SUSTAINABLE DEVELOPMENT

Transition to Responsible Fisheries

Economic and Policy Implications

AGRICULTURE AND FOOD

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Transition to Responsible Fisheries

ECONOMIC AND POLICY IMPLICATIONS

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POUR DES PÊCHERIES RESPONSABLES : IMPLICATIONS ÉCONOMIQUES ET POLITIQUES

FOREWORD

Following the successful conclusion of its work on sustainable fisheries ("Towards Sustainable Fisheries: Economic Aspects of the Management of Living Marine Resources" OECD, 1997) the OECD Committee for Fisheries decided, in 1997, to embark on a more in-depth analysis and assessment of the costs and benefits associated with a move to responsible fisheries practices. This Study is the fruit of comprehensive discussions within the Committee for Fisheries on the issues surrounding the transition to responsible fisheries. In March 2000, the Committee decided to make this study and its supporting material available to the public.

TABLE OF CONTENTS

Part 3

GOVERNMENT FINANCIAL TRANSFERS AND RESOURCE SUSTAINABILITY

Part 4

MODELLING THE TRANSITION TO RESPONSIBLE FISHERIES

List of Boxes

List of Tables

List of Figures

PREFACE

The Committee for Fisheries decided in 1997 to embark on a major study of the costs and gains associated with a move to responsible and sustainable fisheries. Entitled "*Transition to Responsible Fisheries – Economic and Policy Implications*", the study covers the following distinct areas of work:

- Fisheries Labour and Adjustment to Responsible Fisheries (Part 1 of this publication).
- Post-Harvesting Practices and Responsible Fisheries (Part 2).
- Government Financial Transfers and Resource Sustainability (Part 3).
- Modelling the Transition to Responsible Fisheries (Part 4).

In finalising this work, the Committee for Fisheries also adopted a Statement summarising the key points and the conclusions emanating from the study. The Statement is included in this publication. At its meeting 20-22nd March 2000, the Committee for Fisheries agreed to make this material available to the public.

In carrying out this study, the Committee for Fisheries relied to a large extent on the submission of country case studies and special studies. Separate volumes containing this material have been published for each of the four areas of work and are available free of charge. The documents are also available on the OECD fisheries web site (*www.oecd.org/agr/fish*).

STATEMENT BY THE COMMITTEE FOR FISHERIES

The OECD Committee for Fisheries, at its 85th Session 20-22 March 2000, adopted the following Statement on the Study on the Transition to Responsible Fisheries.[1]

I. Background

The economic and social importance of marine fisheries is considerable. Globally, more than 30 million people[2] depend directly or indirectly on fisheries for their employment and income. As a source of food, fish and fish products account for 17% of all human consumption of animal protein according to the FAO. World marine capture fisheries production reached a new record of 85.7 million tonnes in 1996, and was shortly down to 85.6 million tonnes the following year. However, it is widely recognised that many fish stocks are overexploited[3] and that corrective measures are needed to restore their productivity and ensure long-term sustainability and economic viability of the fisheries sector. While important measures have been taken during the last decade regionally, nationally and internationally, additional efforts are needed to ensure long-term viability of all stocks to the benefit of all. The benefits from such change could be significant; for example, work by the FAO has estimated that better management of marine fisheries could increase production by eight million tonnes.[4]

In response to the increasingly difficult problems faced by fisheries, the international community has adopted various agreements and arrangements that provide a legal and institutional context for responsible fisheries. Among these, the United Nations Convention on the Law of the Sea (UNCLOS) signed in 1982, codified the introduction of 200-mile exclusive economic zones (EEZs). In 1995, states were encouraged to adopt the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, an arrangement that has not yet received sufficient ratification to enter into force. In 1995, the Agreement on Straddling Stocks and Highly Migratory Fish Stocks was adopted; although this Agreement has still not received the necessary number of ratifications to come into effect. In the case of the Code of Conduct for Responsible Fisheries, adopted by the FAO in 1995, states were encouraged to adopt the High Seas Compliance Agreement.

The establishment of new regional fisheries organisations, as well as the reinforcement of existing ones, shows the determination of the international community to reinforce an appropriate legal framework for fishing activities. A common theme highlighted by the various initiatives has been the call for a move to responsible and sustainable management of fisheries. The Declaration of Cancùn (1992) endorsed the concept of responsible fisheries, stating that "this encompasses the sustainable utilisation of fisheries in harmony with the environment; the use of capture and aquaculture practices which are not harmful to ecosystems, resources or their quality; the incorporation of added value to such products through transformation processes meeting the required sanitary standards; the conduct of commercial practices so as to provide consumers access to good quality products".

II. The study by the OECD Committee for Fisheries

More responsible and sustainable management of fisheries will offer improved economic and social returns to the industry and to society as a whole. But the transition to more responsible fisheries can be a difficult process primarily because it involves trading the possibility of long-term gains against short-term costs. Against this background and upon the successful completion of its study on management

instruments[5] in 1996, the OECD Committee for Fisheries decided to embark on a study of the environmental, economic and social implications of a transition to responsible and sustainable fisheries. The purpose of this study is to initiate an analysis of the ways and means through which the quantitative evaluation of the costs and benefits could be undertaken. The measures associated with a transition towards responsible fishing should be identified and their costs and gains assessed.

The Committee decided to address the transition process from four perspectives: *i*) evaluating transition costs and gains; *ii*) exploring the impact of government financial transfers on resource sustainability; *iii*) identifying the social implications of the transition; and *iv*) examining the role of post-harvesting practices in facilitating the transition.

Over the period 1997 to 1999, the Committee reviewed a range of case study experiences from Member countries. Each of these experiences provided valuable insights on the transition process, although each also reflected the unique context of fisheries management in the relevant Member country. The Committee was able to identify a large number of policy-relevant findings and conclusions. These are presented in the four sections below. The case studies and other background material to the four studies have been published as general distribution documents.

III. Findings

A. *An evaluation of the costs and gains*

The extensive empirical material produced by the Committee demonstrates that the transition to more responsible and sustainable fisheries offers the potential for long-run gains that are beneficial to producers, consumers and society as a whole. There are two important challenges that policy makers face in the transition process: *i*) dealing with the complex and, to some extent, uncontrollable nature of the fishery ecosystem; and *ii*) managing the effects of change that must inevitably be faced by the stakeholders in the fishery.

While noting in general the prospects for improved economic and biological performance, some case studies exhibited overcapitalised fisheries that in the short and medium term would be expected to have appreciably smaller harvest sectors. In this context, the choice of management frameworks and supporting policies should be carefully examined. Some management frameworks that enhance industry responsibility can provide for industry self-adjustment. The sense of shared responsibility may be facilitated through approaches by fisheries managers and by the use of management instruments which enhance fishers' sense of shared involvement in solutions (*e.g.* licences, individual quotas, area use rights).

There are no easy ways to smooth the path towards responsible fisheries. It is likely that costs will be incurred in the short-run if the decision is made to restore fish stocks. Decisions on the rate of desired restoration is also likely to involve trade-offs between economic, social and biological components of the fishery system. The need for adjustment in capacity levels may in some cases be unavoidable if long-run economic performance is to be improved and preserved. Dealing with the inherent uncertainties in the fishery system suggests the adoption of prudent and precautionary approaches in setting and executing management objectives. The possibilities for improved economic performance appear to be enhanced if management frameworks provide the sector with sufficient stability over the longer-term.

B. *The impact of government financial transfers on resource sustainability*

This study shows that in 1997, OECD countries expended USD 6.3 billion in government financial transfers to the fishing industry. A transfer is defined as the monetary value of interventions associated with fishery policies. Most transfers are general services that are devoted to fisheries infrastructure and expenditure on activities for ensuring the sustainable use of fish stocks and the aquatic ecosystem (*e.g.* fisheries management, research and enforcement). At least USD 4.9 billion (77% of all transfers) was spent on such activities in 1997 – equal to 13% of the value of the landings. A further USD 1.4 billion was spent on support in the form of direct payments and cost-reducing transfers (*e.g.* modernisation grants, income support and tax exemptions) to the sector in 1997 – equal to 4% of the value of landings. The

nature of government financial transfers in OECD Member countries has changed since the 1970s and 1980s, when they were aimed at developing fisheries.

Direct payments and cost-reducing transfers are often used to reduce fishing capacity (*e.g.* decommissioning schemes). These policies are used for a variety of reasons: to boost profitability, to reduce dependency on the fishery, to meet international obligations and to reduce pressure on stocks. However, they can also have spillover effects into other fisheries and can encourage the introduction of new technology, but the possible negative effects can be avoided if adequate management policies are in place.

Some other direct payments and cost-reducing transfers such as modernisation grants, fish price support, interest subsidies and fuel tax exemptions, can encourage a build-up of capacity and an expansion of fishing activity. Some transfers can imbed industry expectations that may complicate future adjustment efforts. However, many of these effects can be avoided if there are adequate management systems in place. The effect of transfers on resource sustainability is difficult to determine, as there are many influences on fish stock health that are difficult to disentangle. The possible negative effects of some kinds of transfers can be reduced or minimised when transfers policies and resource management policies are coherent.

Some countries consider that the reform of their financial transfers policies, combined with other management measures, have been successful with respect to their resource management objectives. Capacity reducing transfers and dependency reducing transfers, combined with appropriate management measures, can reduce pressure on fish stocks.

C. *The social implications of the transition*

Employment in marine fishing has been declining steadily since 1970 in most OECD Member countries. This is the result of several factors, including technological change, overfishing and extended jurisdiction by coastal states. The transition to responsible fisheries will likely lead to a further contraction in employment, though employment in downstream activities may actually increase.

The distinctive socio-economic characteristics of the fisheries labour-force, and the households and communities in which they live, have important implications for the adjustment process. The general profile of the population at risk from structural reduction in fisheries employment can be characterised as people with little formal education who live in fisheries-dependent communities remote from other centres of employment – particularly share-workers in harvest fisheries and women working for a wage in a coastal processing plant.

Avoiding the need for special measures to address the social welfare needs of fishers and communities is the preferred policy. In anticipating change governments should try to smooth the path for adjustment before a crisis hits, through for example, job counselling, retraining and other active labour-market programs. However, where adjustment to fisheries regimes is likely to be large and abrupt, governments may wish to assist adjustment with more passive policies, such as extended unemployment and retirement benefits. In this regard it should be noted that educational policies which improve the qualification of fishers could play an important role in the transition.

Sustainability will necessitate the creation of policy frameworks that not only ensure sustainability of the resource but also provide a coherent set of signals to fishery workers. When moving towards responsible fisheries, governments should try to better understand how their resource management, social protection and labour market policies interact. The role of short, medium and long term active educational programmes can also be important in facilitating the transition. The long-term goal for sustainable fishing should be to transform the sector into one that is largely capable of adjusting its structure automatically and autonomously.

D. *The role of post-harvesting practices*

The post-harvest sector includes all activities related to fish and fish products following the harvest, including activities related to processing at sea and on land, distribution, sales and retailing to the

consumers. Thus, the post-harvest segment is the link between those who exploit fish resources and those who consume fish. The behaviour and performance of fish processors, distributors and other firms may affect both natural resources and markets, and *vice-versa*. Government policies aimed at influencing the post-harvesting sector may therefore have intended or non-intended spillover effects both upstream and downstream in the product chain. The ongoing work concerning the improvement and collection of basic statistics, both at the national and international level, is very important.

The evidence presented in the study suggests that the post-harvesting sector of many OECD countries is larger than the supporting harvesting sectors, both in terms of value-added and employment. It has also become clear that most Member countries have a limited quantitative knowledge of the extent and activities of the post-harvesting sector. This also concerns the collection of basic statistics both at the national and international level.

While many countries recognise that the practices of the post-harvesting sector can have potentially significant importance in sustaining a move towards responsible fisheries, few report on having implemented an active policy that could underpin such developments. The FAO Code of Conduct includes a section (Article 11) dealing with post-harvesting practices and trade, and the national implementation of this part of the Code will form an important element in the move towards responsible fisheries.

Based on their own experience, some countries are of the view that the post-harvesting sector can play an important role in the application of trade measures which support sustainable fishing practices and fisheries. Nevertheless, trade measures implemented in support of responsible fisheries remains an issue of discussion. According to some case studies, national market intervention mechanisms, when applied in a non-discriminatory fashion, may also contribute to correcting market signals and thus sustain a move towards more responsible and sustainable fisheries practices.

The increasing awareness of consumers of the safety and quality aspects of food in general, and fish in particular, have prompted governments to set minimum quality standards for fish products and to encourage private industry to develop and adhere to quality control systems. A number of operators have schemes that seek to inform consumers on the products they purchase. In this regard, and complementing an early implementation of the Code of Conduct, the development of marketing practices and improvement of consumer information can enhance the move to more responsible fisheries.

IV. Final observations and future work

The Committee's work has shown that several important commercial fish stocks in OECD countries are overexploited and corrective measures are needed to restore the productivity of these stocks. The transition to responsible and sustainable fisheries is complex as it involves a realignment of the range of policies that affect the behaviour of fishers, operators in the post-harvesting sector and other stakeholders. The aim of policy makers and the fishing sector should be to alleviate the negative effects of the transition so that the future stream of benefits outweigh short-term losses, and to evaluate the outcome of alternative strategies and the pace at which change should occur.

The main issue in fisheries management is how to restore fish stocks to environmentally, economically and socially sustainable levels. Some countries consider that fisheries management can be improved, under the responsibility of the administration, by the active participation of management bodies and by the use of management instruments that enhance fisher's sense of shared involvement in solutions. For some other countries, co-management frameworks that provide for input from fishers are considered to be valuable by providing improved user right and stewardship over the resource – in addition to being a valuable source of information. However, all aspects of fisheries – from harvesting to marketing to consumers – should be considered in a comprehensive way for a successful transition process to responsible fisheries. In this regard, it would seem that more effort is needed in consulting a broader set of fishing industry stakeholders.

The benefits of responsible fisheries are long-term and should be subject to particular attention. Transition policies should address short-term social and economic adjustment costs without detracting from long-run conservation objectives.

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The Committee for Fisheries will continue its work on responsible and sustainable fisheries and the promotion of policies and practices which conform to that paradigm. The importance of these efforts was underlined by the 1999 OECD Council Meeting at Ministerial Level which stated that "*Effective and sustainable management of fishery resources and the relationship between resource management and trade require timely international agreement and action. Ministers welcomed the* FAO's *International Plan of Action for the Management of Fishing Capacity, and endorsed* OECD's *ongoing examination of the impacts of government financial transfers and other relevant factors on fishery resources sustainability, including over-fishing*".

In accord with the guidance provided by Ministers, the OECD Committee for Fisheries will continue to contribute to the move to responsible and sustainable fisheries through the implementation of a comprehensive 2000-2002 Programme of Work. In this regard, the Committee will undertake studies on a variety of issues including: analysing fisheries management costs, fisheries trade and investment liberalisation; indicators for monitoring sustainable fisheries development; and the causes and consequences of fishing capacity change.

NOTES

1. OECD (2000), *Transition to Responsible Fisheries – Economic and Policy Implications*, Paris.
2. FAO estimates that by 1990 globally 29 million fishers were active.
3. Among major fish stocks for which information is available, the FAO reports that for 1996, 29% are under- or moderately exploited, 49% are fully exploited, 15% are overfished and 9% are depleted or recovering, thus 24% are overexploited.
4. FAO (1996), Chronicles of Marine Fishery Landings (1950-1994): Trend analysis and fisheries potential, FAO Fisheries Technical Paper, No. 359, Rome.
5. Published by OECD (1997) under the title, *Towards Sustainable Fisheries*, Paris.

Part 1

FISHERIES LABOUR AND ADJUSTMENT TO RESPONSIBLE FISHERIES

FISHERIES LABOUR AND ADJUSTMENT TO RESPONSIBLE FISHERIES

EXECUTIVE SUMMARY

Member countries agree about the need for more durable approaches to managing fishery resources, and are showing increasing willingness to take whatever measures are necessary to ensure the long-term sustainability of their fisheries. The potential social and employment implications of moving to such a state can be significant, however, especially during the transitional phase while fishing effort is being curtailed. The aim of this paper is to explore the implications of structural adjustment for labour in the fisheries sector (both harvest fishing and fish processing), in order to provide advice to policy makers on how to deal with the employment and social implications of moving to a state of responsible fishing.

Following an introductory chapter, *Chapter* II describes in general terms the social impacts of adjusting to responsible fishing that are dependent on the state of the fishery and the method by which the transition is made. The impacts on employment in fish harvesting are to some extent path-dependent – *i.e.* they are affected by the management measures adopted during the transition period and maintained thereafter. If a rationalisation of the fleet is required, reduced levels of employment in harvesting may result – not only in the short- to medium-term, but also in the long run; in other cases the resource may recover sufficiently to allow the number of fishers to reach a higher plateau. But for many fisheries, the consequences of delaying fleet rationalisation – progressively lower returns from fishing and, eventually, the collapse of the fish stocK – could lead to even larger reductions in the workforce. Beyond these few general observations, however, one cannot say much about specific impacts without some knowledge of the particular situation of the particular fishery, including its socio-economic characteristics.

These characteristics are examined more closely in *Chapter* III. To provide a context for that discussion, however, the chapter begins by documenting the rapid structural change that has taken place in the fisheries sector over the last several decades. Adjustments both minor and major have always been required in response to the ebb and flow of fish populations and changes in harvesting technology. Over the last decade, however, adjustment pressures have grown as increasing numbers of fisheries have become over-exploited and governments have responded with short-term measures. In addition, autonomous technological change has led to the substitution of capital for labour. In virtually all OECD countries for which data are available, numbers employed in harvest fisheries have declined significantly – typically by around one-third – since the late 1980s.

The Chapter then discusses the distinctive socio-economic characteristics of the fishery household and production unit and their implications for adjustment to changes that can be expected to take place as governments attempt to place their marine fisheries on a more sustainable basis. The absolute numbers of the jobs at risk in fisheries (relative to national employment) are not so much the problem as is geography. Because jobs in fisheries are concentrated along coasts, where fishing-related activities can form a significant, dominant, or even sole, occupation for the population, regional considerations loom large. In such communities those displaced in the process of structural adjustment could find themselves with few if any alternatives for employment, especially if they are determined to continue living and working in the same communities. The regional concentration of fishing activities is only one aspect of the problem, however. Fishers and fish processing workers typically have low levels of formal education, putting them at a disadvantage against other workers competing for jobs in other sectors. Tradition, and strong roots to the community, further contribute to the low level of labour mobility.

Chapter IV reviews the case studies provided by Canada, Korea, Spain, the United Kingdom and the United States. Each case study describes the forces of structural adjustment, government responses to those pressures, and outcomes. The studies show that, in general, pressures for structural adjustment have arisen from a combination of reduced fishing opportunities (owing to depletion of fish stocks, policies, or both), consequent overcapacity, and technological change. Typically, problems have built up over several years, if not decades, culminating in a sudden crisis. In most cases government responses have included a capacity reduction programme, usually combined with other changes in management instruments, and often accompanied by social protection measures. Structural adjustment programmes tend to create a one-off surge in retirements, and to varying degrees swell the ranks of the unemployed. But a significant proportion of displaced workers find new employment, though most apparently look first to other fishery segments or related maritime industries. This latent reservoir of potential fishers has clear implications for fisheries management, underlining the need to consider any spill-over effects of structural adjustment into other fisheries – not just the movement of capital but also of labour – when designing policies.

Chapter V turns to the question of how governments are attempting to deal with structural adjustment in the fisheries sector. Included within the scope of the analysis are both general and sector-specific programmes for retraining, job creation and so forth that are used to help improve the social conditions of fishers and people in fishing dependent communities and at the same time help them in the adjustment process. Unlike many of the programmes implemented earlier in the 1990s, those being put into action today take a more integrated approach – reflecting the need to move surplus resources out of the sector, while at the same time seeking to maximise alternative employment opportunities within affected communities. Nevertheless, passive labour market policies, such as extended unemployment benefits and early retirement schemes – put in place often for laudable, humanitarian reasons – have and continue to command large shares of government fisheries adjustment budgets. In some cases such policies are enabling reductions in fish-catching capacity to take place; in others they may actually be retarding adjustment in the sector. It is therefore appropriate to ask whether the social goals of such programmes can be achieved through less costly means, and in ways that lead to more sustainable outcomes in terms of fisheries management.

The final *Chapter* (VI) attempts to pull together the lessons from the previous chapters in order to draw policy-relevant conclusions and policy advice on how different social and labour-market policies, as well as non-government initiatives, might be used to help facilitate adjustment in the sector. Labour stickiness in the fishing-related industries seems to pose one of the most serious problems in view of overfished resources, because low mobility makes it difficult to reduce fishing effort. Over the short term, special efforts may be required to find alternative employment for redundant fishery workers, if only through wage subsidies or public service. Early retirement may be the only feasible option for older workers, but it should be regarded as a last resort, preferably offered in the form of a one-time payment. The main, longer-term focus of government efforts should be on smoothing the path of structural adjustment – not only to facilitate the transition to responsible fisheries, but also to reduce the need for costly adjustment programmes in the future.

Perhaps the most difficult challenge for governments will be to redefine the role that they have traditionally played in the sector in attempting to enhance the wealth and well-being of fishing communities – without fostering a culture of dependency within those same communities. As a first step, they should review their social protection and fisheries management policies (including transfers tied to non-labour inputs) so as to eliminate incentives that encourage labour to remain attached to fishing (that is, able to resume fishing) long after fishing has ceased to be profitable. They could also work to develop the productive and innovative capacities of their coastal communities, and to cultivate an environment in which these capacities can be fully realised. In this connection, industry-led (and funded) structural adjustment schemes deserve to be given more serious consideration.

Fundamentally, making the transition to responsible fishing will require more than simply dealing with structural problems during the transitional phase; it will necessitate the creation of policy frameworks that not only ensure the sustainability of the resource but also provide those who obtain their live-

lihood from fishing with a coherent set of signals so that the adjustment process occurs smoothly and largely autonomously. Unless such a systematic approach is taken, governments could find themselves constantly striving for, but never actually achieving the goal of, sustainable fishing. Fisheries sector adjustment policies that seek to reduce capacity and effort, however, must do so mindful of the social context within which adjustment takes place. Otherwise fishers will not leave the industry in a timely manner (*i.e.* before there is a collapse) and one of the principal causes of the overfishing problem will not have been tackled.

Annex 1 catalogues and describes how different countries' social security systems treat different types of workers in the fisheries sector. Considerable variety exists among countries as to coverage under such systems, and the degree to which people employed in the sector are afforded special treatment. In the case of unemployment insurance, for example, coverage ranges from none (in the case of owner-operators of vessels) to much more generous than that provided for the population at large. Special pension systems and early-retirement schemes in many cases allow people working in the fish harvesting sub-sector to retire several years earlier than people working in other sectors of the economy.

I. INTRODUCTION

Adjusting to new economic circumstances is a fact of life common to all sectors in OECD economies. In the fisheries sector, adjustments both minor and major have always been required in response to the ebb and flow of fish populations and changes in harvesting technology. In recent decades, however, adjustment pressures have grown as increasing numbers of fisheries have become over-exploited and governments have responded with short-term measures. Meanwhile, fisheries that currently have too much capacity are providing unsustainable employment levels. This situation is unlikely to improve as long as the forces driving these developments are addressed in a piece-meal, reactive manner.

Recognition of the need for more durable approaches to managing fishery resources is now widespread. The FAO's Code of Conduct in particular entreats governments to take such measures as will be necessary to ensure the long-term sustainability of their fisheries. The potential social and employment implications of moving to such a state could be significant, especially during the transitional phase while fishing effort is being curtailed. If a rationalisation of the fleet is required, reduced levels of employment in harvesting may result. According to one recent estimate, the reduction in global fishing capacity required to attain "reasonably efficient sustainable fisheries" is of the order of magnitude of 50% (Garcia and Newton, 1997).[1] But for many fisheries, the employment consequences of delaying fleet rationalisation – progressively lower returns from fishing and, eventually, the collapse of the fish stock – could be even more brutal in the long run.

The nation-wide implications of moving towards responsible fisheries are not the main concern of governments. In general among OECD Member countries, the fisheries sector contributes marginally to overall employment and the national economy. In only five countries (Greece, Iceland, Ireland, Norway and the United Kingdom) does it account for more than 0.8% of the national labour force. In most countries the share is less than 0.5%. However, because these jobs are concentrated along coasts, where fishing-related activities can form a significant, dominant, or even sole, occupation for the population, regional considerations loom large. The EU has identified more than a hundred such areas dependent on fishing among its member states (DG XIV, 1995). Many more dot remote coastal zones, from northern Norway to the South Island of New Zealand, from the Aleutian Islands of Alaska to the North West Cape of Australia. In such communities those displaced in the process of moving to responsible fisheries could find themselves with few if any alternatives for employment, especially if they are determined to continue living and working in the same communities.

The regional concentration of fishing activities is only part of the problem, however. Fishers and fish processing workers typically have low levels of formal education, putting them at a disadvantage against other workers competing for the same jobs. In general the percentage of people of working age living in rural areas who are college or university graduates is one-quarter to one-half that of those living in and around cities,[2] the relative proportion of college graduates within the fishing industry is probably even less. Tradition, and strong roots to the community, further contribute to the low level of labour mobility.

For these and other reasons, many researchers believe that traditional labour market theory, which stresses relative wage levels as the over-riding determinant of labour mobility, may be poorly suited to fisheries. Labour stickiness in the fishing-related industries poses a serious problem in view of overfished resources, because low mobility makes it difficult to reduce fishing effort. A fisheries sector adjustment policy which seeks to reduce effort, therefore, must do so mindful of the social context within which adjustment takes place. Otherwise fishermen will not leave the industry in a timely manner (*i.e.* before there is a collapse) and one of the principal causes for the overfishing problem will not have been tackled.

