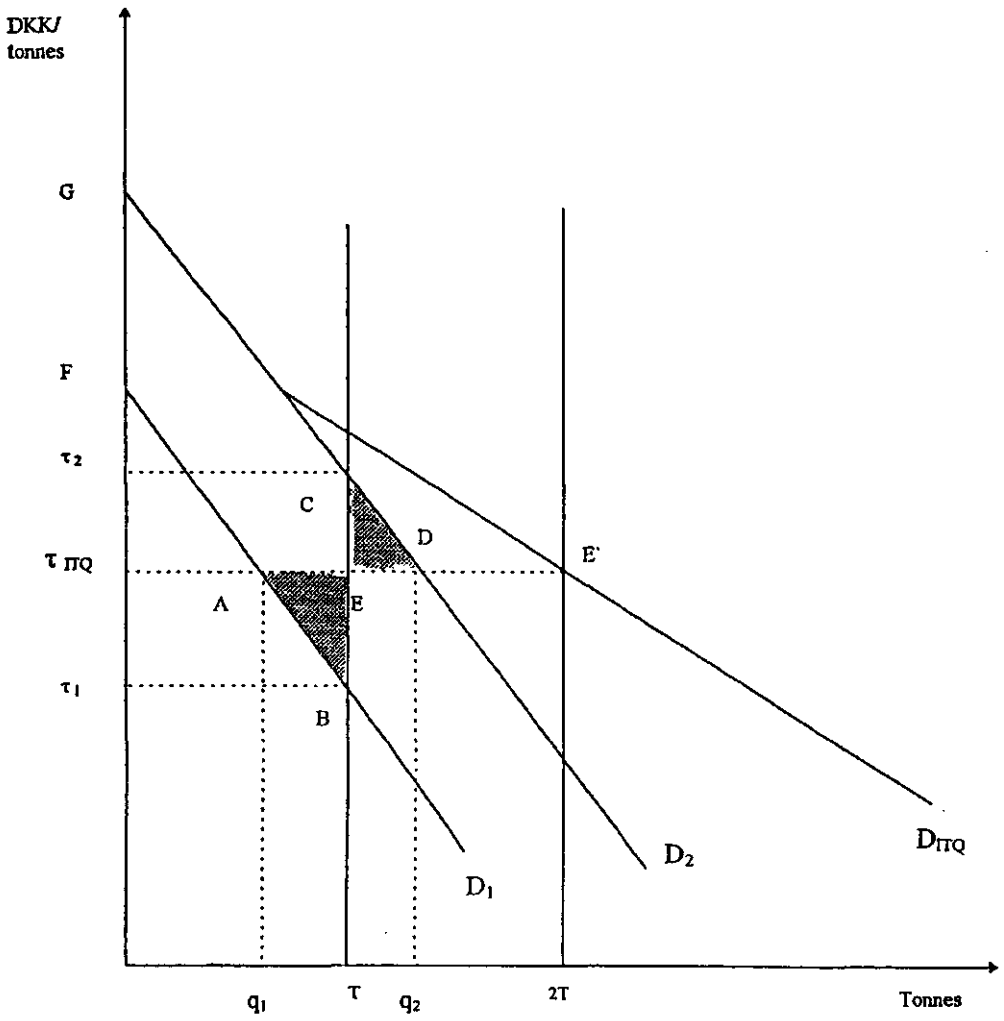


Figure 10.2 Demand for quota, ITQ market and welfare effects

The welfare effects are also shown in figure 3.2. Firm 1 sells quota $T-q_1$ with a value of $ABTq_1$ for $AETq_1$, implying a gain of AEB . Firm 2 purchase quota q_2-T for EDq_2T with a value of CDq_2T , a gain of CDE . The aggregated gain in total producer surplus is therefore $AEB+CDE$ (the shadowed area). The total change in quota income from trade (ΔQI) is $\tau_{ITQ} * 2T - (\tau_1 * T + \tau_2 * T)$ and the total change in harvest income (ΔHI) is $\tau_{ITQ} * E'G - (\tau_1 * BF + \tau_2 * CG)$. The gains are obtained as less efficient vessels sell quota to more efficient vessels. Since it is not possible to increase the total gain further the economic rent from the species is maximized. The quota income $\tau_{ITQ} * 2T$ corresponds to the resource rent and τ_{ITQ} is the marginal user cost of biomass, if $2T$ is the optimal total quota (Moloney and Pearce, 1979). The change in TPS from trade is always positive 1).

10.1.3.2 The effects of going from Command and Control regulation to INTQ regulation

The type of open-access regulation executed in the Danish cod-fisheries (rations) is in principle an INTQ for the ration-period. The analysis of the effects

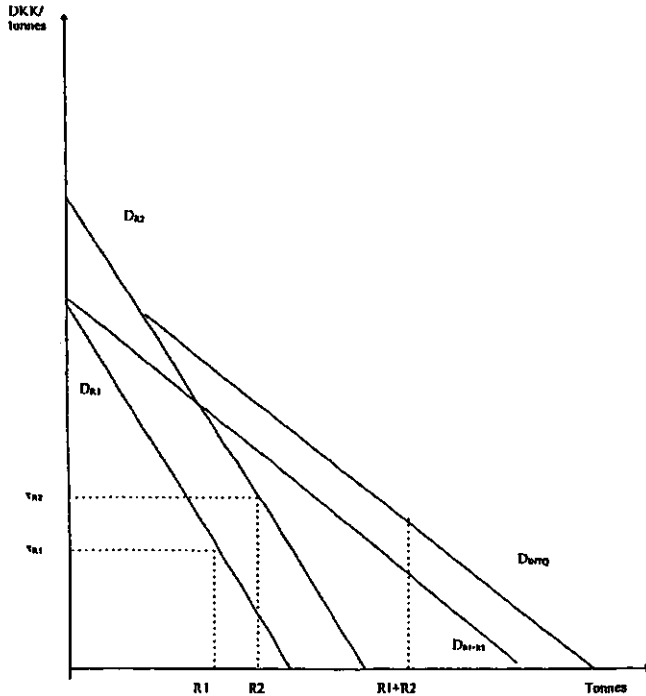


Figure 10.3 The implicit inverse derived demand for rations

- 1) Or zero. This very rare case happens when the initial distribution of quota corresponds exactly with the allocation created by the quota market.

contains therefore the same elements as the analysis above, however, now an explicit market for quotas is not established. The rations (to the extent that they are a limiting factor) will have a positive (shadow) value and for each ration period a demand curve for quota/ration is obtained and by summing the demand curves given the catch distribution on each ration period a implicit demand curve for yearly rations/quotas is obtained, see figure 10.3.

The effects of introducing INTQ is also shown in the figure. The demands curves for INTQ can be obtained by summing the ration demand curves now without the catchdistributions on each ration period. The gain in producer surplus is the area under D_{INTQ} and above D_{R1+R2} up till $R1+R2$. The gain is obtained from reallocation of effort from rationperiods with low implicit unit quota value to period with high implicit unit quota value until $\tau_{R1} = \tau_{R2}$.

10.1.3.3 The effects on the incentives to invest

The effects of trade and adjustment of fishing pattern are estimated, given the amount and composition of the capital stock. In practice the fishermen adjust both the level of quota, fishing pattern and the capital stock simultaneously to maximize the net present value of fishing. The purpose of this section is to show whether existing vessels and fishermen following the implementation of the individual quota system do face changes in the incentives to invest. Fishermen have the option to re-configured their existing vessels given the new operating rules in the IQ-system. However, this option is supposed to be very limited, since changes in the configuration of the capital of a given vessel is difficult without changing the whole ship, i.e. the proportions of a ship is more or less fixed. As noted by Segerson and Squires (1990) an existing vessel is typically sold and another one purchased or a new one is built.

The operating rules under TAC and short term rations are, however, different than the rules under IQ and consequently it can not be expected beforehand that vessels optimal under TAC and rations also are optimal under IQ. The ideal analysis allows for simultaneous adjustment in both quota and capital holdings. However, the approach adapted here is that adjustments in quota holdings are a short term decision and adjustments in capital holdings are a long run decision. Therefore, following the implementation of an ITQ-system the vessel-owner is optimizing the quota-holdings given the existing capital. The intention is to investigate whether an existing vessel will face incentives to exit the fleet following the implementation of the IQ system. If a vessel has incentives to exit the fleet the conclusion of the analysis is that this vessel will only stay in operation in the long run, if the capital holdings are changed.

Open access and open-access regulation

The exit rule under open-access regulation is:

$$\Pi^c < P_k K \tag{3.2}$$

where

Π^c is quasi-rent (or constrained variable profit)

P_K is the unit rental price of capital

K is a capital measure

If the quasi-rent to the capital per period is less than the rental price of capital then the vessel will leave. From this expression some interesting considerations can be made. If the rental price of capital is low, then the vessels will receive higher incentives to stay in the fishery. These situations applies to fisheries with few alternative possibilities or when the vessels are old.

If there are strict regulations in force about extension of the capacity of existing vessels then the vessels that have incentives to stay can not extend their capacity/capital in order to fish with lower average cost.

The expression can also be used to evaluate under which circumstances there will be entry of capital (new investment). The rental price of capital is in these cases higher than for existing vessels. If there is open access regulation of the type as in the Danish North Sea fishery for human consumption then there will be very limited possibilities to increase the short run profit, because the catches can not be increased. Only through cost savings the profit can increase. Hereto comes the expenses to buy an existing and similar vessel out of the fishery. The entry rule for new-comers can be formulated as:

$$IV < (\Pi^c - P_K K)/r \quad (3.3)$$

where

IV is the cost of buying an existing and similar vessel out of the fishery

r is the discount rate

If the cost of entry is less than the capitalized value of future earnings then entry is possible. Comparison of equations (3.2) and (3.3) shows the asymmetric between the exit and entry rule.

Individual non-transferable quotas

Under INTQs there is a shadow cost of quotas. It can be shown (see e.g. Squires 1993 and Vestergaard 1996) that adjusting each output price of the outputs subject to quota by the shadow prices of quotas and then optimizing the production plan without the quota constraints gives exactly the same solution as optimizing with the output prices and quota constraints. Therefore the implicit exit rule under INTQ is:

$$0 > \Pi^c - \pi_T Q_0 - P_K K \quad (3.4)$$

where

Q_0 is the initial quota holding of the firm

If $\Pi^c - P_K K > 0$, the vessel is still making money, but if the inequality relation (3.4) is fulfilled, a vessel with another configuration or the existing vessel with changes in the capital composition may do even better. Anyhow there are incentives to disinvest and whether the vessel will leave or not or whether the vessel will be replaced or not is beforehand impossible to answer. However, the more negative the right hand side of equation (3.4) is the more likely it will be that the vessel will exit.

In reality a combined market of quotas and vessels on the market for vessels is created, for an example see Flaaten, Heen and Salvanes (1996). Since a vessel with INTQ is more valuable than a vessel without INTQ the value of the quota is included in the price of capital, because the individual quota (IQ) is non-transferable. This implies that the price of capital is higher for a vessel with INTQ than a vessel without INTQ.

Individual transferable quotas

Under ITQs the exit rule for a given vessel can be formulated as:

$$\tau_{ITQ} Q_0 > \Pi^c - \tau_T (Q - Q_0) - P_K K \quad (3.5)$$

where

Q is the quota holdings after trade

If the payoff per period from exit (the left hand side) is higher than the income earned in the fishery per period (the right hand side) the vessel will exit. By reformulating (3.5) the following expression is obtained:

$$P_K K > \Pi^c - \tau_T Q \quad (3.6)$$

If the return to the capital measured by the rental price (left hand side) is higher than the actual return earned (right hand side) then the vessel will exit.

The long run effect is that the demand curve for quotas is shifted out in figure 3.2 as inefficient vessels leave the fleet.

10.1.4 The structure of the Danish fisheries in the North Sea and Skagerrak

The Danish fishery 1) is normally divided into human consumption fisheries and industrial fisheries, see chapter 5.1 and 6.1 for a detailed description. Since cod is the single most important species in the human consumption fish-

1) The concept fishery is here defined based on either target species strategy (e.g. lobster fishery) and may consist of single or multiple species targeted and caught or either a strategy where a mix of species is caught (e.g. the mixed human consumption fishery). The concept can further be specified based on area and time period (e.g. lobster fishery in Skagerrak in september).

eries, the analysis will focus on vessels (and consequently fisheries) for which cod is an important species.

In the North Sea and Skagerrak there are the following fisheries where human consumption species and cod are important:

1. Mixed human consumption fishery after round- and flatfish. The composition varies over the year and between fishing grounds. The gears involved are trawl, gill-netters and Danish seiners. The target species vary over the year and can vary according to the gear type used, but cod, haddock, saithe, plaice and sole are the main species. This fishery could probably be divided into several fisheries, but this will require very detailed data.
2. The lobster fishery in Skagerrak (and Kattegat). Only trawlers are involved in this fishery. Important (by-)catch of cod.
3. Shrimp fishery. Also only trawl. Important catches of cod and lobster.
4. Norway trout fishery. It is an industrial fishery conducted by trawl only. Important bycatches of cod, saithe and haddock.

The fleet (or part of it) can beside these fisheries change to the following fisheries:

5. Sandell in the North Sea. Mainly trawl. A single species and an industrial fishery.
6. Cod in the Baltic Sea. Mainly trawl, but gill-netters participate as well. In general a single species fishery.
7. Herring in the Baltic Sea and Kattegat. Mainly trawl.
8. Sprat fishery. Trawl. In principle a single species and an industrial fishery.

The cod fisheries in 1993

The Danish fisheries after cod takes place in 4 different areas: the North Sea (ICES area 4AC), Skagerrak (3AN), Kattegat (3AS) and the Baltic Sea (3BD). 4AC has border to 3AN, who also has border to 3AS. 3BD has border to 3AS. The catches for 1993 in the areas were 19,465, 11,940, 4,270 and 9,590 tonnes, respectively (appendix A3.1).

The fleet participating in the fisheries is composed of three gear types: Gill-netters (258 vessels in 1993), Danish seiners (104) and trawlers (341). The total number of vessels is 703. The former proposal about ITQs suggests that only vessels longer than 12m are included in an ITQ-system. From table 5.1 the landings from vessels in a potential ITQ-system of the 5 main human consumption species show that the system will cover a large part of the catches from the North Sea and Skagerrak.

Nearly all the gill-netters participate in the fishery in 4AC and about 1/2 of them also in 3AN. Only a few gill-netters take part in the fishery in 3AS and 3BD. The gill-netters target different round- and flatfish.

The Danish seiners have the same overall fishing-pattern as the gill-netters: they participate in the fisheries in 4AC and 3AN and to a small extent also in 3AS and 3BD. The Danish Seiners target different roundfish and plaice.

The trawlers have a more variable fishing pattern. The trawlers have mainly less than 100 GRT and some of them participate beside the codfisheries in the sandell fishery and in the herring fishery.

The regulation and the regulatory process.

The regulation of the fishery 1) after cod, haddock, saithe and sole is based on TACs divided into quarterly total quotas which are divided into rations for a given period, in some cases depending on the size of vessels. However, the number of participating vessels is not regulated so during the year the rations can get smaller or the rationperiod can be shortened and in some cases the fishery after a species is simply closed. Also the herring and mackerel fisheries are in principle regulated by this method. It is possible in a number of cases to transfer ration from one period to the next.

Whether the regulation carried out in 1993 has been a limiting factor (a binding constraint) for the fleet can be investigated in several ways. It can be indicated by comparing the TAC and the total catch for the relevant species. If the catch is close to the TAC (say 10% deviation) the regulation can have been a limiting factor. In the North Sea the total catch for cod, saithe, sole, mackerel, herring and sprat was within 10% of the TAC. In Skagerrak the TAC for cod, plaice, mackerel, and sprat have been exploited over 90%. In Kattegat the total catch for cod and mackerel and in the Baltic Sea the total catch for Cod is within 10% of the TAC.

Examination of how the regulation has changed over the year can also provide insight in which species have been a limiting factor due to regulation. If the regulation has been changed relatively often in a downgoing direction then the fishery is being constrained. The regulation for cod in the North Sea, Skagerrak and Kattegat was not changed significantly until november where the rations were cut down for all areas and the ration period shortened for North Sea and Skagerrak. The cod fishery in the Baltic Sea was stopped several times during the year and the rations were changed as well indicating very limiting conditions. The regulation of haddock in all areas was cancelled in august, while the rations of saithe in all areas was changed several times before the fishery was stopped in October. Finally the regulation of sole in the North Sea indicates limiting possibilities, change of rations several times and one stop, before the fishery finally was closed in November.

From this it can be concluded that the cod and saithe fishery in all the 4 areas have been constrained by the limited TAC. Sole has been constrained in the North Sea. The TAC for plaice in the Skagerrak was exploited over 90%, but no regulation was carried out. Other fisheries that have been limited in 1993 are sprat (part of the industrial fishery) and mackerel in the North Sea and Skagerrak, and herring in the North Sea.

1) In the regulation context the term fishery is not used as in the literature. Cod fishery is simple the situation where cod is (a part of) the catch.

Modeling or construction of the behavior from the actual allocation of effort in 1993 mostly takes into account this regulation environment, see also appendix A4a.

10.1.5 Formulation of the empirical model

The database and relevant vessels.

Only vessels which fulfill the following three conditions are considered:

1. Vessel length over 12 meter;
2. Total catch of cod in the North Sea and Skagerrak in 1993 is more than 15 tonnes.
3. The total revenue from fishing in the North Sea and Skagerrak is over 1/4 of the total revenue.

The first condition is as mentioned based on former proposals about ITQs in the danish fisheries, which all exclude vessels with a length lesser than 12 meter. The second condition secures that vessels are excluded if they in 1993 had a minor catch of cod in the North Sea and Skagerrak. These vessels will therefore not be important in a potential ITQ-system based on the catch record in 1993. By the third condition are only vessels selected for which the North Sea and Skagerrak are important fishing areas. There are only 10 vessels out of the 470 that fulfill condition 1) and 2) that didn't fulfill condition 3) as well.

In order to have a manageable model only vessels from the port of Esbjerg and Thyboron were considered. Esbjerg and Thyboron are located on the west coast of Jutland and the vessels have the North Sea and Skagerrak as their main fishing areas. Thus they will be an important part of any regulation system of the cod fisheries in these areas. There are 18 vessels from Esbjerg and 149 vessels from Thyboron, in total 167 vessels, see appendix A3.1.

The data consists of:

1. information on the volume and value of landings of each of the following species: cod, haddock, saithe, plaice, sole, lobster, shrimp, herring, mackerel, species for industrial purpose. Other species are grouped together;
2. the month of landing;
3. the fishing area for every trip made in 1993 of the relevant vessels.

The cost information is limited. Here are only aggregate data from a few ports available.

The trip information allows for a division of the annual fishery activity based on month and area. The data allows to a minor extent for division into several different fisheries. The different fisheries - defined here by target species and area - are:

1. Mixed human consumption fishery in the North Sea, Skagerrak and Kattegat.
2. Lobster in the North Sea, Skagerrak and Kattegat (>30%).

3. Shrimp in the North Sea and Skagerrak (>30%).
4. Cod in the Baltic Sea.
5. Herring in all 4 areas (>50%).
6. Industrial (>50%).
7. Mackerel (>50%).
8. Sole (>15%)

These fisheries can be separated from each other based on the mesh-size regulation. The general mesh size is 100 mm, but for herring, sole, mackerel, lobster, shrimp smaller mesh size can be used, if the total catch contains a certain proportion of the relevant and targeted species (the percentage in blanket above).

This division gives 19 fisheries and consequently 12*19 different activities. The mixed human consumption fishery in the North Sea and Skagerrak can probably be divided into several different fisheries, but given the data it seems not reasonable to divide this fishery further. However, the division by month and area compensates to some extent for this, because the changes in species composition, i.e. change of fishery, are connected to a given time period. Each vessel take part only in 10-20% of the total number of activities and a large part do have a stable fishing pattern with participation in 1 to 3 fisheries in 1-2 areas over the year, see appendix A3.3.

The model

A detailed description of the model and the data and the construction process is provided in appendices 3 and 4. The model is first formulated as a linear programming model using 1993 as the baseline year. This model is then calibrated to the observed behaviour in 1993 using a new method called Positive Mathematical Programming (PMP). The PMP approach is described in appendix 4. The calibrated model can be used to forecast the effects of Individual quotas.

Scenarios analysis of individual quotas

The allocation of individual quotas (IQs) is assumed to be based on the catch-record of 1993. The allocation is also assumed to be assigned to each vessel as a percentage of the total quota. We will at the outset look at three overall and different scenarios:

1. IQs for cod in the North Sea and Skagerrak.
2. IQs for cod in the North Sea and Skagerrak and sole in the North Sea and all the other areas.
3. IQs as in 2, but extended with IQs on saithe for all areas.

These scenarios are based on how the TAC for each species is determined and on species that tend to be the most important. For cod there are TACs for all 4 areas. There are two TACs for sole, North Sea and all the other areas respectively, while one TAC is formulated for saithe.

The next two sections will analyze the results of different policy scenarios of INTQs and ITQs.

10.1.6 Results of individual non-transferable quotas

In this section we will give the results of analyzing the different policy scenarios of INTQs (as outlined above) in the model.

Allocation of INTQs for cod in the North Sea and Skagerrak

The total short run gain from allocating each vessel two INTQs for cod in the North Sea and the Skagerrak respectively corresponding to the catches in 1993 is 7.43%, see table 10.1.

Table 10.1 Changes in quasi-rent, revenue, and cost following INTQs. 1,000 DKK

Scenarios	Quasi-rent (%)	TR (%)	TC (%)	Labour	Other var. costs
1	8,860 (7.4)	12,486 (4.4)	3,806 (2.3)	4,560 (4.3)	-0,754 (1.3)
2	6,260 (5.4)	6,410 (2.3)	0,150 (0.0)	2,281 (2.1)	-2,131 (3.6)
3	5,227 (4.5)	4,083 (1.4)	-1,114 (-0.7)	1,357 (1.3)	-2,501 (4.2)

Note: TR and TC is total revenue and total costs respectively.

The gain comes from allowing each firm to allocate effort to the periods where the quasi-rent is highest. There are in principle three sources contributing to the gain: higher catches of other species, fishing in times of the year where the prices are relatively higher and cost savings due to reallocation. From table 10.1 it can be seen that the gain is not due to costs savings, since the total cost increase by 2.3%. However, since labor cost is a part of the revenue it could be interesting to look at the changes in labor cost and the other variable cost separately. The increase in cost is due to increasing labor cost (4.3% higher), since the other variable cost falls by 1.3%, see table 10.1. The overall conclusion is therefore that the gain to a large extent (about 91%) is due to higher gross total revenue from the fishery.

Catches of other species increases, see appendix A3.4, mainly the catches in The North Sea (4AC) increases, especially sole, plaice and saithe respectively. This is an important feature of the joint production technology. Since it is a short term change, it can be expected that as the fisher's changes factor inputs the substitution towards other species will increase. However, the result here indicates that the substitution possibilities are limited for this fleet to the North Sea and to sole (catches increase over 40%), while catches of plaice and saithe increase about 5% and 11%, respectively. Changes of fishing activities to other areas seem also not to be any serious problem in the short run.