The aims of this study are twofold. The first is to attempt to assess the possible social and employment implications of moving to responsible fisheries. The second is to help identify policy options for dealing with these implications, and for overcoming, or at least easing, the associated adjustment rigidities. It is hoped that in so doing it should be possible to advance towards better tailored adjustment measures and thus facilitate adjustment in the fishing sector.

Lessons from past experiences suggest that these impacts are likely to fall unevenly on different segments of the fishing community – an important consideration in the design of well-targeted policies. Social and employment impacts are conditioned by certain characteristics of the labour force and of the regions in which they work – namely, the age, educational attainment and skills of the people employed in harvesting and ancillary activities; the degree to which the region is dependent on the industry for their livelihood, and its current level of unemployment; the availability of employment opportunities to which fishery sector workers are suited; the nature of the social security system; and so forth. These characteristics are anything but uniform across the OECD and even within countries. Chapter III provides a general overview of the socio-economic characteristics; including a brief historical perspective on trends affecting OECD fisheries over the last 25 years.

The paper then turns to consider how social and labour market policies influence the behaviour of labour, and the way in which they interact with fisheries management policies. It is generally recognised that some social and labour policies may actually be creating obstacles to structural adjustment, while others may be helping to remove fishing effort and capacity. What is still needed is to catalogue and describe these policies in a systematic way, and to analyse their impacts on fishermen, processors and the coastal communities. Included within the scope of the analysis are both general and sector-specific social and labour policies, as well as programmes for retraining, job creation and so forth that are used to help improve the social conditions of fishers and people in fishing dependent communities and at the same time help them in the adjustment process.

The fourth section of the paper then examines how different social and labour-market policies, as well as non-government initiatives, might be used to help facilitate adjustment in the sector. Many countries have already had experiences with adapting such policies to the special circumstances of the fisheries sector. In this paper, the lessons that can be drawn from such experiences will be considered from the viewpoint of the transition to responsible fisheries.

II. SOCIAL AND LABOUR IMPLICATIONS OF ADJUSTING TO RESPONSIBLE FISHING

No single combination of circumstances can be used to typify the potential social and employment implications of moving to responsible fisheries. For one, any impacts would depend on the width of the gap between current conditions and optimal conditions in each fishery. The distance across this gap varies enormously from one fishery to another. Some fisheries are already being managed responsibly, some are even underexploited, and still others are being overexploited to differing degrees. Of those in the latter category, there are several possible pathways by which the transition to responsible fishing can be achieved.

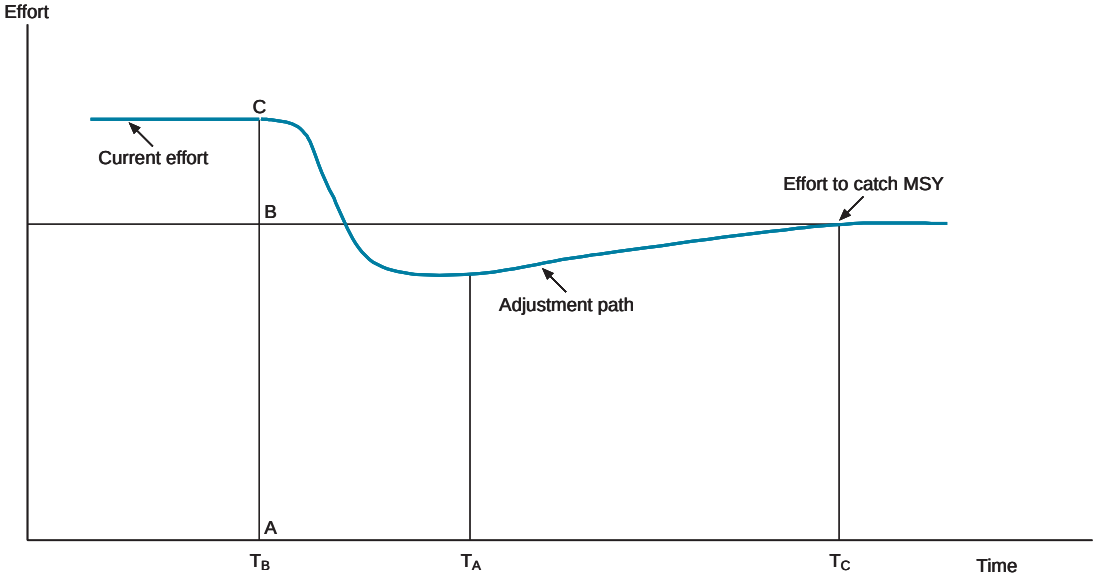
The aim of this chapter is to describe in general terms the social impacts of adjusting to responsible fishing that are dependent on the state of the fishery and the method by which the transition is made. Specific impacts will be conditioned as well by the characteristics of the affected labour force, which are discussed in Chapter III.

A. Effects on levels of employment

Implications for employment in harvesting

The effects on employment in harvesting of moving to more responsible fishing clearly depend on the extent to which fishing effort – essentially employment – has to be curtailed, and how long it has to be curtailed. The general path of fishing effort adjustment following an intervention designed to increase the long-run viability of a fishery is depicted in Figure 1. Four stages can be identified: pre-intervention, post-intervention, rebuild and full recovery.

Figure 1. **Stylised fishing-effort adjustment path**



Source: OECD.

Prior to an intervention, the level of employment in the fishery could be rising, stable or falling. Following intervention effort will in most cases fall, sometimes rapidly. In the third stage effort begins to rise as the amount that can be harvested increases. Eventually it settles at a new, stable level that is consistent with maximum, or optimal, sustainable yield. Because the fish have become easier to find, and the remaining fleet is assumed to be more efficient on average than the fleet that existed prior to intervention, however, the new level of effort could fall below what it was before the intervention.

These relationships, however, may not hold for all situations. Some fisheries are currently being overfished only to a small extent, or only in certain years. It may be that a minor modification of the management instruments used, or a slight reduction in effort using existing instruments, or an increase in the resources devoted to enforcement, would be sufficient to increase stock size to the level that will produce the maximum sustainable level (MSY). In other cases, the transition to responsible fisheries may require progressively or immediately reducing fishing effort by a substantial amount. In the extreme, it may necessitate imposing a total moratorium on fishing activities altogether. The worse shape a fishery is in, the greater the likelihood that delaying reform will eventually require that such drastic actions be taken.

To the extent that the transition to responsible fisheries could imply changes in the mix of management instruments used in particular cases, any employment effects would also depend on which mixes were adopted. As shown in the OECD's report *Towards Sustainable Fisheries* (OECD, 1997) – henceforth referred to in this document as the "*Management Study*" – for any given management objective, different instruments will generate different employment outcomes.

In an open-access fishery, fishing effort expands until total revenue just covers total costs. This level of effort generates no rents, and usually results over the long run in harvests that are smaller than MSY. Introducing management instruments into the fishery may or may not generate rents, but if they are implemented on the basis of accurate information about stocks, they should in principle lead to larger harvests. The short- and long-run consequences for catch per unit effort, the numbers of workers employed, and the seasonality and stability of employment, however, can differ greatly depending on what instruments are used and how they are implemented.

The OECD's *Management Study* examined these issues from both a theoretical and an empirical perspective, considering three generic types of instruments: output controls, input controls, and technical measures. Its main findings with regard to employment in harvesting are summarised in a highly simplified form in Table 1. Two points should be kept in mind when reading the table. First, it refers to the

Table 1. **Summary of the effects on income and employment of different management instruments**[a]

Management instrument	Expected effect on:						Evidence of expected employment related outcomes strongly supported by the OECD's *Management Study*?
	Length of fishing season	Stability within the season	Catch per unit of effort		Harvesting employment		
			Short- run	Long- run	Short- run	Long- run	
Output controls							
TACs	–	–	–	–	–	+	Yes, for the most part.
Individual quotas	+	+	0	+	–	–	Yes, for the most part.
Vessel catch limits	+	+	–	–	–	–	No: difficult to confirm.
Input controls							
Limited no. of licenses	–	–	0	+	–	– or +	Supporting evidence mixed.
Individual effort controls	+	+	–	–	–	– or +	No: evidence weak.
Gear and vessel restrict.	0	0	–	–	–	– or +	No: evidence weak.
Technical measures							
Size and sex selectivity	0	0	–	–	–	– or +	No: evidence weak.
Time closures	–	??	–	–	–	– or +	No: difficult to substantiate.
Area closures	??	??	–	–	–	– or +	No: difficult to substantiate.

a) Based on *Towards Sustainable Fisheries* (OECD, 1997).
Note: – = negative effect; + = positive effect; 0 = no or negligible effect; ?? = can not be predicted *a priori*.

effects of moving from an unmanaged (open access) to a managed situation using each instrument in isolation. The effects of changing from one management regime to another (which nowadays is more common), or of adopting particular combinations of instruments, cannot be so easily summarised in tabular form. Second, it refers to the situation for single-species fisheries. The consequences of introducing specific instruments into multi-species fisheries, fisheries characterised by a high degree of species interactions, migration, and uncertainty regarding the productivity of the fish stock, are much more complex and fishery-specific. Finally, it is assumed that the fleet is over-capitalised prior to fishing at MSY.

The three main types of *output controls*, competitive total allowable catch (TAC) quotas, individual quotas (IQs and ITQs) and vessel catch limits, differ considerably in their employment implications. A *competitive* TAC *quota* works, essentially, by making a fishery artificially inefficient (Cunningham, *et al.*, 1985). Initially, depending on how much lower the quota is set below current harvest levels, introducing a TAC will cause a decline in harvesting employment. (Whether employment in other fishing-related activities will decline depends on other factors, such as access to imported fish.) But as the stock recovers, effort will increase and so will employment, perhaps to above the previous level. Because no limits are placed on effort, however, a "race-to-fish" ensues, shortening the season and creating a higher degree of variability within that season. In general, these expected outcomes were strongly supported by empirical evidence in the M*anagement* S*tudy*.

Imposing *individual quotas* also initially results in reduced employment. If the IQs are transferable, however, some rationalisation of the fleet can be expected, leading in the long run to greater capacity utilisation. For many species of fish, the length of the fishing season will increase and employment will become more stable. Employment will rise as the allowable catch increases, but not proportionally – the end result can in fact be fewer jobs in harvesting than under the open access regime it replaces. These expected outcomes were also strongly supported by empirical evidence in the M*anagement* S*tudy*.

The expected long-run effects of individual, or vessel, *catch limits* (which restrict landings per day, week or month but do not limit entry), when used in isolation, are a smoothing out of the distribution of landings and effort, a shrinking in the fleet size (and average size of the fishing unit), and a reduction in harvesting employment. They can be expected to favour small over large producers, thus protecting owner-operated fishing vessels. However, because the M*anagement* S*tudy* found no case where vessel catch limits were *not* used in conjunction with other management instruments, these expectations are difficult to confirm on the basis of empirical evidence.

Introducing *input controls* – such as allocating a limited number of licences to fish, or restricting the amount of time gear or a fishing vessel may spend at sea – generally works by making the individual fishery unit less efficient. L*imited licences* are expected to induce somewhat similar, but less pronounced, effects as introducing a competitive TAC quota, but the evidence on them is mixed. I*ndividual effort quotas*, to be effective, must sum up to less than the total amount of effort being expended before the management measure was adopted. Their effects on employment depend, however, on whether there is a flexible or inflexible relationship between the effort unit being controlled and how much that unit can catch. If the relationship is inflexible, they are expected to function in much the same way as individual catch quotas. However, the M*anagement* S*tudy* found little evidence on the social outcomes of individual effort quotas on which to base any strong conclusions. G*ear and vessel restrictions* prevent fishers from using equipment that they would otherwise find profitable to use. Costs are increased in the short- and long-run, causing some initial departure from the industry, but if (as expected) landings increase, employment may recover. Other aspects, such as the length of season and variability of the catch are unaffected.

T*echnical measures* in support of output and input controls include sex- and size-selective restrictions, and time and area closures. Restrictions on the sex (*e.g.* prohibiting the catching of egg-bearing females) and size (*e.g.* requiring a minimum mesh size) of fish caught are intended to enhance the spawning stock and recruitment, and thus the fishery's yield. In the short-run they are mainly expected to lower harvesting productivity, which may lead to departure from the industry. Over the long-run, as the resource stock grows, new entrants will be attracted back into the fishery, and employment could in theory rise. However, the M*anagement* S*tudy* found only weak empirical support for the expectation of increased employment under sex- and size- selective measures. Moreover, based on the empirical evidence, such

measures do not appear to mitigate the race-to-fish; this outcome suggests at best no lengthening of the season or stabilisation of landings.

When a fishery is closed for part of the year, or a part of it is closed on a permanent basis, some fishers will be induced to leave the sector. In theory, labour will be shed in the short-run and be taken on in the long-run if the fishery had started from a situation of over-exploitation. Once a new equilibrium is established, the total number of producers, vessels and employment may be more or less than initially. But because *time and area closures* are almost always used in conjunction with other management measures, the M*anagement* S*tudy* found these expected effects practically impossible to substantiate.[3]

Implications for employment in fish processing and other fishing-related activities

Because of the multiplier effect, the increases in revenues that would be expected in the long-run from moving to responsible fisheries should benefit most activities upstream and downstream from the harvesting sector:

Employment in firms that service boats and supply them with equipment, fuel and stores would increase if fleet sizes increased. Depending on the nature of the administrative services required by the fishery (such as management, research, surveillance and monitoring) fishing at MSY may result in higher employment. Increased employment opportunities would also be created in marketing the superior and often more abundant products.

During the transition period, however, reduced landings in the short run can lead to reduced employment in dependent industries. It can also reveal inefficiencies in these industries, creating added pressure for structural adjustment. In Newfoundland, for example, which is only now beginning to consider partially lifting the ban on cod fishing introduced in 1992, a recent study suggests that, even with new fisheries and assuming a full recovery of groundfish stocks, there is an urgent need to consolidate and reduce the number of processing plants – perhaps by as much as two-thirds.[4]

As with employment in the harvesting sector, different management instruments can be expected to generate different impacts for associated activities by affecting optimal capacity and capacity utilisation. In a single-species fishery regulated solely by a TAC, for example, landings tend to be concentrated around specific periods, creating the need for greater capacity in the ports, in the processing sector, and along the distribution chain. Under an ITQ regime the landings tend to be more spread out over time, creating the opposite effects. In multi-species fisheries and in fisheries where different species are being harvested at different times, such effects may be less important because of the possibility for fishers and processors to switch from one species to another.

Implications for employment in other activities

At a general level, economic theory suggests that policies that encourage the expansion of capacity in one sector leads to the bidding away of factors of production from other sectors. The sectors most likely to be affected by this bidding away of resources are those that require similar mixes of production factors to that required by fishing. Since fishing can be quite capital-intensive, as well as a heavy user of purchased inputs such as fuel, this means that manufacturing and other capital-intensive sectors are more likely to be adversely affected by over-fishing than the service sector, which uses relatively large amounts of labour relative to capital (OECD, 1994*a*). On the other hand, because the fisheries sector accounts for such a small proportion of GDP in most OECD countries, such adverse affects are likely to have been minor. Nonetheless, to the extent that changes in fisheries management policy lead to a more efficient use of capital and labour in the fisheries sector, other sectors may benefit in small ways. The net effects on employment can only be explored with the aid of a general equilibrium model, however; such an analysis was beyond the scope of this study.

At a more specific level, one can also assume that economic activities that compete directly with commercial fishing for marine resources and for berthing places in harbours may also have been adversely affected by over-capacity in marine fisheries. Conflicts with the sport fishing industry, for example, are commonplace and appear to be on the increase in some countries. Fishing vessels may compete

for space in harbours with vessels used for maritime transport, recreational boats and boats used by the tourism industry. Hence, to the extent that transition to more responsible fishing changes the structure and scale of the sector, the activities of, and employment in, these other industries will be affected also.

Implications for physical capital

Those who own capital used for fishing, such as vessels and gear, will be affected by any policy that changes access to or the harvest from the fishery in which they have been involved. If there are no limitations placed on the disposal of these assets, their owners may simply be able to sell them in another fishery. However, some fishery-specific assets (*e.g.* lobster pots) may be too specialised to find uses in other fisheries or sectors, or the costs of transporting them to another fishery that can make use of them may be prohibitive. This stock of capital will be considered "sunk" (in the economic sense) by its owners, and therefore have a low opportunity cost. Its owners may remain in the fishery until the assets are lost or depreciate to a point where the cost of maintaining them pushes total operating costs above gross revenues.

If, on the other hand, no action is taken to reduce the amount of capital employed, so as to bring it into line with the available fishery resource, losses on capital value will occur. These losses will be borne by different groups of individuals and institutions, depending on the financial structure of the fishery. Where the vessels and gear are largely owned by small skipper-owners, some may become insolvent.

III. THE OECD FISHERIES HOUSEHOLD AND PRODUCTION UNIT: AN OVERVIEW OF ITS SOCIO-ECONOMIC CHARACTERISTICS

Making the transition to responsible fisheries, with its pressures to reduce capacity and effort, will invariably induce further structural adjustment in many of the fisheries of OECD countries. The social and employment impacts in any particular fishery, however, are likely to vary considerably according to the characteristics of the affected labour force – namely, the age, educational attainment and skills of the people employed in harvesting and ancillary activities; the degree to which the region is dependent on the industry for their livelihood, and its current level of unemployment; the availability of employment opportunities to which fishery sector workers are suited; the nature of the social security system in place; and so forth. In considering the types of adjustments that may take place, it also is important to bear in mind that structural adjustment is not a new experience for the sector. Indeed, in some countries it has been occurring at a rapid pace.

The purpose of this section is, first of all, to briefly highlight the major trends in employment in marine fisheries over the last 25 years, and to identify the forces that have shaped the sector. Its second objective is to provide an overview of the current state of employment in the sector, with a view towards identifying those segments of the fishing industry that are most likely to encounter difficulties with structural adjustment.

A. An historical perspective on OECD fisheries employment

Employment in the marine fisheries of most OECD countries was lower in 1996 than in any year since 1970 – and probably since records began to be kept. There are exceptions: Iceland and Portugal had about the same numbers of fishers as in 1974, as did perhaps Australia. But the general trend has been downward, especially since the mid- to late-1980s (Figures 2, 3 and 4). Typically, of the countries for which consistent, long-term data on employment in fisheries are available, the numbers of fishers have dropped by around one-third since that period.

A number of countries did experience a dozen years or so, rough from 1976 through 1988, during which employment in fish harvesting fell less dramatically than previously, or even increased. Several explanations for this phenomenon occur frequently in the literature (see, *e.g.* Doeringer, Terkla and Watson, 1995). The imposition of 200-mile limits beginning in the late 1970s, and the corresponding decline of foreign fishing, created massive redundant capacity in countries with large distant-water fleets and led to the expansion of domestic fleets in many countries with large coastlines. Not only did fleets grow larger in many cases, but with new, more sophisticated fish-locating and harvesting technology they became for awhile more productive. Eventually landings began to fall, but rising demand and buoyant prices validated continuing investment. By the late 1980s, however, price increases were no longer able to offset declines in stocks. Restructuring – often encouraged by government programmes – led invariably to reduced employment in fishing.

The release of labour in fish harvesting over time has resulted from a complex interplay of economic, technological, biological and policy-related forces. The evolution of technology in fishing has been aimed both at substituting capital for labour and at offsetting the consequences of chasing ever scarcer fish resources. Within a context of rising labour costs, declining fish stocks – and, in many cases, grants and other forms of assistance for fleet modernisation – such technological innovations have fed a gradual process of capital accumulation in fish harvesting.

Figure 2. **Numbers employed in the marine fisheries of Japan, 1970-1996**

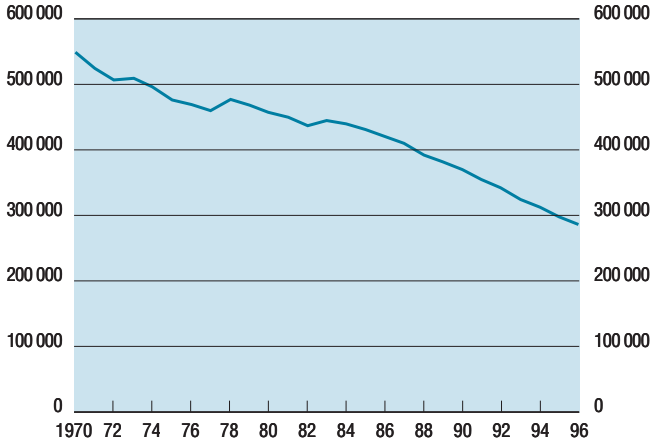


Figure 3. **Numbers employed in the marine fisheries of Norway, Poland and Portugal, 1970-1996**

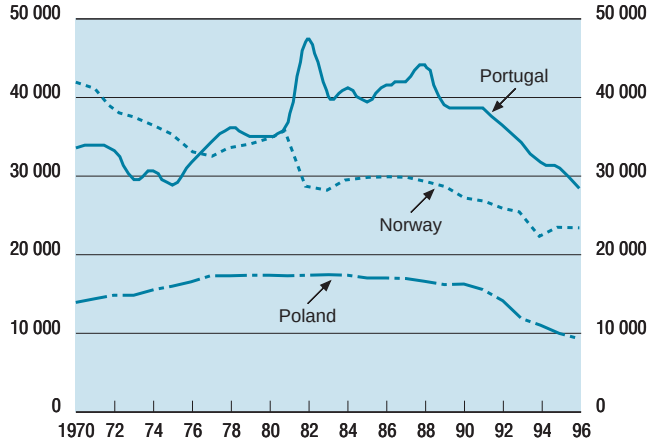
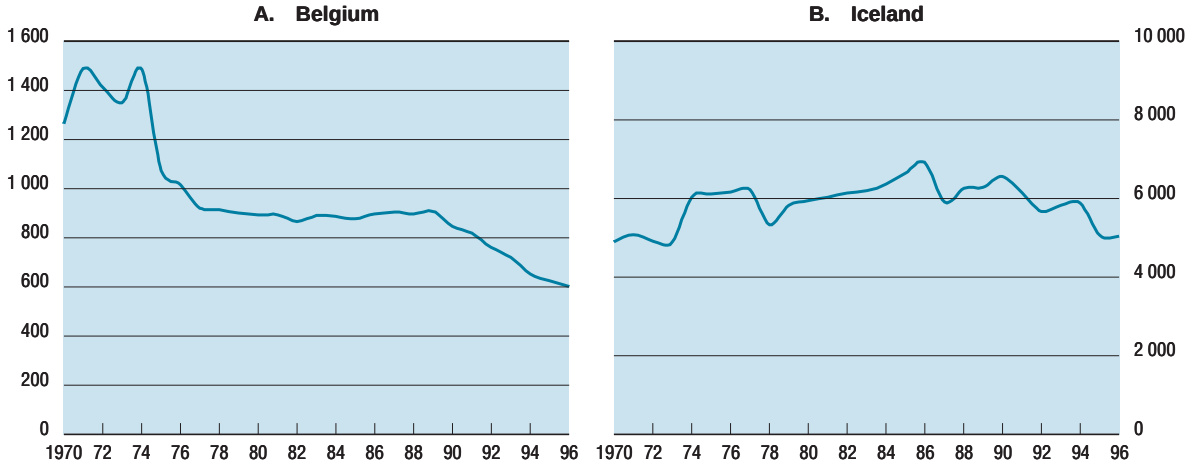


Figure 4. **Numbers employed in the marine fisheries of Belgium and Iceland, 1970-1996**



Source: OECD.

This process has not been even among or even within countries, however. The fish harvesting sub-sector, once comprised almost exclusively of small-scale, family owned-business, supports a variety of production arrangements. Nowadays, in many fisheries "atomistic and large-scale, vertically integrated producers directly compete with one another; factory-owned vessels operate alongside family-owned vessels; and large, highly mechanised processing plants compete against small, labour-intensive ones" (Doeringer, Terkla and Watson, 1995: 3). In short, within the same regions, sometimes within the same fisheries, fishing enterprises coexist while exhibiting different sizes, operating efficiencies and income generating potentials.

One other development may be contributing to the reduction of local employment in fisheries, especially in countries with large distant water fishing fleets: the re-registration of fishing vessels under flags of convenience. Although no data are available on the extent of reflagging, it is commonly asserted in the international fishing press that a number of vessels formerly flying the flag of an OECD fishing nation have re-registered under the flag of countries with much less stringent labour laws. When this happens, the majority of the previous crew are replaced by nationals from developing countries.

B. Socio-economic characteristics of the fisheries sector in OECD Member countries

This section attempts to elaborate on the heterogeneity and distinctive socio-economic characteristics of fisheries labour that are likely to have a bearing on the design of policies to promote structural adjustment. The data used in the examples should be regarded as indicative. Because of its small size, and difficulties in obtaining data, the fisheries sector in many countries often attracts little attention from statisticians.

The predominance of owner-operators and share-fishing

To varying extents in Member countries, the fishery sector's work force is dominated by "self-employed" workers. This category consists mainly of owner-operators of fishing vessels and family workers, but also includes share fishers in most countries. Thus fishing, along with agriculture, is one of the few remaining capital-intensive sectors still dominated by an organisational structure combining a component of labour (owner-operators) and the ownership of sectoral assets. One implication of this structure is that while fishery households may enjoy moderate or even high levels of wealth compared with other households,[5] this wealth tends to be invested in a poorly diversified way: the principle asset is the fishing vessel and associated gear. Among urban workers, the principal asset (aside from human capital) is likely to be the family home, followed by pension-related assets and other financial assets such as bank accounts and stock portfolios (OECD, 1994*a*). The effect of the fishery household's concentrated investment strategy is compounded by the fact that, unlike most other households (apart from small businesses owners and farmers), the fisher works in the sector in which most of his or her assets are invested.

An important factor to consider when attempting to predict how labour will adjusts to changing economic conditions is the extent to which it, together with other factor inputs into harvesting and processing, are fixed. Generally this depends on the scale of the enterprises involved in production. Large-scale operations can quickly adjust their workforce to changes in catch levels, by shedding surplus labour according to redundancy schedules that more or less reflect the marginal productivity of labour in the industry. Family obligations in the small-scale segment of the industry, by contrast, normally constrain downward adjustments in the short term (Doeringer, Moss and Terkla, 1986). Rather, adjustment occurs at a different rate and along different margins: the least efficient labour is not necessarily the labour that is likely to be shed first (Doeringer, Terkla and Watson, 1995).

Although the structures of the fishing fleets of OECD Member countries are evolving, with ever larger enterprises displacing smaller, family owned and operated enterprises, the latter still remains numerically predominant, at least in terms of numbers employed. In Denmark, for example, 68% of the firms engaged in marine fish harvesting employ only one or two people, accounting for at least 40% of employment in the sub-sector; another 22% employ three to five people (Danish Directorate of Fisheries, 1997). Comparisons of data on the numbers of enterprises or fishing vessels and the numbers of employees working for those enterprises or on those vessels suggests a similar ownership structure in other countries.

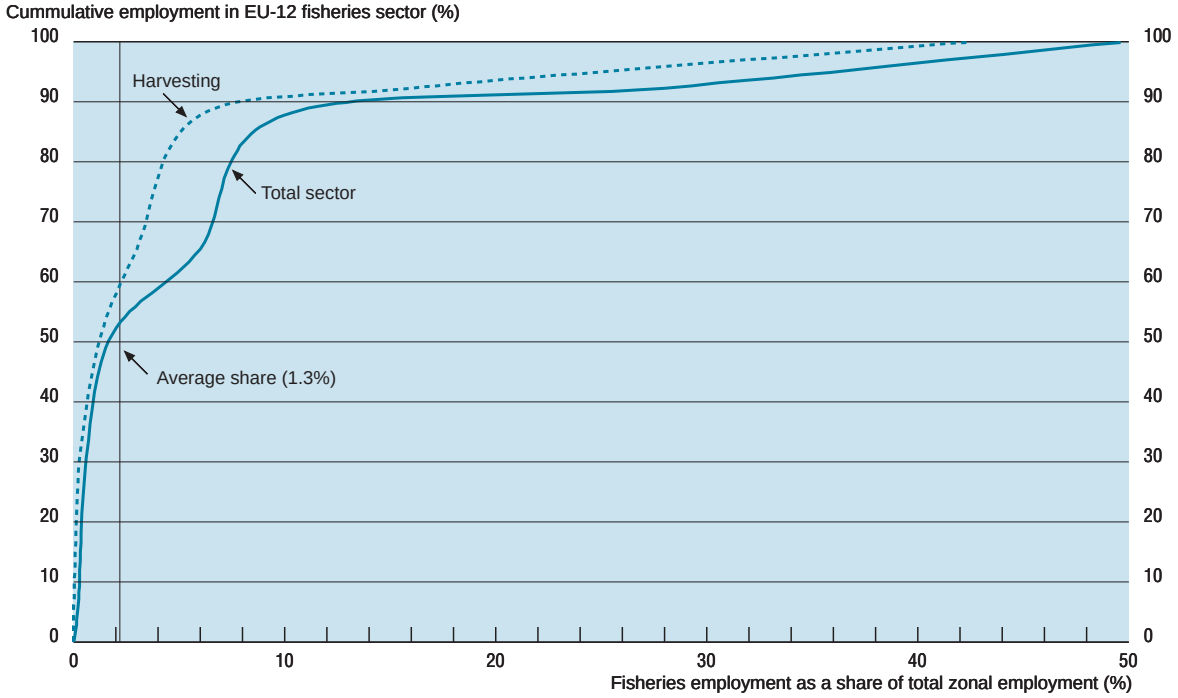
The predominant form of remuneration on fishing vessels has traditionally been, and remains, the fishing "share" – *i.e.* a payment based on a pre-determined proportion of the revenues from the sale of the catch. In many OECD fisheries, skippers and crew are paid a fixed wage per trip, in addition to the share, but the share normally forms the largest part of their income from fishing. The share system has been criticised by some labour groups in recent years, who feel that it does not offer workers in the fisheries sector an adequately predictable income, and disqualifies them from some forms of social insurance available to employees earning fixed wages.

Employment and community dependence

Over large heterogeneous geographic units, the dependency on fishing often takes on a distribution similar to that shown in Figure 5 for the European Union. Overall, circa 1990 (the latest year for which such data are available), the fisheries sector[6] accounted for 1.3% of people actively employed in the coastal zone of the EU. This result is not surprising, since the majority of the EU's population also lives in this area. Of the approximately 300 coastal zones of varying sizes examined in the study from which the data for Figure 5 are derived, only 15% depended on the fisheries sector for 5% or more of the jobs in their area (Salz, 1993). Looked at in the way indicated by the chart, zonal dependency on employment in the fisheries sector can be partitioned into three areas. One-third of the people employed in the fisheries sector worked in zones that were 5% or more dependent on them; one-third worked in zones that were between 0.66% and 5% dependent; and one-third worked in areas that were less than 0.66% dependent. The most-dependent coastal zones were found to be: north-west Spain, south Atlantic Spain, eastern Italy, Scotland, mainland Portugal, Greece and Belgium

Within more homogenous or remote coastal zone areas (such as the Pacific coasts of North American north of the 50th parallel and south of the 27th parallel, northern Norway, Newfoundland, etc.), fishing forms a much more integral part of the coastal economy. It is these areas, along with the dependent areas

Figure 5. **EU coastal zones on employment in the fisheries sector, circa 1990**



Source: Based on data reported in Salz (1993).

of the more heterogeneous regions, that are most sensitive to developments affecting the fishing industry. It is also in these areas that finding or creating alternative employment opportunities for displaced workers could be the most difficult – both because of this dependency and because, often, local unemployment rates are already high.[7] In Canada, for example, levels of unemployment as of December 1997 were highest in the four Atlantic provinces and Quebec, with Newfoundland leading at 17.5% – double the national average (Little and Bourette, 1998).

The predominance of men in fishing

Information on the sex of people employed in the fisheries sector is not regularly reported on a consistent basis for all countries. Most of the information that is reported pertains to the harvesting subsector. What it suggests is that, as in agriculture, harvesting remains a male-dominated occupation, while processing is dominated by females.[8]

In the FAO's most recent compilation of statistics on numbers of fishers (FAO, 1997), for example, separate statistics on the sex of fishers are reported for very few countries; within the OECD, only Canada, Japan, Norway and Sweden provide such data. Table 2 shows that women account for around 13% of workers in harvest fisheries in Canada, and 18% in Japan, compared with less than 3% in Norway, Portugal and Sweden. Women may account for a significant share of the marine harvest fisheries workforce in other countries (*e.g.* Korea), but in most they probably do not exceed 5%.

Table 2. **Marine fishers in selected OECD countries, by sex**

Country	Year of data	Number of fishers	
		Male	Female
Canada		40 390	6 255
Japan	1996	235 000	52 300
Norway	1995	23 020	633
Portugal	1991	22 564	558
Sweden	1994	2 974	25

Sources: **Canada:** Department of Fisheries and Oceans; **Japan:** MAFF (1998); Portugal: INE (1998); **other countries:** FAO (1997).

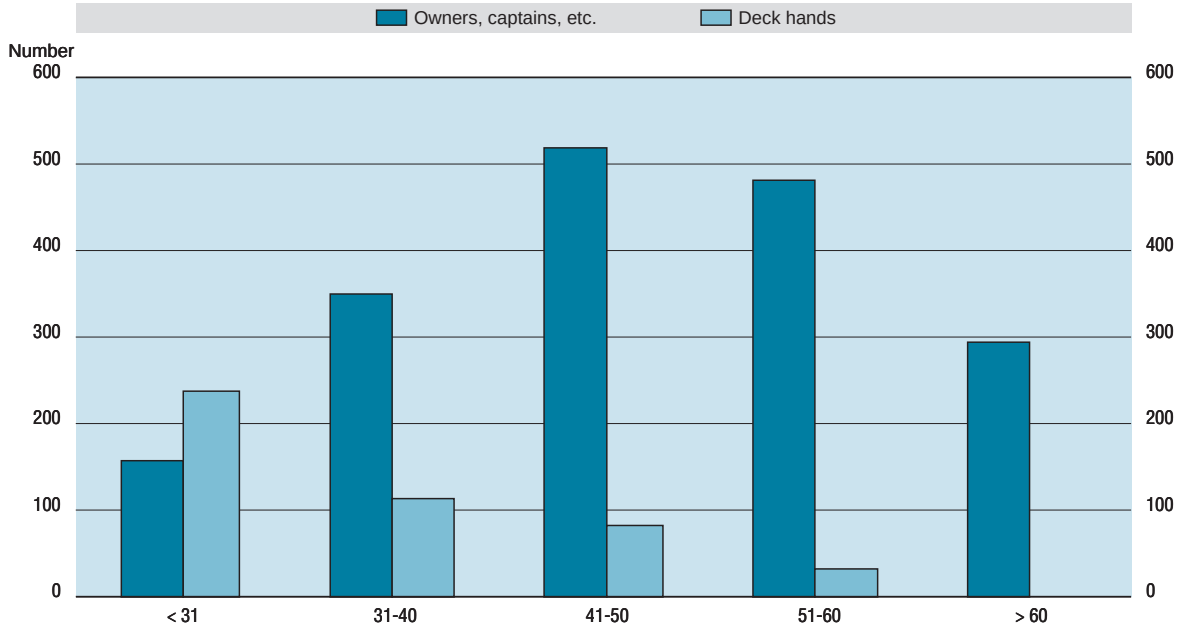
Such statistics probably understate the degree of involvement of women in fisheries, however. As pointed out in a recent editorial in the European Commission's *Pesca Info* newsletter (No. 8):

> "In fact, fishermen very often leave various tasks, like accounting and dealing with administrative documents, to their wives. … At the processing level, the role of women in sardine-canning factories is a long-standing tradition. … There are often large numbers, if not a majority, of women working both as employees and managers in the fish trade. ... Admittedly, women on ships remains the exception;… However, women are also found in responsible positions: shipowner, trader (one of the main Italian businesses in this industry even had the distinctive feature of all of its employees being women), representative for professional organisations, minister or ... European Commissioner."

The ageing of labour in fish harvesting

As in agriculture and other industries made up mainly of small-scale independent units, the average age of owners-operators is typically greater than that found in the working population at large, while the average age of hired workers is, if anything, younger than average. Statistics on the age profile of commercial fishers working on marine fishing vessels of up to 250 cubic metres capacity in Germany show this difference clearly: 72% of owners, captains and owner-captains were older than 40 years, against 24% of

Figure 6. **Age composition of commercial fishers in Germany as of 30.9.96**[1]



1. Vessels of small deep sea fisheries (up to 250 cubic metres) and of the coastal fisheries.
Source: Data BMELF (1997), p. 217.

deck hands (Figure 6). Similarly, of the 1 751 firms accounting for 98% of the total output of the Danish fishery in 1996, around two-thirds were headed by commercial fishers older than 40 years (Danish Institute of Agricultural and Fisheries Economics, 1997). The high percentage of deck hands younger than 40 is not surprising, since most either obtain their own vessel by the time they reach their mid-40s or leave the sector.

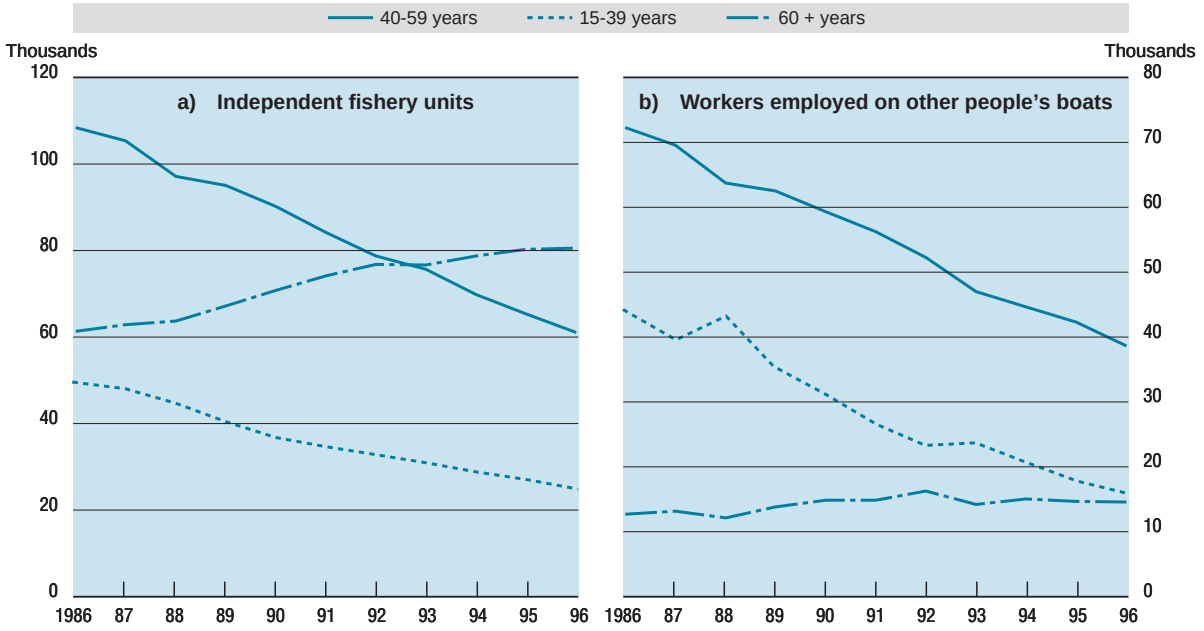
Data on the age structure of fishery workers in Japan and Korea (see that country's case study) show that the labour force is especially skewed towards the older generation in those two countries. Figure 7*a*) shows the most recent data on participation in the fisheries sector by three age classes of males in Japan. In 1996, people 60 years-old or older (60+) comprised the most numerous age class working for independent (mainly family-owned) fishery units, and the least numerous age class of hired employees. For both types of employment, the number middle-aged (40-59 years-old) men employed in harvesting was more than twice that of the youngest age class (15-39 years-old), which covers a broader span of years.

The trends in participation by the oldest group are notable because they run counter to those of the other groups: for both types of employment the number of 60+ men engaged in fishing actually rose. The explanation for these trends would appear to be that, as employment in the fisheries sector contracted in Japan, fewer young workers were recruited, and a significant number of men in the 15-39 years-old age group left the industry. Some workers in the 40-59 years-old age group also left the sector, but many (probably the oldest within this range) continued fishing until they were at least 60 years old. The question of whether those who left the sector found employment elsewhere cannot be answered by the data.

While Japan and Korea appear to be towards one end of the spectrum, an older-than-average labour force in fisheries is to be expected. Indeed, there are several features of the sector that could cause fishers' average ages to be permanently higher than those of the general working population:

- As has been already noted, the fishing sector is declining in employment terms. That is, with each successive generation, a smaller proportion of the younger-age cohort is attracted to the sector. This fact alone would shift the age distribution upward relative to that of a growing sector.

Figure 7. **Trends in participation in fisheries by males of different age classes in Japan, 1986-1996**



Note: Numbers refer to situation on 1 November of each year.
Source: Japan, Ministry of Agriculture, Forestry and Fisheries (1999).

- Second, in some countries a significant proportion of fishers continue to fish beyond the legally mandated retirement age for industrial and service workers. Because older workers are not compelled to leave the fisheries workforce in their mid-60s, the average age of fishers tends to be higher.
- The sector contains significant numbers of owner-operators who, in socio-economic terms, are probably much more comparable to owners of small- and medium-sized businesses than to the general work force. That is to say, a part of the owner-operator population can be expected to have lived long enough to have acquired their assets through inheritance, savings, or both.

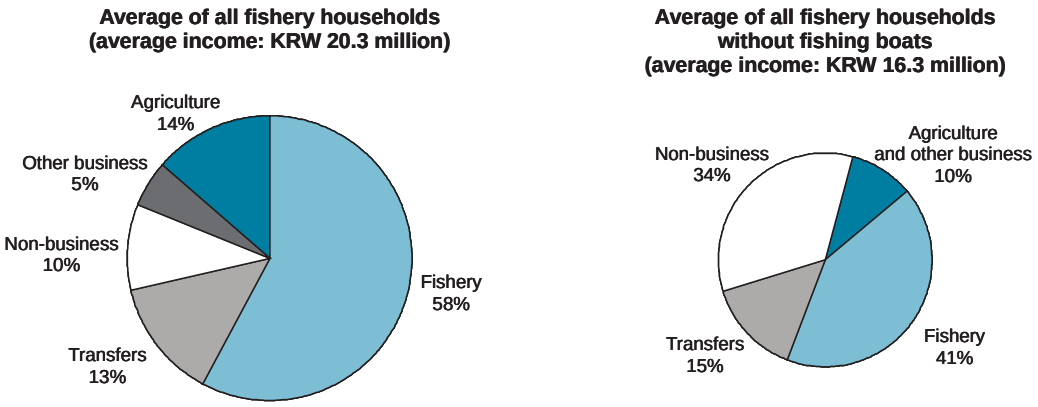
The age structure of the labour force in harvesting is significant, since it is generally assumed that the older a person (beyond the age of, say, 39), the more difficult it is to re-employ them in another occupation.

Educational attainment and transferability of skills

The educational attainment of workers in an industry provides a partial indication of their ability to adjust to changing economic circumstances. Unfortunately, internationally comparable data on the educational attainment of workers in the fisheries sector are scarce. National statistics normally refer to non-mining primary industries in the aggregate, which in most countries are dominated by agriculture. (The other sectors included in this grouping are hunting, fishing and, in some countries, forestry.) For those countries that have published sector-specific data, however, the statistics would appear to support the general impression of a labour force characterised by low educational attainment levels. A 1981 census in Canada, for example, revealed that only 23% of the people employed in fish harvesting and 21% of people employed in processing had benefited from more than 13 years of education (Nowak, 1991). By comparison, the corresponding share for industry as a whole (based on 1987 data) was 29%, and for services it was 46% (OECD, 1994*a*). By the 1991 census the educational level had improved, but only marginally: 64% of harvesting workers and 63% of processing workers were without secondary school diploma.

Educational attainment is an incomplete indicator for the fisheries sector, however, because informal learning and on-the-job experience may play an important role, especially in providing skills that are marketable in other marine industries, such as commercial shipping. Moreover, many workers in the fishery sector are believed to be pluriactive – that is, engage in other activities to supplement their fishery-related income. Most professional fishers in Finland, for example, are also part-time farmers (Kettunen, 1996), as are fishers in the Azores, Portugal. Figure 8 provides a slightly different perspective on pluriactivity, showing the sources of income for fishery households (households in which at least one family member works in a fishing occupation) in Korea. On average, households in that country obtain more than 40% of their income from sources other than fishing or aquaculture; the figure is even higher for households without fishing boats, which tend to be older than average.

Figure 8. **Sources of income for fishery households in Korea in 1997**



Source: Data source: National Statistical Office.

In agriculture, pluriactivity often forms part of a strategy used by farmers to manage their progression out of farming (OECD, 1994*a*). Presumably it plays, or can play, a similar role in the fisheries sector too. An important benefit of pluriactivity is that it helps offset the effects of poor diversification, lowering the exposure of fishery households to fishery-sector events. Thus, in response to a shock to the fishery sector, the fishery household may adjust by increasing non-fishery employment. This reaction is in evidence in the several of the examples from results of surveys of participants in vessel reduction programmes included in the Japanese case study for the Impact of Government Financial Transfers on Fisheries Resource Sustainability study. Clearly, the success of a "pluriactive strategy" depends on the availability of local employment opportunities that are not closely linked to the fisheries sector.

The special case of immigrant labour

In most OECD countries, owners of flag vessels fishing in their EEZs tend to be nationals. The same cannot always be said of deck hands, and people working for fish processors. Data on the number of foreign nationals employed by fish processing firms are scarce, but anecdotal evidence suggests that they make up a minor, but still significant percentage of the workforce in some countries.[9] Figures are available for Korea, which in 1991 began to allow the recruitment of foreign nationals in its harvest sector. As of 1996, there were more than 4 500 foreign nationals employed on Korean fishing vessels, mainly working as hired crew, accounting for 3% of the full-time workforce.

Whether or not structural adjustment in the industry is made any easier or more difficult by the presence of foreign nationals depends on the workers' conditions of employment and immigrant status. Those employed under short-term arrangements, which require that they return to their home country after a relatively brief period of work, often enjoy few if any rights to continued employment, and can easily be laid off. Those who have been employed for more than a year, however, often acquire residency rights and other forms of social protection. These foreign nationals, once made redundant, may encounter difficulty in finding alternative employment, especially if their language skills and level of educational attainment do not match the requirements of local employers.

C. Summary: a profile of at-risk fishery workers and fishers

Based on the preceding analysis, a profile emerges of the fisheries sector worker whose welfare is likely to be most adversely affected by the transition to responsible fisheries. From a social welfare perspective, the people that are likely to need assistance are those whose income levels, adjusted for family circumstances, fall below what would be considered, by society at large, to be unacceptably low. By this criterion the at-risk population would be comprised mainly of people with little formal education who live in fisheries-dependent communities remote from other centres of employment – generally, men working in harvest fisheries for a share of the catch and women working in fish processing plants for a wage. Those at most risk are likely to be working in a region with few prospects for developing alternative fisheries or industries, such as tourism. Hired labour, which is likely to be shed before family labour, may be able to relocate to another region easier than those with a capital stake in the fishery. Where a significant share of these hired labour are immigrants, however, immigration policy is likely to influence the problems they face in adjusting to change.

Because this profile concentrates on social welfare considerations, it does not include highly-indebted owner-operators and local suppliers to the industry, who would probably run greater risks of bankruptcy in the event of a several-year cessation of fishing or major reduction in harvest levels, but who would not necessarily be regarded as needy from a social welfare perspective. The share of fishery workers who would fall into this category is difficult to determine in advance, but it could be significant in some fisheries. In most cases the absolute numbers involved will be small relative to the total labour force of a region or country, however.

IV. SUMMARIES OF CASE STUDIES OF ADJUSTMENT

A. Introduction

This chapter summarises the case studies of structural adjustment in the fisheries sector provided by five Member countries: Canada, Korea, Spain, the United Kingdom and the United States. These case studies vary considerably in depth, focus and analytical framework, but together they may be seen as reflecting a reasonably representative cross-section of situations and experiences. To take one dimension – dependency on fishing – the studies range from British Columbia (Canada), where some of the affected individuals live in communities that are accessible only by boat, to Korea, the most densely populated country in the OECD.

The general structure of these case studies is: *i*) identification of the pressures for structural adjustment; *ii*) government responses (if any) to these pressures; and *iii*) outcomes.

B. British Columbia, Canada (Pacific salmon)

Recent years have witnessed an alarming decline in the commercial catch of Pacific salmon off the coast of British Columbia. Having averaged 75 600 tonnes during 1991-1994, the commercial catch for 1996 was expected to be less than 25 000 (this number has since been revised to 42 100 tonnes) – making it, together with 1995's outcome, the lowest two-year catch since the 1950s. Adding to the fisher's woes, the prices for salmon had dropped by one-third in real terms from the beginning of the 1990s.

On 29 March 1996 Canada's Minister of Fisheries and Oceans announced a new Pacific Salmon Revitalisation Strategy (PSRS) in an attempt to bring effort into line with the available fisheries resource. The strategy involved the following key elements:

- A new approach to fisheries management, embracing conservation through risk-averse strategies.
- A voluntary licence retirement programme: almost 800 vessels and their licences were retired under a voluntary "buyback" scheme – completed in 1996 at a cost to the Federal Government of CAD 78.5 million (USD 56 million).
- New licensing measures: initially, each licence holder could choose only one area to fish (from among two areas created for seine, three for gillnet and three for troll fishing); and one type of gear. After the initial allocation of area and single-gear licences, licence-holders could purchase additional licences from existing fishers to fish other areas or with other gear (called "stacking"); some 375 were sold, of which 256 were for gillnet fishing.
- A review of intersectoral allocations, examining the complex issue of salmon sharing arrangements among aboriginal groups, commercial fishers, and sport fishers.
- Transitional measures, including an option to decline from fishing salmon in 1996 and not pay the associated licence fee, and to delay selecting an area until 1997.

In conjunction with the PSRS, a fleet reduction target of 50% (to be achieved over several years) was established. As of end-1997 one-third of this target had been met – 18% through licence buy-backs and 16% through licence stacking.

The estimated employment effects of the poor salmon season and of the PSRS are shown in Table 3. Overall, some 7 800 workers in the BC salmon industry are expected to have been displaced as a combined result of the poor fishing season in 1996 and the PSRS. This number represents just under one-third the total number of people employed in the industry during the previous four-year period. Permanent job losses in the fish-harvesting sub-sector account for 35% of the total, of which the PSRS accounted for three-quarters.

Table 3. **Employment impacts of the 1996 salmon season and the of the PSRS in British Columbia**

Sector	Average 1991-94 employment	Job losses owing to:			Employment losses (person years)
		Poor season (short-term)	PSRS (short- and longer-term)	Both	
Commercial					
Salmon fleet	10 585	615	2 750	3 365	1 345
Skippers	4 367	238	1 173	1 411	565
Deckhands	6 218	377	1 577	1 954	780
Fleet suppliers	615	155	145	300	180
Processing plants	3 950	1 690	0	1 690	507
Transport and handling	640	270	0	270	80
Sport Fishery	8 625	2 175	0	2 175	890
Total	24 415	4 905	2 895	7 800	3 002

Source: Gordon Gislason, Edna Lam and Marilyn Mohan, "Fishing for Answers: Coastal Communities and the BC Salmon Fishery", Final Report to the BC Job Protection Commission, ARA Consulting Group, Inc., Victoria, BC, Canada.