Allocation of INTQs for cod in the North Sea and Skagerrak and sole in the North Sea and in all other areas.

Each vessel is here allocated four INTQs. Referring to tables 10.1 and appendix A3.4 the results of adding quotas on sole are as expected. Compared to allocation of INTQs for cod the gains in quasi-rent and the catches of other

species decrease. By adding more quota constraints the firm's substitution possibilities will decrease, because of increasing limitations in reorganizing the firm's joint harvesting, i.e. Le Chatelier effect. Since the Le Chatelier effect occurs, the firm may have increasing difficulties in matching the harvesting rates with quota holdings and therefore INTQs can contribute to the problems of quota overage. In appendix A3.4 it seems not to be a problem on the industry level, since the catches are the same as in 1993.

Allocation of INTQs for cod in the North Sea and Skagerrak, sole in the North Sea and in all other areas and saithe in all areas

Five INTQs are allocated to each vessel. The gains in quasi-rent and catches of non-quota species decrease further, but compared to the outcome of 1993 there are still gains of allocating each firm INTQs (table 10.1). An inspection of the catches of the quota species indicates that adding the quota on saithe might lead to problems of quota overage, see appendix A3.4. Since the model requires the firm's to comply with the quota constraints, the firm's can not continue harvesting species with binding quota constraints even if there are still quota left for the other quota species. In reality the firm might continue harvesting and dispose the excess production beyond quota either as discard at-sea or landings beside official channels.

Distributional effects and incentives to invest/disinvest

Appendix A3.5 shows that out of a total number of 168 vessels 54 faced negative profit and 113 had positive profit in 1993. The distribution on gear-type indicates that more trawlers (12 out of 27) and Danish seiners (30 out of 77) than the average have negative profit, while more gill-netters (51 out of 73) obtain positive profit. Under the current regulation scheme it must be expected that some adjustment still will take place, mainly towards gill-netters.

Under INTQs the profit of each firm will increase and for a number of vessels this increase may result in positive profit. However, the analysis shows that vessels which under the current regulation scheme had negative profit continue to have negative profit under the INTQ system, only 2 out of 54 vessel change from negative to positive profit in all the scenarios. The reason is that the vessels with negative profit were not in any significant way influenced by the 1993 regulation scheme and therefore optimized more or less without any constraints. Under INTQ these vessels are not expected to change behaviour, since relaxing the constraints will not change the optimal production plan of these vessels. INTQ will, however, increase the profit of vessels which were constrained by the 1993 regulation. The conclusion is therefore (based on profit comparisons) that an INTQ system is a benefit for the vessels which were constrained under the 1993 regulation.

10.1.7 Results of individual transferable quotas

In this section we will give the results of analyzing the different policy scenarios of ITQs in the model.

Allocation of ITQs for cod in the North Sea and Skagerrak

The total short run gain from allocating each vessel two ITQs for cod in the North Sea and the Skagerrak respectively corresponding to the catches in 1993 is 13.2% or 15.4 million DKK, see table 10.2.

Table 10.2 Changes in quasi-rent, revenue, and cost following ITQs. 1,000 DKK

Scenario	Quasi-rent	TR (%)	TC (%)	Labour	Other var. costs
1	15,410 (13.2)	8,589 (3.0)	-6,821 (-4.1)	2,848 (2.7)	-9,668 (-16.4)
2	14,133 (12.1)	3,556 (1.3)	-10,577 (-6.4)	884 (0.8)	-11,461 (-19.4)
3	13,805 (11.8)	1,919 (0.7)	-11,886 (-7.2)	336 (0.3)	-12,222 (-20.7)

Note:TR and TC is total revenue and total cost respectively.

These gains (compared to 1993) comes from two sources, better planing of fishing operations for each vessel due to individual quotas and reallocation of quota holdings from less efficient vessels to more efficient vessel through trade of quota. From table 10.2 it can be seen that increase in revenue counts for about 1/3 of the gains and cost savings (i.e. savings in other variable cost) for about 2/3 of the gains. Compared to the gains under INTQs the gains under ITQs is mainly due to cost savings which arises when the quotas are traded. This result is in accordance with the main hypotheses about ITQs.

Catches (appendix A3.6) of other species than cod will increase under ITQs except plaice in Skagerrak. The catches of plaice (and in limited extent sole) in the North Sea will increase less than under INTQs, see appendix A3.6. This indicates that the vessels which sell quotas are vessels which catch the main part of the plaice, i.e., first of all the Danish seiners.

The catches of other species than sole in the North Sea and plaice tend to increase more than under INTQs which shows that ITQs not only lead to cost savings but also a better utilization of the catch possibilities of other species, i.e. higher revenues.

Allocation of ITQs for cod in the North Sea and Skagerrak and sole in the North Sea and in all other areas

The gain is 12.1% which mainly comes from cost savings. The revenue increases but the contribution to the overall gain is more than halved compared to scenario 1. This shows that the fleet at the overall level after the introduction of ITQs on sole can not compensate in full extent by substitution of catches of other species. In fact the catches of other species fall compared to ITQs on cod (i.e. scenario 1), but the figures show that the decrease is moderate. The increase in revenue is less than under INTQs although catches of many of the other species are higher. However, the catches of plaice in the North Sea are substantial lower under ITQs than under INTQs which explains the lower increase in revenue. Again the vessel selling quota's have plaice as a important part of their catches, i.e., Danish seiners.

Allocation of ITQs for cod in the North Sea and Skagerrak, sole in the North Sea and in all other areas and saithe in all areas

The gain in quasi-rent is 11.8% which is over 2½ times higher than the gain under INTQs. The gain under scenario 1 was about 1,75 times higher, so the fleet can at an overall level under ITQs adjust easier to implementations of more quota's than under INTQs. Almost the total gain in quasi-rent is coming from cost savings, only about 10% of the gain is due to increase in revenue.

Under INTQs each firm experience a loss (or decrease in gain compared to the 1993 situation) in quasi-rent as more and more quota's are added, see table 10.3. However, when the IQs are made transferable, the fleet can reduce the loss by trading the quota's. This leads to an increase in the gain of trade when more and more quota's are implemented, see table 10.3.

Table 10.3 Quasi-rent and gains of trade. 1,000 DKK

Scenarios	1993	INTQs	ITQs	Gains of
1	116,851	125,531	132,262	6,731
2	116,851	123,112	130,984	7,872
3	116,851	122,078	130,656	8,578

The difference in gain in quasi-rent under ITQs for all three scenarios is within a range of 2 million DKK (or 10.4%) and substantial lesser than under INTQs which indicate that the fleet on the industry level has greater opportunity to adjust to limited quotas when the quotas are transferable than when they are non-transferable. This is an important point because many ITQ-systems have *de facto* been more or less an INTQ-system and consequently, because the system has limited the transferability, the problems arising with discards ect. are enlarged.

The results of the model show that at the industry level the fleet can match the quota levels set in 1993, i.e., positive quota prices are formed and in principle there should not be problems with discards or quota overage. This requires a well functioning quota market and enforcement.

The quota price

Since the quasi-rent and catches in all the scenarios are relatively equal the equilibrium quota price can also be expected to be more or less equal in the scenarios, see table 10.4. The quota price of cod for area 3AN is about 3 DKK and 5.3 DKK for area 4 AC. For sole the prices are 19 DKK and 24.5 DKK, respectively, while for saithe the price is 8 DKK. The largest change in quota price is obtained for cod in area 3AN from scenarios 2 to 3, a drop at 0.5 DKK (17%). This drop is due to implementation of ITQ on saithe which lead to an decrease in catches of saithe in 4 AC and consequently makes cod quota less demanded, indicating complementarity between saithe and cod in area 4 AC.

Table 10.4 Quota prices per species and area. DKK/lunit

Scenarios	Cod		Sole		Saithe AA
	3AN	4AC	4AC	OA	
1	3.02	5.31			
2	3.00	5.35	19.09	24.56	
3	2.49	5.14	19.07	24.60	7.97

Notes: OA means other areas and AA all areas.

The quota prices is less than the output prices, but in several cases greater than the output price adjusted by the crew share. This indicates that under joint production the quota prices also reflect the value of other species which can be landed when additional quota is obtain.

Trade of quota

Since the trade of quota is voluntary, every vessel-owner who trades is better off under ITQs than under INTQs. The profit increases for all the vessels. Vessels with economic advantages by selling quotas are doing so and obtain earnings which are higher than the earnings they could obtain by using the quota themselves. The same argument applies to the buying vessels. There is an extensive amount of trading, in fact all the vessels are active in the quota market. There are 86 sellers and 81 buyers in the market under scenario 1. The main sellers are Danish Seiners, trawlers and gill-netters less than 20 GRT. Whether a trade-owner is a seller or a buyer in the market is in general independent of the profit result in 1993. However, the main part of the sellers are vessels with negative profit in 1993 and the main part of the buyers are vessels with positive profit. After trade the number of vessels with negative profit fall to 39 from 54 in 1993 (scenario 1).

Incentives to exit

However, this is not the whole story. By creating an quota market the holdings of quotas have an opportunity value which is real expense for the vessel-owners. The profit for the vessel-owners must therefore be compared with the value of the quota. If the value of the quota is higher than the profit, the vessel-owner has incentives to leave the sector, see equation 3.5 in section 10.1.3.3.

In tables 10.5-10.7 are shown the number of vessels with positive incentives and negative incentives to remain in the fleet in the three different scenarios, respectively.

Table 10.5 Number of vessels with incentives to exit by gear and size-groups (scenario 1)

	GRT	No (E+L)		
		E a)	L b)	Total (E+L)
Gill-netters	< 20	+2/0-	+26/19-	+28/19-
	≥ 20	+3/1-	+11/1-	+14/2-
Trawlers	< 20		+2/3-	+2/3-
	20 - 59		+0/7-	+0/7-
	60 - 99	+2/0-	+2/0-	+4/0-
	≥ 100	+1/1-	+5/4-	+6/5-
Danish seiners	< 19.9		+1/2-	+1/2-
	≥ 20	+3/5-	+16/50-	+19/55-
Total		+11/7-	+63/86-	+74/93-

Notes: + indicates incentives to stay, - incentives to exit.
a) Esbjerg; b) Lemvig (Thyborøn).

Table 10.6 Number of vessels with incentives to exit by gear and size-groups (scenario 2)

	GRT	No (E+L)		
		E a)	L b)	Total (E+L)
Gill-netters	< 20	+2/0-	+19/26-	+21/26-
	≥ 20	+3/1-	+10/2-	+13/3-
Trawlers	< 20		+2/3-	+2/3-
	20 - 59		+0/7-	+0/7-
	60 - 99	+2/0-	+2/0-	+4/0-
	≥ 100	+1/1-	+5/4-	+6/5-
Danish seiners	< 19.9		+1/2-	+1/2-
	≥ 20	+3/5-	+16/50-	+19/55-
Total		+11/7-	+55/94-	+66/101-

Notes: + indicates incentives to stay, - incentives to exit.
a) Esbjerg; b) Lemvig (Thyborøn).

The number of vessels with incentives to exit under scenario 1 increased from 54 to 93 vessels, which are mainly trawlers less than 60 GRT and Danish seiners. Under scenario 2 the number of vessels with incentives to exit is further increased to 101 due to higher number of gill-netters (less than 20 GRT). Scenario 3 is almost like scenario 2, number of vessels with incentives to exit is here 99. Common for all the scenarios is that vessels with negative profit in 1993 should all also exit under the ITQ-system. A number of vessels with positive profit in 1993 (between 39 and 46) is also expected to exit the fleet. These are mainly Danish seiners larger than 20 GRT (25-26 vessels), trawlers between 20 and 60 GRT (2-3 vessels) and gill-netters larger than 20 GRT (7-14 vessels).

Table 10.7 Number of vessels with incentives to exit by gear and size-groups (scenario 3)

	GRT	No (E+L)		
		E a)	L b)	Total (E+L)
Gill-netters	< 20	+2/0-	+19/26-	+21/26-
	≥ 20	+3/1-	+10/2-	+13/3-
Trawlers	< 20		+2/3-	+2/3-
	20 - 59		+1/6-	+1/6-
	60 - 99	+2/0-	+2/0-	+4/0-
	≥ 100	+1/1-	+5/4-	+6/5-
Danish seiners	< 19.9		+1/2-	+1/2-
	≥ 20	+3/5-	+17/49-	+20/54-
Total		+11/7-	+57/92-	+68/99-

Notes: + indicates incentives to stay, - incentives to exit.

a) Esbjerg; b) Lemvig (Thyborøn).

10.1.8 Conclusions

The results of the model indicate that the adjustment of the fleet which has taken place since 1987 is not finished. About 1/3 of the vessels operate with negative profits. The negative profit, particularly within the Danish seiners and trawlers, is consistent with the adjustments in the fleet up 1993.

Implementation of an ITQ-system can increase the quasi-rent of the fleet by about 12%. For a comprehensive ITQ-system covering the vessels catching a significant amount of roundfish in the North Sea or/and Skagerrak the gain in quasi-rent could be up to 70 million DKK per year. Whether this is enough to cover the expenses of implementing and running the system is an open question.

The resulting fleet structure under an ITQ system, i.e. the adjustments expected in the long run, is more or less in accordance with the development up till now. The number of vessels with incentives to exit the fleet increases by about 75%. The gain of the ITQ-system in the long run can therefore be larger because of exit of inefficient vessels and redundant capital. However, the period for this adjustment can be long, if the alternatives for both labor and capital is limited and this could be an argument for still to support decommissioning vessels. The main change in the adjustment pattern compared to the adjustment up till now is that trawlers between 20 and 60 GRT and gill-netters less than 20 GRT are affected by the ITQ-system to exit the fleet.

10.2 Perspectives on continuity of individual enterprises in the Netherlands

The Dutch Agricultural Economics Research Institute has analyzed the economic consequences of measures such as TAC-decreases. The analysis is car-

ried out using a fleet model (programmed in FORTRAN) which has already been developed some years ago (LEI-publication 5.79).

The predictive value of the model has been tested in the past. In 1988 an analysis was done with respect to the Dutch cutter fleet. It was concluded that within 2-4 years about 100 to 140 vessels with 50-70,000 kW would probably leave the fleet. Overcapacity was especially evident in the roundfish sector and with respect to Eurocutters.

In reality the number of vessels decreased from 603 in 1988 to 494 at the end of 1991. Total kW of the fleet dropped by about 70,000 kW. Recession in the roundfish sector hit hard as earnings and effort of the vessels almost halved between 1988 and 1991. The number of Eurocutters changed hardly in this period. On the one hand, several Eurocutters retired from the sector as was predicted by the model, on the other hand a significant number of new Eurocutters were built by former owners of larger cutters having sufficient quota.

In general, one can say that the model proved to be pretty accurate in the 1988 analysis in predicting future developments of the fleet in the short and long term.

10.2.1 Methodology of the model

The Dutch cutter fleet consists mainly of beam trawlers which fish for flatfish in the North Sea. Less important target species are shrimp (smaller vessels) and cod (medium sized vessels). Quotas for plaice and sole dropped sharply in 1996 and are even lower in 1997. The question is how many vessels will be able to survive in the short and long run, in light of these quota reductions.

The model analysis was based on detailed information about:

- individual fishing rights (ITQs) in 1996 for plaice, sole, cod, whiting and herring of the entire fleet (461 vessels);
- individual gross revenues of the vessels involved in shrimp fishing in 1994;
- average composition of costs in 1995, subdivided into some 25 components, for 13 different kW-groups and two regions, based on LEI-DLO annual costs and earnings surveys, which involve about one third of the fleet;
- average annual fishing effort in kW-days for the same kW-groups;
- average level of solvability (debts) for small, medium and large vessels.
- average prices of fish and fuel in 1996

Subsequently the following steps have been implemented:

- a. Potential gross revenues have been calculated for each individual vessel according to their individual quotas and average fish prices. To account for by-catches of species which are not regulated, 17.5% has been added to the potential 'quota' revenues.
- b. Costs were aggregated into the following components:
 - fuel;
 - remuneration of the crew including the owner;

- other variable costs;
 - interest costs and depreciation costs of investments not financed with debt;
 - costs of debt (repayment/interest on loans);
 - other fixed costs.
- c. Two levels of break-even gross revenues were calculated for each vessel, which were considered relevant as a requirement to survive in the short and long term:

Long term (4-7 years)

All costs are covered, including depreciation on the vessel and all costs of capital.

Short term (1-3 years)

Costs of depreciation and interest of investments not externally financed are not covered. All other costs, including costs of debt, are compensated by earnings.

In the calculation of break-even gross revenues a constant productivity was assumed. In this way lower (potential) earnings lead to accordingly lower variable costs. This is also true with respect to the remuneration of the crew which is dependent on earnings minus fuel costs.

- d. For each vessel the following ratio could be calculated for both time periods:

Ratio = potential gross revenues/ break-even gross revenues

For each period the vessels were divided into 4 groups according to this ratio in order to qualify their apparent economic strength:

- Strong : ratio > 1
- Reasonable : 0.8 < ratio < 1
- Dubious : 0.6 < ratio < 0.8
- Weak : ratio < 0.6

10.2.2 Results

Using the model on the active Dutch cutters at the end of 1995, the following matrix was obtained, which assesses the economic strength of the cutters.

Table 10.8 Economic strength of the Dutch cutter fleet on the basis of 1996 ITQs in the short term (number of vessels)

HP-group	Weak	Dubious	Reasonable	Strong	Total fleet
0 - 260	17	4	4	87	112
261 - 300	20	11	18	85	134
301 - 1100	2	7	4	10	23
1101-	14	18	59	101	192
Total fleet	53	40	85	283	461

It is expected that in the short term about 50 to 90 vessels classified as dubious or weak will run into serious financial problems. In one to three years these vessels will have trouble to meet their short term financial obligations. If these ships were to quit the fishing business about 35,000 to 80,000 HP engine power would leave the fleet. This represents about 12% of the total fleet. However, these vessels possess only a very small share of the national quota. The obvious conclusion is therefore that vessel-owners who invested more than average in quota now have better chances for survival.

A closer look at the 50-90 troubled ships learns us that most of them are small. However, this prediction is probably too pessimistic. Many of the smaller vessel-owners (0-260 HP) fish mainly for shrimp and are used to low incomes and results. A lot of them will probably continue their business.

About 35% of the troubled vessels has more than 1,100 HP. Cutters from the northern ports face more serious problems than their southern colleagues. Only about 5 vessels of the southern fleet (south of Katwijk) may have to stop fishing before 1999.

Table 10.9 Economic strength on the basis of 1996 ITQs of the Dutch cutter fleet in the long term (number of vessels)

HP-group	Weak	Dubious	Reasonable	Strong	Total fleet
0 - 260	33	17	18	44	112
261 - 300	52	15	15	52	134
301 - 1100	8	5	4	6	23
1101 -	29	70	45	48	192
Total fleet	122	107	82	150	461

The prospects of the Dutch cutter fleet in the long run will further deteriorate if quota remain at the 1996 level. About 120 to 230 cutters will not be able to replace their vessels in time because of lacking earnings. This means that a significant part of the Dutch cutter fleet, 80,000 to 230,000 HP, is in danger in the long run.

The fishing rights of the concerned vessels amount for 37% of the national sole and plaice quota. The other vessels, which are expected to survive, possess 63% of the quota but only 53% of the total kW in the cutter fishery. It seems that vessel owners, who have invested heavily in quotas, are on the right track.

Of the 229 weak or dubious vessels 100 have engines over 1,100 HP. This amounts for almost 50% of the larger cutters at the end of 1995. Also about half of the Eurocutters will be in serious problems on the long run.

As can be expected most of the ships older than 20 years are classified as weak or dubious. Only 82 of 197 older vessels are expected to survive. Ships younger than 10 years are considered to be in a stronger economic position. Possibly 50 of 130 vessels may have to leave the business.

The above calculations are probably too pessimistic. Many of the smaller vessel-owners (0-260 HP) fish mainly for shrimp and are used to low incomes and results. A lot of them will probably continue their business.

The above calculations are based on 1996 TACs, which were much lower than in 1995, and 1996 fish prices which were much higher. Further model analysis seems to indicate that these factors compensated each other to a large extent.

In reality about 14 vessels retired from fishing in 1996 with about 10,000 HPs.

10.2.3 Sensitivity analysis

In addition to the analysis of the real data a sensitivity analysis has been carried out with the model. It turned out that changes in fish prices have a bigger influence on the chances for survival of vessels than changes in fuel prices. For instance a decrease of fish prices of 10% leads to an extra 60,000 troubled HPs on the long run. On the other hand an increase of fuel prices of 10% leads to about 35,000 HPs extra troubled in the long run.

If the fuel price would rise by 20% this would endanger 50,000 HPs. It is clear that larger vessels are more vulnerable to this increase than vessels with engine power below 300 HP.

10.2.4 Prediction for 1997

The calculations in sections 10.2.1 to 10.2.3 are based on 1996 ITQs. In this section a prediction will be made for the Dutch cutter fleet on the basis of 1997 ITQs. These ITQs are again lower, especially with respect to sole (-15%). Furthermore assumptions had to be made with respect to prices: (compared to 1996 real prices);

- plaice : -10%
- sole : + 3%
- fuel : + 0%

Table 10.10 Economic strength on the basis of 1997 ITQs of the Dutch cutter fleet in the short term (number of vessels)

HP-group	Weak	Dubious	Reasonable	Strong	Total fleet
0- 260	17	5	4	86	112
261- 300	21	11	19	83	134
301-1100	2	9	2	10	23
1101-	18	55	51	66	192
Total fleet	58	80	78	245	461

About 60 to 130 vessels are in trouble in the short term on the basis of 1997 quota. These vessels will not be able to meet their financial obligations. The number of vessels classified as dubious will double compared to 1996 1). The vessels which are in trouble have relatively little options to buy or hire new quota. Quota prices are high in 1997 and most of these enterprises will have difficulties convincing their bank to lend them more money.

Table 10.11 shows the average flatfish ITQs per vessel. The vessels up to 1,100 HP are monthly involved in other fisheries (shrimp, cod, whiting), whereas the size >1,100 HP consist of specialized beam trawlers. Sole and plaice are by far the most important target species for these vessels.

Table 10.11 Average sole/plaice ITQ per vessel in tonnes (1997 estimates)

HP-group	1996 Sole	1997 Sole	1996 Plaice	1997 Plaice
0 - 260	0.7	0.6	0.8	0.7
261 - 300	11.1	9.5	24.6	21.7
301 - 1100	11.2	9.2	30.6	27.4
1101 -	80.5	66.6	156.5	140.1

Source: Ministry of Agriculture Nature Management and Fisheries, LEI-DLO.