Overall, the PSRS resulted in an increase in the market value of fishing enterprises, because of higher income potential and the expanded market for licences. And total crew earnings are now distributed among a fewer number of crew. For those who left the industry, the licence retirement and stacking measures provided relief to those experiencing financial difficulties, by increasing the asset value of the licences. Licence sales enabled those interested in pursuing retraining or relocating to other areas with a means to do so, and provided those nearing retirement age to retire early.

Interestingly, the case study reckons that the PSRS itself would contribute to no further job losses in downstream industries. Such an outcome follows directly from the assumption that the salmon catch in future years would be no worse than in 1996. Although the commercial fleet was reduced by the PSRS, it will still be able to catch whatever fish are available. Consequently, the fish transporters, handlers and processors will have at least the same amount of fish to work with. Employment in the sports fishery is also expected to be unaffected by the plan. The main effects in the non-harvest sub-sectors have been a consequence of increased competition for existing jobs from displaced salmon vessels: there is evidence, for example, that former salmon fishers are now competing for salmon packing jobs.

While fleet job losses represented less than 1% of total employment in the Province, losses at the regional scale ranged from 5% to 11% of the employment base.[10] At the local level, job losses accounted for between 9% and 14% of the employment base in five isolated communities, 18% in another, and 46% in the worst-hit community. Most of these communities are predominantly comprised of aboriginal Canadians ("First Nations"), for whom salmon has been a mainstay for millennia. These communities offer few alternative prospects for employment outside the sector, at least in the short-term, and prior to the salmon fishery crisis were already suffering from unemployment rates in excess of 20%.

Although detailed data are not provided on changes in the employment status of salmon fishery workers who lost their jobs in 1996 and 1997, the study does report the results of a training needs assessment carried out in March 1997. That report, which was based on 1 143 interviews with members

of the Pacific salmon fisheries workforce, found that the majority of respondents wished to continue working in the salmon fishery. Many also expressed interest in diversifying into other fisheries; indeed, many were already involved in other fisheries. And over one-half indicated an interest in working outside the fishing industry. The interviews revealed that almost two-thirds of respondents had worked in other occupations before or since entering the fishing industry and had developed transferable skills, particularly in the mechanical, electrical, woodworking and metalworking trades. However, the majority of jobs that fishers had held outside the industry were primarily of a part-time or seasonable nature, providing fishers with temporary employment while they awaited opportunities within the fishing industry.

Of those workers displaced from the fishing industry at the height of the 1996 fishing season, about half were in need of some employment assistance, and of those about half were in dire need of it. Moreover, with the low catch, many fishers and plant workers would not qualify for federal Employment Insurance in 1996.

In response to these rapid changes, an independent Federal-Provincial Review Panel was formed in September 1996 to review the impacts of the PSRS on individuals and communities. In response to the recommendations of the Panel, the Federal Government pledged funding in the amount of CAD 35.7 million in support of a suite of adjustment measures. This announcement was followed, in April 1997, by an agreement between the Federal and Provincial governments. The programmes supported by the Federal government included:

- *Compensation for gear rendered redundant* (CAD 6.4 million) – Provided compensation to combination gear licence-holders for gear rendered redundant as a result of the introduction of the single gear and area licensing provisions; the maximum amount payable to any eligible recipient was CAD 10 000 per salmon licence.
- *Facilitated access to credit* (CAD 5.5 million) – Provided loans to seine, troll and gillnet licence-holders wishing to stack a second licence in order to fish another area, gear or both, but who were unable to obtain the necessary credit from traditional sources.
- *Habitat restoration and enhancement* (CAD 30 million) – Helped rebuild salmon stocks, with priority given to projects that increase stocks most at risk, especially those employing displaced salmon fishers.
- *Federal Human Resources Programme Assistance* (CAD 26 million) – Helped displaced fishery workers, mainly in the form of job creation partnerships, employment subsidies and transitional jobs.
- *Federal-Provincial Industry and Community Development Team* – Established to formulate a range of options to develop affected fishing communities.
- *Provincial Community Fisheries Development Centres* – Established in May 1997 for the delivery of community-based fisheries initiatives, especially aimed at increasing the capacity of fisheries-based communities to: *i*) undertake fisheries sector development and transition planning; *ii*) assist unemployed fisheries workers; and *iii*) increase or maintain salmon fisheries through habitat restoration and enhancement. The management of these centres is carries out by a non-profit society.

An *early retirement* programme had also been envisaged in response to one of the Review Panel's recommendations, to which purpose the Federal Government announced it would contribute CAD 7.7 million – if the Province would match this amount. (It did not.) However, as pointed out in the case study, among those profiting from the voluntary licence retirement programme were fishers at or nearing retirement age. Some form of early retirement programme was nonetheless deemed necessary to help assist displaced fishers who were not licence holders at the time.

The case study observes that there were, as with any situation implying job loss, social and psychological implications for the affected individuals and their families. But these impacts were mitigated to some extent by the fact that the PSRS provided fishers with options within which they could choose their adaptation strategies. And for those experiencing the greatest difficulty in adjusting, supplementary programmes provided a safety net. In sum, according to the case study, "the introduction of structural

adjustment programmes has assisted in successfully addressing key areas of concern identified by the Review Panel and the Pacific salmon fishing as a whole. Perhaps, more importantly, the strengthening of federal-provincial and DFO-Industry partnerships aimed at moving to a more responsible fishery through improved conservation and management of the resource, provides a promising future for a robust and economically viable Pacific salmon fishery."

Post-script: new initiatives since the case study was written

In June 1998, the Government of Canada announced the Canadian Fisheries Adjustment and Restructuring (CFAR) initiative which, among other goals, sought to solidify the previous programmes under the PSRS and encourage the restructuring of the Pacific salmon fishery. The key programme elements of the Pacific component of the CFAR are:

- Measures to protect and rebuild fish stocks and habitat (CAD 100 million).
- A new round of licence retirement, selective fishing practices and diversification of commercial fisheries (CAD 200 million).
- Pre-season cost compensation, early retirement, and adjustment and economic development measures for displaced workers and affected communities (CAD 100 million).

The 1998/99 rounds of salmon licence retirement removed 746 licences (in addition to the 797 salmon licences removed under PSRS in 1996). From a high of close to 4 400 salmon licences in 1995, the number as of autumn 1999 stood at approximately 2 800. It is expected that another 750 will be removed before the current program is complete.

C. Korea

The case study on Korea examines factors that led the Korean Government to initiate a structural adjustment programme for fisheries in 1994. This programme addresses three main problems in the country's fisheries: overfishing in marine waters, the high cost of hired labour, and income disparities in fishery-dependent communities.

The problem of overfishing, according to the study's author, can be attributed partly to past Government support policies, which encouraged the expansion of fishing capacity. Korea's production of fishery products increased five-fold in thirty years, reaching 3.35 million tonnes in 1995, of which 43% was harvested from the country's adjacent seas. Today, overfishing is a common phenomenon throughout the country; only a few coastal areas have managed to escape it. Meanwhile, degradation of coastal waters caused by water pollution and the reclamation of inter-tidal mudflats continues to take its toll on the marine environment.

The resulting decline in the profitability of fishing discouraged young people from entering the sector, and drove them out of the fishing communities in search of alternative employment – generally in the inland manufacturing and service centres which, at least until 1997, had no trouble absorbing them. Since 1981 the number of fishery workers between the ages of 15 and 29 years has fallen by over 80%, and as of 1994 this age group accounted for just 5% of the roughly 200 000 people employed in fishing. By contrast, more than half of Korea's fishery workers are older than 49 years. The ageing of the population, along with the widening of income gaps between fishery and non-fishery sectors, has helped perpetuate a cycle of poverty in many fishery-dependent communities.

Fishing capacity continued to increase during the 1970s and 1980s, nevertheless. Ironically, the shortage of labour willing to work as crew members on Korean-flag vessels drove up wages and hence vessel-owners' operating costs. In 1981, in an effort to alleviate this shortage, the Government introduced a programme to train young people to succeed retiring fishers; 6 791 received such training over the following 13 years, and 60% of them went into capture fisheries. Labour costs were still considered to be too high, however, so in 1991 the Government began allowing vessel-owners to recruit foreign workers. By 1996 the number of these workers had risen to over 4 500, of which 2 812 were employed in the distant water fleet.[11]

In 1994 the Government began to take a different approach to the management of its fisheries. In an effort to prevent further over-exploitation of living marine resources in its adjacent waters, the Government announced its intention to: increase the effectiveness of its management system; halt further degradation of coastal environments; and reduce effort in the country's fishing zone so as to allow over-exploited fishery resources to recover. Complementing these policies, and with the additional aim of improving the welfare of fisheries communities, the Government pledged to upgrade infrastructure (particularly in the areas of education and health care, but also by improving fish processing and marketing facilities) and increase part-time employment opportunities in these communities. Such policies are seen as particularly important for displaced fishers in the intermediate (30-49) age group, who have low levels of educational attainment and therefore face greater difficulties in competing for jobs in other sectors.

In order to reduce fishing effort, the Government introduced a ten-year Fisheries Structural Adjustment Plan (FSAP), involving the following elements:

- A freeze in the number of fishing vessels (especially the number of trawlers) and a prohibition on the construction of new vessels.
- The mandatory retraction of a licence upon the retirement of either a vessel or its owner, until fishing effort has been reduced to a level considered optimum for the fishery concerned.
- A programme to buy back fishing licences (compensation is paid out to vessel-owners at a rate roughly equal to three-years of gross earnings).

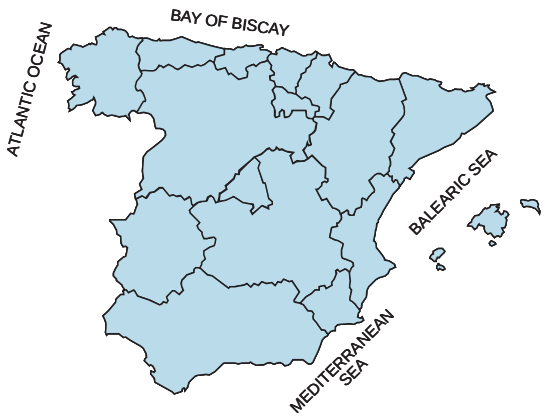
The programme is being implemented in three stages: *i*) the closing of selected fishing grounds – particularly spawning and nursery grounds – and the elimination of certain gear used in coastal fisheries; *ii*) reducing fishing vessels and tonnage from off-shore fisheries; and *iii*) eliminating over-capacity in both the coastal and off-shore fisheries. Stage I was largely completed in 1994 and 1995; Stage II started in 1996, and Stage III is due to be completed by 2004.

As the author of the case study remarks, "in light of the limited funds available, the structural adjustment plan … will take time to achieve its objectives." During its first three years, 324 vessels (5 406 GRT) were removed from coastal and off-shore fisheries, leaving a remaining total of 1 264 vessels (62 578 GRT). As a result of the removal of these vessels, 1 666 fishers were displaced, or about 1% of the total previously employed. Yet over-fishing continued to be a problem.

Interestingly, the author notes that one, perhaps unintended, consequence of Korea's fishery structural adjustment policy is that, by making deckhands on decommissioned vessels redundant, it has helped alleviate the shortage of fishery workers in coastal and off-shore fisheries. This outcome, he observes, underscores the need for policy makers to understand the behaviour of the labour market, especially its mobility, when introducing a structural adjustment policy.

Concluding, the author notes the need to strengthen relevant support programmes, such as training displaced workers for alternative employment. The success of the structural adjustment policy will necessitate a transformation in the economies of the fishing communities which, in his view, will require "substantial government support and investment…, in particular to build up the necessary infrastructure."

D. Spain



Spain's distant water fleet, like those of other major fishing nations, was profoundly affected by loss of access to traditional fishing grounds in the mid-1970s and early 1980s – notably, those off the coasts of Iceland, Canada, Argentina, Morocco, and Namibia, where Spanish vessels had been fishing for decades, and in some cases centuries.[12] Between 1976 and 1979 landings dropped in volume by over 20%, and did not recover to mid-1970 levels until a decade later.

Meanwhile, the Spanish fleet underwent technological changes that radically altered the way fishing, and fish processing were carried out – changes that generally led to the substitution of capital for labour. And since the fishing industry was, and still is, geographically concentrated in Spain – with one region, Galicia, home to half of the nation's fishing vessels and 41% of its fishers (of which there were more than 110 000 at the end of the 1970s), not to mention dependent suppliers – such changes held the potential for social instability.

In order to ease the burden of adjusting to this ever-changing situation, the Spanish Government introduced a number of measures, including unemployment subsidies, training programmes, public investment in the fleet, and support for new sectors, such as fish farming, fish processing and coastal tourism. These actions were also supported by various local or regional institutions and, following Spain's accession to the European Community, the EU. Frequently, funding was shared among different authorities and the private sector.

Among the fisheries-specific social security policies provided by Spain are unemployment benefits and retirement pensions, including special provisions for early retirement. In addition, special pensions are available for disabled fishers, families of destitute fishers, and fishers' widows and orphans. The State contribution to these schemes is not reported in the case study, but what the study does show is that the number of people receiving a fishing pension (including dependants and survivors) has since 1992 exceeded the number actually employed in harvest fishing and now stands at around 82 000. Of that total, just under half of the payments go to retired or permanently disabled fishers; the rest go to their widows or orphans.

An important component of the Government's structural adjustment package has been payments for the definitive withdrawal of fishing vessels from Community waters. Including both Community and Spanish funds, ESP 48.3 billion (ECU 288 million) was paid out for this purpose between 1989 (when the programme was initiated) and 1995. Over the same period, some ESP 34.3 billion was provided for the modernisation of existing fishing vessels and the construction of new ones. One of the objectives of the modernisation programme is to increase the level of comfort and safety on-board fishing vessels by, for example, increasing the space and number of sanitary facilities available to the crew. In Spain, fishing has the second-highest rate (after mining) of work-related accidents of any occupation.

In the view of the case study's author, the effectiveness of Spain's policies over the last two decades should be judged by the following criteria:

- Have they allowed the necessary reduction of employment?
- Have they allowed production to be maintained?
- Have they allowed productivity to be maintained?
- Have they allowed enough social stability to prevent social crisis?

Rather than construct a counterfactual, the author looks for evidence in the performance of Spain's capture fisheries: in all cases, the trends are pointing in the desired direction. For him, the over-riding criterion is social stability:

"A large number of communities are dependent – economically, socially, culturally – on fishing. Withdrawing government support from such communities is likely to be met by strong resistance, and in

some cases even social conflict. This possibility of conflict deters policy makers from undertaking the changes needed to bring fishing capacity and effort into line with the available resources."

The case study also reveals a subtle link between social assistance and the monitoring and enforcement of fishing laws that may not always be apparent to the casual observer. In Spain, all fisheries, including coastal fisheries, are regulated officially by a system of limited licenses. But effective surveillance of this system depends heavily on the co-operation of the numerous coastal fishing villages that dot the country's mainland and island coasts. As in other countries, the residents of these villages tend to form cohesive societies, suspicious of outside authority. Illegal fishing is tolerated by the community if it is felt that the person has no other way to support him or herself. On the other hand, if an individual is receiving income assistance, the community's attitude is clear: he or she should no longer fish. Thus, in Spain's particular situation at least, social assistance works to strengthen social control.

Spain has not experienced a major social crisis in fisheries, though it has witnessed some problems at the local level, and no regions have suffered large-scale out-migration or sharp falls in living standards. Thus far, the processes of adapting to overcapitalisation and over-employment in Spain have taken place gradually and have usually been accepted by society. Employment in marine capture fisheries has declined steadily, at an annual rate of around 1.4% (by ⅓ between 1976 and 1996), and unemployment among fishers has remained at roughly 9% of the employable fishing labour force. And, as would be expected in a declining industry, the average age of workers in the fishing industry has risen to 41 – four years older than the average age of Spain's active adult population.

With regard to landings, the Spanish fleet has suffered two shocks: the progressive implementation of the 200-mile zones in the 1970s, and the restrictions imposed on it after Spain joined the European Union in 1986. But the fleet was able to adapt to these new situation, and the total volume and (nominal) value of the catch has been increasing since then. Over the same period, tonnes landed per fisher increased, except for a four-year period between 1989 and 1992.

The study concludes that, in the Spanish case, public intervention has allowed a gradual and non-traumatic adaptation of Spain's fishing sector, and moreover it has helped to maintain levels of production and labour productivity in the medium term, with significant reductions in employment levels.

E. United Kingdom

Although the United Kingdom did not provide an official case study for this project, it did make available a study that it had commissioned on a vessel decommissioning scheme that it ran between 1993 and 1996 (Nautilus Consultants, 1997). Although, as the report points out, the 1993-96 decommissioning scheme was aimed principally at reducing the size of the UK fleet, and was mainly judged against that objective, information was collected that can provide insights into how those directly affected by the scheme responded to their new situation.

The UK decommissioning scheme was announced in 1992 as part of a package of measures responding to capacity reduction targets laid down by European Community legislation. The overall fleet target required a reduction by 1996 in tonnage and engine power equivalent to 10.5%, and activity reductions equivalent to 8.5%, of fleet capacity. In addition to the decommissioning scheme, the package included: limitations on days-at-sea; new rules governing the transfer of vessel licences, effectively increasing the penalty for licence aggregation and imposing new

penalties on other forms of licence transfers; and the introduction of restrictive licensing for vessels of 10 metres and under in length.

An estimated 2 250 fishers were displaced by the decommissioning scheme, of which roughly 25% were skippers and the rest other members of the crew. How they fared afterwards depended to a large extent on the particular economic circumstances within their region, such as the rate of unemployment, job availability, fishermen's remuneration relative to other earnings within the region, and the importance of the fishery sector relative to other employment groups.

Table 4 shows the results of a occupational survey carried out among 351 skippers, from across the United Kingdom, following decommissioning or the sale of the vessel in which they had been in charge. The Table shows that more than one-quarter of skippers returned to sea (as skipper, crew or mate), presumably in fishing. This trend was stronger among the western and northern UK ports than among the eastern and southern. Having lost their vessels, many sought either to re-invest in newer vessels (often in the under 10-metre category) or to seek employment on other vessels. Similar attitudes were held by the crew.

Table 4. **Changes in skipper's employment following decommissioning or sale of vessel**

Occupational status	Regions of the United Kingdom							UK Total
	Eastern Scotland	Highland and Western Scotland	Northern Ireland	North-west England	Wales	Southern England	Eastern England	
	Percentage of responses (including no response) within each region							
Retired	21	13	14	0	8	10	10	12
Returned to fishing	23	38	31	24	50	29	22	27
Fisheries enforcement	10	0	2	5	0	3	2	3
Oil rig	17	8	7	5	0	7	16	11
Recreation	10	32	24	24	25	32	22	24
Fish processing or retailing	0	0	2	0	0	0	5	2
Other	8	5	5	14	8	7	4	6
Unemployed	8	5	14	24	8	7	16	12
No response	4	0	0	5	0	3	3	2
	Total number surveyed							
All status categories	52	40	42	21	12	68	116	351

Source: Survey conducted by Nautilus Consultants, as reported in Nautilus (1997), p. 67.

More than one-third of displaced skippers were able to find work in other marine-related activities, such as the offshore oil industry or companies engaged in sea-based recreation (*e.g.* angling, boat chartering and scuba diving), or in fisheries enforcement. By contrast, 12% of skippers were unemployed at the time of the survey; variations among regions were large: from 5% in Highland and Western Scotland to 24% in north-western England. The 12% who had formally retired can be compared to the 9.3% of those who gave "nearing age of retirement", and 4.8% who gave "state of health", as the main reasons for submitting an application for a decommissioning grant.

The consultants concluded that the pattern of re-deployment of skippers from the fisheries sector was broadly similar to that found in an earlier study that they had prepared for the European Commission (Nautilus Consultants, 1995) – *i.e.*:

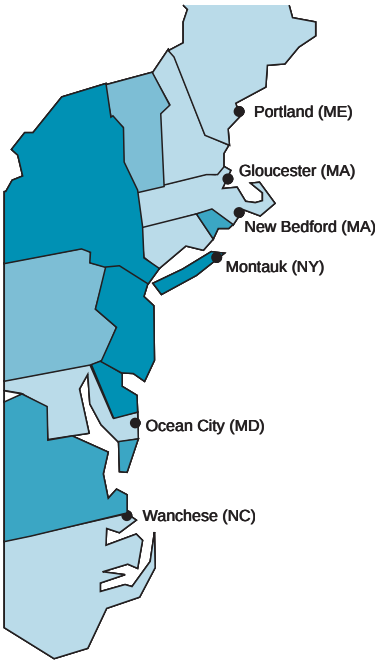
- Employment in urban areas was generally more attainable, while employment in rural areas was often confined to seasonal work (*e.g.* recreational activities).
- The more skilled fishers, usually those in possession of skippers' tickets, had little difficulty in finding employment, with most skippers (or engineers) finding work within 6 to 12 weeks.

- Unskilled crew encountered difficulty in obtaining jobs, particularly in rural areas where they could be out of work for up to nine months. Many of these individuals returned to work at sea.

They noted also that fishers had several characteristics that were considered valuable to some employers: namely, a willingness to work long hours at unsociable times, a strong aptitude for team-work, a knowledge of the sea, and specialised skills such as in navigation and mechanics.

Finally, it is worth noting that when the consultants posed the question to successful applicants to the scheme "what options would you have explored had there been no decommissioning scheme?", only a small majority (52%) stated that they would have carried on fishing. One-third responded that they would have sold their vessel and licence, and another 6% would have retired or left for other reasons. However, while these vessel owners might have left the industry, their vessels and licences would have remained in circulation.

F. United States of America



The case study provided by the United States examines a particular region of that country – specifically, five primary and nine secondary fishing ports along the Atlantic coast from Maine to North Carolina that have connections to the multispecies groundfish fishery (MGF). Unlike the other case studies it does not analyse the effects of a particular structural adjustment policy; rather, it shows how fishers and their communities adapted (or not) to what the authors refer to as the social and economic crisis in the MGF of the mid-1990s. Indeed, by dealing with a period contemporaneous with the introduction of targeted structural adjustment measures – among others, a vessel buy-back programme – it provides some important insights into the behaviour of fishers during a period of adjustment.

According to the authors of the case study, the crisis in the New England and mid-Atlantic groundfish fishery was precipitated by changes in the Multispecies Groundfish Management Plan (notably, Amendments No. 5 and No. 7), and in Marine Mammal Protection Legislation. But in the view of many of those interviewed by the authors, the roots of the crisis lay deeper. Most fishers traced the origins of their problems to policies fashioned during the 1970s and early 1980s that encouraged low-cost loans, technological advances, and unlimited entry into the fishery. The over-capitalisation that occurred, fishers argued, laid the basis of the economic and social disruption and the associated reduction in trust that fishers have in national and regional management agencies. More and more, for example, fishers are tending to disagree with State and Federal assessments of the conditions of stocks.

The Federal Government's response to the crisis, as described elsewhere, was to declare a "natural disaster" in March 1994, thereby making available USD 30 million in relief assistance for the states of Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, New Jersey, and New York. Much of this money was used to help retrain fishers for other occupations. A year later, a USD 2 million Fishing Capacity Reduction Demonstration Program (FCRDP) was announced. This pilot programme, modelled after the one being applied in the United Kingdom, was intended to help determine whether a larger vessel and licence buy-back programme could be designed that would be broadly acceptable to fishers and fishing communities, while significantly reducing the size of the fishing fleet. Eleven groundfish fishing vessels and 26 federal fishing permits were removed. The FCRDP was then followed by additional appropriations under a new, Fishing Capacity Reduction Initiative (FCRI). Some USD 24 million was used to purchase 78 vessels (accounting for roughly 18% of the effort applied to groundfishing in the region), most of which were scrapped or legally sunk. Another USD 76 million was used to provide economic assistance to fishing families.

The investigators found that, in responding to the situation prevailing in the mid-1990s, most fishers attempted to maintain their attachment to the sea and to avoid low-wage sectors of the economy by making any of several, often radical, adjustments to their lifestyles – *e.g.* experimenting with new fisheries; dealing with reduced incomes by rotating or laying off crew (keeping individual shares stable); supplementing incomes with casual shore employment or with the labour of their spouses; or curtailing consumption. While moving into alternative fisheries was the preferred response, most of the larger vessels had become too specialised and too dependent on family networks for staffing to be able to shift easily into other fisheries. Owners of small and medium-sized vessels (9 to 23 metres) had more success in moving into other fisheries, yet they often met with hostility where such fisheries are dominated by families and fleets that have been in those fisheries for generations. This social resistance was complemented by official resistance in some cases as state legislatures, fearful that those displaced from the MGF would move into their waters, began devising legal means to limit entry.

Those who moved into shore-based jobs tended to work in areas that were related to fishing or to seafaring (*e.g.* repairing boats or piloting passenger or cargo vessels). Intriguingly, programmes designed to train fishers in aquaculture did not meet with great success. As the authors observe, fishers view as flawed efforts to encourage them to move into aquaculture, because such efforts do not demonstrate an understanding of the way fishers see themselves, which is more as hunters than as farmers.

An important message from the case study, however, is that while individual fishers may have developed various strategies for dealing with reduced fishing opportunities, these strategies were conditioned by local and cultural factors. From their community studies, the case study's authors identify five variables as useful in predicting dependence on the MGF. These are:

- *The degree to which fishers in a port are isolated or integrated into other fisheries or sectors of the economy.* The more isolated or socially and culturally cut off fishers are from the wider society, the more dependent they tend to be on fishing.
- *The types of vessels that characterise the fleet.* Fleets dominated by large, highly specialised vessels tend to be more dependent on the MGF than those with smaller or mixed vessels.
- *The degree of specialisation in the* MGF.
- *The percentage of the population involved in fishing or fishing-related activities.*
- *The degree of competition and frequency of conflict among fleets within a port.* Higher levels of both are associated with high levels of dependence.

Based on a consideration of these variables, the authors rated three New England ports (New Bedford and Gloucester, Massachusetts; and Portland, Maine) as among the most heavily dependent on the MGF. However, the crisis within the MGF affected all ports because groundfishing forms a crucial part of many fishers' annual rounds and because displaced groundfishers could move into other fisheries.

Fishers interviewed identified a number of critical issues or problems that they believed were of importance to understanding current and past adjustments to crises. Among those most relevant to this report:

- Fishers respond to crises based on past experience, and tend to move into new fisheries and new territories as opposed to moving into other sectors of the economy.
- Current regulations are confining them to specific fisheries, curtailing their abilities to remain flexible by responding to changing fish stocks.
- Institutional responses, primarily the vessel buy-back program and the retraining programs, have been unsuccessful.
- In designing regulations, fisheries managers often fail to take into account the full effect of regulations on the families and households of fishers.
- Credit and insurance have become severe problems within the fisheries, with not only banks and insurance companies refusing to finance and cover vessels, but also trip suppliers, marine repair personnel, and other related businesses backing away from the fishing industry. As a consequence, fishers have had to rely more on their own internal resources, particularly alternate forms of capital that are available to them by virtue of their membership in meaningful social groups and enclaves.

Efforts to address the crisis in the MGF since the early 1990s have come from many sources, including fishing organisations, city and state governments, the Federal government, and individual fishers and their families. As of 1996, the view was that these efforts were not well co-ordinated. As the study's authors conclude, success of these programs is heavily dependent on a better understanding of the nature and extent of the crisis and the unique characteristics and adaptive strategies of fisher families and communities across the MGF.

G. Summary

The foregoing summaries of the case studies deal with a wide range of situations and structural adjustment experiences, covering a few years in some cases, two or more decades in others. Several common themes and messages may be extracted from them, however.

First, in general, pressures for structural adjustment have arisen from a combination of reduced fishing opportunities (owing to depletion of fish stocks, policies, or both), consequent overcapacity, and technological change. Typically, problems have built up over several years, if not decades, culminating in a sudden crisis. For countries with large distant water fleets, like Spain, the major change was the declaration of 200-mile limits, and its accession to the European Union. In the case of British Columbia's salmon industry, the period of decline in salmon landings accelerated during its last three years and was accompanied by a dramatic fall in prices. In most cases government responses have included a capacity reduction programme, usually combined with other changes in management instruments, and often accompanied by social protection measures.

The impacts of structural adjustment on vessel owners, crew and fishing communities differed largely according to the speed of the changes, the age of the displaced workforce, and the alternative economic activities available to them. These opportunities depended to a large extent on the degree of isolation of the affected fishing communities, the dependence of those communities on fishing, the social and cultural ties of fishers to those communities, and the current economic climate. Although *ex post* surveys of occupational status were mentioned only in the Canadian and UK case studies, it is clear that structural adjustment created a short-term surge in retirements, and to varying degrees swelled the ranks of the unemployed. But a significant number of displaced workers were able to find new employment, and most apparently sought work in fishing or other maritime industries. As reflected in several of the studies, fishers do have some transferable skills that are valued by other sectors, but the desire to stay in fishing is strong.

This phenomenon – the preference for those previously employed in fishing to continue in fishing or, as a second-best alternative, in other jobs close to the sea – should not be surprising, given the long ties that many fishers have to their communities, the skills that they have developed, and normal human inertia. The tenacity shown by many fishers – most vividly documented in the case study on the US Atlantic groundfish industry – with which they contrive to remain attached to the industry, while hoping for a turnaround in its fortunes, is perhaps more remarkable. This latent reservoir of potential fishers has clear implications for fisheries management, including monitoring and enforcement. It also means that policy makers need to consider any spill-over effects of structural adjustment into other fisheries – not just the movement of capital but also of labour – when designing policies.

If entry into other fisheries is regulated, for example through limited licences or quotas, a spill-over problem should not arise. But as shown in the Spanish case study, laws and their enforcement are two different things. Where coastal communities regard illegal fishing by one of its members as tolerable if the individual has no other way to support him or herself, providing some other means of support – *e.g.* alternative employment or, if that is not possible, social assistance – becomes especially important.

A rather different aspect of the spill-over effect is touched upon in several of the other case studies, and highlighted in the case study on Korea. By shedding labour, the pool of individuals with skills in fishing was expanded, creating increased competition for jobs in harvest fishing and associated industries and in some cases heightening social conflict. Although this effect was often salutary for those vessel owners who elected to continue fishing, the implication is that it put downward pressure on wages in those activities and communities where the available labour was surplus to needs.

V. MANAGING THE TRANSITION TO RESPONSIBLE FISHERIES

The preferred outcome of structural adjustment involving the shedding of surplus labour from an industry is the redeployment of that labour in an activity in which their value-added is greater than it was previously. As the preceding chapters have shown, the transition to more responsible fishing is likely in many cases to result in localised job losses in fish harvesting and a redistribution of employment in fish processing. If the size of the adjustment is enough to lead to an increase in the spawning stock, those who remain in the sector are likely to see improved revenues over the long run. Others will find alternatives to fishing more attractive. Structural adjustment is not a one-time event: changes in technology and other variables bearing on how fishing and fish processing is prosecuted will continue to require adjustments in the relationship between the natural resource, capital and labour.

Much adjustment in commercial fishing, as in other industries, occurs independent of government help. People hear of an opportunity for more remunerative employment elsewhere, sell their boat and leave. Teenagers who in earlier times might have followed their parents' footsteps into fishing choose a different vocation. Given the current state of many marine fish stocks, however, the adjustments that may need to take place, or may be forced upon a fishery by its collapse, could in many situations be quite substantial – requiring anywhere up to half of current fishery workers to leave the fishery. When such a state of affairs is reached, especially in a fishery-dependent region – normal social safety nets may be inadequate for the task. During the initial stages of the transition period, at least, some form of additional government intervention may be warranted in order to facilitate the process of structural adjustment generally and to reduce the attendant social and economic hardships in particular.

What kind of government intervention may be needed will depend in part on the fishery management regime that is in place at different times during the transition, as well as the state of the fishery. If, for example, the fishery authorities are starting with an open-access fishery that is over-fished, but not on the precipice of collapse, and create property rights that are tradable (*e.g.* through the creation of ITQs) coincident with a reduction in the TAC to a more sustainable level, a large part of the rationalisation of the fleet can occur through market forces: those wishing to leave the fishery will sell their rights to others who expect to be able to pursue fishing more efficiently. Such a transition process may in itself do little to help deckhands and other quota-less labourers, and may lead to a socially undesirable reallocation of quota, but it should at least provide a means for a relatively smooth exit from the fishery of a significant portion of the affected labour force.

Governments have four principal means for alleviating the adverse employment and personal financial impacts of structural adjustment (Gupta, Schiller and Ma, 1999). First, they can help to stimulate private-sector employment generally by pursuing sound macroeconomic and structural policies; such economy-wide approaches can be vitally important in the long run. Second, they can use active labour-market programmes (through retraining and other programmes) in order to help the unemployed find new jobs. Third, they can apply passive labour market policies to support displaced workers during unemployment and reduce personal financial losses. Lump-sum payments and early retirement schemes fall under this category. Finally, they can try to moderate the pace of adjustment in a way that spreads out the impacts over time.

It is important to stress that these different approaches are not necessarily, nor even usually, mutually exclusive. As seen in the previous chapter, most government strategies to facilitate industry rationalisation combine several types of programmes, generally to address different problems and periods. The following two sections look at the appropriateness of various types of active and passive labour market

policies in dealing with specific circumstances and target populations. In the final section questions relating to the pace of restructuring and adjustment are examined.

A. Facilitating the redeployment of workers

Although adjustment to temporary unemployment is a commonplace occurrence in modern economies, it does not always proceed seamlessly. Usually there are mismatches between the skills of the displaced workers and those required to fill vacant positions. Or the workers are accustomed to an income level that has been artificially inflated as a result of government policies and are reluctant to accept a job that pays less. And, often, accepting new employment may require that the affected workers move away from the communities to which they have developed strong social ties.

Active labour market policies (ALMPs) are aimed at overcoming some of these impediments by enhancing labour market mobility and adjustment; facilitating the redeployment of workers to productive activities; and, generally, enabling people to seize new job opportunities as they arise. They are proactive and therefore distinct from "passive" policies – such as unemployment insurance, early retirement schemes and the like – which simply provide entitlements. The OECD *Job Study* identified three general categories of ALMPs:

- Services provided by public employment agencies.
- Labour market training (and retraining).
- Job creation.

The focus of this section is on the latter two types of programmes. However, the important role of public employment agencies merits brief mention. These agencies exist in most OECD countries to help unemployed workers in the job search process, provide employment counselling and serve as a job broker. Several national public employment agencies maintain extensive computer data bases of job vacancies and job seekers. And some countries have made an active effort to ensure that people living in rural areas, including fishing communities, have adequate access to their services. A few have even provided counsellors specifically trained in helping fishers.

The amounts spent by governments on active labour market policies to date has generally been small compared with expenditures on training for people who stay in the sector, or on more passive labour adjustment measures. Canada's The Atlantic Groundfish Strategy (TAGS) programme, which probably constitutes the greatest single concentrated structural adjustment effort targeted at fishers and fish plant workers to date, spent around CAD 170 million (USD 115 million) between May 1994 and September 1998 on active labour market programmes (one-fifth of the amount originally budgeted), but even that amount was just 5% of the total spent on all income support and adjustment measures. The annual expenditures by EU Member states and by the United States on active labour market programmes for fishers in recent years have typically been in the range of a few million US dollars. Still, as recognition of the need to adapt fishing capacity to available resources has increased, such policies have grown in importance.

Training, retraining and relocating

Labour market training and retraining schemes exist in most OECD Member countries. In several countries they constitute the largest category of active programmes. Additional resources for training and retraining have also often been provided under programmes aimed at developing less-favoured regions and rural areas. More often than not, retraining programmes financed under such programmes are targeted on groups for which it is possible to attribute identifiable adjustment needs, including fishers. The *Canadian* Province of British Columbia's Natural Resource Community Fund, run by the Ministry of Employment and Investment, for example, is specifically designed to help single resource industry communities adjust to severe economic dislocation.

The EU's constellation of regional programmes provides another example, specifically targeted to fishing. Since 1994, when the European Commission integrated most of the areas dependent on fishing into the territorial objectives of its structural funds, and launched its PESCA Initiative, Member states

have been able to draw upon the funds to finance, among other activities, programmes to help retrain fishers. To date, only a few Member states have availed themselves of funds for this purpose (more often they are used to develop training courses for workers who want to remain in the harvesting or processing segments), but more programmes are expected. However, a proposed regulation recently adopted by the Commission relating to structural aid for the fishing industry and aquaculture would, beginning in the year 2000, provide non-renewable individual compensatory payments (up to a maximum of Euro 50 000) to help fishermen who have been employed for at least for five years in the fishing industry to retrain or diversify their activities outside sea fisheries.[13]

Judiciously administered, expenditure on re-training (whether in the form of training services or contributions to help defray the costs of training organised by the individuals themselves) is thought to distort labour markets less than most other government interventions in labour markets,[14] and can save national treasuries money in the long-run. A well-designed and targeted programme would focus on enhancing the mobility of fisheries labour towards more economically productive uses, both within and outside fisheries. Since the mobility of any factor depends in part on its quality and on the capacity of other economic sectors to absorb it, the programme should, where appropriate, be co-ordinated with other adjustment policies, particularly programmes to facilitate the withdrawal of obsolete fishing capacity. It is also desirable that the choice of training options should be consistent with needs of other sectors. Funding for feasibility studies of alternative non-fishing business possibilities can help in this regard.

Another form of assistance that is often linked with retraining is mobility assistance – *i.e.* assistance to help job seekers look for work outside of their regions and to relocate once they secure employment. Such assistance was offered under Canada's TAGS, for example, and was taken up by 2% of all clients (HRDC, 1998, p. 35). The typical recipient was a single, young man with some formal education who had previously worked in a fish processing plant – *i.e.* the profile of somebody most able and likely to find and be willing to take up a job elsewhere. The idea of encouraging or helping people move out of fishing communities is sometimes controversial, however, especially within affected communities. As observed in a recent report on the TAGS (HRDC, 1998*a*):

> "For some, the high level of out-migration will be taken as an encouraging sign. It indicates that labour market behaviour is changing, that people are making rational choices regarding their futures, and that community reliance on government transfers will decrease as they do. However, for many of those remaining in the communities, particularly the older generation who feel they have little or no realistic prospects for competing in job markets in other centres like Toronto or Calgary, the 'flight of the young' is viewed with great concern."

Clearly, there are limits on the degree to which retraining can overcome other impediments to re-employment, particularly geographic isolation and the absorptive capacity of the local job market. But, given the propensity for fishers to seek work in fishing or other marine-based industries, retraining at least increases the odds that more of them will be able to move into other are occupations. Such programmes can form an important part of fishery adjustment strategies – if there are jobs available that the fishery workers can fill.

Creating new jobs

Governments have long involved themselves in activities intended to stimulate the creation of new jobs in general, and to channel job-creating investments towards particular regions, areas or groups in society. Such activities generally take the form of:

- direct job creation programmes in public or non-profit organisations;
- wage cost subsidies to private employers; and
- programmes to help those who are unemployed (or underemployed) to start new enterprises.

Programmes to attract firms to set up or expand operations in particular regions can also be a mechanism for job creation.

Direct job creation schemes once played a central role in the labour markets of OECD countries, but in the 1980s many of these general schemes were scaled down or abolished. Those remaining have

tended to be reserved for job-seekers who have experienced long periods of unemployment or face other disadvantages (OECD, 1994), often as a transitional, short-term measure. Employment on a public works project is one traditional outlet. *Denmark* helps to find places for people who have been unemployed, generally for more than two years, in both the public and the private sector. The scheme lasts, respectively, seven or nine months, with employees being paid the going wage rate in the private sector and the employer receiving a lump sum subsidy. Several countries, such as *Australia*, *Belgium*, *Canada* and *Ireland*, use targeted wage subsidies, usually covering only part of the employee's wages.

Many more OECD countries provide assistance to unemployed individuals who wish to start new enterprises or diversify their activities (see OECD, 1993*a*). These types of programmes are often integrated into *regional development* and *rural development* policies. The benefits provided may range from counselling services to outright investment grants. *Australia's* Rural Community Access Programme, for example, relies mainly on providing business advisors and counsellors for rural areas. In *Norway*, advisory and counselling services are provided in rural areas under its Rural Development Support Scheme; in addition, financial assistance is available through the Norwegian Entrepreneur Grants programme. Several of *Canada's* development programmes for fishery-dependent regions have included programmes to help former fishery workers establish new businesses; under TAGS, for example, CAD 0.4 million was provided for self-employment assistance.

Public programmes more targeted to the fisheries sector or to fishing dependent communities have tended to encourage diversification into closely-related activities (*e.g.* aquaculture) or that attempt to extract added value from resources readily at hand (*e.g.* tourism). A significant proportion of the projects financed under the European Commission's PESCA Initiative (Box 1) would appear to fall into one of these two categories.

Box 1. Job creation under the European Commission's PESCA initiative

As of end-1996, 67 projects had been approved for PESCA funding in Ireland, of which 20 were located in the south-western corner of the country. Nine projects are mainly concerned with the breeding of shellfish. One project, involving 7 fishers, is breeding mussels in enclosures. It is being overseen on location by a permanent adviser. Another project aims to breed scallop spat until the they are numerous enough to be reared extensively. Two other projects are more directly related to fishing: one involves repopulating lobster in Bantry Bay, the other producing a video film on fish-manipulation techniques at sea. Tourism is being promoted by, for example, providing funds to acquire a purpose-built boat for fishing excursions, and constructing a new marina to house around 50 pleasure boats (DG XIV, 1996*b*).

One project that has recently received backing from PESCA stems from a proposal put forward by the Scottish Fishermen's Federation (SFF) to recruit and retrain fishers for work in the off-shore petroleum industry. The SFF believes that fisher from the region, who have a good knowledge both of the physical environment and of other marine activities, can help ensure communication between the oil industry and others involved in marine industries and prevent interference between users. In addition, fishing vessels would be redeployed to monitor and protect structures left on the sea bed by the oil industry. Between 10 and 15 skippers could receive offers of employment in connection with other activities (marine liaison personnel) and a similar number of vessels could be used for surveillance.

Increasingly, job creation programmes in coastal communities are using the labour of fishers to improve the fisheries themselves. Among the projects funded under *Canada's* CAD 4.4 (USD 3.25) million West Coast Fishery adjustment strategy, for example, is one intended to help rebuild salmon stocks through habitat restoration. Priority is being given to projects that employ displaced salmon fishers. More recently, *Australia* announced a AUD 11.6 (USD 9) million package of initiatives to support its "Oceans

Policy", of which the bulk – AUD 9.75 (USD 7.6) million – will go to a new Fisheries Action Program, which will fund community projects over five years that protect and restore fish habitats (Parer, 1997). The United States' National Resource Conservation Service, which has outreach programmes in every county in the country, has provided funds to help employ unemployed fishers in stream restoration and erosion control work near salmon spawning areas.

Public job creation programmes do not yield results overnight, of course, and if not well-designed can simply end up being seen as "make-work" schemes – *i.e.* with a low marginal value of output – leaving the people employed in them no better equipped to compete in the labour market on their own when programme funding runs out. In the particular case of fish-habitat restoration and enhancement projects that employ displaced fishers, the fishers should not be given the impression that the fruits of their labour will necessarily be sufficient to re-establish fish stocks to a level ample enough to provide them once again with a job in the fishery.

Job creation programmes do have one important advantage: they offer a means by which what may have started as a response to a fisheries-specific crisis can be turned into a community development project. By offering block grants for a limited duration (*e.g.* five years), central governments can shift some of the responsibility – and ownership – for the general development problems of a community or region to the local authorities. These grants could then be spent on projects chosen and designed by the communities themselves and tailored to their specific needs. Some communities may decide to spend the money on wage subsidies or public jobs, others on attracting new industries. Some may simply pay for people to relocate elsewhere. For such an approach to work, however, two criteria would have to be met: *i*) the threat of not renewing the grant would have to be credible; and *ii*) the community development agency would have to have the capacity to administer government funds responsibly.

B. Passive labour-market policies: providing income support and reducing financial losses

Active labour market policies cannot address all of the problems associated with structural adjustment, and are most effective when implemented before job losses overwhelm the local economy. But even individuals undergoing an extended period of training may encounter financial problems severe enough to warrant the provision of some kind of government assistance, such as limited-term income support. Whether they can obtain such assistance – *e.g.* through normal unemployment insurance and means-tested in-kind benefits (such as food vouchers) – varies considerably by country and by the prior contractual relationship between the employee and his or her employer.

Providing income transfers to the unemployed

All OECD countries protect the majority of their working populations from the risk of unemployment. In most countries the main form of protection is social insurance, whereby eligibility for benefits depends on having contributed some proportion of prior earnings to a government-run unemployment insurance (UI) scheme (Annex 1). The amount and duration of benefit is usually related to the level of earnings before becoming unemployed, the period of contribution and, often, the age of the recipient. Most such systems are compulsory, though a few permit the voluntary affiliation of workers, especially the self-employed. Several countries offer means-tested (*i.e.* based on the recipient's assets, income or both) social assistance, in addition to or instead of UI, for citizens or residents who are not covered by or who are no longer eligible for unemployment benefits. The payment is typically equivalent to the minimum benefit provided under UI, and often (but not always: *e.g.* Portugal and Spain) is not limited in time as long as the recipient remains capable and available for work.

Wage-earners in *fish processing* appear to be covered by UI systems in most OECD countries, though those undertaking the first stages of processing for local fishing fleets may be considered as seasonal workers and on that basis excluded. At least three countries (France, Italy and Japan) exclude seasonal workers from their general UI system; and Germany, Italy, Portugal and Spain exclude casual, temporary or occasional labour. Both Belgium and the United States exclude family labour from normal UI. These exclusions may also be of relevance to fish harvesting.

Wage-earners in *fish harvesting* in general appear to be covered by the majority of countries' UI systems. In C*anada*, for example, wage-earners working on offshore trawlers are eligible for normal UI benefits. But wage-earners in fish harvesting are the exception, and are far less numerous than those working for a share of the catch. Indeed, in most countries share fishers are treated the same as self-employed individuals. In some, the self-employed are required to make their own provisions against loss of employment. Self-employed fishers and share fishers appear to fall into this category in at least five Member countries. C*anada*, F*rance* and N*orway* number among the few countries that operate separate, customised UI systems that cover both wage-earning crew members and skipper-owners.

The experiences that countries have had with unemployment insurance in the fisheries sector thus reflects to a large extent these differences in coverage, as well as fishery-specific factors, such as the number of displaced workers relative to the local labour market and the nature and duration of the adjustment period. Even in countries where unemployment insurance benefits have been available to self-employed and share fishers, such benefits may run out quickly, especially if the fishery has experienced a period of rapid decline. For this reason, governments have on occasion instituted exceptional measures for providing economic assistance to fish-workers and their dependent families. Such assistance has typically taken one of three forms: extending unemployment benefits to fishery workers (if they are not already covered); extending the period of qualification for benefits (if they are); or offering lump-sum, or "compensatory", payments or loans to workers who lose their jobs (especially as a result of a government intervention). Early retirement schemes, which are available only to workers who meet certain age or duration-of-employment criteria (discussed below), generally can be similarly classified.

Lump-sum payments related solely to the permanent loss of employment in a fishery – as opposed to income assistance during a temporary cessation of fishing, or "compensatory" payments for gear or vessels made redundant – have been used rarely by governments. Among the case studies prepared for this analysis, none reports their use. However, at least one example can be cited. Since November 1995, the European Commission has authorised Member states to offer individual compensatory payments (up to a maximum of Euro 7 000 per individual beneficiary) in case of redundancy due to the permanent cessation of fishing by the vessel – provided that the vessel on which the beneficiary was employed has been the object of a government measure permanently stopping its activities.[15] Under the Commission's latest proposals, the maximum payment will be increased to ECU 10 000, beginning in the year 2000.

P*roviding income transfers to older fishers*

Older fishers (and, to a lesser extent fish plant workers), especially those past the age of 55, have proven to be the most difficult socio-economic group to retrain or to find employment for outside the fishing sector. Compared with fishery workers under 40 years of age, they tend to have less formal education, a longer history of self-employment, and stronger financial and social ties to the fishery. Yet it is generally the older fishers who own the vessels and associated licences, posses the most knowledge about the fishery, and who therefore have the greatest influence on fishing effort. Dealing with the adjustment problems of those older workers who have had to stop fishing because of a crisis, and encouraging others to leave the fishery before such a point is reached, remains one of the main challenges facing fisheries managers.

To some extent older fishers can be thought of as a special case of the general unemployment problem: the policy choices are the same, though the size or duration of benefits required may have to be greater than for younger workers in order to achieve the same results. The temptation, however, is to give up hope of ever re-employing this group, and instead to find some means for providing income support until such time that they qualify for a "normal" pension, either under a fishery-specific or a general pension scheme.[16] One way that governments have done that is simply to alter entitlement conditions for disability or unemployment benefits (*e.g.* eliminating the requirement to remain actively available for employment) so that older workers can use them, effectively, to withdraw early from the labour force. The extent to which such derogations have been used to provide *de facto* early retirement for fishery workers is not known, but MacFarlan and Oxley (1997) note that by the mid-1990s the use of early retirement

schemes for labour-market reasons had become commonplace in a number of OECD countries, especially in Europe.

More is known about special *early retirement schemes* which a number of OECD countries have created to encourage the departure of older workers from the harvest or fish processing sector generally, or even from specific fisheries. Such schemes generally provide extra incentives to go into retirement, and should therefore be distinguished from the flexible, and actuarially neutral, early retirement schemes available in a few countries that allow workers to retire before the statutory age at a substantially reduced benefit rate.

As described in Annex 1, only a few countries have created permanent early retirement schemes for fishers. Most other schemes have been introduced on an *ad hoc* basis, for a limited duration, almost always in connection with a vessel or licence retirement (buy-back) programme. The following examples are by no means exhaustive.

- *Atlantic Groundfish Fishery (Canada)*. In October 1995 Canada announced an early retirement programme for fishers in Newfoundland, Nova Scotia and Prince Edward Island as part of its Atlantic Groundfish Strategy (TAGS). Those who wished to participate in the programme had to submit bids. Successful bidders then had to agree to leave the commercial fishing industry permanently, but were allowed to keep or dispose of their vessel and gear at their discretion. An early retirement scheme for workers in fish processing plants aged 50-64 was also introduced at the same time. The package of post-TAGS measures announced in June 1998 extended the early retirement programme [for an indefinite period] and provided up to CAD 65 million in federal assistance. All those eligible for TAGS benefits as of 1 January 1998, and who were aged 55 to 64 on 31 December 1998, were eligible for retirement benefits. Based on past experience, the retirement package is likely to be most attractive to older plant workers in areas where plants have closed permanently as well as to older crew members, especially those who worked on vessels removed from the fishery through licence retirement.[17]
- *Pacific Salmon Fishery (Canada)*. In October 1996 *Canada* proposed a similar early retirement programme for fishers in British Columbia as part of its Pacific Salmon Revitalization Strategy. Implementation of a programme was delayed, however, until the announcement in June 1998 of a new "Canadian Coho Recovery Plan".[18]
- *European Union*. On 20 November 1995 the Council of the European Union adopted a regulation enabling EU Member states to obtain part financing from the FIFG for national early retirement schemes and individual compensatory payments for fishers. To qualify for early retirement, beneficiaries must be at least 55 years-old and able to demonstrate that they have worked for at least 10 years as fishers. Moreover, the number of beneficiaries may not exceed the number of jobs eliminated on-board fishing vessels as a result of their decommissioning or transfer to a third country.
- *Japan*. In the event that a fishing boat is scrapped or sunk in the sea under a government-approved fishery restructuring plan, financial transfers are provided to fund retirement allowances for boat crews.