10.3 Modelling the effects of UK property rights

10.3.1 Scenarios

The information available for the UK on property rights does not lend itself to sophisticated modelling techniques. Nor, in the absence of such data, is it appropriate in this context to develop theory or techniques of analysis. It seems wiser to consider a few simple budgeting estimates of what might happen if property rights developed in certain ways.

- 1) Vessels classified as 'in trouble' for the 1996 analysis have not been excluded for this analysis on the basis of the 1997 quota.

The basis for this somewhat rough approach comes mainly from the data on costs and earnings. As indicated earlier these figures do not relate to a sufficiently large and random sample to allow reasonably accurate population estimates; they do, however, represent a group of vessels and indicate what has happened to some if not all of the fleet.

The two main scenarios under consideration relate to the possible impact of having to invest in property rights or alternatively of having to pay a significant fee for that entitlement. In the first case, the impact is due to the entry of new owners replacing those who had the licences originally. The original holders' cost structure excluded anything related to the value of the licence which had been conferred on them for nothing. In the long run all licences will have a recognised value and the investment will need a return; other inputs will eventually earn less to allow this return on the new 'asset' of the licence but this will not happen in the short run; the cost will either discourage the entry of below average performers or cause such new entrants to fail. Only after such departures is capacity likely to decline and bring the longer run benefits of added earnings from sharing the total quotas among fewer participants.

The second case assumes that the government, which pays for the research and negotiations involved in devising and setting TACs as well as the enforcement to secure them, charges for the licences. The indications for the UK are of the combined costs of research, enforcement and administration amounting to perhaps £60m. The charge therefore would be around 10% of the value of UK landings and a roughly similar percentage of the value of the fleet.

10.3.2 Scenario 1, transfer of licences to allow for new entries

We can look at the first scenario in two ways. One is to consider the annual effect as licences are transferred to allow for new entries; the other is to consider the longer run situation when all the values are realised and a return on total investment is needed. In looking at the short term change, we have to use a variety of assumptions about turnover of vessels and or people. The sources on the subject are inadequate; the age distribution of vessels is available but one for fishermen is not. Table 10.12 gives the recent figures for the former; they suggest that just under half the fleet in terms of numbers and capacity is under 20 years old with roughly two thirds under 25; vessels over 30 years old tend to disappear from the fleet and an average life of 25 years seems appropriate. This 4% rate of turnover will understate the actual rate as there will be movement of vessels to new ownership due to the other changes affecting labour and capital as fishermen retire and investors disengage.

The problems over definitions of fishermen and their small number nationally makes reliance on the decennial population census figures to derive estimates of length of their working lives inappropriate. The indications are that fishing is an arduous and dangerous occupation; the average time in the industry reflects the balance between those leaving for other occupations and those remaining for all their working lives; it is probably no more than 25 years. The departure of labour and of investment may therefore double the rate of

change. Two figures for turnover (4% and 8%) may be therefore worth considering. It might be argued on the basis of the relatively few new vessels entering the fleet in recent years that the structure will stagnate as the average age increases. Thus the lower rate of turnover may be nearer the mark in the short run, with changing crew and investors being the main influence.

Table 10.12 Ages of UK vessels over 10 metres at end 1995

	Number	(Percent)	VCU	(Percent)
Up to 5	94	3.3	33,372	5.0
6-10	522	18.3	112,641	16.9
11-15	303	10.6	70,089	10.5
16-20	342	12.0	93,628	14.0
21-25	520	18.2	147,517	22.1
25-30	368	12.9	83,978	12.6
31-35	223	7.8	51,118	7.7
Over 35	449	15.7	70,423	10.5
Unknown	34	1.2	4,445	0.7
Total	2,855	100.0	667,211	100.0

Source: UK Sea Fisheries Statistics MAFF.

Tables 8.13-8.15 indicated the financial results for various classes of vessel as well as those for certain high and low performers in the pelagic, trawling and seining sectors. The average figures allowed the estimate given in table 9.12 of the impact of capital charges such as the additional costs due to the value of licences on these vessels. The calculations in the following paragraphs are based on the results from ranking the vessels according to the level of profits and on the associated financial data; table 10.13 shows the range from the worst performers to the best. A straight line relationship, derived from the upper and lower quartiles, is extrapolated to give an estimate of the distribution of performance across the group.

Deduction of a charge for the licence (at a rate of 10%) shows the financial consequences on the cost side. In the initial stages the annual change in ownership results in either 4% or 8% of the licences having to be bought and only this proportion is charged. There are no benefits assumed in the short term. In the longer term, all vessels will have changed hands and the charge will apply to the whole fleet. It is also appropriate to adjust the average earnings in line with the expected larger individual share in the future (as vessels depart) and this shows the benefit.

There are a number of weaknesses in the assumptions underlying the calculations. In particular, the use of averages for the costs of licences and for adjusting the levels of earnings when capacity declines, as well as the reliance on a non-random sample, makes the estimates very rough. This indicates an area needing further and more detailed analysis, as well as considerable improvement in the data.

Table 10.13 Percentage distribution of vessels ranked according to profit

	Group	Profit (£)	Profit plus Crew Share (£)
a. Pelagic	0-10%	-48,868	137,280
	10-20%	-16,948	187,000
	20-30%	14,972	236,720
	30-40%	46,892	286,440
	40-50%	78,812	336,160
	50-60%	110,732	385,880
	60-70%	142,652	435,600
	70-80%	174,572	485,320
	80-90%	206,492	535,040
	90-100%	238,412	584,760
b. Medium trawlers	0-10%	-3,311	74,205
	10-20%	7,939	90,215
	20-30%	19,189	106,225
	30-40%	30,439	122,235
	40-50%	41,689	138,245
	50-60%	52,939	154,255
	60-70%	64,189	170,265
	70-80%	75,439	186,275
	80-90%	86,689	202,285
	90-100%	97,939	218,295
c. Small seiners	0-10%	-21,165	65,258
	10-20%	-10,355	81,738
	20-30%	455	98,218
	30-40%	11,265	114,698
	40-50%	22,075	131,178
	50-60%	32,885	147,658
	60-70%	43,695	164,138
	70-80%	54,505	180,618
	80-90%	65,315	197,098
	90-100%	76,125	213,578

Source: Estimates from SeaFish Survey of Costs and Earnings.

Pelagic vessels

The sample showed a range in profit from -£24,928 in the lower quartile to £214,451 in the upper one and in profit plus crew share from £174,570 to £547,440. Extrapolation of these figures gives the estimates in the table which imply that a positive move of 1% in the distribution (from worst to best) is associated with additions to profit and profits plus crew share of £3,193 and £4,972 respectively. The impact of deducting charges based on a licence worth £2m at 10% is considerable. In the short term, the likelihood is of perhaps 4% or 8% of the licences being transferred each year and entering as annual costs of £200,000. Such transfers generally move licences from the less successful to the more successful but it is assumed that the moves will be spread across the per-

formance groups. Thus each will be subject to additional costs of 4% or 8% of £200,000, adding £8,000 or £16,000 to the loss or deducting it from the profit.

The relevant comparison in the short run is with profit plus crew share. With an average of 10 men involved and an acceptable minimum wage of £20,000 (somewhat below the average recorded in the survey), the estimates indicate that around 19% of the distribution would not meet target crew share with 4% turnover and around 21% with double that rate. These would change to virtually all vessels meeting the target if £10,000 was an acceptable short run wage.

Over the longer run a charge of £200,000 on all vessels (10% of licence value) and an adjustment to earnings resulting from vessels departures seem appropriate. The indications are that a large part of the sector would be at risk. Only the top two groups exceed £200,000 in profit. Against that the average earnings of £821,188 would rise as the quotas were divided among fewer vessels. For example if the least profitable 20% left, the others would each have something over £200,000 in extra returns. This would leave the others in profit after paying the licence charge. Clearly the results are very sensitive to the prices of mackerel and herring. Price increases of around 10%, not a high figure in relation to recent increases for mackerel of many times that amount, would see those vessels under pressure to depart drop to under 15%. Equally a cut in quotas of 10% would offset such a price increase.

Demersal vessels

The samples for trawlers and seiners similarly provided ranges of performance. For medium sized trawlers, profits ranged from £5,126 in the lower quartile to £89,482 in the upper one. The corresponding figures for profit plus crew share were £86,213 and £206,257. Extrapolation of these figures gives the estimates shown in table 10.13 with changes of £1,125 for profit and £1,601 for profit plus crew share associated with a move of 1% in the ranking by performance. For small seiners the ranges were -£13,052 to £67,988 for profit and £77,618 to £201,218 for profit plus crew share. They imply changes of £1,081 and £1,648 respectively associated with a change of 1% in the ranking position.

The main element in the cost of a licence in these sectors is that of the track record, with the value per tonne of entitlement roughly equal to the value of a tonne of fish for species under quota. (The impact of charging for the licence is less in the demersal sector than the pelagic because its cost in relation to earnings is much lower.) If the calculations carried out for the pelagic sample are repeated, the results show the percentage of demersal vessels at risk. The medium sized trawlers would pay perhaps £300,000 for their licences, giving an annual charge of £30,000. In the short run this means an annual charge of £1,200 with a 4% turnover and £2,400 with 8%. If the need is to find wages of £15,000 each for a crew of 6 (total £90,000), over 15% would fall below target with the lower rate of turnover and perhaps 1% more at the higher rate. If wages of £10,000 were acceptable, all vessels would meet the target return, at both rates of turnover.

In the longer run the annual charge would amount to £30,000 and the critical comparison is with profit. The distribution shows roughly one third fall-

ing below this level. As before departures of some of the vessels at risk would improve the fortunes of those remaining. If the least profitable 10% left, the rest would each have additional earnings of around £35,000 and be clearly profitable. The break-even point of removing the loss makers and paying the licence charge looks to be when something like the least profitable 5% leave. As before the calculations are sensitive to assumptions about acceptable wage levels and fish prices. It seems unlikely that price increases like the recent ones for mackerel will occur. What may be more likely in this sector is a reduction in overall quotas which would have substantial negative implications.

Small seiners

The results for the small seiners indicate a similar position to that for medium trawlers. The licence cost would probably be around £200,000. This implies a charge of £20,000, equivalent to £800 and £1,600 at the lower and higher rates of turnover. The impact in the short run in this sector would again be smaller than in the pelagic. With a crew of between 5 and 6 needing £15,000 each (total £82,500), the sample suggests that around 15% would not meet the target return at the lower rate of turnover and slightly more at the higher. As with the medium trawlers an acceptable wage of £10,000 would see all the vessels meet the target return at both rates of turnover in the fleet.

In the longer run, the comparison between the profit levels and the annual cost of a licence at £20,000 shows something over 40% in the distribution falling below the critical level. Again it is necessary to consider the impact of departures on the earnings of the remaining vessels. The departure of the least profitable 10% would add around £35,000 to the average earnings of the remaining vessels. This would remove the loss makers and is the break-even point, unlike the situation with the medium trawlers which moved out of losses with the departure of the worst 5%. The sensitivities to wage rates, fish prices and quota levels apply as with the other sectors.

Assumptions

It should be stressed that two crucial assumptions underly these estimates and they may be flawed. The first is that the samples give a reasonable impression of the industry and the second is that vessels leave the fleet in the long run if they make losses. It may well be that adjustment takes place over a series of periods. The first stage is of vessels remaining as long as some return to crew as wages is forthcoming; the second still discounts the value of fixed investment as long as normal wages are covered; the third only occurs when the fixed investment is exhausted. Compounding the complexity may be expectations concerning the appreciation of the value of licences.

The assumptions under the first scenario did not reflect the value to owners of the licences as well as the implicit costs generated by them. Thus the estimates of vessels at risk may overestimate the likely level of departures, if owners regard licences as appreciating assets.

10.3.2 Scenario 2, annual licence fee

The second scenario is that the Government charges an annual licence fee. It seems certain that pressure to reduce capacity would be even greater under this alternative policy. An annual charge or licence fee of 10% would have a much more severe impact in the short run as it would affect all vessels, not just the small proportion of vessel changing hands in that year. In the longer run it would result in the remaining vessels having to pay a charge that rose in step with their larger share of the landings.

The value of the licence varies with the sector and is relatively small for vessels operating in the shellfish sectors and certain others. Thus the move to charging in relation to the value of landings would produce a differential impact. It would impose heavier burdens in the shellfish sector and increase pressures to leave. It would probably increase the pressure on the demersal sector but not as much. The impact on the pelagic sector would be less as assessment on the value of landings would lead to a smaller cost than a charge based on the very high value of licences in this sector. The eventual outcome for the value of the licence is difficult to predict beyond judging that it will decline but will not vanish unless the demand for entry is lower than the availability of access.

Decommissioning

A further factor needs to be kept in mind. Decommissioning is estimated to have removed something like 6.5% of capacity in three years at a cost of £26.2m since its re-introduction in 1993. It removes the licence as well as the vessel and in effect provides the floor to the market. Its future success in reducing capacity will depend on the values attached to vessels and licences by their owners; these seems to be on an upward trend. This may reflect an idea of what owners are expecting by selling the licence in the future or operating the vessel under better conditions. In any event they are reducing the impact of the decommissioning scheme; the first two tranches took out 4.5% of capacity at a cost of £16.6m while the third took out only 2% for £9.6m; this implies an increase in cost per unit removed of 30%. This upward drift in licence value, partly fuelled by quota hopping and by assumptions about increased earnings and appreciating values, implies ever increasing financial pressures on those wishing to enter the industry or expand. In compensation there may be increased benefits for those wishing to leave the industry.

11. EFFECTIVENESS OF PROPERTY RIGHTS FOR FISHERIES MANAGEMENT POLICIES

11.1 Effectiveness of property rights for the Danish fisheries management policy

11.1.1 Main conclusions regarding the Danish fishery limitations and property rights

- The vessel licence and the recognition as a commercial fisherman are two types of property rights in the Danish fishery which give a general access to the benefit stream from the fishery.
- Apart from these general entitlements, individual rights exist for some fisheries, such as the herring licence.
- Rations, i.e. the right to fish a specified quantity of a certain species in a certain time period, can not be considered as property rights since these permits are issued to all the applicants.
- More individual rights will probably be created in future. Trials with INTQs and assignments of fishing days indicate this and a working group has recommended (May 1993) to introduce ITQs for the main part of the Danish fleet. Moreover, the vessel licence will become valuable when the fish stocks would recover.
- Adverse economic results in the traditional main fisheries have caused, in combination with the decommissioning scheme, a reduction of 20% of the total GRT of the fleet in the period 1986-1992;
- The number of trawlers and Danish seiners decreased relatively more in this period. Attractiveness of the decommissioning scheme has been more important for the reduction of this latter fleet segment, consisting of older vessels, than adverse economic results.
- Fishery restrictions and low prices will probably determine the return on capital of the vessels involved in the human consumption fisheries in the medium term.
- The restrictions on extension of capacity add extra costs, to consider in decisions for investments in new vessels.
- The results of the ITQ model in chapter 10 indicate that the adjustment of the fleet, that has taken place since 1987, is not finished.
- Implementation of an ITQ-system could increase the gross margin of the fleet by about 12%. In case of a comprehensive ITQ-system the gain in gross margin could be up to 70 million DKK per year. It is an open question whether this is enough to cover the expenses of implementing and running such a system.
- The gain of an ITQ-system could be substantial in the long run because of exit of inefficient vessels and of redundant capital.

11.1.2 Property rights in the Danish fishery and the objectives of Common Fisheries Policy

Given the relatively poor quality of the entitlements in the Danish fisheries, the effect of these property rights on the realisation of the goals of the Common Fisheries Policy can be considered as being minor. The goal of the Common Fisheries Policy is (Council regulation no 3760/92):

- To protect and conserve available and accessible living marine resources and to provide a rational and responsible exploitation on a sustainable basis subject to the needs of both the producers and the consumers and the implication for the marine eco-system.

The established Community system is therefore aiming at management of the exploitation activities with the goal to achieve a permanent balance between resources and exploitation. To achieve this goal several Community measures has been implemented (e.g. catch limitations (TACs) and the MAGP).

The main limitation created by the Danish fishery policy has been the introduction of vessel licenses and restrictions on the extension of the capacity of the fleet and the single vessel. This measure together with the decommissioning scheme has contributed successfully to the realisation of the goal of the MAGP for reduction in the overall fishing capacity.

However, because the main stocks exploited by the Danish fleet declined in the period the reduction in the fleet seems not to have had the intentional effect of improving the stocks and the main effect of the reduced fleet has been that fewer vessels are sharing the Danish part of TACs which all things equal gives higher average catches per vessel.

11.1.3 Property rights in the Danish fishery and the national objectives of fisheries management

The national policy can only operate within the framework of the Common Fishery Policy (CFP) and, consequently has to meet the requirements of the CFP, such as the TACs and the MAGP. This leaves very limited room for an independent policy. National policy is more or less reduced to *how* to implement the CFP on the national level.

The purpose of the Danish regulation of fisheries is more or less the same as the goal of the CFP, namely to protect the stocks, secure rational exploitation and balance between capacity and available resources. However, the (explicitly) purpose of the Danish regulation is also to take economic and employment considerations into account both in general and for single regions as well. In the Danish case the overall objective is to ensure a better exploitation of the resources compared to the outcome of a free fishery. A better exploitation is defined in relation to:

- the conservation of the resources;
- efficient, including good seasonal, exploitation;
- the relation between resource and capacity;

- economic and employment considerations in general and in different regions.

These objectives or considerations include both efficiency and social factors as well as resource conservation in the allocative process. In any actual allocation the final outcome is based on a mixture or compromise of these objectives.

The Ministry of Fisheries prepares for every year detailed guidelines for the fisheries based on these goals using a set of different measures. Among the measures to fulfil the national goals are:

- division of the available catch in time periods and areas;
- closure of fishery;
- distribution of the catch for vessel-groups, for single vessels or gear-type;
- maximal fishing time, number of landings and catch per trip;
- permissions or licenses to fisheries.

As shown in chapters 5 and 6 the Danish fisheries are in principle open access fisheries, where exploitation of the resource is regulated by quotas, and/or rations for a given time period (fishery related measures), while the access to the sector as a whole is regulated by vessels licence and authorization of commercial fishermen (fishing sector related measures). The fishery related measures regulate indirectly the access to the resource. This kind of regulation with allocation of the resource (for Denmark the available resources for the most important species are determined as a fix share of the TACs for EU) amongst different fleet segments is more or less political determined. The regulation directly allocates the resource to the fishermen (or group of fishermen).

Acceptance of the allocation mechanism by the fishermen is important, because the process creates winners and losers. The losers might even go bankrupt. An open process is central, because it can ensure compliance. It is also important that the outcome is perceived as equitable and fair. A central element in the Danish regulation has been open access to the different fisheries. Hereby everyone can participate in the different fisheries. By the use of rations available for a limited period the allowable catch is directly allocated to the participating fishermen. This allocation system seems to be perceived by the Danish fishermen as a fair system.

Finally it should be remarked that the representatives of the fishermen's association are member of a committee that provides advice to the Minister of Fisheries on regulation issues.

11.1.4 The possible review of the Common Fisheries Policy related to property rights, the Danish position

The Danish approach to management is not in favour of creating individual property rights which can be subject to trade, i.e. become valuable. The position is to provide a regulation system where better planning of the fishing activities are possible, but without creating exclusivity of fishing rights or access rights to each of the fisheries. This fundamental feature is found in the two

fisheries regulated by yearly individual quotas. It is also possible to participate in these fisheries fishing under a regulation system based on short term rations and the access to these fisheries are consequently not 100% closed.

So far property rights have been created on the sector level. If access to the sector is provided then, in general, the fishermen have open access to the different fisheries and can select an appropriate fishery pattern during the season if some of the Danish quota is available. To secure that the Danish part of the TACs is not overfished the fisheries are regulated by rations of limited duration (1 week to 3 month) and in a few cases by yearly rations.

The effects of the decommissioning scheme and control of capacity is finally showing up in terms of higher average value of catch per vessel, because both the catch level and the price level has been stable/slightly increasing in the last 2-3 years.

Under the review of the CFP the position is to change the current quota management system to an effort or fishing day based system, where each vessel is allocated a certain number of fishing days. For the system to work it is necessary to drop the quotas. Biological information in the effort system is used to adjust the number of fishing days of the vessels. For example, when the fishing level on a species is too high then the number of fishing days allocated is reduced.

The limited access to the sector and control of the existing fishing capacity is crucial for such a system. The future control of the capacity should therefore be based on vessel licenses and control of the capacity of each single fishing vessel. Therefore the system of inserting new capacity only if equal amount of existing capacity is leaving the fleet is necessarily a part of a regulation scheme based on days-at-sea.

Since the consequence is to eliminate the TAC system, allocation of the fishing possibilities to each Member State is based on a fishing power (days-at-sea) of the fleet. It is therefore necessary to implement the system uniformly in the regulation in all the countries of EU or at least for the countries fishing in the same area. One of the problems with the existing CFP is that the benefit of behaving responsible does not fall to the responsible fishermen, because of the different kind of regulation on the national level. By regulating with the same means with the same purpose the potential benefit of regulation could be more clear and understandable.

11.2 Effectiveness of property rights for the Dutch fisheries policy

11.2.1 Main conclusions regarding the Dutch property rights

The main findings and observations from the Dutch part of the previous chapters are:

- The evolution of the regulations shows a dynamic process. Limitations have been transformed into individual rights and these rights have developed from individual quotas (IQs) for sole and plaice (allocated in 1976) towards individual transferable quotas (ITQs) for all quota species.

- The effectiveness of the ITQs has been promoted importantly by supplementary measures such as a HP ceiling, decommission schemes, heavy enforcement, days at sea regulations and co-management by groups of quota holders.
- Every limiting measure has (more or less unintentionally) created a right in the Dutch sea fishery. HP imitations have led to valuable HP-licences, limitations for the coastal zone (EU file registrations) have been transformed into rights to fish in this zone, limitations for shrimp fishery have resulted in two kinds of shrimp permits. All these rights are tradeable.
- Changes in regulations in the period 1993-1996 mainly regarded further individualisation of fishing rights and transfer of management tasks from the ministry ¹⁾ towards the industry, i.e. the co-management groups.
- Investments in high priced ITQs since 1988 indicate that these rights have become a separate production factor, which is, in the perception of the vessel owners, indispensable for the continuity of their enterprise.
- There are similarities between the milk- and the fish quotation with respect to price increases of individual quotas and concentration of production rights. Both sectors have faced problems of ownership succession and (fiscal) solutions for agriculture have been or will be applied to the fishery sector.
- Fishing rights have had important implications for the structure of the cutter fishery. The concentration tendency has been accelerated and investments have shifted from vessels to rights. This has resulted in a kind of freeze of the fleet.
- Lower price levels of rights in other EU countries have stimulated reflagging of Dutch vessels. Money could be generated for reinvestment abroad by selling Dutch ITQs to other Dutch vessel owners.
- Concentration of ITQ ownership in the Dutch cutter fishery in the period 1988-1997 has developed less than concentration of these rights in Iceland and New Zealand.
- Investments of ITQs include 'marginal' quantities and require a pay out period of at least nine years. 'Full' ITQs cannot be made profitable at market prices so that insurmountable barriers exist for newcomers.
- Purchased fishing rights have become important intangible assets on the balance sheet of Dutch fishing enterprises and cause 10-15% extra costs of depreciation and interest.
- The individual rights on the basis of the 1996 flatfish quotas were too low for 50-90 vessels, of which some 30 bigger cutters (17% of the size class >1,100 HP). This number will be more than double on the basis of the 1997 quotas. An important part of these vessels will run into heavy financial troubles on the short term (1-3 years) if the quota situation will not improve in the near future.