In contrast with some buy-back programmes, most early retirement schemes these days require that a fisher accepting an early retirement package agrees not only to retire permanently from the fishery that he or she has left, but from all commercial marine fisheries within the nation's jurisdiction. For this and other reasons offering early retirement to fishers can seem attractive compared with less politically palatable options. For one, it disposes of what often seems to be an intractable problem: the difficulty of getting middle-aged workers with limited and specialised skills to make a permanent adjustment to economic self-sufficiency outside the industry. It spreads out government expenditures over several years, as opposed to all-at-once (in contrast with lump-sum payments). It helps remove people from the jobless statistics, thus artificially reducing the official unemployment rate. And it enables people and their spending power to remain in their communities – a feature of special relevance to remote fishing villages.

But at the macro-economic level each new early retirement scheme contributes to the proliferation of such schemes, thereby strengthening calls by other sectors for equal treatment. The spread of non-actuarially neutral pension schemes has been one of the main factors contributing to the lowering of the

average effective age of retirement in OECD countries over the last two decades, particularly among men (Blöndal and Scarpetta, 1998). Although the trend towards earlier withdrawal from the labour force has not placed a major burden on OECD countries so far, it is expected that as the "baby-boom" generation starts moving into retirement during the next two decades the ratio of the working-age population to the total population will drop. The lower the average effective age of retirement, the larger the benefit population and the smaller the tax base on which the funding of social protection schemes depends (Blöndal and Scarpetta, 1997).

In this respect, governments may find some useful guidance in the principles for reform of pension systems set out in the OECD report *Maintaining Prosperity in an Ageing Society*, which was endorsed in 1998 by the OECD Council of Ministers and subsequently by OECD Health and Social Ministers:

1. Public pension systems, taxation systems and social transfer programmes should be reformed to remove financial incentives to early retirement, and financial disincentives to later retirement.
2. A variety of reforms will be needed to ensure that more job opportunities are available for older workers and that they are equipped with the necessary skill and competence to take them.
3. Fiscal consolidation should be pursued, and public debt burdens should be reduced. This could involve phased reductions in public pension benefits and anticipatory hikes in contribution rates.
4. Retirement income should be provided by a mix of tax-and-transfer systems, advance-funded systems, private savings and earnings. The objective is risk diversification, a better balance of burden-sharing between generations, and to give individuals more flexibility over their retirement decision.
5. The development of advance-funded pension systems should go hand-in-hand with that of the financial market infrastructure, including the establishment of a modern and effective regulatory framework.
6. Strategic frameworks should be put in place at the national level now in order to harmonise these ageing reforms over time, and to ensure adequate attention to implementation and the build-up of public understanding and support.

Alternatives to early retirement schemes need to be pursued more vigorously. Although re-training of people close to retirement age may not be practical (Calmfors, 1994: 33), wage subsidies, public projects or other job-creation measures may in some cases be able to provide gainful employment at lower net cost.

Compensating owners for financial losses

As several studies have shown (see, for example, Read and Buck, 1997; Holland *et al.*, 1999; Muse, 1999), government-funded buy-back (decommissioning) programmes can be and are sometimes used as an instrument for accomplishing social objectives – particularly to remove surplus labour or to "compensate" owners for losses on capital value – in addition to pursuing the objectives with which they are more commonly associated: conservation and economic efficiency. It is beyond the scope of this chapter to describe such programmes or to evaluate their effects on fisheries sustainability. However, in as much as buy-back programmes may be seen as a way to provide economic relief and to overcome an important impediment to structural adjustment in the sector – the devaluation of fishery-specific assets owned by self-employed fishers – some general observations on the equity implications of the different approaches is warranted.

Vessel, gear or licence buyback programs have nearly always originated as a response to a crisis created by the collapse or decline of stocks – usually a crisis that is expected to continue unless an adjustment is made, such as through a re-allocation of catch rights (Holland *et al.*, 1999). Irrespective of cause, such events generally lead to a reduction in harvests or revenues, usually both, of particular groups of fishers. Buyback programmes, in addition to improving (if only temporarily) the average harvests and revenues of those who remain in the fishery, provide a means by which those who wish to withdraw their capital from the fishery can recoup at least some portion of their investment (Holland *et al.*, 1999). The design

Box 2. Privately funded fishery restructuring initiatives

While it is clear that governments will often have to involve themselves in the process of structural adjustment in the fisheries sector, privately funded initiatives may also have a role to play. One of the first examples of such an approach is the North Atlantic Salmon Fund (NASF), a body founded in 1989 under the leadership of Orri Vigfússon, an Icelander, "to work for the global restoration of the wild Atlantic salmon and to promote a better sea environment for the fish."* In addition to putting pressure on coastal states of the North Atlantic to improve their efforts to protect and conserve stocks of wild Atlantic Salmon, the NASF has negotiated its own "Conservation Partnership Agreements" (CPAs) with communities engaged in the commercial fishing of wild salmon. Through these CPAs, the NASF funds alternative employment and economic development projects in return for an covenant to cease fishing for wild salmon on the high seas.

Examples of CPAs negotiated by the NASF are given in its June 1996 Progress Report and its March 1997 "Report to NASF supporters". As of June 1996, the NASF had spent around USD 5 million in implementing various quota compensation and CPA projects. One of the first such projects involved a moratorium on open seas salmon fishing around the Faeroe Islands, which went into effect in 1991 and is still in place. More recently, the NASF, together with Greenland's National Fish and Wildlife Foundation, has been helping to develop alternative fisheries (based on lumpfish) in Greenland.

One factor in the NASF's favour is that it concerns a fish species that is both well-known to the public at large, and for which there is an important alternative user group to commercial fishers: river anglers. It would be difficult to imagine that a similar scheme for, say capelin, could attract as much private support. At the very least, however, the initiative demonstrates the potential for mobilising private money for the conservation of certain fish species, in a way that also addresses the employment and social implications of reduced fishing.

* *http://www.gamefishing.co.uk*/NASF/*nasfpg*96.*htm*.

of buyback programmes can have quite different equity implications depending on the criteria used to decide which vessels or licences get retired.

In several cases, for example, the selection criteria have favoured older licence holders or vessel owners. C*anada's* Pacific Salmon Revitalisation Strategy, described in Chapter 4, did not initially include an early retirement programme, but the appreciation in value of licences (by between 50 and 100%; *see* Read and Buck, 1997) created by the buy-back programme and changes in the management regime was sufficient to enable a number of fishers in their late 50s and early 60s to sell their licences and retire. A licence and vessel and buy-back programme introduced into the same fishery 15 years earlier gave priority to fishers who indicated health problems or an interest in retiring as the reason for submitting an application (Holland *et al.*, 1999). Similarly, a vessel decommissioning scheme operated by D*enmark* between the years 1987 and 1993 used a set of selection criteria that gave greater weight to vessel owners 60 years or older (Frost, Smit and Sparre, 1995). In J*apan*, funding for voluntary restructuring under the Special Measures Law for Fisheries Reconstruction is available only if many of the workers displaced by the restructuring are expected to retire.

Other equity effects are less intentional and can influence fisher behaviour in the future. As Holland *et al.*, 1999 point out, buyback programmes may be perceived by fishers who left the fishery before it reached a crisis point as "penalising" them for acting responsibly. And programmes that rank applications on the ratio of the bid to historical catches – while being cost-effective in removing capacity – clearly provide the greatest benefits to those fishers who had previously been the most active. Seeing this, vessel and licence owners in other over-fished fisheries may engage in strategic behaviour – delaying departure in the hope of benefiting from a buyout scheme, and in the latter case may accelerate their fishing, even while stocks are in decline, in order to establish a significant catch history. Indeed, even former, but recently inactive participants may engage in such behaviour as a way to capture a share of the anticipated windfall (Read and Buck, 1997).

A more fundamental equity concern relates to whether those vessel and licence owners who remain in the fishery after a major rationalisation – and who can often expect to profit from the resulting lower costs and higher revenues – should not contribute to compensating those who leave it. Industry-funded schemes largely avoid this problem. One of the first countries to take this approach was I*celand*, which established a nation-wide Development Fund of the Fisheries in 1994 (replacing a similar but more limited "Rationalisation Fund of the Fisheries" established in 1990) to decommission fishing vessels and obsolete plants. Funding is through levies and surcharges on vessels and firms operating in the sector and state guaranteed loans. The scheme has been described by Klemensson (1999) as "an intra-industry effort held together by legislation rather than a public scheme in the usual sense." In the United States, Section 312*d*) of The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), as amended through 11 October 1996, similarly authorises industry-funded fishing capacity reduction programmes, supported by government-backed loans. Unlike Iceland's Development Fund, however, the programmes are implemented on a fishery-by-fishery basis.

Finally, as many critics have pointed out, buyback programmes alone rarely help other groups that may be affected by fleet reductions, such as crew members, people who have lost their jobs in fishery support industries and so forth. For this reason most of the current government buyback programmes include supplementary adjustment programmes to assist individuals who are unable to benefit from the buyback.

D*rawbacks of passive adjustment assistance*

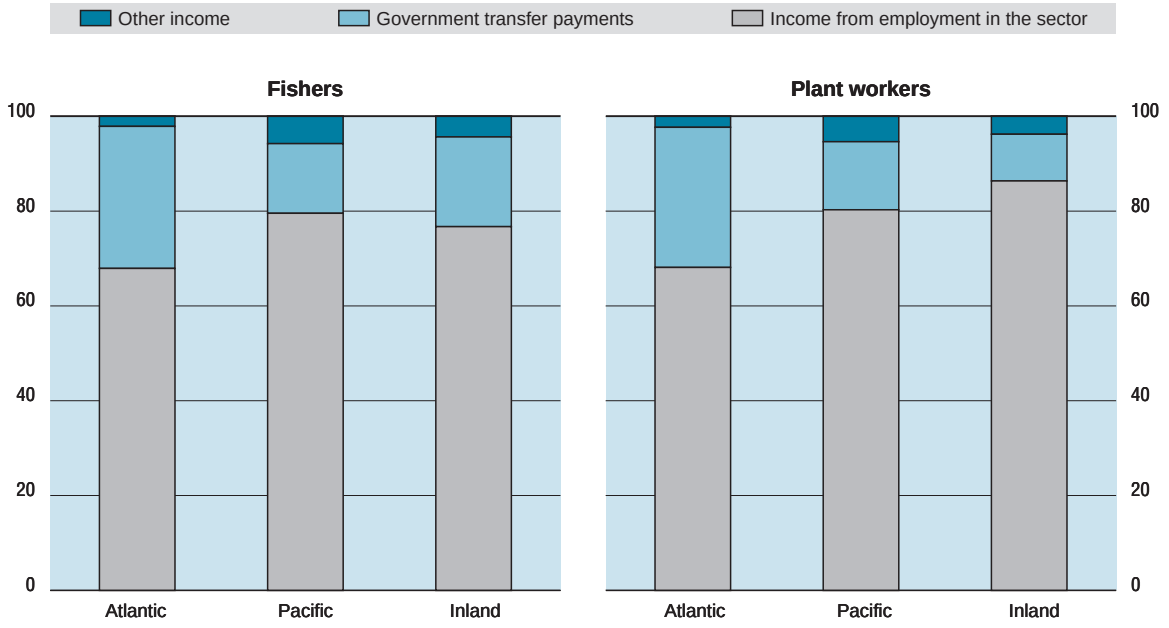
Dealing with industry adjustment problems through passive measures, while solving the immediate needs of affected individuals, can be costly to governments over the long run, particularly if the measures are provided indefinitely or repeated often (even in different fisheries) and costs of entry into the fishery are low (see, for example, Holland *et al.*, 1999). As underscored by the OECD (1996, p. 29): "the size and duration of unemployment and related welfare benefits impinge on the labour market behaviour of the employed, the unemployed and employers." Like disaster assistance generally, such policies are vulnerable to moral hazard, feeding expectations both within the sector and in other sectors vulnerable to economic down-turns that they can rely on the government to rescue them from a future crisis – self imposed or not. To the degree that such schemes reduce the difficulties of enterprises in shedding labour, they may simply end up shifting costs from the private to the public sector – in effect, providing a subsidy for firms (MacFarlan and Oxley, 1997, p. 175). Passive adjustment measures also tend to reduce the apparent risks that potential entrants into and investors in a sector might otherwise perceive; more individuals are attracted to an occupation for which they are not suited, and take fewer diversification strategies on their own (like acquiring different skills) to insure against unplanned contingencies.

The distortive effects of passive measures are, of course, less pronounced when other forces act on a sector to constrain or reduce its effective capacity – especially when the causes of the contraction are extraordinary, beyond the control of fisheries managers, and permanent. The expulsion of distant-water fleets from former fishing grounds, as happened to Spanish vessels from the mid-1970s through the early 1980s (see that country's case study), evidently required action to deal with the unemployment of large numbers of affected crew. By contrast, the use of aid for the temporary cessation of fishing activities in cases where the events that give rise to the stoppages are foreseeable and regular – a type of aid that has been used in the past by at least one EU Member state – is clearly "designed to free the recipient from costs which it would have to bear in the ordinary way as part of its normal business."[19]

The distortions created by passive assistance measures become most acute when social insurance programmes alter the attractiveness of fishing relative to alternative economic activities. That was certainly one of the effects of the Special Seasonable Fishermen's Benefits Programme, which operated in Canada between 1956 and 1996.[20] Basically, the programme provided fishers with up to 27 weeks of cash benefits during the "off-season" – generally between 1 November and 15 May – based on insured earnings during the qualifying period (31 March through 31 October). Even in relatively "normal" years, recourse by the fishing industry to UI benefits was high. In 1981, for example, UI benefits plus other social transfers accounted for roughly one-quarter of the incomes received by both self-employed fishers and

employees of fish processing firms. In 1990, by which time the groundfish base was well on its way to collapse, the dependence on social transfers had reached one-third (Task Force on Incomes and Adjustment in the Atlantic Fishery, 1993); see Figure 9. An analysis by Ferris and Plourde (1980, p. 116) of the first twelve years of that programme concluded that the presence of unemployment insurance accounted for one-half of the inshore fishing boats in Newfoundland. More recently, Roy (1998) has shown that the programme also modified the returns to fish in such a way that it changed the amount of time spent by individuals in fishing – reducing the fishing season for regular fishers and probably increasing the fishing season of marginal fishers. Together, these and other effects delayed restructuring of the industry, thereby swelling the ranks of families dependent on unemployment insurance and adding to the Government's costs when the whole sector was thrown into crisis as a result of the collapse of the north-west Atlantic groundfish fishery in 1992.

Figure 9. **Sources of income among fishers and plant workers in Canada, by Province, in 1991**
Percentage of total income



Source: OECD.

C. The pace of adjustment

Whether explicitly and intentionally or not, many if not most OECD governments are attempting to rationalise fish harvesting at a pace that avoids major disruptions in fisheries employment. Abrupt changes in management regimes and deep cuts in TACs have been the exception, almost always forced upon authorities by the (imminent) collapse of a fishery. While in some cases the "soft-landing" approach can succeed in its main objective – cushioning job losses without simply delaying the need to take drastic measures later on – it is not without costs.

One set of costs relates to inefficiencies created in the labour market, uncertainties and the formation of expectations. Prolonging the retention of labour and capital in a sector in excess of what may be regarded as optimal given the available resource reduces returns to those factors of production

and prevents them from being shifted to more productive uses. Prolonging structural adjustment can also alter expectations, creating uncertainties about the actual intent and future direction of fisheries management and encouraging rent-seeking behaviour – "possibly exacerbating the inevitable distress that will likely come when overfishing and stock recovery must eventually be addressed" (Read and Buck, 1997).

The programmes that Canada implemented in response to its Atlantic groundfish crisis illustrate another intrinsic risk in delaying structural adjustment in over-exploited fisheries: the strain it can put on government resources when the need for measures appears suddenly, the time available to develop an effective strategy is short and the number of potential claimants is large. As pointed out in a 1997 report by the Auditor General of Canada (OAG, 1997), the CAD 1.9 billion Atlantic Groundfish Strategy was rushed through in just four months (between January and April 1994) and many changes had to be made subsequently to take into account unforeseen factors and events. The number of people thought to be eligible for income support over the four-year life of TAGS was under-estimated by one-third, and the share of funds allocated to income support had to be more than doubled. As noted by Human Resources Development Canada in response to the 1999 *Report of the Auditor General of Canada*: "The urgency of addressing, with constrained resources, the immediate needs of the 40 000 TAGS clients in the early stages of the implementation [of the programme] cannot be understated."

Such experiences reinforce an often heard lament, that co-ordination between fisheries managers and those responsible for the social welfare of their countries or regions could be improved. Such co-ordination and communication is vital if government's role in facilitating adjustment in the sector is to become more proactive and less reactive. If social service agencies and labour departments are to anticipate the needs of fishing communities they need to be given adequate warning of major changes in fisheries management regimes.

D. Conclusions

Addressing the social implications of labour and capital adjustment is crucial to assuring a smooth transition to sustainable and responsible fishing. This chapter has focussed mainly on the different approaches available to governments to deal with short- to medium-term adjustment problems when making the transition to responsible fishing. Clearly, the optimal mix of active and passive labour market policies must be tailored to circumstances. As Calmfors (1994: 34) advises, programme designers should strive for a "balanced portfolio", which recognises that there are decreasing returns to scale whenever one tries to apply one solution to all labour market problems. Active labour market policies – though by no means panaceas – are generally to be preferred over passive labour market policies, especially if those who administer them are provided with sufficient warning and resources to carry out their tasks.

Prevention of the need for special adjustment measures, through more effective management and the elimination of policies that encourage fishing capacity and effort, may be the least costly strategy in the long-run, however. While no precise figure on expenditure is yet available, it can be safely estimated that several billion US dollars have been spent on structural adjustment measures in the fishery sectors of OECD countries over the last decade. Much of this expenditure could have been avoided had the fisheries been managed more sustainably and fisheries labour been given consistent signals regarding the need for adjustment. Too often, social policies have been used as a safety valve to relieve pressure in the short-term, while more long-term structural problems remained unaddressed. The point here is not to criticise with the benefit of hindsight but to draw attention to the potential costs involved in dealing with delayed adjustment and to underscore the need to place the sector on a self-adjusting footing as quickly as possible.

VI. SUMMARY AND CONCLUSIONS

This paper has tried to answer four questions: *i*) how are workers in the fisheries sector likely to be affected by structural changes brought about by the transition to responsible fishing?; *ii*) what special characteristics of the fisheries labour force and of fisheries communities should be borne in mind when designing policies that will affect the nature of adjustment; *iii*) what kinds of policies and programmes have countries used to promote adjustment?; and iv) what lessons can we learn from these experiences to guide policy makers in the future? Although the coverage of national experiences and programmes in this paper is not complete (see Box 3 for recommendations for further work), several tentative observations can be made.

Box 3. Recommendations for further work

In the course of preparing this study, a number of issues were identified that could not be adequately explored in depth because of insufficient data and a limited number of case studies. In general, a more thorough analysis of the interactions among the different social and labour market policies (as they apply to fishers), and how these policies interact with resource management and support policies would be useful. For example:

- How do vessel retirement schemes interact with early retirement schemes? Are they necessary complements to each other? Many countries have initiated or are contemplating adopting such schemes. It would be helpful to understand better what their actual impact has been on fishing employment.
- Is there sufficient coherence between fisheries management policies and social and labour market policies? Policy makers almost never set their yearly fishing TACs and quotas according to biological criteria alone; they almost always take economic and social impacts of these policies into account. But in so doing they often impose extra burdens on social welfare programmes. Are those who actually administer social and labour market programmes kept informed of the consequences of such decisions?
- How successful have active labour market policies been in helping unemployed fishers find new work, provide them with useful new skills, and create new employment opportunities in their regions? Information on the implementation of these programmes is readily available, but much less has been reported on their results.

This study began with a discussion of the range of employment consequences that could be expected during and following the transition to responsible fisheries. It showed in general terms that changes in employment levels are likely in both the short- and long-run. The magnitude of these changes will depend on how much overcapacity there is at the time that the transition begins to be implemented. In some cases the transition to responsible fisheries will mean a change in the management regime. Because different management instruments create different conditions for access and entry into a fishery, and affect productivity and the distribution of rents in diverse ways, the social and employment implications of the transition will be "path dependent" – that is, depend in part on what mix of instruments are used in the process.

The type of impacts will also depend on the socio-economic characteristics of the affected labour forces, particularly in the harvesting sub-sector, and of the regions in which they work. In general, it would

appear that the relatively old average age of owner-operators, the relatively low level of formal education of workers throughout the industry, and the high dependency of many – but by no means all – coastal communities on fishing, may be among the most important (non-policy-related) impediments to structural adjustment. The poorly diversified investment strategy of owner-operators, which concentrates human and physical capital investment in the sector, means that the impact of policy changes on the income and wealth of some vessel owner-operators will be large. Offsetting this effect, on the other hand, is the tendency for many fishery households to be pluriactive; that is, to engage in multiple activities to earn income. These features, combined with the natural reluctance of many fishers to abandon their occupation and their communities, will affect the fishery household's approach to adjustment.

The transition to responsible fishing will give rise to many countervailing adjustment pressures. These, taken together, will form a complicated overall pattern of adjustment. To assess the scope and shape of such adjustments requires an understanding of the particular circumstances of each fishery and the management regime under which it is prosecuted. The case studies presented in Chapter IV shed some light on the process. What they show, in general, is that pressures for structural adjustment have arisen from a combination of reduced fishing opportunities, consequent overcapacity, and technological change. Typically, problems have built up over several years, if not decades, culminating in a crisis situation. In most cases government responses have included a capacity reduction programme, usually combined with other changes in management instruments, and often accompanied by social protection measures. Structural adjustment programmes tended to create a one-off surge in retirements, and to varying degrees swell the ranks of the unemployed. But a significant proportion of displaced workers find new employment, though most apparently look first to other fishery segments or related maritime industries. This latent reservoir of potential fishers has important implications for fisheries management, underlining the need to consider any spill-over effects of structural adjustment into other fisheries – not just the movement of capital but also of labour – when designing policies.

It must be stressed that past experience shows that people working in the sector are far from passive in responding to changing incentives. They use their talents, their creativity, and their physical and financial capital to take advantage of new opportunities. Often, as indicated in the case study on the United Kingdom, fishers are more flexible than other workers with regard to the timing and seasonable of distribution of work. They are also accustomed to being self-employed. Some will therefore be successful in meeting the new challenges on their own. Others, however, may need assistance.

In dealing with the employment impacts of the transition to responsible fishing, policy-makers will find themselves confronted with three main challenges. First, they will need to address the social welfare implications of changes in catch levels and any redistribution of access rights, especially in those rural communities and households that are hardest hit by these changes and who have the fewest options of adjustment. For them, some form of social assistance (if they are not already covered by normal unemployment insurance) may be warranted, in addition to job placement and counselling services. One of the most important policy priorities will be to deal with the particular problems posed by the high average age of fishers and the sometimes different treatment afforded to non-wage-earners under social insurance schemes. In this respect, special efforts will be required to find alternative employment for these people, if only through wage subsidies or public service. Early retirement may be the only feasible option in some cases, but it should be regarded as a last resort, preferably offered in the form of a one-time payment.

Second, they will need to smooth the path of structural adjustment – not only to facilitate the transition to responsible fisheries, but also to reduce the need for costly adjustment programmes in the future. Most workers, whether in harvesting or processing, wage earners or self-employed, can benefit from countries' active labour market programmes. The resources committed to these programmes, and the degree to which they are tailored to the special needs of the fishing industry and dependent communities, varies considerably, however. While it is difficult to assess the effectiveness of programmes of a general nature in helping displaced fishery workers, it does appear that amount of resources being devoted to retraining and job-creation programmes specifically targeted at that group is growing. All of these programmes will no doubt continue to play important roles in a balanced portfolio of adjustment

measures, as will community-led investments in educational and cultural infrastructure. In all but the most isolated areas, such infrastructure would not only increase local employment, both directly and indirectly, but also improve the ability of coastal communities to retain employment by raising the quality of life.

The third, and perhaps most difficult, challenge will be to redefine the role that governments have traditionally played in the sector in attempting to enhance the wealth and well-being of fishing communities – without fostering a culture of dependency. As a start, policy-makers should work to develop the productive and innovative capacities of their coastal communities, and to cultivate an environment in which these capacities can be fully realised. New ways to encourage industry-led structural adjustment efforts should be given more serious consideration.

A sustainable fishery is one that is largely capable of adjusting its structure automatically and autonomously. This should become one of the primary tenets of fisheries policy. Minimising the role of government in the structural adjustment process is important for two reasons: to control government spending and to avoid moral hazard. That means changing social protection and fisheries management policies (including transfers tied to non-labour inputs) so as to eliminate incentives that encourage labour to remain attached to fishing (that is, able to resume fishing) long after fishing has ceased to be profitable.

Governments should take a fresh look at how their resource management, social protection, and labour market policies interact in the fisheries sector. In particular, they should review the rules governing eligibility for benefits and the amount of entitlements for which fishery workers qualify under state-financed social insurance schemes with a view to ensuring that the policies are no more generous than they are for other occupations. Likewise, when contemplating alternative approaches to fisheries management, they should seriously consider management regimes that contain built-in incentives for continuous adjustment of labour and capital inputs. Otherwise, they may find themselves having to deal with structural adjustment problems in the fisheries sector again … and again and again.

But, fundamentally, making the transition to responsible fishing will require more than simply dealing with structural problems during the transitional phase; it will necessitate the creation of policy frameworks that not only ensure the sustainability of the resource but also provide those who obtain their livelihood from fishing with a coherent set of signals so that the adjustment process occurs smoothly and largely autonomously. Unless such a systematic approach is taken, governments could find themselves constantly striving for, but never actually achieving the goal of, sustainable fishing.