1) Ministry of Agriculture, Nature Management and Fisheries.

11.2.2 Property rights in the Dutch fishery and the objectives of the Common Fisheries Policy

The question is whether the system of property rights in the Netherlands has contributed to the realisation of the CFP goals or did this system of individual rights hamper the realisation of these goals?

Four goals of the CFP are considered to answer these questions:

- stock conservation;
- viability of the fishing sector;
- availability of fish for the consumer;
- protection of the environment.

Stock conservation

The annual TACs are the most important measure for stock conservation. Sole, plaice, cod, whiting and herring are the main quota species for the Dutch fishing sector. The individual fishing rights (mainly ITQs) are a mean to distribute the Dutch part of the TACs for these species amongst the vessel-owners. Thus, the system of rights can only indirectly contribute to this CFP goal.

The question is if this distribution system has been adequate to comply with the Dutch part of the TACs.

Three periods can be distinguished in this respect:

- a. the period 1983-1988. Enforcement was inadequate in these years to get a good compliance with the quota. The sole and plaice quotas at that time meant severe limitations but overshooting of them was cheap so that 'the race for fish' continued.
- b. 1988-1990/91. Quota overfishing became more and more expensive due to increasing fines, resulting from heavy enforcement measures. However, individual fishermen still did not have a guarantee that they could take up their full quota. They still feared that fishery would be stopped before the end of the year with a part of their individual quota unused. In particular, the owners of the larger beamers, having an ITQ shortage, persisted in their cheating practices. The 'prisoners' dilemma was still working in this period 1) and the measures were more perceived as fishing limitations than as fishing rights.
- c. 1991/92-1996. Fishermen felt their practices of quota overfishing more and more unsatisfactory, which led to a growing support for the policy of the Dutch Government to make the fishing sector more responsible for the compliance with the quotas. Moreover, the intention of this policy was to get a better price formation through a better distribution of landings throughout the year. After some pressure of the ministry of Agriculture, Nature Management and Fisheries, co-management of the quotas

1) Elaborated more extensively in the thesis (forthcoming) of E.W.J. Hoefnagel, which studies the process towards collective action of Dutch fishermen.

by 'Groups' was implemented in 1993¹⁾. The individual rights were pooled in these Groups (though the ITQ holders remained the 'owners') and the individual fishermen got more certainty about the full uptake of their quotas. Obligated sales via auctions and sanctions of the Board of the Groups resulted in a kind of protection of the individual rights. Hence the rights' side of the quota measures became more important in the early nineties. The important trade in ITQs and the high prices that were paid for sole/plaice ITQs demonstrates this. This also shows that the rights became a separate production factor, apart from the vessel. Referring to the question posed above it can be concluded that the system of individual (output) rights has developed towards an adequate TAC distribution system. The situation in 1996 underline this conclusion since the Groups managed to reduce the fishing effort (days-at-sea) by 15-20% to get compliance with the importantly reduced plaice quota.

As a result of this, the price of plaice rose by 17.5% in 1996, compared with 1995, so that the skipper-owners were 'rewarded' for their good quota management.

The development described above regard individual output rights. Input rights i.e. HP-licences support the compliance with the quotas since an effective fence has been established around the capacity of the vessels. The licences are tradable, which result in rather costly investments in HP rights for vessel owners who want to expand their capacity.

Viability of the fishing sector

Individual tradable quota tend to promote efficiency in the fishery sector, as has been concluded from the experiences in New Zealand, Australia and Iceland (chapters 5 and 6). The question is if this also applies for the Dutch cutter fishery?

There has been some concentration of ITQs in the cutter sector as has been shown in chapter 8.2. This means to some extent an improvement of efficiency, since the tendency has been that the owners of the smallest quotas have left the fishery. The ITQs have been based (partly) on historical performances so that it can be assumed that the least efficient operators have left the fishery. Efficient in this respect in a sense of landing the catches at the lowest costs per kilogramme. However, the developments have been more complicated since:

- a. improvement of efficiency has not been caused by fishing rights alone, but also by decommissioning. Such a measure always tends to lead to efficiency gains for the sector;

1) Described more in detail by E.W.J. Hoefnagel and W. Smit in 'Experiences in Dutch co-management of marine fish resources', OECD-issue paper, Paris (forthcoming).

- b. quota hopping has led to reflagging of vessels that, in a number of cases, were exploited efficiently. This may have led to a more efficient exploitation of foreign quotas.

On the other hand, there are some factors that indicate efficiency gains as a result of individual rights:

1. the share of the sole/plaice ITQs of the bigger vessels in the TAC has increased as a result of ITQ purchases. This means a better utilization of the capacity of these vessels;
2. leasing of quotas became more important after the establishment of the Groups in 1993. This enabled a better utilization of the individual rights;
3. the individualization of the cod/whiting rights in 1994 has led to a better adaptation of the rights to the fishing pattern of the beam trawlers. This results in a more efficient exploitation of the by-catches of those vessels, which otherwise had to be discarded.

Barriers to new entrants could be a negative factor for the viability of the sector. 'New blood' in the fishery could induce efficiency improvements and prevent a kind of attrition. However, in this respect this is not a problem since competition and entry of sons of the skipper-owners lead to a continuous tendency to increase productivity 1).

Finally, it has to be added that efficiency gains may be reduced more or less by higher costs of quota purchases or leases. The financial position of bigger enterprises changed after 1991 as the level of debts increased substantially, amongst other things, as a result of quota investments 2).

Availability of fish for the consumer

There is no direct relationship between the system of fishing rights and the availability of fish for the consumer. The improved compliance with the quota is of importance in this respect. This means in fact a reduced availability of fish and higher prices for the consumer. In the longer run the supply could return at a higher level as a result of successful management of the fish stocks.

Protection of the environment

One type of fishing rights, entry rights to the coastal zone ('EU file I and II') has some relationship with environment protection. Vessels that are entitled to fish in this zone are limited through this file registration. In the same way as for other fishing rights, the right aspect of the limitation has become more important. This meant growing attractiveness of the limited area for outsiders and increase of capacity (up to 221 kW) of those who were already in. The tendency is that more and more vessels with entitlements for the coastal zone

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- 1) The study 'Return on Capital in the European Fishery Industry', Davidse et al., 1996, DG XIV, BIOECO/93/14 p. 78-81 has devoted a section on productivity of beam trawlers.
 - 2) Annual editions 1991-1995 of LEI-DLO 'Fisheries and Figures'.

reach the 221 kW maximum. The result has been a substantial increase of the HP capacity in this zone (by 27.5% in the period 1983-1995, as is shown in chapter 8). This means a shift from engine power used outside to inside the coastal zone. Hence, this rights system for the coastal waters is not discriminatory enough to realize the original objectives for fishing effort in this area.

An interesting aspect of the individualized fishing rights is that the 'Green Movement' could consider to buy rights, e.g. ITQs, to protect the fishstocks more than according to the TACs. However, the problem has to be solved that these rights now may be separated from a fishing vessel only for a limited period.

Finally, it can be stated that tradable individual (pollution) rights are a well-known instrument in the framework of environmental policy. In this respect there is a parallel with ITQs, as has been emphasized by Hoefnagel (1996).

11.2.3 Property rights in the Dutch fishery and the national objectives of fisheries management

Objectives

The Dutch sea fisheries policy is part of the Common Fisheries Policy of the EU. The Government is thereby bound by agreements made within the EU framework. The specific objectives of the Dutch policy in this respect are: to meet the requirements from the EUs conservation policy (TACs) and from the structural policy (MAGPs) 1). Nevertheless, there is some freedom for an own national policy. The general objective of this policy is (Policy Document 'Balanced Fisheries', 1993): 'to promote responsible fishing efforts and a balanced exploitation of fish stocks.' This means:

- a. fishing is promoted as an economic activity;
- b. the management of fishing resources is promoted in such a way that the continued viability of the fisheries sector is ensured;
- c. fishing effort must be harmonized with existing nature values.

The own responsibility of the fishing sector is a basic principle that has, more or less explicitly, driven the Dutch policy in the period 1983-1996 (and also in the seventies). This principle explains why the Dutch Government has issued individual quotas in 1976 to the vessel owners and it was also a driving force behind the striving for co-management of the quotas by groups of right holders (established in 1993). In this respect the Dutch Government has a specific policy which differs from other countries. France and Belgium for instance have a clear policy to maintain the disposition of the quotas on the side of the government and allocation of individual rights is (so far) unthinkable 2).

The specific aims of the Dutch fisheries policy are mostly consistent with

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- 1) Multi-annual Guidance Programmes.
 - 2) Prat J.L. (1996), 'Le droit des pêches maritimes en France face à la propriété des ressources maritimes', Sevilla, September 5, 1996 and Maertens L., Zeevisserijdienst, Oostende (pers. comm. 1996).

the responsibility principle and they contain (in the Policy Document, mentioned before):

- a restricted role to creating the right conditions to ensure the continued viability of the fisheries sector. This approach leaves room for a more flexible TAC- and quota policy, which means multi-annual TACs and the merging of TACs for demersal fish species;
- a quota policy based on safe biological levels (MBAL), which leaves more room to the responsibility of the sector than the so called 'economic fish stock management';
- simplification of the fishery regulations in the longer run. One of the ways to reach this aim is by introducing effort-limiting measures, such as replacing the national quotas with days-at-sea at EU level;
- pressure for a freeze on the total engine capacity for the 12-mile zone and to control the engine power by a torsionmeter.

Effectiveness of the property rights

The objectives mentioned above under points a) and b) are comparable with the objective 'viability of the fishing sector' discussed under the goals of the CFP. This leads to the same conclusions: the growing confidence in the rights has enabled a better quota management, resulting in substantial price increases that have compensated (partially) the losses of catches. Effective enforcement has clearly contributed to this development.

The aim of continued viability under b) refers to the longer term. In this respect there is a lack of effectiveness of the ITQs due to uncertainties regarding future developments of the fish stocks. Fishermen don't have the confidence yet that current limitations will result in much higher quotas in future. In fact, the property rights in fishing are a right to a (very) fluctuating benefit stream. This touches the manageability of the fish stocks. Experiences with TACs and catches for sole, plaice and herring in the period 1983-1996 point out that fish stocks may develop sometimes in an unexpected way. Influences of nature (e.g. severe winters) may affect the catches positively and negatively in a short term. Some biologists (Daan, 1996, p. 11) conclude that the North Sea is an open system and not very well manageable.

These circumstances cause that skipper-owners don't feel that they have, in the long run, a strong interest to limit the catches in view of increases of quota values, as seems to be the case in New Zealand (Major and Wallis, 1996, p. 63). It must be added that these uncertainties limit the significance of any policy instrument.

Also in view of these uncertainties it can be observed that the pooling of the individual rights by the co-management groups has created more inner strength in the sector, which may lead to a favourable position compared with other European countries.

Point c) of the Dutch policy objectives refers to nature values, comparable with the objective 'protection of the environment' of the CFP. Thus the same conclusions apply in this respect 1): Rights to the coastal zone are not precisely defined yet to prevent an increase of the engine capacity there and 2) ITQs

could in principle be bought by environmental organisations to reduce the pressure on the fish stocks more than in accordance with the TACs.

The following comments can be given on the 'specific' aims' of the Dutch fisheries policy:

- more flexible TACs will cause no or hardly any problems on individual quota level. It is very difficult for skipper-owners to land exactly the quantities of sole, plaice and cod that they are entitled to, according to their ITQ. Possibilities to merge quantities of e.g. sole and plaice will meet the interests of the quota holders. This could be a feasible management measure when these transfers remain limited (Salz, et al., 1996, p. 204);
- a quota policy based on safe biological levels could lead to rather high TACs, as long as the relevant stock is above MBAL 1). The Government would expect too much of the responsibility of the industry when she assumes that Groups and individual quota holders will save a part of their quota allocations in view of future gains.
- replacing national quotas by communal days-at-sea would mean a shift from output- towards input rights. This could lead to a dilution of the Dutch ITQ rights, though the value of them could be maintained in another form. Interviews with people from the industry (outcomes described hereafter) have made clear, however, that stability in the regulations is very important for the planning of fishing strategies and for investment decisions.
- a freeze of the capacity in the coastal zone could be realized with existing input rights, i.e. HP-licences. Therefore, it should be stipulated that vessel owners, entitled to fish in the coastal zone, are allowed to increase their engine capacity only when they acquire such licences from other owners with a similar entitlement.

Perceptions of fishing rights amongst vessel owners

Another method to assess the effectiveness of the Dutch fishing rights has been the interviewing of persons in the industry. Thirty one vessel owners were interviewed in the period December 1994-October 1996. Most of these fishers participate in the LEI-DLO costs and earnings investigation. All types of vessels, from small shrimp cutters to big beamers, were involved in this panel and the regional distribution included vessels from northern (23) and from southern (8) ports. The vessel owners have been visited personally and structured interviews were held. The available questionnaire was used as a kind of checklist and was helpful to structure the discussions. Because of this interview method, the sample is rather small (7.5% of the cutter fleet involved). However, the consistency in the answers (table 11.1) allows rather clear conclusions. The questions regarded 2):

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- 1) Minimum Biological Acceptable Level.
 - 2) Firstly, the vessel owners were asked to categorize the answer in 'positive', 'neutral' or 'negative' and in 'yes' or 'no' and then the reasons for this judgement were asked.

- appreciation of the system of individual transferable quota;
- bottlenecks in case of succession of ownership of the firm;
- need for changes of the regulations;
- opinions about the system of co-management groups 1).

Table 11.1 Opinions of Dutch vessel owners on fishing rights

	Number of respondents
1. Appreciation system of ITQs	
positive	25
neutral	3
negative	3
2. Fishing rights bottleneck for succession	
yes	22
no	8
not clear	1
3. Necessary changes in regulations	
yes	14
no	11
no opinion	6

1. Appreciation of the ITQ system. A clear majority of the respondents evaluated the ITQ system as 'positive'. They expressed as reasons:
 - 'you know where you are now';
 - 'more certainty';
 - 'protection against big vessels which are also limited now';
 - 'more tranquility in the sector';
 - 'better planning possibilities';
 - 'a fence around the fleet';
 - 'possibility to get a better finance from the bank on the basis of a quota';
 Negative qualifications included 'bad utilisation of quotas', 'wrong allocation of the rights' (still grievances about distribution of individual quotas in the past) and 'no chances for newcomers'.
2. Rights bottleneck for succession? This is clearly the case according to most of the respondents and they mentioned the following reasons:
 - 'high prices of the sole/plaice quotas';
 - 'fiscal claims';
 - 'firm has debt to family after taking over';

1) Question posed to fourteen vessel owners.

- 'we are condemned to each other' (the experience that the son(s) can no longer start an enterprise for themselves, but have to stay in father's firm);
3. Necessary changes in regulations. In spite of a positive judgement, rather many vessel owners suggested changes in the regulations:
 - 'more certainty in future (allocations)';
 - 'earlier quota allocations' (vessel owners now receive their individual quota allocation by the end of December);
 - 'more limitations for the coastal zone' and for 'shrimp permits';
 - 'better opportunities for newcomers';
 - 'special rules for taking over the firm within the family';
 4. Opinions about the working of the co-management system. This question was posed to a part (14) of the vessel owners. Most of them (13) expressed the qualification 'good' and the explanations therefore were:
 - 'better possibilities for hiring and renting of quota';
 - 'more actions together', e.g. 'buying cod rights from other groups';
 - 'good information on quota uptake from the group Board'.

This brief enquiry to the Group system included ten fishermen from northern ports and three from southern ones. These observations are in line with the perceptions of vessel owners from Urk, as presented in a study on Dutch co-management experiences (nt). These fishermen also expressed a positive attitude towards the group system, whereby the unrestrained possibility to hire or rent quotas was mentioned by all respondents as the most important advantage of group membership.

It has to be kept in mind that most of these interviews were held in a period (1994/95) when the Dutch sole and plaice quotas were not very limiting. Another situation occurred in 1996, when the plaice quota was decreased by 32%. Rather many people in the industry feared in the beginning of that year that the Group system would not hold and that cheating practices of the period 1988-1990/91 would return. However, management by the groups led to compliance with the low plaice quota in 1996 through diminishing of the fishing effort by some 20%.

Interviews with staff members from banks and with accountants were also held in the period 1994-1996. Representatives of four banks were asked for their policy and their opinions regarding:

- ITQs as a security for a loan;
- the value of the right to be considered in case of financing;
- the duration of the right;
- the effectiveness of the ITQ system;
- bottlenecks and disadvantages of the right system.

Available fishing rights, i.e. ITQs are always an important security for a loan. One of the banks treats them as a collateral and takes the market value into account. The other banks combine the rights with the vessel whereby the ITQ has a P.M. value. The rights may lead to a higher finance if the other banking conditions are met.

The banks require a short pay-back period for the security aspect of the right and their time horizon therefore ends by 2002, when the CFP will possibly be reviewed.

The representatives of the banks expressed a positive attitude towards the ITQ- and the Group system. 'The fishery is better manageable now' and has also a greater stability in their views. However, uncertainties through changing rules and 'too much politics' were considered as disadvantages. The bankers stressed the need for more certainty (e.g. with respect to 2002) and more consistency in fisheries policies.

Finally, the two accountants who were interviewed, also expressed a positive attitude towards the ITQ- and the Group system. They mentioned that the systems now have become clear and well established. Flexibility for the firms has improved through hiring and renting of individual quotas. There are still fiscal problems of succession to overcome, though progress has been made so far. An example of this is a limited liability enterprise whereby the ITQs can be estimated against the profitability value, which is lower than the market value of 'marginal' quotas. Gains in case of transfers and thus taxation, can be lower in such cases.

The following main conclusions can be drawn from these interviews:

- Fishing rights, especially ITQs, have evolved towards a rather effective management instrument, allowing a far better compliance with the TACs;
- The Groups have taken up responsibilities for quota management, which has created more support in the industry for limiting measures;
- ITQs and the Groups are 'nested' in the Dutch fishery sector, which means that vested interests have been created;
- These interests mean a need for stability and continuity in regulations;
- The national fisheries management has reduced its efforts of control and enforcement and hence the costs of management.

These conclusions confirm rather well the observations regarding the effectiveness of the rights from the viewpoint of the national objectives of fisheries management.

11.2.4 Possible future developments with respect to the Dutch property rights

The Dutch regime of property rights seems to have developed towards a well balanced system in a period of twenty years, up to 1996. The limitations on capacity and catches had evolved towards individual rights which were rather well accepted in that year. Co-responsibility through the co-management groups was very important therefore.

This section explores possible impacts of future developments on the property rights system.

Succession and transfer of rights

In the UK section on modelling (chapter 10.3) appears that all licences will have a recognised value in the long run, due to the entry of newcomers. This will probably not fully be the case for the Dutch situation, since fiscal allowances enable transfer of the rights at zero value as far as certain family relations are concerned. However, these allowances will not solve all problems of rights transfers so that a part of the rights has to be bought, probably at high prices. It can be expected that price barriers will prevent outsiders from entry to the fishery so that rights will be bought by those who are already in the sector. This means further concentration of rights amongst existing enterprises which will lead to an ongoing process of adaptation of rights to the capacity of the vessel. This does not necessarily lead to a major concentration of rights as is the case in the Icelandic fisheries. The Dutch ITQ concentration level was far below the one in Iceland, in 1996, as has been explained in chapter 6.3. Furthermore, large purchased ITQ quantities cannot generate an adequate profit level because of the high prices for the rights, as has been pointed out in chapter 9.2. But markets are dynamic and this also applies for the future ITQ market. Therefore, the concentration issue will be on the agenda of the future Dutch fishery debate. Dissatisfaction about renting of ITQs by those who are not active (or no more active) in fishing has already arisen 1).

Development of fish stocks

The current (1996/97) low flatfish quota will cause financial troubles for a substantial number of enterprises. Model explorations (Chapter 10.2) indicate that this could lead to a reduction of 12-15% of the 1995 HP capacity on a rather short term (1-3 years). This could be in addition to the departures described above, which result from a more or less autonomous process of barriers for succession.

The past 25 years show rather fluctuating fish stock levels. This could continue in future. There are signals 2) of a recovering plaice- and cod stock, though it is unsure yet whether this will result in substantial higher catches in future. Anyhow, fish stock levels will continue to fluctuate which requires flexibility in property rights systems. The Dutch system seems to have this flexibility as the ITQs are in fact a percentage of the TAC and trade allows a better adaptation to individual circumstances. In case of necessity to leave the fishery an extra proceed can be received from the ITQ, or renting of the right can generate an income. The limited horsepower rights act as a ceiling, preventing extension of capacity.

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- 1) 'Visserijnieuws' of April 18, 1997 reports about this dissatisfaction, expressed during the annual meeting of the Dutch Union of Fishers.
 - 2) The Dutch biological institute RIVO-DLO reports a strong new year class of plaice, on the basis of quantities of zero-year plaice caught, in Visserijnieuws of November 1st, 1996 and the edition of April 18st of this magazine reports big quantities of one year cod, observed during a February 1997 assessment of different institutes.

Development of the fleet

The current aging of the fleet will probably continue in future. Purchases of rights, i.e. ITQs, will require financial means which may partly absorb the reservations (depreciations) for replacement of vessels. Expansion of capacity has become more expensive since additional HP rights have to be bought. This situation of rights and also the capacity limitations abroad will continue to hamper the market for second-handed vessels. Hence, there are no signals that the 'freeze' of the cutter fleet will disappear in the near future. Nevertheless, innovations will be implemented, whereby the quality aspect of fish handling on board is getting more attention.

Possible review of the CFP in 2002

Different scenarios are thinkable now (spring 1997) with respect to a CFP review in 2002. The following intends to consider some possible consequences for the Dutch property rights of each of these scenarios. The choice of these scenarios has been based more or less on 'what's in the air now', i.e. statements from EU side and the views of the UK CFP Review Group 1).

- 1) The CFP will remain broadly the same as the current approach. In that case the time horizon of the Dutch current property rights regime expands. This may create good opportunities to stabilise and to secure the rights more than they are now. Interviews during this study have revealed some uncertainty with respect to the rights because of '2002'. It will be in the interest of the right holders and of other 'players' in the sector like banks, to give the rights more explicitly juridical security. In this respect there might be a development towards the situation in Iceland where 'ITQs are in all major aspects analogous to conventional property rights' 2).
2. Management and control of the fisheries will devolve to a regional grouping, e.g. for the North Sea. The UK CFP Review Group has plead for such an approach. A similar developement would probably be not unfavourable for the Dutch property rights situation. TACs will probably continued to be set and the Dutch rights distribution does not necessarily be changed. The co-management groups seem to form an adequate socio-economic infrastructure to face such a policy change. Complications with respect to the jurisdiction might arise when a specific management organisation would be established.
3. The continuation of the derogation from the 'equal access to a common resource principle' will be considered. A paper of the rapporteur of the Fisheries Committee of the EU Parliament contains such a view 3). This could lead to a developement towards 'free movement of people and

1) 'Fishing News', August 2, 1996, 'Summary and recommendations of the CFP Review Group'.

2) Magnusson, S., (deputy Judge), 'Constitutional property protection and transferable fishing quotas in Iceland', p. 67 in 'Property rights in the fishing industry', Pétursdóttir G., editor, Fisheries Research Institute, Reykjavik, 1997.

3) As reported in 'Fishing News', March 26th, 1997.

goods', a fundamental principle of the Common Market. This scenario is very controversial and will meet heavy resistance, in particular from UKs fishing industry.

The Dutch attitude towards this scenario seems to be rather positive. The Dutch policy (not only in fisheries) has been always in favour of free trade from the circumstances of an open economy. Quota hopping by Dutch fishing enterprises is quite understandable from this position. The Dutch Fishers Union (one of the two national Fishers Organisations) has published a view on '2002' 1), which contains a plea for individual distribution of rights in all EU countries whereby these individual catch rights should be transferable.

The conclusion from this brief exploration of possible scenarios is that the Dutch property rights regime does not contain major bottlenecks in view of eventual changes of the CFP in 2002.

Possible future changes in the Dutch property rights

The Dutch system of rights seems to have arrived, after a period of twenty years, in a phase where no major changes are needed. Aspects to be considered, however, may be:

- Rights for fishing in the coastal zone. A freeze of the HP capacity for the coastal zone could be considered. The Policy Document 'Balanced Fisheries' already contains such an intention 2). Therefore, a shift from fishing entitlements from outside the 12 miles zone to this coastal area could be made impossible.
- Succession of ownership. Not all fiscal allowances for agricultural holdings are applicable yet (April 1997) to fishing enterprises. There should be equality in this respect because of the similarities between property rights in agriculture and in fishing. A Parliamentary vote (in 1994) already foresees such an equality, but this has not led to a relevant regulation so far.
- Barriers for newcomers. High prices of rights prevent newcomers, in particular non-family members of the right holders, to enter the fishery. Specific allowances for outsiders could be considered to remove these barriers. A LEI-DLO study for the dairy sector (Daatselaar et al., 1994) suggests 'skimming of' milk quota in case of transfers, to reserve quantities for newcomers. The outcomes of this study were, however, not very welcomed by the industry, apart from an organisation of young farmers. Beside this, it may be difficult to prevent the use of such allowances, e.g. lower prices, for speculative purposes, when they have been handed out.
- A charge for management costs on the rights, as is the case in the Icelandic and New Zealand fisheries. This would lead to an unbearable taxation

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- 1) 'Vissers regisseren hun toekomst', Lange Termijn Nota Visserij, Nederlandse Vissers Bond, 1996.
 - 2) Policy Document 'Balanced Fisheries', Dutch Ministry of Agriculture, Nature Management and Fisheries, 1992, p. 17.

for many right holders in the current situation of low quotas. Moreover, the industry already bears costs of management through the co-management groups, which monitor the uptake of the quota.

- More emphasis on effort policy in stead of output measures. This could need a translation of ITQs into input rights, as has been suggested by the chairman of the Dutch Fish Commodity Board 1). The advantages of these input rights ('new chances for the Dutch fleet') should be weighed well against important aspects such as: vested interests- stabilisation of regulations and the increasing management attitude of the ITQ holders. Input rights might stimulate again the hunting behaviour of the fishermen.

11.3 Effectiveness of property rights for the UK fisheries management policy

11.3.1 Main conclusions regarding the UK fishery limitations and property rights

- The UK management policy consisted of two strands, both before and after entry to the Community. The first was conservation, which lay wholly within Government hands; the second was structure, which was left to the industry to decide, with the Government providing investment aid and other assistance, such as decommissioning.
- Both the Government and the industry did not originally envisage the creation of private property rights in the sea fisheries. The industry preferred that central authority should control the licensing, from the perception of the market leading to concentration and damage to fishing communities.
- The initial development of property rights related to the vessels. Subsequently, the importance of what the vessel had caught in the past, its track record, in determining its future entitlement resulted in this element being the critical one in determining most of the value of a licence.
- Current discussions about setting fixed quotas (as opposed to the rolling averages of past performance which set track records) indicate continuing problems with property rights. Fixed shares of quotas could mean a move towards ITQs, despite a lack of support for them.
- The markets for rights are neither transparent nor well understood generally. Whether the changes after considering fixed shares of quotas leads to more clearly defined markets or whether POs will dominate in private transactions remains uncertain.

1) Langstraat D.J. 'Een behouden vangst', in the publication 'Met de toekomst in zee', North Sea Directorate of the Ministry of Transport, Public Works and Water Management, 1996.

- Combination of conservation, new technology and structural measures has resulted in both a reduction in capacity and a concentration in entitlements.
- The move of responsibility for improving their property and defending it, from the Government to the individuals, still seems a long way off.

11.3.2 UK property rights and CFP objectives

It is clear on balance that the emergence of property rights in the UK industry is helpful in achieving CFP objectives. These objectives include conservation, structure, socio-economic considerations, markets and external relationships as well as the implicit though unspecified one of minimising the degree of derogation from the principles of the Treaty of Rome.

Property rights, allied to decommissioning and other measures, ensure that the UK fleet is restructured in a way that reduces capacity. This helps to secure EU wide targets directly and by demonstrating equity to other Member States contributes to securing their MAGP compliance. It also results in diminished pressure on the stocks as a smaller but more efficient fleet should be able to target its species and markets more effectively. This has repercussions in terms of incomes with lower costs and better returns raising the level of prosperity. Conservation, with reduced discarding of over-quota catches or unwanted sizes or species, is also assisted. There should also be further environmental benefits from decreased effort.

Early indications of the impact of property rights on concentration and regional implication do not suggest problems of a socio-economic nature. The trend towards reduced numbers of vessels continues but there is little evidence of regional losses. The fishery dependent parts of South West England, Northern Ireland and the North and West of Scotland seem to have maintained their position. It may well be that property rights in fishing have the same effects as in dairying; milk production left the areas where better paying alternatives existed after selling their milk quotas; and track records have to some extent gone to the fishery dependent areas from regions with other available employment.

To the extent that the UK fleet is reduced, so the external negotiations become easier. These relate to shared stocks as with Norway or access to Third Country grounds as with Canada. The related aims in conservation are more easily and demonstrably met.

The implicit aim of minimising the degree of derogation from the principles of the Treaty of Rome is not an aspect specifically mentioned. There must, however, be an underlying belief that, as with other industries and markets, there exists freedom for capital, labour and enterprise to cross national boundaries within the EU. The problems associated with UK property rights in fishing being available for other EU nationals to acquire show the difficulties clearly. In effect property rights and their trade allow the principles of the Treaty to over-ride the derogations (the apparent national ownership of its share of the TACs).

11.3.3 UK property rights and national objectives

The contribution of UK property rights to national objectives is broadly similar to that made to the aims of the CFP. They encourage the industry to do its own re-structuring and improve its efficiency. By so doing, capacity is reduced and conservation and other environmental aspects are enhanced. The degree of regionalisation and concentration that has occurred has not cut across wider interests in regional development and employment. The enhanced role of the POs (resulting from the management of track records) is promising; it holds out some promise that Government may be able to disengage to some extent from detailed regulation of the industry, though heavy enforcement costs remain. As to consumer interests, the improved industrial structure may be expected to serve them well with better quality and possibly lower prices.

The one area where there is a clash is in the sale of entitlement to other EU nationals enabling them to fish against UK quotas. Without the property rights in vessels originally and now in track records as well, there could have been no acquisition of shares of the UK quotas. The previous Government placed a priority on recovering these shares despite the failure of an earlier attempt under the 1988 Merchant Shipping Act to reserve entitlement to UK nationals. It is likely that the current Government will return to the subject. The probability of success seems open to question; the provisions of the Treaty of Rome find an echo in the traditional UK welcome to inward investment even with foreign ownership and repatriation of profit.

11.3.4 Possible CFP review of property rights - UK effects and views

The CFP must be reviewed and its replacement introduced in 2002. There seem to be four possible scenarios for the future. The first and likeliest is that the derogation will still apply and the system will be broadly the same as the current approach. The second is that the 'open access' subject to EU control will come into being. The third and fourth are that ownership, management and control of the fisheries will devolve either to national level or to a wider regional grouping (e.g. the North Sea).

There is little doubt that concerns over conservation make some extension of the current regime the likeliest outcome. Prevention of over-fishing is central to the continued existence of the EU industry. With TACs and their allocation being the basis, the current property rights in track records or fixed quotas provide a basis for further development. Whether such changes lead to ITQs alone or to some underpinning with other rights in capacity, effort or area entitlement remains to be seen. The benefits of having an annual charge on these rights to pay for the enforcement and other costs seem clear both in terms of equity and of encouragement to reduce capacity. What is less certain is whether the whole system will move under the control of the Commission or remain delegated as at present.

The second approach seems more complex. If the system consisted merely of deregulating the EU industry, the ramifications would be extensive. It would be simple to turn the EUs extended economic zone (including territorial waters)

into a common resource for the EU fleet. It would be less easy to deal with wider fisheries and environmental management. If the solution lay in maintaining current EU conservation and external agreements, there would be relatively little change from much of the existing system. Under these circumstances, existing property rights and any developments would be helpful.

The third and fourth alternatives seem departures from the common aims of the EU. There would be sub-areas and sub-fleets to consider. The existence of property rights would facilitate the management but the enforcement of their entitlements might prove more difficult, as the sea areas decreased and the opportunities for cross-boundary activity and misdeclaring increased.

A completely different opportunity might arise if the development of marine science allowed marine fish farming and ranching to be practical propositions. The offshore oil industry provides an example of property rights which are clearly defined and defensible. Similarly marine fish farming in cages or shellfish beds or rafts meet the criteria of clear ownership and defined legal status. It seems unlikely, however, that allocating blocks of sea will prove worthwhile until knowledge exists that a combination of structures, modified light and salinity and the encouragement of other useful environmental developments will allow controlled production.

11.4 Comparison of the property rights systems in Denmark, the Netherlands and the United Kingdom

11.4.1 The nature of the property rights

This study includes three quite different types of property rights systems which makes comparison interesting. The system in Denmark is least developed towards individual property rights. In fact, state property dominates in this fishery sector. The main individual Danish rights are the authorisation as a commercial fisher and the vessel licence. These two kinds of rights give access to the benefit stream that arises from fishing on the quota species. Furthermore, there is (according to the definition of property rights from Bromley, quoted in chapter 5) a 'duty of all others to respect the conditions that protect that stream'. The Danish Government protects the fishing rights by limiting the entry to the fishery so that the two main rights meet this definition of property rights.

On the other hand, the study includes the property rights system in the Dutch near water fishery, characterized by individual tradable rights for all the quota species and also for the (HP) capacity. These individual rights are the kind of property rights promoted by Christy (1996) and they are, as he states, '...the nuclei of larger sole-ownership corporations or collectives'. Co-management groups are these collectives in the Dutch situation. This system seems to be well balanced now, after twenty years of development. It has come under heavy pressure in 1996, because of low flatfish quota. The experiences in that year have pointed out, however, that the system can withstand such a pressure.

The British property rights system can be situated between these two systems. The rights (licences, track records and vessel capacity units) are, in principle, connected with the vessel. However, they can be identified separately by selling vessels and disconnecting the right from the vessels. As such, they may have a substantial value in themselves. The system is still developing and may be at a cross point, whereby one direction is ITQs and another one communal property rights (Goodlad, 1996). The latter option would mean a kind of common property by the POs.

Figure 11.1 gives a survey of the property rights systems in the three countries. It also shows how they originate from the setting of TACs and the implementation of MAGPs. The key point is that limiting measures may have two sides: a limiting one and a property one. However, not every limiting measure creates a right. Technical measures like mesh size rules impose limitations but don't create rights.

What does the limitation transform into a (property) right? That is the element of exclusivity. Mesh size rules do not create rights since they are not exclusive but apply to everyone who has the right to fish. The same applies to limitations for the coastal zone, e.g. only accessible for vessels of 300 HP or less. They do not create property rights when everybody having such a vessel is allowed to fish there. Only when certain persons or vessels are entitled to fish in the zone a property right is created in the sense of Bromley's definition. Therefore, the Danish monthly 'rations' for instance are not property rights since every fisher with a licensed vessel can apply for them. The OECD study on fisheries management 1) identifies them as 'trip limits: '... it is unclear that they function as individual quotas and they will be analyzed as trip limits with limited licence' (p. 75). These rights can better be considered as use rights in the context of this property rights study. Modifying Bromley's definition, an use right can be defined in this respect as: a right to a benefit stream that is owned, not by the user, but by another person or by an institution.

Figures 11.2 and 11.3 compare the nature of the input and of the output rights in Denmark, the Netherlands and the United Kingdom.

1) 'Synthesis report for the study on the economic aspects of the management of marine living resources', Paris, 1996 (forthcoming).

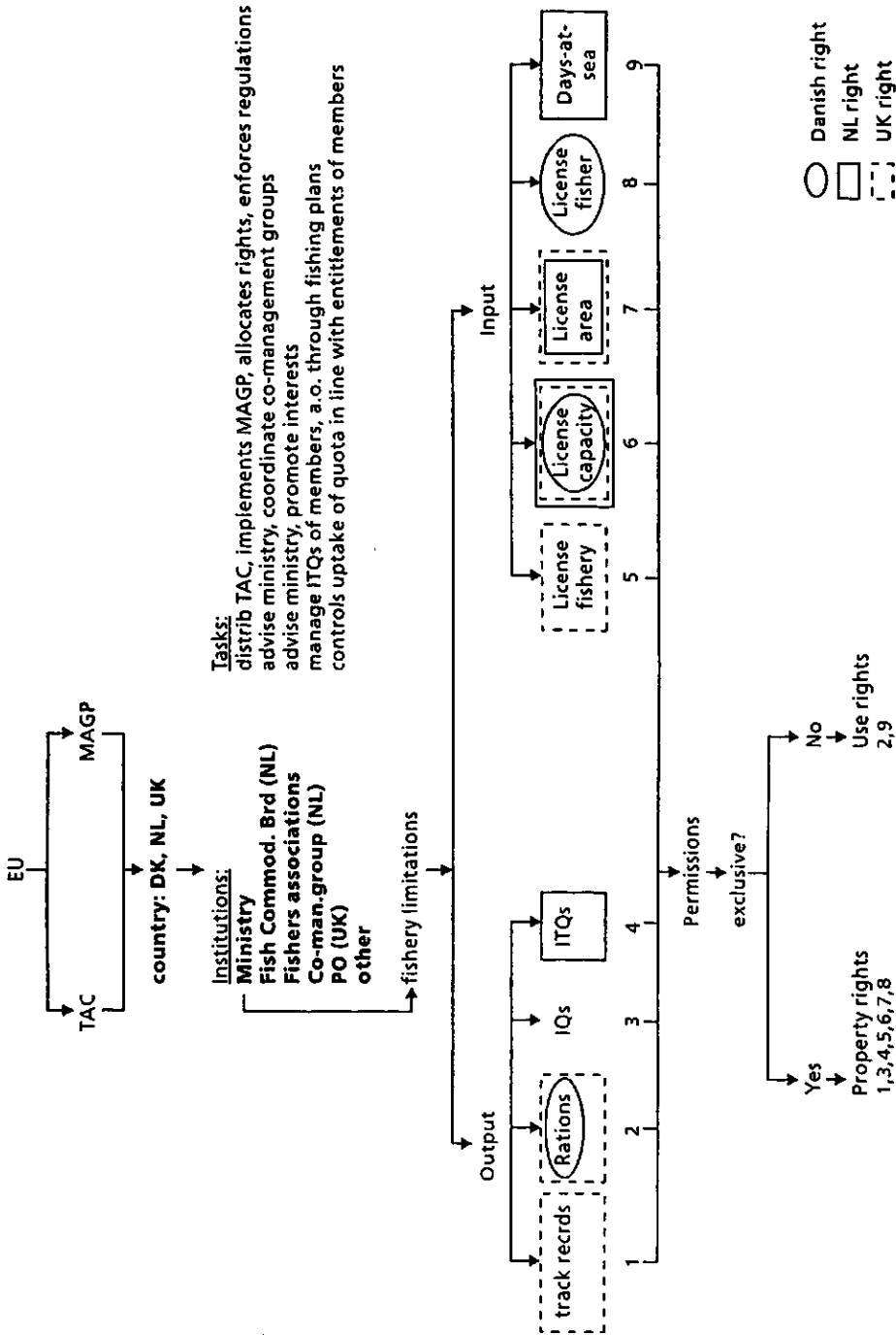


Figure 11.1 Survey of fishing rights in Denmark, the Netherlands and the United Kingdom in 1996

Right	Vessel licence	Horsepower licence	Capacity (VCU) licence
Country	Denmark	The Netherlands	The United Kingdom
Exclusivity	New licences issued to a limited extent	Allocated to certain vessels, no new licences	Allocated to certain vessels. No new licences, reductions secured on entry of replacement vess.
Quality of title	To insert specified vessel into the Danish fishery	To fish on quota species with maximum, specified horsepower	To fish on certain species, subject to track record
Transferability	Not transferable, only when the vessel is sold	Transferable separate from vessel	Usually transferred with vessel, but may be separated
Divisibility	Not divisible, aggregation allowed	Can be divided and aggregated	Can be divided and aggregated
Duration	Indefinite	Unlimited if linked to vessel, 6 months for free licenses	For the lifetime of the current regulation
Flexibility	Limited flexibility	Flexible, all quota species may be fished, no gear limit.	Vessel can be used in any fishery where track record allows and other regulations such as gear or seasonal bans permit

Figure 11.2 Characteristics of the main fishing **input** right in Denmark, the Netherlands and the United Kingdom a)

a) The characteristics in the 'star' of Anthony D. Scott, included in chapter 5 of this study.

Right	Ration	Individual Transferable Quota	Track Record
Country	Denmark	the Netherlands	the United Kingdom
Exclusivity	Not exclusive	Quantity exclusively allocated to vessel owner	High degree, entitlement allocated to vessel owner, subject to performance over the years
Quality of title	To catch a given quantity of fish in the period of ration	To fish quantity to maximum in certain year	Entitled to fish quantity to maximum in certain year
Transferability	Not transferable	Transferable separate from vessel	Transferable separate from vessel
Divisibility	Not divisible	Can be divided and aggregated	Can be divided and aggregated
Duration	Period of ration	Annual allocation of quantity, period of right only limited for ITQs free from vessel: two years	Permanent unless or until legislation changes
Flexibility	Ration is defined for certain area	Only limitation: no sales of ITQ-parts to non-holders. Rent/lease of ITQs allowed	Specific to species but flexible in use and disposal

Figure 11.3 Characteristics of the main fishing **output** right in Denmark, the Netherlands and the United Kingdom a)

a) The characteristics in the 'star' of Anthony D. Scott, included in chapter 5 of this study.

11.4.2 Factors influencing property rights regimes

Comparison of different property rights systems could raise the question: which is the best system? F.T. Christy has a rather clear answer to this question. In his paper to the 8th Biennial Conference of the Institute of Fisheries Economics and Trade 1) he states in this respect: 'The transition to property rights regimes in fisheries is occurring with a speed which, I think, is not fully appreciated. The process is inexorable' (p. 3). The command and control system of fisheries management is a paradigm lost in his view and property rights regimes represent the paradigm gained. In this respect he quotes Hannesson (in press, 1996): 'The state would become redundant as a management authority and its

1) 'Paradigms lost: the death rattle of open access and the advent of property rights regimes in fisheries', Francis T.Christy, prepared for the 8th Biennial Conference of the Institute of Fisheries Economics and Trade, Marrakesh, Morocco, 1-4 July 1996.

only role would be the ultimate upholding of the rule of law and the honoring of contracts'.

From this point of view the Danish command and control system is more or less obsolete and would or should move to the Dutch regime of property rights. This regime meets rather well the 'new paradigm' of Christy since ITQs have been established for all quota species, managed by user groups and the Government aims to reduce its role. However, the views expressed in Christy's paper can be criticized by arguing that property rights systems cannot be considered in itself. There are several influencing factors which explain why the regulations are as they are:

- the policy of the Government, that may not be in favour of individual property rights, as is the case in Denmark and also in countries like France and in Belgium. Policy makers may have the opinion that they lose too much control over the fishery when they allocate rights to individuals or organisations;
- the attitude of the fishermen, e.g. they may opposed against individual property rights because they fear concentration of rights amongst bigger enterprises;
- the fleet structure and the fishery, which may be more or less suited for the implementation of property rights such as ITQs. In this respect the rather homogeneous Dutch beam trawl fleet is less complicated than the more diversified British and Danish fishery;
- the situation of the fish stocks, e.g. a stock in danger that needs a severe reduction in TACs, compared with the open access circumstances, may have other consequences for limiting measures and rights than 'healthy' fish stocks.
- costs of enforcement, which can be high in case of individual rights, since defending the rights can lead to extra litigation accomodated in the courts.

Influences

Effects

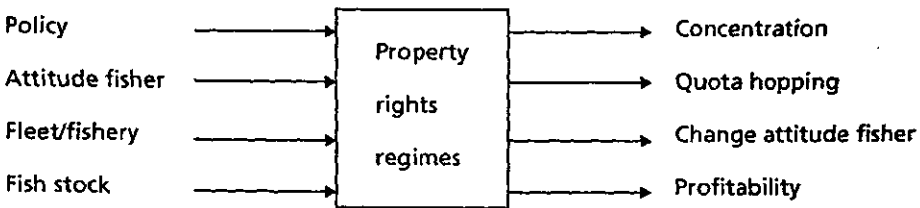


Figure 11.4 Selected influences on and effects of property rights in the fishing industry

Hence, property right regimes are to a certain extent dependant variables. On the other hand they may induce new developments when they have been implemented. Examples are quota hopping and concentration tendencies that have been accelerated because of trade in rights. Figure 11.4 intends to illustrate that property rights regimes cannot be considered in isolation but rather as a part of a comprehensive policy.

Although property rights regimes have to be considered in their 'environment' it is useful to consider them from a number of criteria. This has been done in the schemes in figures 11.5 and 11.6. The first three and the last two criteria reflect the CFP objectives. The other criteria have been derived from Bohm P. and C.S. Russel (1995) 1 ('information intensity', 'flexibility' and 'political considerations') and from the Australian contribution to the OECD study (see note in 11.4.1) on management techniques in fisheries ('management costs' and 'income distribution effects').