Annex 1

SOCIAL PROTECTION POLICIES IN THE FISHERIES SECTOR

A. Introduction

All OECD Member countries have some form of generic labour market or social policies in place which provide unemployment benefits, retirement income, and social assistance. They are generally available to all wage earners, in most cases including those involved in activities other than harvesting, such as workers in fish processing plants. Their applicability to self-employed individuals, and to fishers in particular, however, varies considerably. In some countries fishers are covered by countries' general schemes, in others they are not. Such differences may have important implications for how adjustment processes are carried through and how effective they are in removing excess effort. In this section an attempt has been made to better understanding how such policies apply to fishers, and those working in processing and support industries, and to explore and clarify their links to fisheries management policies.

B. A survey of current social protection policies affecting the fisheries sector

Policies affecting conditions and income while employed

As in all other sectors of the economy, the fishing sector works within a general framework of policies that are applicable to all economic activities, which include generic labour market regulations, macro-economic policies, and rules governing international trade. These polices, which are usually administered at the national level, seek to provide a stable economic and social environment. For the purposes of this study, the policies and programmes that are of particular relevance to the fisheries sector are those that regulate the conditions for hiring and dismissing workers, and, in some cases, whether and which employers should pay their workers at least a minimum wage. Such policies are of interest to the process of structural adjustment in the fisheries sector because they may have an important bearing on mobility in and out of the sector.

General labour laws

All OECD countries have established laws that govern aspects of who can be hired (*e.g.* minimum age limits), how they can be fired, the terms of their employment (*e.g.* maximum hours worked each day or each week), and the conditions under which they work (*e.g.* their exposure to health and safety hazards). Generally such laws appear to apply to workers in the fish processing industry as they do in other industries.

Because of the special nature of fishing, specific codes have often been established relating to certain aspects of the work. Typically, general rules will apply to some aspects, specific rules to others. In France, for example, rules governing the training of employees, including fishers, are set out in the general *Code du travail*, whereas rules regulating the employment of youths on fishing boats are set out in the *Code du travail maritime*. Unlike seafarers employed on merchant vessels, there is no single *international* convention laying down minimum standards for seafarers in the fishing industry, though guidelines have been suggested (see Box 4).

Minimum-wage policies

Several OECD Member countries have adopted legislation establishing a statutory minimum wage. (The self-employed are, by definition, excluded from such laws.) In some countries the applicability of such laws is tied to participation in the social security system; in others, like the United States, the two are not linked. The majority of Member countries do not have a legislated minimum wage *per se*, but instead rely on administrative extension of collective agreements. That is, employers in major industries are bound to negotiate with labour unions on a package of measures, usually including wages, and the outcomes of these agreements are then extended to other industries or sectors. Under both types of systems, the laws apply equally to foreign citizens working within their countries and nationals. Exemptions from minimum-wage regulations are common, however; typically they do not apply to:

- Family workers.
- Those employing only a few (non-family) workers.

Box 4. The treatment of fishing labour under international conventions

International attempts to improve the working conditions of fishers at sea have a long history, dating back to general efforts at the beginning of the 20th century to improve the safety of merchant ships. However, the nature of the fishing industry makes it difficult to develop regulations for other sections of the shipping industry that can be applied without modification to fishing vessels as well. This box summarises the current status of the main international instruments.

Article 94 of UNCLOS, which sets out the duties of Flag States, clearly states that every State shall "assume jurisdiction under its internal law over each ship flying its flag and its master, officers and crew in respect of administrative, technical and social matters concerning the ship." Safety of the crew is a primary concern. Paragraph 3, for example, establishes that "Every State shall take such measures for ships flying its flag as are necessary to ensure safety at sea ...", with regard to (among other considerations), "*b*) the manning of ships, labour conditions and the training of crews, taking into account the applicable international instruments." These international instruments relate mainly to conventions and recommendations negotiated under the auspices of the International Maritime Organisation (IMO) and the International Labour Office (ILO).

Several of the IMO's conventions concerning seafarers in general apply also to workers employed on fishing vessels. For example, Chapter V of the 1973 International Convention for the Safety of Life at Sea (SOLAS), as modified by the Protocols of 1978 and 1988, identifies certain navigation safety services that should be provided by Contracting Governments and sets forth provisions of an operational nature applicable in general to all ships on all voyages, including fishing vessels. Parts of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78) also apply to fishing vessels.

Over the last decade the ILO has adopted two conventions specific to the fisheries sector: the 1993 Protocol to the Torremolinos International Convention for the Safety of Fishing Vessels (1977) and the International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel (1995), also known as STCW-F. Both of these Conventions apply only to crews of seagoing fishing vessels, including vessels processing their catch, that measure 24 metres or longer. As of 1 March 1999 they had attracted only a small fraction of the 15 needed ratifications – five (Cuba, Denmark, Iceland, Norway and Sweden) for the Torremolinos Convention and two (Denmark and Russia) for the STCW-F. Neither Convention has entered into force.

Fishers are also included within the ILO's core Conventions, and a significant proportion of its instruments applicable to seafarers can be applied to fishing vessels – subject to consultations with the social partners. In addition, the ILO has adopted a number of instruments specifically addressed to fishers, including recommendations concerning the limitation of hours of work in the fishing industry (No. 7) and on the vocational training of fishers (No. 126). Five ILO Conventions apply to the fisheries sector:

- No. 113, concerning the medical examination of fishers;
- No. 114, concerning fishers' articles of agreement;
- No. 125, concerning fishers' certificates of competency;
- No. 126, concerning accommodation on-board fishing vessels; and
- No. 138, concerning the minimum age of fishers.

- Domestic help.
- Restaurant workers.
- Farm workers.
- Hired labour on fishing boats.

Considering this list together with the exemption for the self-employed, it would appear that most fishers are *not* bound by minimum-wage legislation. Countries wherein at least some fishers are covered by minimum wage legislation include F*rance* and certain Scandinavian countries (in the latter case wage-earners employed on large fishing boats).

Employment-conditional benefits, tax credits and other income-maintenance programmes

Employment-conditional benefits are designed to encourage participation in the labour force, especially among low-paid workers, and to shift the balance between the incomes a person receives while working and what he or she

is entitled to when out of work (OECD, 1996*a*). The distinguishing feature of such benefits is that they are income-tested but, unlike unemployment benefits, are only available to those who continue to work.

General employment-conditional benefits are provided by six OECD countries: Canada, Ireland, Italy, New Zealand, the United Kingdom, and the United States. In the three European countries they are provided as direct income supplements and are administered by social security or welfare departments. In the others they are given as tax credits. Several of the programmes only apply to families with children, and two require claimants to work a minimum number of hours a week (19 in Ireland and 16 in the United Kingdom). Additional details on these policies are given in the OECD's mid-1996 E*mployment Outlook* (OECD, 1996*a*, Table 2.6).

Benefits that are conditional on a person's occupation are uncommon in OECD countries. The only example found so far that is tailored to the fisheries sector is a minimum-income guarantee scheme operated by N*orway*. There, fishers and vessel owners are able to obtain cash benefits if income from their fishing activities falls below a certain threshold. In addition, the fishers and vessel owners must demonstrate that: they are fishing efficiently; that the catch is being sold through recognised sales agents; and that despite meeting these conditions they are failing to earn a minimum income.

Social security

The term *social security* refers to programmes established in law that insure individuals against interruption or loss of earning power (US Social Security Administration, 1995). It normally encompasses unemployment benefit programmes; old age, disability and survivor programmes; work-injury programmes; and certain special programmes to cover expenditures arising from marriage, birth or death. While all social security programmes are intended to extend access to an adequate level of social protection to most or all members of society, it is those that most directly affect employment mobility that are of most relevance to this study.

As with the discussion of framework measures, the focus here is on the coverage, timing and duration of programme benefits, rather than on their monetary value to recipients. However, the monetary transfers involved can be significant. In the case of France's social protection scheme for the fisheries sector (ENIM), for example, gross outlays in 1996 were around FF 8.8 billion (USD 1.4 billion). To that amount, working fishers contributed only FF 1.6 billion; the largest single source of funds, an explicit subsidy of FF 4.1 billion, was provided by the central government (MAP, 1997). France is unlikely to be exceptional in this regard: implicit transfers to current and retired fishers in other countries, while generally less well documented, may well be of similar magnitude relative to the size of the sector.

U*nemployment benefit programmes*

All OECD countries protect the majority of their working populations from the risk of unemployment. In most countries the main form of protection is social insurance, whereby eligibility for benefits depends on having contributed some proportion of prior earnings to a government-run unemployment insurance (UI) scheme (Table 5). The amount and duration of benefit is usually related to the level of earnings before becoming unemployed, the period of contribution and, often, the age of the person. Most such systems are compulsory, though a few permit the voluntary affiliation of workers, especially the self-employed.

Several countries also offer means-tested (*i.e.* based on the recipient's assets, income or both) social assistance, in addition to or instead of UI, for citizens or residents who are not covered by or who are no longer eligible for unemployment benefits. The payment is typically equivalent to the minimum benefit provided under UI, and often (but not always: *e.g.* Portugal and Spain) is not limited in time as long as the recipient remains capable and available for work. Sweden, whose normal UI system is voluntary, operates a labour-market cash benefit programme that provides a fixed daily payment of SKr 245 (USD 33) for up to 300 days (450 days at age 55-64) to persons seeking employment who are ineligible for benefits under normal UI. Australia and New Zealand provide only unemployment assistance, which can include family, housing and child-care benefits in addition to cash.

Wage-earners in the *fish processing* sub-sector appear to be covered by UI systems in most OECD countries, though those undertaking the first stages of processing for local fishing fleets may be considered as seasonal workers and on that basis excluded. At least three countries (France, Italy and Japan) exclude seasonal workers from their general UI system; and Germany, Italy, Portugal and Spain exclude casual, temporary or occasional labour. These exclusions may also be of relevance to the fish harvesting sub-sector.

Wage-earners in the *fish harvesting* sub-sector in general appear to be covered by the majority of countries' UI systems. In C*anada*, for example, wage-earners working on offshore trawlers are eligible for normal UI benefits, though self-employed fishers and crew members whose income is based on a share of the catch are not. F*rance* and N*orway* number among the few countries that operate separate, customised UI systems that cover both wage-earning crew members and skipper-owners. N*orway's* scheme provides benefits in the event that a fishing vessel is idled for reasons beyond its control, or because a fisher has been made redundant. Of possible relevance to small-scale fishers, both B*elgium* and the U*nited States* exclude family labour from normal UI.

Table 5. **Coverage of the fishing sector by government-sponsored unemployment insurance (UI) and social assistance (SA) systems**

Country	Description of general scheme		Fishers covered under general system?		Exclusions (other than age-related) and special schemes of possible relevance to the fisheries sector
	Type(s) of System(s)[1]	Maximum benefit duration[2]	Income from wage[4]	Income from share[4]	
Australia	UA	Unlimited UA	Yes	Yes	None.
Belgium	CI	If *dependents*: unlimited; *otherwise*: reduced after 1 year	No(S)?	No(S)?	Casual and family labour.
Canada	SI	10-50 weeks, then SA	Yes	Yes(sp)	Self-employed other than fishers; casual workers.
Denmark	SVI	5 years, then SA	Yes	Yes?	–
Finland	SVI	500 days (5d/week), then SA	Yes	Yes	–
France	CI	4-27 months, then max additional 33 months at declining rate; then SA	No(F)	No(F)	Seasonal workers; special systems for dock workers, merchant seamen, and subcontracted workers.
Germany	SI	up to 24 months on UI, then UA	Yes	Yes	A few categories of self-employed.
Greece	SI	5-12 months	No(S)?	No(S)?	Special system for seamen.
Iceland	SI	52 weeks; renewable	Yes	Yes	–
Ireland	SI, UA	15 months, then UA	Yes	No(SE)?	Certain part-time employees and self-employed.
Italy	CI	6 months	Yes	No(F)	Occasional and seasonal workers. Fishers have received money in connection with capacity reduction schemes.
Japan	SI	90-300 days, then SA	Yes(v)	Yes(v)	Seasonal workers whose term of employ is ≤4 months.
Korea	SI	30-210 days	Yes?	Yes?	
Mexico	SI	(Lump sum)	Yes?	No(SE)?	Self-employed.
Netherlands	SI	6-54 months, then flat rate, then SA	Yes	Yes	–
New Zealand	UA	Unlimited UA	Yes	Yes	None.
Norway	SI	80 weeks +13, twice, then UA	No(F)	No(F)	–
Poland	SI	9-24 months	Yes	Yes	–
Portugal	SI	12-30 months; some UA thereafter	Yes	Yes	Self-employed.
Spain	CI	4-24 months, reducing after 6 months, then 6 months of UA, then SA	No(F)	No(F)	–
Sweden	SVI	300-450 days (5d/wk), renewable after 5 months on job	Yes	Yes	Special schemes for self-employed.
Turkey	–	(Lump sum)	Yes	No(SE)	Self-employed.
U.K.	CI	12 months, then UA	Yes	No(SE)	Self-employed; employees earning less than £58/week.
United States	CI	26 weeks[3]	Yes	No(SE)	Self-employed; casual employees and family labour.

1. Abbreviations: CI = compulsory insurance system; SI = social insurance system; SVI = subsidised voluntary insurance system; UA = unemployment assistance system.
2. In most cases where range is shown, benefit period is determined by the insured period and/or the age at the time of unemployment. Abbreviations: SA = social assistance; UA = unemployment assistance.
3. Up to 13 weeks longer in areas of high unemployment. Then general assistance (in addition to Food Stamps).
4. Abbreviations: F = special scheme for fishers; S = special scheme for seamen; SE = special scheme for the self-employed; sp = covered by general scheme, but special provisions concerning benefits and contributions.

Sources: United States, Social Security Administration, *Social Security Programs Throughout the World* – 1995, Research Report #64, U.S. Government Printing Office, Washington, D.C., July 1995; OECD, *Employment Outlook – July* 1996, OECD Publications, Paris.

In several countries, the self-employed are required to make their own provisions against loss of employment. Self-employed fishers and sharemen appear to fall into this category in at least five Member countries. Nevertheless, governments in some cases provide a degree of social insurance for these workers.

Old-age pension and early retirement schemes

All OECD countries offer some form of social security for their elderly citizens. In most countries this takes the form of social insurance: workers or their employers, usually both, contribute to a fund during the years that they are employed, and then receive a pension upon reaching a statutory "retirement" age. Whether or not the person actually has to retire to receive entitlements varies by country. In most OECD countries the age at which men can begin drawing a full state pension is 65, though it ranges from 60 in Turkey to 67 in Denmark, Iceland and Norway (Table 6). A few countries set a span of years during which a worker may qualify for an old-age pension, rather than one set age, basing the actual age of retirement on years of covered employment. For example, a worker who began contributing to the scheme at age 16 would be able to retire five years earlier than one who began contributing at age 21. Some allow workers to start drawing a reduced pension from as young as 50 (but more often from 55 or 60).

Table 6. **Coverage of the fishing sector by government-sponsored old-age pension schemes**

Country	Description of general scheme			Fishers covered under general scheme?		Special provisions possibly applicable to fishers
	Type of Scheme(s)[1]	Minimum age to qualify[2]		Income from wage[5]	Income from share[5]	
		Early[3]	Full[4]			
Australia	U, SA	–	65	Yes	Yes	Supplemental pension for retiries in remote areas.
Belgium	SI	60p	60-65	No(S)	No(S/SE)	–
Canada	U, SI	60	65	Yes	No(SE)	–
Denmark	Multiple	50	67	Yes	Yes	–
Finland	U, SER	60	65	No(M)	No(M)	–
France	SI, SER, SA	–	60-65	No(F)	No(F)	–
Germany	SI	60u	63	Yes	Yes	–
Greece	SI	60	58-65	No(F)	No(F)	Pension at 60 if 3600 days in arduous employment.
Iceland	U, SI, SA	–	65, 67	Yes	Yes	–
Ireland	SI, SA	55u	65-66	Yes	Yes	–
Italy	SI, SA	50u	63	Yes	Yes	–
Japan	SI	60	65	No(F)	No(F)	–
Korea	SI	45, 60	65	Yes	Yes	Fishers previously treated separately.
Mexico	SI, MS	60u	65	Yes	No(SE)	–
Netherlands	SI	–	65	Yes	Yes	–
New Zealand	U, SA	–	63	Yes	Yes	–
Norway	U, SI, SA	–	67	No(F)	No(F)	–
Poland	SI	–	65	Yes	Yes?	Earlier pension for maritime employment.
Portugal	SI, SA	55	65	Yes	Yes	Earlier pension if the fisher has worked for 30 or more years, or 15 years at sea.
Spain	SI	60	65	No(F)	No(F)	Earlier pension for difficult or dangerous work.
Sweden	U, SI	60	65	Yes	Yes	–
Turkey	SI	–	60	Yes	No(SE)	–
U.K.	SI, SA	55	65	Yes	Yes(SP)	–
United States	SI	62	65	Yes	Yes	–

1. Abbreviations: MS = mandatory system of saving for retirement; SI = social insurance system; SA = social assistance system; SER = statutory earnings-related pension plans; U = universal scheme.
2. Ages are for men only. In many cases women may qualify for a pension at up to 5 years earlier than men.
3. Abbreviations: p = prepension if replaced by unemployed worker; u = early retirement possible if unemployed for an extended period (conditions vary by country; in some cases means-tested). Note: two ages separated by a comma indicates different schemes.
4. When range of years given, indicates full pension possible if worker satisfies minimum criteria at the earlier age.
5. Abbreviations: F = special scheme for fishers; S = special scheme for seamen; SE = special scheme for the self-employed; SP covered by general scheme, but special provisions concerning benefits and contributions.

Sources: United States, Social Security Administration, *Social Security Programs Throughout the World* – 1995, Research Report #64, U.S. Government Printing Office, Washington, D.C., July 1995; European Commission, MISSOC: *Social Protection in the Member States of the Union – Situation on July 1st 1995 and Evolution*, Luxembourg, Office for Official Publications of the European Communities, 1996.

Derogations from these general rules based on the sex or personal situation of the worker are common. Many countries, for instance, allow women to retire on full pension at an earlier age than men – typically 60 – though the tendency in recent years has been to eliminate such sex-based differentials. Unemployment is also in some

countries a condition that allows a worker to begin drawing entitlements a few years before reaching the statutory age. In Belgium men may retire at age 60 if they are replaced by an unemployed worker. Some countries also offer earlier retirement to workers covered under the general scheme who have been employed in particular occupations or industries (*e.g.* teaching, the iron and steel industry, or coal mining), or whose work is considered unhealthy or arduous (G*reece*), difficult or dangerous (S*pain*). Workers in most countries can start drawing a special "disability pension" at any age (usually subject to a minimum period of covered employment) if they become incapacitated.

The applicability of a general scheme to workers in the fisheries sector varies considerably among OECD Member countries. Everywhere, workers in the *processing* sub-sector are covered under a general scheme. But in about half the maritime countries those in the *harvesting* sub-sector, particularly fishers not earning a fixed wage (*e.g.* share fishers), are covered under special schemes. In F*inland* fishers are covered by a scheme that covers all maritime occupations; in F*rance*, G*ermany*, G*reece*, J*apan* and P*ortugal*, specific schemes operate for fishers.

A few countries, such as N*orway* and S*pain*, provide special early retirement schemes for fishers on more permanent basis. Norway's scheme, for instance, covers fishers between the ages of 60 and 66. Upon reaching the age of 67, the fishers then qualify for a full state pension under the general scheme.

C. Structure of the notes

These notes examine – for individual Member countries with marine fishing industries – the social security policies and active labour market policies as they apply to people working in the fishing industry. Each section begins with an overview of the country's fisheries sector and the policies that regulate it. This is followed by a brief description of the country's social security and active labour market policies, including regional and rural development programmes.

D. EU Countries

In 1994, the EU integrated most of the areas dependent on fishing into one or more of the territorial objectives of its structural funds – *i.e. objectives* 1 and 6 ("late-developing regions"), 2 ("reconversion of industrial zones in decline"), and 5*b* ("development of rural areas") – making them eligible for assistance from the EU's three general funds: the European Regional Development Fund (ERDF); the European Social Fund (ESF), and the European Agriculture (Guarantee and) Guidance Fund (EAGGF). This assistance is in addition to that provided through the Financial Instrument for Fisheries Guidance (FIFG). At the same time, the Commission launched a new initiative, called PESCA, which channels extra funds for economic development in areas dependent on fishing. With an overall budget of almost ECU 300 million for the period 1994-99, PESCA is intended to help the fishing industry adjust to the social and economic repercussions of restructuring. Aid is provided for:

- retraining;
- diversification of activities in eligible areas;
- job maintenance or creation; and
- productive investment.

PESCA applies in practically all coastal areas where fishing is a significant industry. Both public and private organizations – including regional or local authorities, chambers of commerce, small and medium-sized enterprises, fishermen's co-operatives, and training centres – can apply for PESCA assistance.

The rate of Community joint-financing varies according to the type of project and the region in question. For productive investment in objective-1 regions, the EU will finance up to 50% of the total project cost; in other regions it will finance up to 30% of the total project cost. For other projects the corresponding share limits are 75% and 50% of total project cost.

From the outset, the PESCA initiative has been seen as a way of developing relatively specialized projects which would not otherwise have fitted into more established frameworks. Better information has led to the development of a number of innovative micro-projects, some with a transnational dimension.

F*rance*

*O*verview

France's production of fish and shellfish is valued annually at just over FF 8 (USD 1.4) billion, of which approximately FF 5.6 (USD 1) billion is derived from fishing at sea. The annual harvest – almost 600 000 tonnes of fish molluscs and crustaceans – is insufficient to cover domestic demand, which is constantly increasing. Shellfish culture, particularly of oysters, is of growing importance, particularly in Brittany. Brittany also accounts for over half of the wild catch in both value and volume terms, and 40% of the fleet.

Nearly 1 500 fish or shellfish unloading points have been identified in France (including overseas departments), of which 100 can be called proper fishing ports. The size of the fishing fleet and the number of fishermen have both

been steadily decreasing. Since 1986 the number of vessels has almost halved (to 6 500), of which all but one-fifth belong to single-boat owners. Over the same period, the fleet's tonnage declined by 13% (to 176 000 GRT.), with the biggest declines among boats of less than 12 metres. The total number of fishers employed for more than three months a year at sea now stands at around 17 000, compared with almost 23 000 in 1988.[21] About two-thirds of these fishers are considered full-time (*i.e.* spend more than six months a year at sea).

Social security

France's system of social protection is complex, and is based primarily on the 'standard employment relationship' – *i.e.* full-time, permanent work with lifelong insurance contributions (Eardley, *et al.*, 1996). Within the general social security system are several occupationally-based schemes for different categories of workers and their families. The core scheme, the *Régime général*, provides insurance-based coverage for sickness and occupational injuries, maternity leave, old age pensions and death benefits for about 70% of the population. Unemployment benefits are not strictly part of the social security system; rather, they are administered at the local level by Associations for Employees in Industry and Commerce (ASSEDIC), which work within a national structure called UNEDIC. Both the *Régime général* and the ASSEDIC applies to wage earners and salaried workers in the fish processing sector and those who work for firms that transport the fish. Self-employed people working in these industries are covered under special schemes that provide for old-age pensions but not unemployment insurance. Seasonal workers are also excluded from the UI scheme.

All people who work on fishing boats, those engaged in aquaculture, and those working for companies that supply and service the fleet, are covered under a separate labour law (the *Code du Travail Maritime*) and system of social security. Nonetheless, many features of this special regime are similar to the general regime. A minimum wage applies, pegged to the general minimum wage (SMIC), according to the number of hours worked each week. Unemployment insurance is available to all fishers, but is compulsory for those working on boats longer than 25 metres or over 50 GRT. Retirement on full pension is possible at 55 years, financed out of a special fund to which fishers contribute. A special "pre-retirement" pension is provided to fishers who have reached the age of 50 and have contributed to the scheme for at least 25 years.

In 1996 a framework bill on sea fishing and marine aquaculture was presented to Parliament which proposed, among other changes, several modifications to the "social relations" in the fish harvesting sector. One proposed amendment would reconcile the minimum wage (SMIC) with the share system, so that a minimum average wage would be assured over the year. Meanwhile, the relative merits of affiliating independent fishers with local ASSEDICs is currently a topic of intense debate. Finally, the Government is considering whether to introduce a temporary early-retirement scheme to complement a vessel retirement programme.

Ireland

Social insurance and unemployment assistance

Fishermen who are employees on board a vessel pay Class A Social Insurance contributions in the normal way, and have the same access to insurance-related benefits as any other contributor (Unemployment Benefit (UB); Disability Benefit (DB); Dental and Optical benefit after a qualifying period). There is both an employer and an employee portion to the social insurance contribution in this case.

Since 1993, share fishermen, who are self-employed, have had the opportunity to pay special Class P social insurance, which entitles them to up to 13 weeks of unemployment benefit (UB) payments.

The Social Welfare Act, 1999 brought in a special scheme under Unemployment Assistance, called "Fishing Assist" for self-employed fishermen, who are not covered by social insurance. This scheme, which went into effect on 1 April 1999, applies a less rigorous income assessment to fishermen applying for Unemployment Assistance than heretofore, and is designed to help low-income fishermen on marginally viable boats. The main points of difference over the scheme previously in force are as follows:

- 80% of the fisherman's self-employed income is assessed, as opposed to 100% heretofore.
- Additional income disregards for children are applied: there are no disregards for children under regular Unemployment Assistance.
- A relaxation of "signing-on" arrangements: fishers will not be obliged to sign onto the live register weekly or fortnightly as before.

Annual income is averaged over 52 weeks for the purpose of the calculation of assistance payments. Income is calculated for the 52 weeks immediately prior to the application for assistance.