The three types of licences in Denmark, the Netherlands and the United Kingdom do not show major differences in possibilities to meet the CFP objectives, to promote the viability, in the level of acceptance and in management costs. The Dutch and UK licence seem to be more flexible because of the transferability and the UK one appears to be somewhat more rigid since penalties on replacement are included.

The output rights show some similarities between the Dutch ITQ and the UK track record, whereby the first one seems to be a more clear individual right than the track record. The POs play a more important role in allocating the quantities to be fished than the Dutch management groups. In the latter case, the ITQs are decisive, whereby the groups act as an intermediate for leasing and renting of ITQs.

Comparing the ITQs and the track records with the Danish rations, it appears that extra incentives to leave the fishery result from the two first kinds of rights since they will provide an extra proceed in that case.

The criteria 'viability' reveals another difference between the Danish rations on the one hand and the Dutch and UK output rights on the other as the rations secure a certain income distribution whereas the ITQs and the track records bring more dynamics in the sector and may cause some concentration by trade of the rights.

Finally, it seems that the UK property rights regime is still developing whereas the Dutch system looks more stabilised in 1996.

Again, this comparison of property rights system does not allow conclusions on 'what is the best system'. Rather, it shows that such systems are dependant variables to some extent, as has been pointed out in the beginning of this section.

Property rights systems are not only dependant variables. As figure 11.4 illustrates, they may induce developements from the moment that they have

1) Alternative policy instruments, chapter 10 in Handbook of Natural Resource and Energy Economics, Vol. 1, edited by A.V. Kneese and J.L. Sweeney. Elsevier Science Publishers.

Right	Vessel licence	Horsepower licence	Capacity (VCU) licence
Country	Denmark	The Netherlands	The United Kingdom
Ability to meet conservation objectives	Prevents expansion of capacity after profitable years as happened under 'open access'. Eases pressure on stocks	Prevents expansion of capacity after profitable years as happened under 'open access'. Eases pressure on stocks	Prevents expansion of capacity and causes decrease due to penalties on bringing in replacement vessels. Eases pressure on stocks
Ability to meet MAGP objectives	Withdrawal of licenses by decommissioning. The extent will depend on profitability	Withdrawal of licences by decommissioning. The extent will depend on profitability	Penalties on replacement and decommissioning are facilitated by the system and help secure the objectives. The extent will depend on profits in new vessels and losses causing others to depart
Protection of the environment	Protection improved as capacity controlled and reduced	Protection improved as capacity controlled and reduced	Protection improved as capacity controlled and reduced
Management costs - monit./enforcement - information intensity	Registration of each vessel and its characteristics. Control of each vessel's capacity	Costs of technical controls, complications defining nr. of HPs, registration of fleet and license transfers	Costs are not substantial as technical details necessary for registration. Problems remain with measurement and attempts to design rule beaters
Flexibility in face of econ./biolog. change	More difficult to adjust the technology of the vessels, because of investment limitations	Transferability promotes flexibility, exits apart from decommissioning stimulated by proceeds of rights. Days at sea regulation leads to extra flexibility, as effort may increase without change in capacity	Changes in economic or biological aspects can be handled more easily due to capacity control, unless the changes are so great as to call for much greater reduction, or less probably some expansion, in response to the new environment

Right	Vessel licence	Horsepower licence	Capacity (VCU) licence
Country	Denmark	The Netherlands	The United Kingdom
Political considerations - stabilization - support industry	Well developed. Industry used to licence and accept it	Well developed, no major changes since 1988, industry used to licence, accepted as a right	Mixed responses from government, society and the industry. Some preference for deregulation and some uneasiness at the value now residing in licences is more than offset by acceptance of a system by the industry and others. It is familiar and seen by most as offering some check to over-fishing
Viability of the fishing sector - efficiency - dynamic incentives - income distribution	Prevents short term rent dissipation or arising of high losses by expansion. Long run rent can dissipate since non-constrained inputs are maximized.	Prevents rent dissipation or arising of high losses by expansion, transfers promote efficiency though extra costs incurred, non-constrained inputs are maximized, concentration tendency	Improves fishing industry by preventing increase in capacity and by facilitating decrease. Allows more effective technology but favours those already in the business at the expense of new entrants
Availability of fish for consumer Market oriented	No restrictions for marketing, apart from TAC and fish stock situation	No restrictions for marketing, apart from TAC and fish stock situation	Neutral of new entrants

Figure 11.5 Evaluation of the main fishing input right in Denmark, the Netherlands and the United Kingdom

Right	Ration	Individual Transferable Quota	Track record
Country	Denmark	The Netherlands	The United Kingdom
Ability to meet conservation objectives	TACs directly allocated to vessels/fleets. Fishery closed when TAC has been taken up	depends on TAC, which is directly translated into ITQs, better compliance through co-management	Directly linked to TAC. PO can manage and discipline members to secure compliance.
Ability to meet MAGP objectives	No separate effect	Trade results in vessels leaving due to small ITQs	Trade results in vessels leaving due to small entitlements or to penalties on aggregating when replacement vessels introduced
Protection of the environment	No separate effect	Depends on TAC level, possibility buying of ITQs by environmental groups (?)	Reduced capacity allies to targeting of TR species prevents incidental damage to stocks
Management costs - monit./enforcement - information intensity	Rather high management costs through control of landings	Rather high management costs through control of landings, register of trade/lease of ITQs, much info. needed for co-management groups	Some costs reduced through PO discipline and others increased due to need for more detailed records. Mainly neutral as TAC and other enforcement needed in any event
Flexibility in face of econ./biolog. change	Size of ration follows biological change, if TAC changes	Flexible through trade/lease, ITQs follow TAC as a fixed share	The ability to divide and aggregate TR's through trade or PO management allows this
Political consideration - stabilization - support industry	Since TACs for main species are/have been low, the ration system lacks support from the industry	Stabilized since 1990/91, supported, but dissatisfaction with TAC reductions in 1996/97	Some uneasiness within the industry, society and Government due to traditional belief in universal right to fish in the sea and dislike of possible concentration and monopoly. Accepted as best way of dividing up entitlement but better ways still sought. (Current discussions focus on replacing rolling average TR's by fixed quotas)

Right	Ration	Individual Transferable Quota	Track record
Country Viability of the fishing sector - efficiency - dynamic incentives - income distribution	Denmark Rations secure certain income distribution, but do not promote efficiency because of open access to the single fisheries	The Netherlands Efficiency gains through trade/ lease of ITQs, dynamic by acquiring extra (foreign) rights, concentration tendency	The United Kingdom Help to improve efficiency at firm level with better match of capacity and entitlement through trade. Also encourage exits and increases average returns for those remaining. May result in regional losses (and national to other EU) due to trade concentrating TR ownership
Availability of fish consumer Market oriented	Depends of the level of TAC	Depends on TAC, marketing improved through fishing plans, co-management	Individual and PO ownership of TR's for various species allow better timing and presentation. If trade allows better technology and less capacity pressing on the stocks, supplies may be augmented and prices to consumer held stable or reduced

Figure 11.6 Evaluation of the main fishing **output** right in Denmark, the Netherlands and the United Kingdom

	State property	State/Common/ Private property	Private property	Full private property
	main feature of Danish PR regime	combination in British PR regime	dominates in Dutch PR regime	in theory, advocated by Christy, Hannesson a)
TAC	set by EU Council of ministers	set by EU Council of ministers	set by EU Council of ministers	set by holders of Territorial- or Stock User Rights (TURFs or SURFs) b)
Distribution of TAC	ministry allocates Danish part through rations per time period	ministry allocates main UK part to Pos, which distribute further to vessels	ministry allocates Dutch part to individual ITQ holders	right holders have taken over functions of Government and distribute TAC through e.g. ITQs
Monitoring of landings/ Enforcement	ministry of Agriculture and Fisheries	ministry of Agriculture, Fisheries and Food/POs	ministry of Agriculture, Nature Management and Fisheries/Co-Management Groups	right holders

Figure 11.7 Property rights regimes on a 'scale' from state towards private property

a) Christy F.T., 'Paradigm lost: The death rattle of open access and the advent of property rights regimes in fisheries', 8th Biennial Conference of the Institute of Fisheries Economics and Trade, Morocco, 1-4 July 1996. Hannesson R., 'Rights based fishing: The role of property rights in fisheries management', ICES, St. Johns, New Foundland, 1994; b) Christy's approach not only includes private (individual) rights but also communal property.

been implemented. The structure of the industry in the three countries has been influenced more or less by the rights (chapter 8), quota hopping has arisen and the attitude of a number Dutch fishermen is changing from a pure hunter towards a calculating quota manager.

Property rights may provide another view on fisheries management. The scheme in figure 11.7 intends to consider fisheries management from this viewpoint, whereby different property rights regimes are classified on a 'scale' from state towards private property. This might lead to a better understanding of the importance of an adequate rights definition for an effective fisheries management.

11.5 Lessons from other countries

11.5.1 Fishing rights in Iceland

Contents of the right	: To land a maximum quantity in a certain year of 11 species (cod, haddock, saithe, redfish, Greenland halibut, plaice, herring, capelin, shrimp, lobster and scallops), based on a fixed share of the TAC, ITQ on each of the species.
Fisheries involved	: All the fisheries within the exclusive 200 miles fishing zone of Iceland. The system of ITQs account for over 95% of the total volume of the fisheries. The remainder of the catch appears only as by-catch.
Objective	: Allocation of the TAC to individual vessels to improve the economics of the fishing industry and to conserve the fish stocks.
Duration of the right	: the shares are permanent
Transferable	: Yes, but subject to certain restrictions on the leasing of annual quotas.
Accomp. measures	: Fishing vessel license and different technical measures
Effects on structure	: In the pelagic fisheries, herring and capelin, the ITQ system has produced an substantial increase in economic efficiency. In the herring fishery the catch per unit effort increased by a factor of five in the period 1980-1993, while the biomass increased by a factor 2-3. In the capelin fishery both the total tonnage of the fleet and the fishing effort fell by about 25%. In the demersal fisheries the experience is more mixed, because the ITQ system has been operating together with an effort based system and because the TAC for cod (the main species) consequently has been set too high. High quota prices can, however, indicate that the system is generating substantial rents.

Since the fishing effort and capacity has been reduced in the period, mainly through exit of minor vessels, the number of firms and quota holders have decreased during the period, leading to some concentration of the fishing rights.

The system seems not to have had an adverse impact on the regional habitation.

Policy effectiveness : The ITQ system has increased the economic efficiency of the fishing industry. The problems have mainly been about the equity aspects of the ITQ system and the latest changes in the system have had the objective to limit the transferability of the annual quotas in order to reduce the speculative element of quota holdings.

11.5.2 Fishing rights in Norway

Contents of the right : Fishing and vessel licenses and vessel quotas. The offshore fisheries are regulated by vessels licenses and in many cases also by individual yearly quotas. The coastal fisheries for cod is regulated by vessel quotas.

Fisheries involved : About 80% of the Norwegian fishery in value are regulated by some sort of license limitation or vessel quotas.

Objective : To prevent further increase of the fishing effort and to increase economic efficiency and maintain settlement and employment in outlying districts.

Duration of the right : The vessel licenses are permanent, while the vessel quotas are annual

Transferable : No, but in practice the rights follow the vessel

Accomp. measures : Different technical measures and a scrapping programme

Effects on structure : The number of full-time vessel over 13 meter has been relatively constant from 1980, while the number of part-time vessels has declined. Vessels under 13m have declined in the number in this period and the coastal fleet has declined by 6% in the period 1990-95.

There has been in the 80s a relatively large reduction in the fleet from the northern part of Norway because of poor resource conditions in the Barents Sea (mainly cod). The introduction of vessel quotas in 1990 has therefore frozen this reduction and redistribution of fleet.

Policy effectiveness : The biological effects of the regulation seem to have been quite good, especially since the late 80s.

The main problem of the system has been the lack of adjustments *in the fleet*, because of the overcapacity at the time of implementation of the system. Merging of vessel quotas and licenses are allowed, if vessels are withdrawn permanently from fishing. The principle of non-transferability of the rights will be maintained.

11.5.3 Fishing rights in Canada

The size and variety of the Canadian fisheries, as well as their importance to the national economy, have meant that most of the problems as well as possible solutions have been encountered there. The principal lessons to be learned from these experiences number three.

1. The first is the inventiveness of the industry in reaction to regulations;
2. the second is the need for and high cost of effective enforcement;
3. the third is the benefit that can be realised from successful policies.

Inventiveness

The inventiveness of the industry in devising ways to get round regulations is hardly surprising in a competitive situation. Many of the measures, whether in terms of licensing vessels, imposing gear or area bans and allocating quotas to different sectors, added only to costs; they did not take away the incentives to 'race to fish'. Advantage still accrued to whoever got the most. Thus 'capital stuffing' and other attempts to maintain a competitive edge were conspicuous. The difficulties resulting ranged from unemployment at all levels in the industry, waste and inefficiency through over investment and failure to meet consumer demand adequately.

Cost of enforcement

The need for regulations (and the ways in which they were avoided) made compliance a major issue. With conservation needs pulling one way and short term catching necessities pulling another, compliance was neither automatic nor easily obtained. Enforcement costs in aerial surveillance, sea patrols and inspections, as well as land based investigations were very high. When these costs and the limited success of the various conservation measures were considered, the benefits seemed slight. A change in policy to accommodate the peculiar nature of the industry was recognised as needed and duly introduced.

Policy effectiveness

The introduction of Enterprise Allocations in the Atlantic groundfish fisheries in 1982 took account of the economic dimensions of the problems and their solution. The individual allocations of quota to the large companies concerned removed the incentive to race. Improvements occurred not just in the reduction of catching costs for the companies but in the processing sector, with less seasonal unemployment, and in markets, with better quality. For the companies control over the resource stretched the season and allowed reduction

in the number of vessels as well as better utilisation of the factories. For those working on the processing side, lay-offs were less frequent and employment more secure. As to the marketing side, catching and processing to order provided more of what the consumer demanded.

The extension of this system into a more general one of ITQs on the East Coast showed the importance of fitting the policy to the situation. Benefits were realised in reducing over-investment, extending the catching seasons and reducing market gluts. Problems did, however, arise. Arguments arose over initial allocations as did worries about transferability and concentration of ownership. Enforcement costs increased in some sectors but fell in others where the previous monitoring system had been complicated by the co-existence of differing management regimes.

The Canadian experience shows that the benefits of allocating quotas to the industry are considerable in theory and realised in practice. There is a reduction in over-investment in catching and processing; seasons are extended with benefits in more stable employment and better meeting of consumer demand; and excessive political lobbying is reduced. These naturally contribute considerable economic benefits. The offsetting costs lie in securing compliance and these vary according to the sectoral features.

11.5.4 Fishing rights in the United States

As with Canada, the historical situation in the United States provided an industry with competitive enterprise co-existing with a need for conservation as well as local and sectoral interests concerned with employment and incomes. The lessons to be learned relate to the swift moving nature of the industry; its ability to turn the opportunities of the late 70s (when extended limits brought additional resources) into the problems of subsequent decades was remarkable.

Some of the examples from the United States, such as the one from Wisconsin relating to Lake Superior trout (chapter 6), show the need to keep costs and benefits in balance. While the programme reduced numbers and operating costs while improving market returns, the enforcement costs were very high. They even included a 'sting' operation to catch and imprison those illegally catching and marketing the trout.

Perhaps the most significant lesson to be learned is how extreme the degree of 'capital stuffing' can be. The Pacific Halibut fishery saw its length of season go from 56 days in 1981, through 12 in 1987 and 2 in 1989, to less than half a day in 1993. Increase in vessel numbers and sizes explained this development. Similar problems of over-investment affect other Pacific fisheries such as salmon.

The East coast provides a contrasting example in the Atlantic Surfclam fishery. The introduction of an ITQ programme in 1990 led to a substantial drop in the number of vessels from 128 to 59. This improved productivity and efficiency. Against these improvements must be set a reduction in local employment (possibly transferred to other sectors) and a high degree of concentration in ownership of ITQs. In the first two years the numbers of owners declined from 67 to 50 and the share of the three largest rose from 51.3% to 58.1%.

The relevance of appropriate legislation in allocating quotas is underlined in the Magnuson Act which generally reserves ownership of sea fisheries to the Federal government. This indicates that resources may only be expropriated for the period of the specific programmes introduced. Thus the various ITQs, though bought and sold freely, do not have the duration and quality of title of a permanent property right.

11.5.5 Fishing rights in New Zealand

Contents of the right	: To harvest a specified percentage of the TAC from a stock in a given Quota Management Area
Fishery involved	: Most commercial fisheries (32 species), representing appr. 80% of the commercial catch from the New Zealand Economic Zone.
Objective	: To ensure sustainable harvests and an efficient fishery
Duration of the right	: Perpetual
Transferable	: Yes, high level of transfers, three times the amount issued since 1986.
Accomp. measures	: Flexibilities in taking up ITQs, e.g. to solve by-catch problems. Surrender overcaught fish to Government. Maximum percentages for individual ITQ ownership (35% in case of deepwater species). Mesh size rules, closed seasons. Permits for non-quota species.
Effects on structure	: Change in quota ownership, in that processors have acquired ITQs. Concentration of ITQ ownership: three largest consortiums owned 50% of the quota in 1992. Increased significance of the fishery in terms of production value (rise of 80% nominally in the period 1986-1995) and of employment (rise of 38% in this period).
Policy effectiveness	: Fish stocks were in a rather good shape in 1995, only 8.7% of the 149 stocks were estimated below MSY level. High capital value of ITQs created (1 bln ECU). Vested interests of the fishers in stock recovery. Rationalization of the inshore fleet. Rather high costs of enforcement (some 100 fisheries officers). Two-thirds of management and research costs are recovered from the industry. Expensive court cases. The system has become complex. The government has redefined its role: responsibility for a sustainable use of the fish resources, whereby the fishers may be more involved in managing the fishery.

The New Zealand experiences learn that fish stocks can be brought in a rather healthy state by a property rights regime in the form of ITQs. However,

the system concerns sole ownership of an Economic zone by one country, which is less complicated than in the EU fisheries management situation.

Recovering management costs as in the NZ fishery could be considered also in EU fishing nations. The current low EU TACs, however, will leave hardly any or no room for such costs coverage.

Fishers in New Zealand have vested interests in the fish stocks since a stock recovery increases the value of their quotas (Major and Wallis 1996, p.65). This would also be a positive factor for the EU fisheries management. It seems, however, that uncertainties with respect to fish stocks in EU waters are too high to rely on good returns when fishers invest in stocks by effort reductions.

The level of ITQ trade is much higher than in the Dutch situation (shown in chapter 6) and indicates that there are incentives for improvement of efficiency.

The New Zealand system also learns that there is a nearly continuous need for adaptations. The major concentration of ITQ ownership may meet objections when the New Zealand system is considered as an example for implementation in other countries.

An interesting feature is the development towards co-management by the fishers which seems to be somewhat parallel with the development of the Dutch ITQ system.

From a social point of view there seem to be some disadvantages. Duncan, (Fishfolk message on Internet, 7 March 1996) describes the impact of ITQs in the northern part of New Zealand. He observes a major decline in direct employment in the fisheries in this region (Northland). Local perceptions of the impact of the ITQ system seem to be quite negative. Fishermen feel a 'lot of pressure to sell their quota to the larger companies'. Reduced profits from leasing quota 'increases the incentive to high grade'. Furthermore, 'there was certainly good anecdotal evidence that the informal economy was thriving' (a black market was mentioned). This is only an observation in one region and such circumstances might be of minor importance in the whole situation of the New Zealand ITQ regime. Nevertheless it illustrates that (social) disadvantages of ITQ systems, which are feared for instant in the Danish and in parts of the UK fisheries, occur in practice.

11.5.6 Fishing rights in Australia

Contents of the right	: To harvest a specified percentage of the TAC for the relevant species or to participate in the fishery with a specified capacity.
Fishery involved	: Southern bluefin tuna, South-east fishery (ITQs) and input rights ('Class A' and 'Class B' units) for the Northern prawn fishery
Objective	: To conserve the stocks and to improve the economic performance of the fleets.
Duration of the right	: Perpetual.
Transferable	: Yes.
Accomp. measures	: Licenses, restrictions for owning quota (South-east).

- Effects on structure : Concentration of ITQ ownership: 5% of the quota holders held 62% of the southern bluefin tuna quota in 1992/93. Gains in resource rents. Reduction of fishing capacity, the lowest in the south east fishery.
- Policy effectiveness : Improvement of efficiency. Rather high costs of surveillance and compliance, but most of the costs are fully recovered by the industry. It is not sure whether the conservation objectives (for the tuna and for the south-east fishery) has been met. Important reduction in boat capacity. Effectiveness for the south-east ITQ scheme not very clear because of multi-species character, multiple jurisdiction and inadequately defined user rights.

An important lesson from the Australian experience is that input controls (in force before the ITQ regime) may not work well. The fishing effort has been increased through substitution of unconstrained for constrained inputs. 'The input controls have not provided an incentive for excess capacity to be removed' (Campbell et al., 1996, p. 2).

Lessons can also be drawn from one not very successful implementation of ITQs (in the south-east fishery): good consultations with the industry, well defined rights and a sound, uniform jurisdiction are a prerequisite for successful implementation.

Major concentration of rights has also occurred in the Australian fisheries, in particular in the Southern bluefin tuna fishery. Good opportunities in other fisheries may have stimulated this process.

Increased industry involvement in the management of the Australian fisheries is also an issue there. It has been argued that it is only the task of the Australian Fisheries Management Authority to get sustainability in the fishery by setting biological reference points whereas the industry should strive for economic efficiency in his own way. Exel and Kaufman state in this respect (p. 26): 'While cost recovery is not a prerequisite to increased industry involvement, it appears to be a powerful stimulant'. For the European situation it seems to be an important prerequisite that the catching sector expects benefits from a sound management of the stocks to be prepared to recover costs.

11.5.7 Fishing rights in Japan

- Contents of the right : Licence to participate in a certain fishery in a defined area. Common rights, granted to a Fishermen's Cooperative Association (FCA), are important for coastal fisheries.
- Fishery involved : Coastal fisheries, Ministry licensed fisheries in offshore and in distant waters, Governor licensed fisheries, located between coastal and offshore fisheries.

Objective	: To protect fishery resources, regulate and minimise conflicts between various fisheries and to establish a fishing order (Coastal and Governor licensed fisheries).
Duration of the right	: Different for various rights: 5 years (set-net, demarcated fishery), 10 years for common fishery right. Ministry licensed fishery 1-5 years. Governor licensed normally 5 years.
Transferable	: No, for the common rights of the FCAs. Ministry and Governor licensed: yes, under certain conditions.
Accomp. measures	: Closed seasons, minimum size, limit fishing days, pooling systems
Effects on structure	: FCAs seem to have generated more stability and also greater levels of price and quality stability.
Policy effectiveness	: Co-management by the FCAs seem to decrease the costs of enforcement since fewer formal measures are needed. Homogeneous technologies and modes of operation are important factors for success. There are questions regarding the success of Japanese co-management in achieving stock conservation and economic optimization 1).

The situation in Japan shows that input rights may get a (high) value. Tanaka (1993) states that financial institutions accept the rights as a collateral for a loan. Even the non-tradable common rights of the FCAs appear to have a high value when rights are lost because of coastal development projects. This may result in high compensation payments to the FCAs.

Co-management has a long tradition in Japanese fisheries and it may serve to some extent as an example for the European situation. It does illustrate, however, that property rights regimes are nested in a specific socio-cultural environment, so that these regimes can not be considered in itself, as has been stated before.

11.5.8 OECD Synthesis report for the study on the economic aspects of the management of marine living resources

This report contains a review of the fisheries management practice in OECD member countries. The report has been supplemented by an 'Executive Summary' which evaluates the different management instruments. The synthesis report has a set of 25 national reports as a principal source of information. The report has a somewhat different point of view, all kinds of management instruments, but some findings are relevant for this study on property rights.

1) Sources: mentioned in chapters 5 and 6, supplemented by the OECD Synthesis report for the study on the economic aspects of the management of marine living resources, (forthcoming, 1996), in particular pp. 131-135.

The OECD study distinguishes between output and input controls. As figure 11.1 shows controls (=limitations) are one side of the coin of the measures and rights represent the other side. In this respect conclusions in the OECD report on I(T)Qs and limited licenses are interesting. I(T)Qs are evaluated most positively (p. 7 of the Executive Summary): They '...are shown to be an effective means of controlling exploitation, of mitigating the race-to-fish and most of its attendant effects, of generating resource rent and increased profits, and of reducing the number of participants in a fishery'. However, the report points also on problems with initial quota allocation and with enforcement and compliance. Under limited licenses (p. 8) 'over-capitalisation and increased harvesting costs are shown to occur...', but the evidence is confounded by the presence of TACs in many of the reported cases'. Under 'Institutional characteristics' it is stated that '...the biological uncertainty and the difficulty associated with defining property rights in fisheries often inhibits the successful use of management programs based solely on market systems'. Nevertheless, the OECD ad hoc Expert Group on Fisheries recommends (p. 14) '... to introduce right based management systems (e.g. transferable individual licenses, individual quotas, and exclusive area user-rights)'. In fact the outcomes of the OECD study point in the same direction as the 'new Paradigm' of Christy, mentioned before.

A main conclusion from this property rights study, however, is that the effective establishment of property rights in fisheries costs much time, may be accelerated by a crisis and mainly depends on the acceptance of the fishers. This is not quite surprising, since the limiting measures in Denmark, the Netherlands and the United Kingdom have been the origin of these rights.

11.6 The implementation of property rights in a fishery

Property rights have, in many cases, developed gradually and unintentionally from limiting measures, as has been stated in previous parts of this study. This observation stresses the need to implement rights on a sound basis. A survey of points to consider before such an implementation is given hereafter. Experiences with property rights, investigated in this study, provide a basis for these 'checkpoints'.

- It should be clear what the management objectives are, whereby the initial aims may be management of the fish stocks, management of the fishery or a combination of both.
- It is recommendable to define the ownership of the rights clearly from the beginning. Therefore, a distinction can be made between state-, common- and private rights, as has been explained in chapter 5.
- State property leaves control of the fishery to an important extent in the hands of the Government and may establish barriers for foreign fishers to acquire rights.
- Common property of rights by the fishermen includes transfer of management responsibilities to the industry and may result in better adaptation of measures to the fishing practice. General management objectives

have to be set in this case by the Government, e.g. to meet the requirements from the CFP.

- Allocation of private rights to individual fishermen starts an irreversible process which mostly moves into the direction of tradable rights. Input rights (licences, specifying a certain capacity) and output rights (IQS or ITQs) are the main distinction between kinds of individual rights.
- Definition of the allowed input into the fishery is very important, since non-constrained inputs will be maximized, as for example experiences in the Australian fisheries have shown. Days-at-sea per vessel must also be considered as the fishing effort has to be controlled.
- IQS and ITQs probably have been mostly applied and discussed. The following aims to summarise briefly the main points to consider when implementation of these individual rights is intended.
 1. Control on individual catches should be possible since there will be a strong tendency to catch more than the individual quota when the limitation is severe. Heavy enforcement may be necessary.
 2. Stake-holders in a particular fishery should be well identifiable and rather stable.
 3. A clear and uniform jurisdiction must be available or should be established in view of enforcement of the individual quotas.
 4. Support from the industry should be obtained as much as possible.
 5. The initial allocation of the quotas should be done carefully and preferable with intervention of an independent body. In this way there may be less resistance against the organisation which has to manage the I(T)Q system.
 6. Multi-species fisheries may lead to a need for I(T)Qs for all species or to detailed by-catch regulations.
 7. Stock assessment may be difficult and unreliable since an important difference may arise between catches and recorded landings. Unreported catches, which are sold in the 'black' or 'grey' market, may occur and discarding of fish may be encouraged by selection of the most valuable fish to be landed ('high grading').
 8. Gains of an I(T)Q system may be substantial when the current fishery is not very efficient. Therefore, an ITQ market has to work as free as possible. However, these gains have to be weighed against social costs that may occur, possibly as a result of a concentration process.
 9. ITQs will probably get a high value after some time and possible market effects (high concentration level, speculative quota trade) have to be foreseen, in view of the desired policy effects.
 10. The system can not be ideal in the beginning and the regulations probably will show a dynamic process, whereby consultations with the industry are essential for successful operation of the system in the long run.

11.7 Some juridical aspects with respect to property rights

This study focuses mainly on the economic aspects of property rights. There are of course also important juridical aspects in defining the rights on different levels. Chapter 5 distinguishes in this respect state, common and private property. This matter is rather complicated since the Common Fisheries Policy affects national policies so that the competence to protect the property ownership is involved.

An Article in the EEC-Treaty of Rome (nr. 222) regards property ownership in the context of European and national laws. The article is 1): 'This Treaty leaves the regulation of the property ownership in the Member States unimpeded'.

Two questions are important in this respect from the viewpoint of property rights in fishing:

1. Does article 222 mean that member states have the full competence to define national property rights?
2. Does this article leaves room for the Commission of the EU to establish rights on community level?

The answer on the first question is that national rules on property ownership are bound by EU principles 2). This was confirmed for example by a judgement of the European Court of Justice regarding a case between the Commission and Italy (Case C-235/89). An Italian Law stipulates that a patented invention has to be applied in Italy sufficiently to meet the domestic needs. The Commission considered this as an infringement of the principle of free movement of goods and was put in the right on this point by the EU Court of Justice. Legal experts assume that with respect to article 222 a distinction can be made between the existence of property and the exercise of the right. However, recent jurisprudence brings Bartels (1995) to the conclusion that not only the exercise but also the interpretation of the property ownership is bound by the requirements of the primary EU Law. This makes clear that limitation of ownership of national fish quota to fishermen of the relevant country only is allowed on the basis of the principle of relative stability of the national quotas. This principle has been acknowledged by the European Court of Justice in the 'Romkes' case (Holden, 1994, p. 240).

The second question regards the competence of the Commission to implement rules on property ownership. A number of EU Regulations and judgements of the Court seem to confirm this competence of the Commission. There is for instance an EU Regulation that prescribes a protection period (70 years) for computer software, in the framework of harmonisation. Furthermore, in a

1) Translated from Dutch.

2) This section draws heavily on S.E.Bartels, 'Europees privaatrecht: over de bevoegdheidsverdeling tussen Unie en Lid-Staat met betrekking tot het eigendomsrecht', *Ars Aequi* 1995, p. 244-251 and S.E. Bartels, 'Harmonisatie van het Europese goederenrecht', *Weekblad voor privaatrecht, notariaat en registratie*, 1996, p. 359.

certain case (Spain/the Commission) the Court has judged (13 July 1995) that article 222 does not preserve the competence to rule the patent law only to the national legislator, excluding every action of the Community in this area. This meant in the concerning case that the Commission has the competence to implement supplementary protection certificates for medicines in all Member States for reasons of harmonisation.

The relevancy for the fishery sector is that the Commission may have the competence to establish or influence private property rights, such as (EU) licences, on the basis of EU Regulations. However, interpretations of article 222 may develop further and therefore hard conclusions on this subject can not be drawn (Bartels, 1995).

APPENDICES

Appendix 1 References

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Appendix 2 Dutch cutter fishery

Table A2.1 Dutch cutter fishery. Regional distribution of flatfish ITQs, situation 1 January 1994

Port/region	Total of ITQs		Number of vessels
	sole (tonnes)	plaice (tonnes)	
South:			
Breskens	369	1,042	13
Vlissingen	1,749	4,954	18
Goedereede	4,299	12,626	61
Scheveningen	83	299	9
Region South, other ports	395	1,329	24
North:			
IJmuiden	1,314	4,518	35
Den Helder	5,339	14,342	66
Wieringen	385	1,593	63
Urk	7,849	24,192	123
Region North, other ports	261	1,086	108
Total	22,043	65,982	520

Table A2.2 Dutch cutter fishery. Regional distribution of cod/whiting permits, situation 1 January 1994

Port/region	Number of permits		Total quantity (tonnes)	
	full year	season	Cod	Whiting
Breskens		5	142	56
Vlissingen	3	1	316	126
Stellendam	4	6	584	246
Scheveningen	2	3	307	136
Region South, other ports	1	13	464	184
IJmuiden	13	6	1,479	617
Den Helder	6	4	780	352
Wieringen	18	5	1,870	746
Urk	17	5	1,895	810
Region North, other ports	2	4	305	121
Total	66	52	8,142	3,394

Appendix 3 Data regarding the Danish ITQ model in chapter 10

Table A3.1 Danish landings in 1993 (tonnes)

	Total catches 1993	Landings from vessels in a potential IT Q-system	Esbjerg + Lemvig
COD		28,826	
3AN	11,989	7,516	1,173
3AS	4,469	2,024	62
3BD	10,280	5,739	73
4AC	19,547	13,548	6,260
HADDOCK		3,426	
3AN		1,095	225
3AS	1,603	15	0
3BD		2	0
4AC	3,582	2,314	578
SAITHE		4,214	
3AN		1,303	89
3AS	4,310	44	5
3BD		31	0
4AC		2,836	368
PLAICE		16,269	
3AN	9,127	5,914	2,193
3AS	1,293	470	12
3BD	287	136	5
4AC	16,452	9,749	6,184
SOLE		1,400	
3AN		185	22
3AS	1,430	335	9
3BD		41	0
4AC	1,661	839	248

Table A3.2 *Number of vessels*

	GRT	No	No (E+L)		
			E a)	L b)	Total (E+L)
Gill-netters	< 20	191	2	45	47
	≥ 20	67	4	12	16
Trawlers	< 20	177	0	5	5
	20 - 59	86	0	7	7
	60 - 99	24	2	2	4
	≥ 100	54	2	9	11
Danish seiners	< 19.9	21	0	3	3
	≥ 20	83	8	66	74

a) Esbjerg; b) Lemvig.

Table A3.3 *Number of fisheries (target of species and area)*

	Number of fisheries			
	1	2	3	4+
Esbjerg				
Gill-netters	1	1	4	
Trawlers		1		3
Danish seiners	7	1		
Lemvig				
Gill-netters	5	30	20	2
Trawlers	3	9	6	5
Danish seiners	21	39	7	2
Different area	1	2	3+	
Esbjerg				
Gill-netters	2	4		
Trawlers	1	1	2	
Danish seiners	7	1		
Lemvig				
Gill-netters	34	21	2	
Trawlers	7	6	10	
Danish seiners	23	37	9	

Table A3.4 Total catches of important species under INTQ (tonnes)

		1993	Scenarios		
			1	2	3
3AN	COD	1,173	1,172	1,172	1,169
	HAD	225	246	244	243
	SAI	89	91	88	81
	PLA	2,193	2,215	2,176	2,172
	SOL	22	29	22	22
4AC	COD	6,259	6,259	6,259	6,227
	HAD	578	579	578	568
	SAI	368	411	411	355
	PLA	6,184	6,518	6,495	6,450
	SOL	248	342	247	247
All other areas	COD	135	151	144	140
	HAD	0	0	0	0
	SAI	5	6	5	4
	PLA	16	20	18	18
	SOL	9	12	8	8

Table A3.5 Number of vessels with profit ≥ 0 by gear and size-groups (1993)

	GRT	No (E+L)		
		Esbjerg	Lemvig	Total (E+L)
Gill-netters	< 20	+2/0-	+33/12-	+35/12-
	≥ 20	+4/0-	+12/0-	+16/0-
Trawlers	< 20		+2/3-	+2/3-
	20 - 59		+3/4-	+3/4-
	60 - 99	+2/0-	+2/0	+4/0-
	≥ 100	+1/1-	+5/4-	+6/5-
Danish seiners	< 19.9		+2/1-	+2/1-
	≥ 20	+5/3-	+40/26-	+45/29-
Total		+14/4-	+99/50-	+113/54-

Note: + indicates positive profit, - negative profit.

Table A3.6 Total catches of important species under ITQs (tonnes)

		1993	Scenarios		
			1	2	3
3AN	COD	1,173	1,173	1,173	1,173
	HAD	225	265	265	256
	SAI	89	96	96	67
	PLA	2,193	2,175	2,165	2,168
	SOL	22	31	25	25
4AC	COD	6,259	6,259	6,259	6,259
	HAD	578	593	590	571
	SAI	368	443	442	393
	PLA	6,184	6,293	6,264	6,257
	SOL	248	336	248	248
All other areas	COD	135	148	140	125
	HAD	0	0	0	0
	SAI	5	5	5	1
	PLA	16	20	19	18
	SOL	9	12	6	6

Appendix 4 Specifications of the Danish model

The regulation constraints

The relevant regulation constraints are for cod, haddock, saithe and sole. In the model the weekly or fortnight allocations were formulated as monthly constraints, because the data do not allow for shorter time periods. This aggregation can result in making constraint vessels to unconstrained vessels. However, the regulation system allows vessels to add together two consecutive week or fortnight allocations. We address the problem in the model formulation by saying that a vessel were constrained if it had caught its ration minus the expected catch of the marginal trip.

Another factor the formulation of the constraints had to take into account is that it was possible for a vessel to change between areas within ration periods. The rations were then adjusted according to the time spent in each of the areas. For species regulated by equal ration periods in all 4 areas the formulation of constraints taken this into account was uncomplicated. For species, here only cod, regulated by different ration periods in the four areas, we formulated constraints for each of the different time periods. The rations were as before determined by the time spent in the fishery minus the catch of the marginal trip.

Cod

The constraints for cod were formulated as constraints for the fishery in North Sea and Skagerrak and constraint for the fishery in Kattegat and Baltic Sea, because of different ration periods.

For cod in the North Sea and Skagerrak the ration periods in 1993 were January to March, April-May, June-July, August-September, October-November and December. For each of these periods rations have been allocated to each vessel. The size of the ration was depending of the length of vessel.

For cod in Kattegat and Baltic Sea the rations were weekly allocations.

Haddock

The rations were fortnight allocations until September where the regulation were suspended.

Saithe

The rations were weekly allocations in all 4 areas.

Sole

Weekly allocations in all 4 areas depending on the length of vessel.

The LP model

Based on the structure of the fisheries, the regulation of the fisheries in 1993 and the availability of data, a model is formulated where the firms for each month decide the allocation of effort, given fixed prices of output and input and the regulation.

Let

- l = species (which indirectly defines the fishery)
- f = fishery
- j = period, here month
- k = area

- g = type of gear
- s = vessel class (type of gear and size-group)

The technology of each firm in fishery f in period j and area k can be described as:

$$T_{fjk}(y_{fjk}, x_{fjk}, z; \mu_{fjk}) = 0$$

where

y_{fjk} is a vector of catch of species with element y ,

x_{fjk} is a vector of inputs with elements x ,

z a vector of fixed factors

μ_{fjk} is the regulatory constraint

The firm chooses inputs to maximize the monthly quasi-rent in fishery f in area k:

$$\Pi_{fjk}(p, w; T_{fjk}) = \sum_i p_{ijk} y_{fjk} - \sum_r w_{fjk} x_{fjk}$$

where

p_{ijk} is ex-vessel prices

w_{fjk} is the prices of inputs

For each vessel a LP-problem can now be formulated, where the annual short run profit or the quasi-rent is maximized. The decision variable is the effort allocated to each activity, i.e. in each fishery in each area for each month:

$$\text{Max}_E Z = \sum_{fjk} ((1 - v_s) p_{ijk} a_{ifjk} - VC_s) E_{fjk} \tag{B.1a}$$

subject to

regulation in 1993, i.e.

$$\sum_{j1k1} a_{ifj1k1} E_{fj1k1} < \text{ration}_i \tag{B.1b}$$

$$E_{fjk} < E^{\text{max}} \tag{B.1c}$$

$$E_{fjk} \geq 0 \tag{B.1d}$$

where

v_s is the crew share of revenue for vessel class s

a_{ifjk} is average catch per unit of effort of species i for the vessel

VC_s is the variable cost per unit of unit of effort for vessel class s

E_{fjk} is effort (here number of trips)

E^{max} is the maximal possible effort in a month for the vessel

j1, k1 is subsets of j and k, respectively

The short run profit Z is total revenue minus variable costs. We use actual cost instead of opportunity costs, because the purpose is to investigate the effects of ITQs and quota markets. This means that the actual payment of the crew, i.e. crewshare, is included in B.1a. The first group of constraints (B.1b) contains the regulation scheme formulated here in overall terms. See appendix A for more details. The second con-

straint (B.1c) limits the effort in each month to the maximal observed in a month in 1993.

This formulation only incorporates empirical justified constraints, here i.e. the regulation. Other incorporate normally constraints about input, f.ex. the fishing time, more or less ad hoc. A common procedure is to set an upper limit for the total fishing time per year to the observed in a certain year and limit the fishing time per time-period. Other have set the limit based on activity of the average active vessels or forced the vessels to participate in certain fisheries in order to get realistic fishery patterns.

Nevertheless fishing effort over a large range is not a real constraint, it is available also beyond average production levels to a higher costs, because it often results in increasing costs to labor, maintenance and repairment. However, there is some level, where it is not physically possible to expand effort more, but normally the costs are prohibited high at these effort levels and therefore not considered economic realistic. We include in our model, however, a proxy for the physical upper level of effort, see (B.1c).

The model and LP models in general are using a Leontief production technology for each activity 1). However, our specification of the technology captures the fishermen's ability to shift the mix of species in response to changing parameters and regulation because the fishermen can change activities. For example in response to tighten quota for cod, the fishermen will allocate the fishing effort to other fisheries and activities which have a smaller share of cod and consequently a larger share of other species in the catch. The model captures therefore an important aspect of the production technology and the behavior of the fishermen, the substitution among areas and times of the year. Therefore the non-joint independent activity functions are made joint by the common effort allocation constraints (or quota constraints).

Data

The prices of each species are assumed to be dependent on season, the kind of gear used and in which area the species are caught. From the trip information the prices are calculated as total revenue divided by total catch of the relevant trips.

The average catch of each species per unit of effort for each firm in each fishery, month and area a_{ijk} is calculated as total catch from the relevant trips of each firm divided by the number of trips.

Average variable costs VC_s per trip for vessel class s included expenses to fuel, landing, ice and gear replacement, while the costs to labor were calculated as a share v_s of total revenue. Variable costs data were obtained from accounting statistics from the two harbors, Esbjerg and Thyboron. We use number of trips, since there is no information available about the length of the trips. Since the fisheries in question are human consumption fisheries, where the trip length varies between 1-5 days, it is not assumed that the use of trips instead of number of days will give biased results. In other studies (Squires et. al., 1994, Larson et. al., 1996) using LP the number of trips have been converted into weeks by assuming that if at least one landing were recorded in a week then the vessel was active in this week. The problem with the length of trip is not solved by this method, but reduced to some extent. In econometric studies the problem is 'solved' by assuming that all the inputs and costs for a fishing trip is fixed, since in the short production period of 1-5 days the inputs are largely fixed and

1) Other shortcomings of the LP approach is constant returns to scale and non-jointness in inputs (separate production process for each output or as the case here for group of outputs).

determined by the vessels size or capital stock (see for example Squires and Kirkley 1991). In principle we follow the same approach in our study.

Reconstruction of the production technology

By introduction of ad hoc constraints on fishing time, another problem with LP-models are solved, the calibration problem. The ad hoc constraints on the fishing time result in realistic solutions to the problem, not far away from the observed behavior. Without the constraints on fishing time the solution will normally diverge from the actual production.

Our LP formulation will probably, because of the few empirical justified (binding) constraints, contain a calibration problem, meaning that the solution involves only a few of the observed activities/different trips. Instead of introducing constraints more or less ad hoc in order to produce the observed behavior in the base year, we will use the PMP to calibrate and estimate the model. The introduction of constraints in order to produce the base year outcome, will also limit the ability of the model to predict production etc. under policy changes.

We use a five stage procedure of the PMP approach to estimate the production parameters.

In the first stage the PMP model is formulated and solved. The solution contains information about which fisheries that are marginal and non-marginal, respectively and about the shadow values of the resource/regulation constraints and the calibration constraints.

The variation in catchrates of the marginal fisheries are used in the second stage to estimate the production parameters for the marginal activities/fisheries.

In the third stage the shadow values of the regulation constraints are calculated/updated based on the variation in the catchrates of the marginal fisheries. Given the updated shadow values of the regulation constraints the shadow values of the calibration constraints of the non-marginal fisheries are updated as well.

The parameters for the non-marginal fisheries are then in the fourth stage estimated based on the updated shadowprices.

In the fifth and final stage the calibrated (estimated) problem using the estimated parameters are formulated. The optimal solution to the calibrated problem gives exactly the observed catches in 1993. This calibrated problem is going to be used in the analysis of INTQs and ITQs.

We assume as mentioned in section 10.1.4 that short run profit pr unit of effort is a declining function of effort. Because of fixed proportion of outputs/species the netrevenue for each activity NR_{fjk} can be specified as:

$$NR_{fjk} = (1-v_s) \sum_i p_{ijk} a_{ifjk} = (1-v_s) p_{fjkg} \text{avea}_{fjk} \tag{B.2}$$

Where

p_{fjkg} is the price of the target species in fishery f
 avea_{fjk} is a weighted index of catch ($= \sum_i p_{ijk} a_{ifjk} / p_{fjkg}$)

The weighted index of catch is by the PMP method replaced by a non-linear function, i.e.:

$$\text{avea}_{fjk} = c_{fjk} - d_{fjk} E_{fjk} \tag{B.3}$$

The catchshare of species i cs_{ijk} is:

$$cs_{ijk} = a_{ijk} / ave_{ijk} \quad (B.4)$$

The first stage

The modified LP-problem (the PMP-problem) to (B.1) is completed by adding the two following groups of calibration constraints:

$$E_{ijk} < E_{ijk}^{1993} + \epsilon \quad (B.1e)$$

$$E_{ijk} > E_{ijk}^{1993} - \epsilon \quad (B.1f)$$

From the shadow value of the calibration constraints (B.1e) the marginal and non-marginal fisheries can be found. The non-marginal fisheries have a positive shadowvalue, while the marginal fisheries have a shadowvalue of zero. If there are 4 activities limited by 1 (2) regulation constraint then 3 (2) of the fisheries are non-marginal and 1 (2) marginal. The fisheries with negative quasi-rent is found by constraints B.1f, given by a positive shadowvalue. This shadowvalue is then used to adjust the variable cost of the fishery leading to a non-negative quasi-rent.

The second stage

Having found the marginal fisheries, we use information about the variation in the catches 1) to replace the linear term with average catches with a non-linear function. The variation in the catches can be interpreted as the marginal catch of effort. The variation in the weighted index of catches for each fishery is calculated as the average percentage variation in the weighted index of catches. In the calculation of the variation is only included trips with positive quasi-rents, because it is the expected variation 2), assuming that trips with negative quasi-rent were expected to give at least brake-even.

The parameters (c_{ijk} and d_{ijk}) of the non-linear functions for the marginal fisheries can now be found by solving two equations. One of the equations is B.3. The other equation is:

$$NR_{ijk} \text{ var}_{ijk} = p_{ijk} (c_{ijk} - d_{ijk} E_{ijk}) - p_{ijk} (c_{ijk} - 2 d_{ijk} E_{ijk}) \quad (B.5)$$

where

var_{ijk} is the variation in the weighted catch

Equation (B.5) says that the different between the value of the observed average and the marginal weighted catch given by the variation in the weighted catch (left hand side) is equal to the different between the value of the average product and the marginal product (right hand side). Equation B.3 and B.5 can then be solved for c_{ijk} and d_{ijk} .

The third stage

Recall that the first order conditions for the marginal activities of the modified LP-problem are:

-
- 1) More exact: variation in a weighted index of catch.
 - 2) See Howitt (1995).

$$\sum_i ((1 - v_s) p_{ijk} a_{ijk}) - VC_s - \sum_i a_{ijk} \lambda_{ij} = 0 \quad (B.6)$$

After replacing the linear term with the non-linear function the first order conditions for the marginal activities are:

$$(1 - \text{var}_{\eta k}) \sum_i ((1 - v_s) p_{ijk} a_{ijk}) - VC_s - \sum_i (1 - \text{var}_{\eta k}) a_{ijk} \lambda_{ij}^{\text{new}} = 0 \quad (B.7)$$

Most often the number of marginal activities within a given constraint set is 1 and $\lambda_{ij}^{\text{new}}$ can be solved directly from equation (B.7). With 2 marginal activities indicating that two resource constraints are binding, two equations are needed, because two of the constraints have a positive shadowprice, i.e. $\lambda_{ij}^{\text{new}} > 0$. The equation-system given by B.7 can be solve subject to $\lambda_{ij}^{\text{new}}$.

The first order conditions for the non-marginal activities from the modified LP-problem are:

$$\sum_i ((1 - v_s) p_{ijk} a_{ijk}) - VC_s - \lambda_{2\eta k} - \sum_i a_{ijk} \lambda_{ij} = 0 \quad (B.8)$$

By using the updated shadow value of the regulation constraints $\lambda_{ij}^{\text{new}}$ the shadow values of the calibration constraints $\lambda_{2\eta k}$ is updated by the above equation B.8.

The fourth stage

In the fourth stage the parameters of the non-linear functions for the non-marginal activities are estimated. Again we use two equations, whereas one is B.3. The other equation is that the first order condition for the PMP problem is equal to the first order condition of the calibrated problem in order to produce to base-year solution, i.e.

$$\begin{aligned} \sum_i ((1 - v_s) p_{ijk} a_{ijk}) - VC_s - \lambda_{2\eta k} - \sum_i a_{ijk} \lambda_{ij}^{\text{new}} = \\ p_{ijk} (c_{\eta k} - 2d_{\eta k} E_{\eta k}) - VC_s - \sum_i c s_i (c_{\eta k} - 2d_{\eta k} E_{\eta k}) \lambda_{ij}^{\text{new}} \end{aligned} \quad (B.9)$$

Solving B.9 using B.3 gives:

$$d_{\eta k} = \lambda_{2\eta k} / (p_{ijk} E_{\eta k} - \sum_i c s_i \lambda_{ij}^{\text{new}}) \quad (B.10)$$

Equation B.10 inserted into equation B.3 gives the value of the intercept $c_{\eta k}$.

The fifth stage

Finally the calibrated model can be formulated using the estimated values of $c_{\eta k}$ and $d_{\eta k}$.

$$\text{Max}_E Z = \sum_{\eta k} ((1 - v_s) p_{ijk} (c_{\eta k} - d_{\eta k} E_{\eta k}) - VC_s) E_{\eta k} \quad (B.11a)$$

subject to

regulation in 1993, i.e.

$$\sum_{\eta 1k1} c s_{\eta 1k1} (c_{\eta 1k1} - d_{\eta 1k1} E_{\eta 1k1}) E_{\eta 1k1} < \text{ration}_i \quad (B.11b)$$

$$E_{fjk} < E^{\max} \quad (B.11c)$$

$$E_{fjk} \geq 0 \quad (B.11d)$$

This model will calibrate to the observed effort allocation in 1993. The model can now be used to policy analysis, e.g. by replacing equation B.11b with other regulation systems.

Implementation of INTQs

For each vessel an annual quota is allocated corresponding to the vessels total catch in 1993 1), i.e. based upon historical catches. Equation B.11b in the model is then replaced by equations of the following type:

$$\sum_{fj} c_{s_{fjk}} (c_{fjk} - d_{fjk} E_{fjk}) E_{fjk} < \text{catch}_{ik}^{1993} \quad (B.11e)$$

In some cases the quotas are specified for all areas (i.e. summation over k in B.11e).

Implementation of ITQs

Under ITQs the model has to be extended by the ITQ markets. Formally it is a two-stage problem. The first stage is solving the model B.11 under INTQs treating the quota as a constant. In the second stage the quota is a variable and the model of each vessel (B.11) is aggregated into a model, where the total quasi-rent is maximized and extended by a constraint that the quotas are lesser than the total quota. The solution to this model gives the quota price and the optimal allocation of quota. This two stage problem is solved in one step by the following formulation:

$$\text{Max}_{E,q} \sum_n Z_n = \sum_n (\sum_{fjk} ((1 - v_s) p_{fjk} (c_{fjk} - d_{fjk} E_{fjk}) - VC_s) E_{fjk}) \quad (B.12a)$$

subject to

$$\sum_{fj} c_{s_{fjk}} (c_{fjk} - d_{fjk} E_{fjk}) E_{fjk} < q_{ik}^n \quad (B.12b)$$

$$E_{fjk} < E^{\max} \quad (B.12c)$$

$$q_{ik}^n, E_{fjk} \geq 0 \quad (B.12d)$$

$$\sum_n q_{ik}^n \leq Q_{ik} \quad (B.12e)$$

Because this formulation also maximizes each vessels quasi-rent, the reactions of the fishermen to ITQs are incorporated in the model B.12. This can be seen from inspection of the first order conditions of the model B.12 and the first order condition of a model of a firm under ITQs.

The calibrated model

If the constraint set for 1993 (formally equations B.1b) is binding then the fishermen in general will have incentives to reallocate their fishing activities. Put in another way if a vessel is not constrained by the regulation in 1993, then lifting the regulation

1) This is the common allocation scheme used in other ITQ fisheries.

will not induce the vessel to changes in the fishing activity. An investigation of the shadow prices of the constraint set can therefore give an insight into which vessel that will adjust fishing activities and which fisheries that are the most profitable.

In table B.6.1 is shown number of vessels that were limited, grouped according to number of binding constraints.

Table A.4.1 Number of vessels and number of binding constraints

Number of limitations	E a)			L 2)			Total
	gill netters	trawlers	Danish seiners	gill netters	trawlers	Danish seiners	
0	0	0	5	9	4	12	30
1	1	1	2	4	2	16	26
2	0	1	1	11	6	18	37
3	0	0	0	10	7	9	26
4	1	0	0	6	2	7	16
5	1	1	0	8	1	8	19
6	1	0	0	3	0	0	4
7	2	1	0	3	1	0	7
8	0	0	0	2	0	0	2
	6	4	8	57	23	69	167

	Binding	Non-binding	Binding	Non-binding
Cod	12	6	122	27
Saithe	3	15	14	135
Haddock	1	17	1	148
Sole	5	13	31	118

a) Esbjerg; b) Lemvig.

Over 2/3 of the vessels have ≤ 3 binding constraints (about 1/2 of the vessels have ≤ 2 binding constraints) indicating that the fishing activities have been constrained, but not to a large extent. For a large part of the fleet major reallocation of effort is not expected following change of regulation to IQ. However, this vary according to the gear-type. The gill-netters seems to be more constrained than the trawlers and the Danish seiners.

The table also shows the number of vessels constrained by the different species regulation. Only about 20% of the vessels have not been constrained by the regulation of cod. The regulation of sole have for about 20% of the vessels been a limiting factor, while regulation of saithe has had impact on ca. 10% of the vessels. The regulation of haddock have not been a limiting factor. In general the gill-netters have been constrained by the regulation of cod and sole, the trawlers by the regulation of cod and saithe, and the Danish seiners by the regulation of cod.

These results are both in agreement with how the regulation proceeded in 1993 and what can be expected when the vessels in questions are part of the human consumption fleet.

Since the vessels (table 5.2) participates in 2-3 fisheries over year implying that the number of activities, i.e. variables, is much higher than the number of binding constraints, a normal LP-formulation would have calibration problems.

The shadow prices of cod varies between 0.1 DKK and 155.4 DKK. The shadow prices of saithe and sole varies between 1.5 DKK and 470.7 DKK, and 9.4 DKK and 6715.8 DKK, respectively. These shadow prices indicate very different conditions for the constrained vessels.

Shadow values over the ex-vessel prices (or ex-vessel prices net of crewshare) can be obtained because of joint production. Extra amount of the limited species means also extra catches of the unregulated species and their value are incorporated in the shadow price. Formally (k , j and n subscript omitted):

$$\lambda_i = (p - MC)/c_{si}$$

where

p is a price index of total output

MC is the marginal cost of total output

Under joint production the shadow price is equal to the different between output price and marginal cost scaled by the catchshare of the quota species.

Specifications mathematical programming and the PMP approach

Common to the studies mentioned in section 10.1.2 is that the effects of implementation of ITQ is simulated in unregulated or open access fisheries. However, in many cases such as the Danish codfisheries the fisheries are regulated by open-access regulation which from year to year or even from month to month can change (e.g. different rations). Construction of the technology or the fishers response function is more difficult because of this interaction between policy and fishermen. Further the construction is handicapped by the many changes in regulation, both during the year and between years, which do not give much room for establishing the necessary time series of information, where the regulation environment is relative stable, so econometric analysis can be meaningful applied.

In this study mathematical programming is applied in order to estimate the fishers response. LP-models have often been used in policy analysis because they can be constructed from a minimal data set. Secondly the constraint structure is well suited to incorporate resource and policy constraints. Thirdly they can explicitly show how resources are used. Fourthly LP is a flexible tool, allows for appropriate representation of multiple inputs and outputs, e.g. complementary and competitive relationship. Last and maybe most important they can show the effects of policy constraints and are more understandable for policymakers than econometrics (Squires et. al., 1994).

However, there are problems with the linearity. It gives poor base-year calibration without ad hoc constraints that may bias policy results. Changes in f.ex. prices/input costs do not cause changes in the dual values or type of output, unless they cause a change of basis. The range between change steps may be larger than many levels of policy change, thus making the models inflexible for some type of analysis. A LP model has to be specified in more detail because if its discontinuous response features which results in a number of problems, if the database is insufficient.

The Leontief technology on the inputs can not reflect the gradual substitution of inputs as their costs or quantities are changed.

Calibration problems in LP-models

The LP solution is an extreme point of the binding constraints and normally the number of positive activities in the base year is greater than the number of binding constraints leading to overspecialization of activities compared to the base year. From a mathematical point of view will the resulting solution suffer from overspecialization, when the basis matrix has a rank less than the number of observed base-year activities.

To reduce this calibration error one approach has been to include more or less ad hoc constraints in order to reproduce the base year solution. An another approach has been to endogenize prices and risk leading to non-linear functions.

Aggregate policy models have often a too simplified production and cost technology, based on average values of catch and costs, and it is still a normative approach, attempting to estimate the marginal behavioral reactions to policy changes based on average data. Fishery practices are rare fixed on the margin. They reflect profit maximizing, i.e. trade-offs between catchrates, costs in different fisheries etc.

However, calibration of a model to the base-year data set and constraints is a necessary, but not sufficient condition for a meaningful policy model. The ultimate test for a policy model is its ability to predict behavioral responses out of the sample base-year.

Positive mathematical programming

Instead of introducing constraints more or less ad hoc in order to produce the observed behavior in the base year, another track or method is followed. The introduction of constraints in order to produce the base year outcome, will also limit the ability of the model to predict production etc. under policy changes.

The method is called positive mathematical programming (PMP), see Howitt 1995 and 1995b for a introduction to the method, 'positive' because the method is based on the owners actual behavior and it uses all the available information and reproduce solution equal to realized decisions taken by fishers (use positive information in a normative programming structure). The method can be seen as a compromise between the extremes of LP and econometric estimation. The basic idea in the method is to exchange the linear production functions with non-linear functions, so that the marginal profit is equated across all activities within the constraint set using the base-year outcome. It could also be the linear cost function that was exchanged. Since data on catch-variability are more easily obtained than cost variation, if it more appropriate to calibrate the output and not the cost function.

An alternative explanation to linear technology with constraints is that the profit function is nonlinear in effort 1) for most fisheries and the observed allocation of effort are a result of a mix of unconstrained and constrained optima. Reasons for decreasing gross margin per unit of effort are declining catches due to heterogeneous fishing grounds, risk aversion, increasing costs due to restricted management or vessel capacity or the fixed amount of seasonal operation time available in most fisheries. This relationship describes both the variability in catchrates and the technology and condition for the fishery in general. The fishermen know which fisheries and grounds are the most profitable. The PMP approach assumes that the fishermen uses this knowledge of the effect that expansion or contraction of effort will have on profit per effort.

-
- 1) A simple nonlinear relationship - declining gross margin per unit of effort as a linear function of effort - to capture the essential behavior response of fisher and to work with available restricted databases and model structures. It is a simplification of the complete production process.

The marginal conditions that reflect this knowledge are revealed in the fishery-effort allocation made by the fishermen. By analog to revealed preference, PMP can be thought of as revealed efficiency based on observed effort allocations.

Information about catches is usually available while information about production costs is more rare. The fishermen takes into account several types of costs. The observed level of outputs are therefore the result of a complex decision based, in part on a cost function known to (or perceived by) the fishermen but difficult to observe directly. The PMP approach uses the observed effort allocation and catches which varies from fisher to fisher to infer marginal costs conditions for each observed effort allocation. This inference is based on those parameters that are accurately observed and the usual profit-maximizing and concavity assumptions. The PMP approach views the vessels production as a boundary point, which is a combination of binding constraints and first-order conditions. The relevant constraints should be based on either economic logic or the technical environment. The observed behavioral reactions provide a basis for model calibration in a formal manner that is consistent with microeconomic theory.

The PMP specification leads to smooth respond to policy scenarios and thus the method will produce more realistic reaction behavior to small changes in parameters, i.e. constraints, prices and catchrates. The input demand and supply functions are continuous and differentiable with respect to prices, costs and right-hand side quantities (however, not differentiable at the points of change in basis) in contrast to LP problems where these functions are unchanged until a change in basis and the functions jump to a new level (staircase structure).

In general a calibration problem arise when the number of non-zero activities in the base-year (k) is greater than the number of binding constraints (m). From basic linear algebra we know that any feasible solution will contain a number of variables equal to the number of constraints (equations). The number of variables is the total number of activities and slack variables. Given that for every binding constraint a slack variable leaves the basic, i.e. slack variable = 0, then the optimal number of non-zero activities is equal to the number of binding constraints.

Howitt 1995a discuss the mathematical properties of the method. He shows that a necessary and sufficient condition for profit maximization at the observed level is that the profit function is nonlinear in some of the non-zero activities (k). Exact calibration of the model is possible if the objective function have at least $k-m$ independent instruments/terms to calibrate the $k-m$ activities (non-marginal or independent variables). If calibrating 3 variables and only 1 nonlinear terms available exact calibration is not possible.

In order words: If $k-m$ nonlinear parameters/terms are calculated for the $k-m$ activities the model will exactly calibrate to the base-year values without additional constraints.

If the m still linear terms in the objective function also have to have declining catch/effort then more information is required. The information could be expected variation in catchrates or supply elasticities.

PMP in a simple fishery model

To illustrate the calibration problem and using PMP in a fishery model, a simple example with observation of average catchrates (a_1 and a_2) of one species that have been caught in 2 fisheries can be used. The fisheries are regulated by a total quota Q and the total gross margin from both fisheries is optimized.

$$\text{Max}_E \text{GM} = (p a_1 - \text{VC}) * E_1 + (p a_2 - \text{VC}) * E_2 \quad (1)$$

subject to

$$a_1 E_1 + a_2 E_2 \leq Q \quad (2)$$

where

p is the ex-vessel price

VC is the variable cost

E is effort

The Kuhn-Tucker conditions are:

$$d\text{GM}/dE_1 = p a_1 - \text{VC} - a_1 \lambda_1 \leq 0 \quad (3)$$

$$d\text{GM}/dE_2 = p a_2 - \text{VC} - a_2 \lambda_1 \leq 0 \quad (4)$$

The solution to this problem implies that the whole quota is taken in the fishery with the highest gross margin, here e.g. fishery 1. The value of marginal catch from each fishery is therefore not equated and $E_2 = 0$. However, the observed fishery pattern for the base year is different, there have also been effort in fishery 2, i.e. $E_2 > 0$.

The calibration method finds a non-linear function for the activity with the highest gross margin to replace the constant catchrate:

$$a_1 = b_1 - d_1 E_1 \quad (5)$$

The first-order conditions of the calibrated problem, where (5) have replaced a_1 , are then:

$$d\text{GM}/dE_1 = p (b_1 - 2 d_1 E_1) - \text{VC} - (b_1 - 2 d_1 E_1) \lambda_1 \leq 0 \quad (6)$$

$$d\text{GM}/dE_2 = p a_2 - \text{VC} - a_2 \lambda_1 \leq 0 \quad (7)$$

By adding the following two calibration constraints to the linear problem the conditions which the base-year allocation has to fulfill in order to be an optimal solution can be found.

$$E_1 \leq \bar{E}_1 + \epsilon, (\lambda_2) \quad (8)$$

$$E_2 \leq \bar{E}_2 + \epsilon, (\lambda_3) \quad (9)$$

where

\bar{E} is the effort in the base-year

ϵ a perturbation term, > 0

The first step of the PMP approach is to solve this modified LP-problem (the PMP problem). The solution implies that:

$$dGM/dE_1 = p a_1 - VC - a_1 \lambda_1 - \lambda_2 \leq 0 \quad (10)$$

$$dGM/dE_2 = p a_2 - VC - a_2 \lambda_1 \leq 0 \quad (11)$$

Both E_1 and E_2 are now positive and except for the perturbation term equal to base year effort. λ_1 and λ_2 are also positive, while the shadowprice λ_2 to the second calibration constraint (9) is zero. In this first step the dual values are generated and the fisheries are grouped in marginal and non-marginal fisheries. The non-marginal fisheries are the fisheries with positive shadowprice (here $\lambda_2 > 0$) and these fisheries are going to be calibrated by the method. Beforehand the non-marginal and marginal fisheries are not known. Remark also that the shadowprice of the regulation/resource constraint (λ_1) is determined solely by the marginal fishery. The optimization problem after calibration will have exactly the same second first order condition as the PMP problem (7 and 11) and therefore λ_1 has to be unchanged.

In the second step the parameters are derived. The non-linear function ($b_1 - d_1 E_1$) to replace a_1 has two parameters which have to be 'estimated'. It requires two equations. One is that the average catchrate at the observed level of effort is equal to the observed catchrate, i.e. equation (5).

The second equation is the first order conditions from the above PMP problem (10) and the calibrated problem for E_1 (10), i.e.

$$p a_1 - VC - a_1 \lambda_1 - \lambda_2 = p (b_1 - 2d_1 E_1) - VC - (b_1 - 2d_1 E_1) \lambda_1 \quad (12)$$

Solving for the slope d_1 , using that $a_1 = b_1 - d_1 E_1$, gives

$$d_1 = \lambda_2 / (p E_1 - \lambda_1 E_1) \quad (13)$$

Having estimated the parameters of non-linear function the calibrated problem can now be formulated as the third step:

$$\max GM = (p (b_1 - d_1 E_1) - VC) E_1 + (p a_2 - VC) E_2 \quad (14)$$

s.t.

$$(b_1 - d_1 E_1) * E_1 + a_2 * E_2 \leq Q \quad (15)$$

The solution to this problem gives exactly the observed effort pattern and value of the gross margin. The calibrated problem can now be used in policy analysis.

From this process several points can be made:

1. The PMP approach draws a distinction between the two modeling phases of calibration (estimation) and policy prediction.
2. The procedure is simple and can be used both when the observed number of binding constraints is less than the number of non-zero activities in the base year and when the number of optimal activities is equal to the number of non-zero activities in the base year but at different levels.
3. The method is implemented in three stages: 1. Generation of the dual values using the modified LP-problem. 2. The dual values are used along with the average catchrates to derive catchfunctions parameters. 3. The catch parameters are used with the base year data to specify the calibrated model.
4. When the constraint set gives the base year activity then there is no calibration problem, but if the model is used for policy evaluation, e.g. changing some of the

political constraints, then the model probably will give extreme answers, because of the linearity.

5. All the errors from specification of the catch and cost coefficient are incorporated in the non-linear part. The method do not replace proper datacollection, but can be useful in (reel world) situations where the database is limited, so econometrics can be applied properly.
6. One of the activities (the marginal or dependent) in the example still has constant catchrates. The method will only calculate nonlinear parameters for the non-marginal activities which total number in general is the number of non-zero activities in the base year set minus the number of binding constraints, i.e. in the example $2-1=1$. More information is needed if all activities shall be made nonlinear. One can for example use information about variation in catchrates within the given fishery. This will also change the calculation of the non-linear parameters of the most profitable activities, see Howitt 1995a.
7. In fisheries, where one kind of question is to see what will happen if another regulation system was introduced, for example going from regulation by rations for a certain period less than the fishing season to regulation by INTQ or ITQ, i.e. relaxing the constraint set, the effect will be that the (still) linear activities will used to an extreme point. It is therefore important, at least in this kind of models, to introduce also for the non-calibrated activities some non-linearity using other sources of information, for example about variation in catchrates.