Portugal

Assistance to the unemployed

The general social insurance scheme (Decree No. 119/99 of 14 of April 1999) applies only to salaried workers, not the self-employed. Three different types of unemployment benefits are provided:

- A *normal unemployment subsidy*. The duration of benefits varies according to the age of beneficiary (under 30 years, 12 months; between 30 and 40 years, 18 months; between 40 and 45 years, 24 months; greater than 45 years, 30 months).
- A *subsidy for part-time workers*. Special provisions are provided for those who work part-time.
- Social assistance for the unemployed – this can precede (if the beneficiary does not meet all the requirements for benefiting from the unemployment subsidy, because, for example, he or she does not have the stated period of guarantee of 540 days of salaried work, with the corresponding register of remunerations, in a period of 24 months immediately preceding the date of the unemployment) or follow the unemployment subsidy (once the time limit for benefits have has run out). Duration of the instalments: when preceding, it is equal to the unemployment subsidy; when following, it is equal to half of the cited periods; the allocation of social assistance for unemployment can be prolonged for beneficiaries who at the time of unemployment are 50 or more years-old until they reach the age where they are eligible for early retirement (normally, 55 years).

Unemployment protection for the fisheries sector is carried out in compliance with the special arrangements set out in art. 31 of Decree No. 119/99 of 14 of April 1999; that is, an unemployment subsidy is guaranteed not only to wage workers but also to those who carry on an independent activity – as long as the return from such activity does not exceed, each month, 50% of the guaranteed minimum income of workers in general (art. 6 of the same decree). The unemployment subsidy is paid for a period ranging from 12 to 30 months, depending on the age and duration of prior employment.

Unemployment payments are made for a duration that is increased by the equivalent of two months' subsidy per for each 5-year age increment, starting at age 45, under the condition that the person's contributions to the general scheme have been recorded for at least 20 years previous to unemployment.

Old-age pension

The minimum qualifying age for retirement benefits under the General Scheme is 65 years. Under Articles 20 and 105 of Decree No. 329/93 of 25 September 1993 (as amended by Decree No. 9/99 of 8 January 1999, general and specific legislation, and implemented by Articles 1 and 2 of Superior Executive Decree No. 40/86 of 12 September 1986), special schemes for invalidity and old-age pensions may be granted to licensed professional fishers who meet certain eligibility requirements. Under Article 20 of Decree No. 329/93, fisheries workers may exercise their rights to an old-age pension, beginning at the age of 55 years, if they accrue 30 years of work (as opposed to 30 calendar years of registered contributions for workers covered under the general scheme) – at least 15 of which must have been on fishing vessels. A pension for physical disability related to fishing is also available to fishery workers who attain the age of 50, as long as they have accrued 40 years of service. This legislation applies equally to wage earners, share-workers, and those who are considered self-employed. Art. 4 of the related Superior Executive Decree still allows retirement at the age of 50 if a worker has accrued 40 years of service.

E. Non-EU Countries

Canada

Canada has employed both on-going and time-limited social and labour-market policies to its fisheries sector; those specifically targeted at the Pacific salmon fishery are described in Chapter IV. What follows below is a description of some of that country's other policies and programmes.

The Atlantic Groundfish Strategy (TAGS) *and related programmes*

In response to the collapse of the northern cod stock, which led to the moratorium in 1992, the government implemented the Northern Cod Adjustment and Recovery Program (NCARP) to address the overcapacity problem in the northern cod fishery. Subsequent to 1992, the crisis in the groundfish spread beyond northern cod to almost all of the other groundfish stocks. The government responded to the growing crisis with the announcement of The Atlantic Groundfish Strategy (TAGS) for the long-term adjustment of the Atlantic groundfish fishing industry. The Atlantic Groundfish Strategy came into effect in May 1994. It replaced NCARP and covered fishing areas in five provinces: Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick and Quebec. TAGS provided assistance programs for individuals and communities affected by the groundfish moratorium.

The objectives of TAGS were to restructure the fishing industry in Atlantic Canada to make it economically viable and environmentally sustainable by:

- Renewing the resource and reducing harvesting and processing capacity.
- Facilitating the labour adjustment of individuals affected by the Atlantic fishery crisis.
- Enhancing the profession of those fishers who remained active in the fishing industry.
- Facilitating community economic development by focusing on regional strengths and opportunities in the areas affected by adjustments in the fishing industry.

The implementation of TAGS had a fixed budget of CAD 1.9 billion and involved four federal government organisations: Department of Fisheries and Oceans (DFO) responsible for the restructuring of the fishing industry; Human Resources Development Canada (HRDC) responsible for labour adjustment, including income support; and the Atlantic Canada Opportunities Agency (ACOA) and the Federal Office of Regional Development – Quebec (FORD-Q) responsible for community and regional economic development. These organisations were also to work with provincial and municipal governments, educational institutions and the private sector to implement TAGS.

TAGS incorporated complementary and interdependent activities. The first step involved identifying a core group of fishers and fish processing plants that would continue to be part of the fishing industry. Identifying this core group would allow adjustment measures to be directed according to participants' needs. Long-term regional and community economic development would subsequently increase employment opportunities and guide the direction of training.

The capacity reduction element, the responsibility of Fisheries and Oceans Canada, identified the number of groundfish licences as the main factor in the overcapacity of the industry. A capacity reduction target of 50% was established. This reduction was to be accomplished through the buyback of licences and the provision of early retirement annuities for fishers that were to be included in the "core" group.

Income support was provided to fishers, trawler workers and plant workers affected by the Atlantic groundfish crisis who agreed to participate in the labour adjustment programs offered under TAGS. The active participation measures were designed to facilitate access to employment through, for example, career planning and counselling, mobility assistance and support for re-employment; to prepare individuals for work through, for example, literacy and basic skills training; and to enhance employment opportunities through such means as support for entrepreneurship and restoration of the environment and communities. Human Resources Development Canada also administered the early retirement program for older plant workers.

In June 1998, the Government of Canada announced the Canadian Fisheries Adjustment and Restructuring (CFAR) initiative which solidifies the previous programs under TAGS (The Atlantic Groundfish Strategy) and PSRS (Pacific Salmon Revitalization Strategy), and addresses the permanent downsizing of the Atlantic groundfishery and encourages the restructuring of the Pacific salmon fishery. The measures under the Atlantic component focus on long-term human and resource and community economic development strategies that equip individuals and fishing communities with skills and the assistance they need to prepare for life beyond fishery. The major program components include:

- A new round of fishing licence retirement program.
- Final, lump-sum payments to TAGS clients, to replace monies they would have received had the TAGS program continued for a fifth year as originally planned.
- Adjustment measures to help current and former TAGS recipients become self-employed, get work experience, develop new skills, or relocate; also, a change in the Employment Insurance regulation will help TAGS clients qualify for Employment Insurance as regular claimants.
- Extra help for community and regional economic development.
- A new round of federal-provincial cost-shared early retirement program.

Since 1992, 876 groundfish licences have been retired under the NCARP (Northern Cod Adjustment and Recovery Program) and 478 licences under TAGS. These programs, combined with the Atlantic Licensing Policy Reform (including the establishment of a "core fisher" designation), have resulted in a reduction of groundfish licences from approximately 17 000 to 13 000 as of 1998. Under the latest round of licence retirement, which began in 1998, another 1 650 licences have been removed and, by program completion, it is hoped this number will reach 2 200. In addition, through the previous and current early retirement programs, a total of 822 fishers (333 under TAGS, 489 under CFAR) have retired from the Atlantic fishery.

Policies affecting general employment conditions and incomes

Under the Canadian constitution, labour legislation is primarily a provincial responsibility. Federal jurisdiction mainly applies to subjects of a national, international or interprovincial nature, such as interprovincial and international transports, telecommunications, banks and certain Federal Crown Corporations. General labour laws impose certain restrictions on contracts between employees and employers such as minimum age for employment, minimum wages, leaves, termination of employment, occupational safety and standards and collective bargaining rights.

Under the Income Tax Act, self-employed fishers are allowed to deduct certain amounts they spend on supplies, fuel, gear, etc. to earn their fishing income. For fishing boat owners, accelerated capital cost allowances are also available – *e.g.* 30% on automobiles and office equipments, 20% on engines, electric-generating equipments and gears, and 15% on boats and component parts. Other general employment/business related tax credits include investment tax credit, Goods and Services Tax (GST) input tax credit, and employee and partner GST rebate. There is also a two-year Employment Insurance (EI) premium refund program that provides relief for small business owners due to changes introduced by the new EI legislation.

Social security

Human Resources Development Canada is responsible for Canada's unemployment insurance and old-age security programs. The Old Age Security (OAS) program is the cornerstone of Canada's retirement income system. Benefits include the basic OAS pension, the Guaranteed Income Supplement (GIS) and the Spouse's Allowance (SPA). Provincial benefits for seniors are also available in some provinces.

Unemployment Insurance was changed to Employment Insurance effective in January 1997. The aim was to help those most in need and to provide incentives for beneficiaries to return to work. Changes were introduced to solve basic structural problems such as "disincentives" to work, dependence on unemployment insurance, administrative complexity and inequities in the system. To qualify for benefits, a self-employed fisher would need minimum earnings from fishing as opposed to the minimum hours requirement for regular workers. This earnings threshold varies from CAD 2 500 to CAD 4 200 depending on the regional rate of unemployment. A new entrant/re-entrant would require CAD 5 500 in earnings from the fishery during the qualifying period. Two benefit periods of 26 weeks are available to accommodate the summer and winter fisheries respectively. A flexible window of four weeks at the beginning and end of the benefit period is built in the program that recognises the varying seasons during which fishers work and encourages the extension of productive fishing activities where possible. In May 1997, the Government of Canada announced that a temporary change would be made to the Employment Insurance Regulations that would enable all TAGS beneficiaries to qualify for unemployment benefits under regular entrance requirements.

Active labour market measures

Several federal departments are involved in the design and delivery of active labour market measures. Although these measures apply to all Canadians in need of assistance, they also benefit displaced fisheries workers and coastal fishing communities. Human resources investment activities, including access to skills development and employment opportunities, job creation and labour market information as well as older worker adjustment programs are delivered by HRDC national, regional and local offices. As the Government of Canada's role in direct service delivery evolves, an increasing portion of these activities will be delivered through partnerships with the provinces and territories, and Aboriginal, sectoral and community-based organisations. A temporary three-year CAD 300 million Transitional Job Fund (TJF) was introduced in 1996 to support the development of job creation activities designed to improve the economic conditions of communities experiencing a high level of unemployment.

The Atlantic Canada Opportunities Agency (ACOA), the Federal Office of Regional Development – Quebec (FORD-Q) and the Western Economic Diversification Canada (WEDC) are the three federal agencies responsible for rural and regional development in Atlantic Canada, Quebec and Western Canada respectively. Two major program objectives are to provide greater access to capital and information for small and medium-sized enterprises, and to provide assistance to local communities to take increased responsibility for their own economic development. Strategic investments to improve the environment for regional economic growth are made possible through economic development agreements with the provinces. These federal agencies are also responsible for the regional delivery of special federal initiatives to assist communities in coping with major, sudden downturns in local economic conditions such as in the case of TAGS and PSRS.

In the latest package of fishery restructuring and adjustment measures announced by Canada to assist east-coast fisheries recipients who are eligible for more than one measure may choose from only one of them (Figure 10). The early retirement measure, for example, is available only to individuals who were between the ages of 55 and 64 on 31 December 1998 and were eligible for TAGS (The Atlantic Groundfish Strategy) benefits on 1 January 1998.

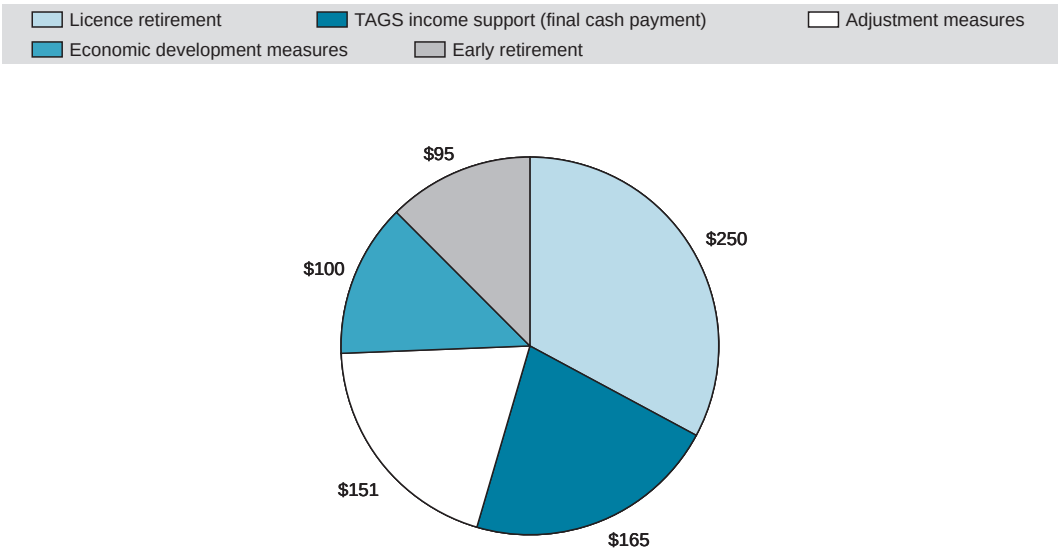
Iceland

In the event of a temporary stoppage of work due to a shortage of raw material, the employer at a of a freezing plant shall have the right to obtain funds from the Unemployment Insurance Fund to pay benefits to workers (Act No. 51 of 1995 on payments from the Unemployment Insurance Fund regarding fishery workers).

Japan

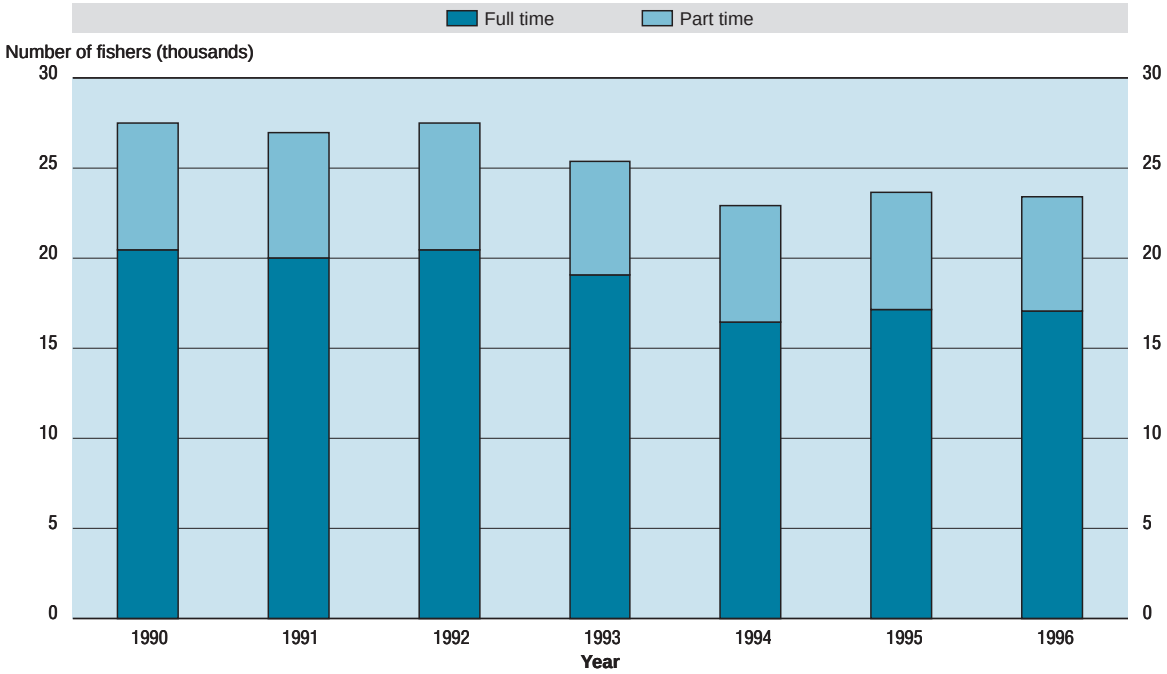
Under the Provisional Measure Law Concerning International Agreements Regarding Unemployed Fisheries Workers, the Special Measures Law for Fisheries Reconstruction, and the Employment Measures Law, measures are available for vocational training, job placement guidance and vocational reconversion.

Figure 10. **New fishery restructuring and adjustment measures announced for east-coast Canada, effective 30 August 1998**



Source: OECD.

Figure 11. **Number of commercial fishers in Norway, 1990-1996**



Source: OECD, 1997.

Norway

Overview

Fish harvesting and processing are important industries for the Norwegian economy as a whole, and account for 14% of total merchandise exports (excluding ships and oil). Cod is the single most important fish species, accounting for around one-quarter of the volume and 45% of the value, of national landings in domestic ports. Other crucial species include saithe, mackerel, herring and Norway pout. Fish farming, particularly of salmon and sea trout, is also of great importance in Norway. Most aquacultural production takes place in the fjords, using open cage systems.

The fishing industry is characterised by small, fishery-dependent communities along the entire coastline of Norway. In Finnmark, the northern-most county, fishing accounts for around two-thirds of total industrial employment. It, together with Troms and Nordland, the two other counties that lie north of or straddle the Arctic Circle, account for almost half of the people employed in harvesting and more than half those employed in fish processing and support industries. The county of Møre og Romdal, on the fjord-etched central west coast, accounts for another 20% of total fishery sector employment (Fiskeridepartementet, 1991). All four counties benefit from proximity to the nutrient-rich waters of the Norwegian current. Besides natural factors, regional and rural development programmes also have had a great influence on the maintenance of settlement and employment, particularly in the coastal areas of the west and north of the country.

Structural adjustment in agriculture and fisheries has accelerated depopulation in many areas. Since 1992, the total number of people engaged in fishing has declined by 16% (Figure 11), though their numbers rose slightly in 1995. Nevertheless, the Government expects fishing, fish processing and associated activities to remain an essential basis for economic development in many regions.

Social security

The Norwegian social security system is characterised by a high degree of universalism. All residents, regardless of nationality, are entitled to universal old-age pensions and family allowances whether or not they are economically active, and irrespective of whether they have contributed to the National Insurance Scheme. For wage-earners in industries upstream and downstream of the harvesting sub-sector, this means having access to a wide panoply of social protection systems, including earnings-related old-age pensions, sickness benefits, and unemployment insurance. Those who are self-employed are covered under the same systems except for unemployment insurance.

Special provisions have been made for fishers in the areas of pensions, unemployment insurance and sickness benefits. The financing of these schemes comes partly from contributions made by employees and employers in the industry, and partly by the Government. Three major programmes form the nucleus of social insurance in the harvesting sub-sector.

A special *unemployment insurance* scheme for fishers (A-*trygdordningen*) provides cash benefits in the event that a fishing vessel is idled – *e.g.* owing to loss of ship, repairs, ice, sickness among the crew, on-land strikes among fish receivers, or because the fishermen have been made redundant. Each member of the crew and the vessel's owner may receive up to NOK 250 (USD 39) per day for six days a week, for a period up to 40 weeks. The measure is industry-financed through a "product tax" on the value of fish harvested. NOK 86 million (USD 13.3 million) was budgeted for this measure in 1997.

A special *early retirement pension* scheme (F*iskeripensjon*) provides income support for fishers between the ages of 60 and 66. The measure is financed by fishers, who each pay an annual subscription charge of NOK 2 000 (USD 310). Qualifying individuals receive anywhere from NOK 31 500 to NOK 65 600 (USD 4 900 to USD 10 200) a year, depending on the number of years that they have contributed to the scheme. The minimum payout is possible after 15 years of contributing employment, while the maximum amount is reached after 30 years. Upon reaching the age of 67, fishers qualify for a full state pension.

Fishers and vessel owners are able to obtain a *minimum income guarantee* (G*arantiordningen*) if income from their fishing activities falls below a certain threshold. Several conditions are attached to the measure: the fishers and vessel owners must demonstrate that they are fishing efficiently; that the catch is being sold through recognised sales agents (a general requirement for all fish landed in Norway); and that despite meeting these conditions they are failing to earn a minimum income of NOK 1 900 a week. The maximum weekly amount obtainable is NOK 1 850 (USD 290), up to a maximum annual total of NOK 37 000 (USD 5700). In the 1996 season about NOK 30 (USD 4.6) million, including administrative costs, was spent on this measure.

Active labour market policies

- General policies

Norway offers various services through its public employment agency. I*nformation* on job vacancies throughout the country is stored on a computerised database and is accessible from any of over 3 500 local offices. Because

the notification of vacancies to the agency is compulsory, the database is virtually comprehensive. The agency also screens job seekers if employers so wish, and offers in-depth counselling and assistance to those who are difficult to place.

- Regional and rural development policies

Norway's general policy objective is to achieve an even distribution of income throughout society. The Government therefore strives to obtain the same level of income and social conditions for fishers as for industrial employees. In addition, it makes extensive efforts to equalise income in different regions through a mixture of support measures, and to promote equal income opportunities throughout the country, in spite of varying production conditions. Regional and rural development policies play an important role in promoting these objectives.

The population density of Norway is the lowest in Europe: 13 persons per square kilometre. That of the regions most dependent on fishing is typically half this. In many communities, a further decline would threaten their future as viable societies able to provide necessary private and public services. After a few years of little change, the population of the four northern-most counties is on the decline again, while the population of the south-eastern area around the Oslo Fjord is increasing. Everywhere the tendency is for people to move away from remote areas and into towns. Because of these demographic forces, the Government has endeavoured to integrate its regional and rural development policies within the framework of agricultural and fisheries policies. Regional, rural and sectoral policies are intended to reinforce each in order tomaintain the features of existing settlement patterns, and to ensure equality in living conditions in all parts of the country.

Norway's regional development policy has two components. The first part aims to create employment within the private sector in rural, peripheral parts of the country and in some areas of industrial decline, by providing state aid to enterprises, but also by using indirect measures to develop business infrastructure. Financial support is allocated through the Norwegian Industrial and Regional Development Fund (SND). The second, and more important, part aims at making infrastructure and essential services (health care, education, etc.) available throughout the country, and on developing rural industries, particularly fisheries and agriculture. This second part of the country's rural development policy sets out strategies for the restructuring of rural industries and promoting rural development and introduces integrated, horizontal development policies covering most components of the economic, social and environmental situation in rural areas by promoting:

- Employment opportunities by diversifying economic activities in rural areas.
- Quality development and marketing measures of rural products and services.
- Innovation, entrepreneurship and research.
- And the development of human resources.

In the mid-1990s the Government introduced a new Rural Development Support Scheme (RDSS) to supplement funding available under the SND. Overall responsibility for the RDSS rests with the Ministry of Agriculture. Agricultural and forestry agencies, in co-operation with other sectors, administer the scheme at the county level. At the local level, authorities dealing with primary industries and regional development are instructed to work together.[22] The RDSS aims to promote economic activities by developing new products and services within or complementary to conventional agriculture and fishing as well as by creating new jobs in rural communities. Business development is not its only focus: attention is also given to developing social networks and actively engaging inhabitants. It also aims to support local initiatives by providing infrastructure for economic development.

Allocations for under the scheme have grown year-by-year. Grants and loans are provided for:

- training (*e.g.* in developing new skills and attitudes), product development, and other promotional activities necessary for starting up a small-scale enterprise;
- development of existing small scale enterprises;
- and investment in new enterprises.

Types of products supported include value-added and processed products, crafts, and rural tourism – *i.e.* products based on resources found in rural areas and which build on Norway's international image. Joint ventures, engaging a more than one sector, are also eligible for support. Special measures are available to encourage women to stay in or move back to villages. In Norway today women are in the majority among students in institutions of higher education. Upon finishing their education they tend to remain in the urban centres, where it is easier to find jobs for which they are qualified. Local advisers have therefore been placed in the extension services to coach fishing families on diversification matters, and to encourage, advise and support female entrepreneurs.

United States

In February 1995 the US Department of Labour and the *State of Massachusetts* announced a USD 2 million, joint federal/state programme that is providing unemployed fishers in the State with job retraining and financial support.

NOTES

1. Arnason (1999, p. 29) regards this estimate as possibly conservative. As he points out, if the same level of capital efficiency as has been registered in various property-rights based fisheries can be replicated on average in the remainder of the world's fisheries, the fleet size required to take a sustainable yield of the global harvest would be just over 20% of its current size.
2. *Source*: OECD Rural Data Surveys.
3. Separate from these effects, the *Management Study* also noted that the distributional consequences within the fishing industry associated with the initial allocation of individual, catch and effort quotas, as well as limited licenses, could be problematic under certain circumstances. It also looked at the way in which co-management institutions influence the outcome of management measures.
4. "Next step for Newfoundland: shut 135 fish factories", *Fishing News International*, February 1997, p. 7.
5. Data comparing fishery household assets with the assets of other households is scarce. But it is notable that in Korea's most recent survey, the average net assets (total assets less liabilities) of fishery households with powered fishing vessels was 13% greater than for the national average household. See *http://www.momaf.go.kr/eng/statistic/susan-4.htm*.
6. Defined in this case to include harvesting and other, related activities: namely, fleet services, processing and transport.
7. According to a recent OECD survey, in 1990 unemployment rates in predominantly rural areas were typically several fractions of a percentage point higher than the national average unemployment rates in about half the maritime OECD countries (OECD, 1996*a*). The highest ratios were in Iceland, Finland and Canada.
8. According to Canada's 1991 fisheries census, just under half the plant workers were female.
9. See, for example, "Norway: a tale of two Arctic tribes", *The Economist*, 29 November 1997, pp. 34 and 36; and "Fish processing work popular among foreign nationals", *Daily News Iceland*, 16 December 1997 (as reported in *http://www.sea-world.com/fis/hotnews/*.
10. The affected regions were the Queen Charlotte Islands, the central coast of the BC mainland, and the northern and western coasts of Vancouver Island. There was actually a slight increase in licences and hence jobs in the Vancouver metropolitan area.
11. These measures were in addition to the special tax treatment accorded to all seafarers, including crew employed on deep-sea fishing vessels owned by a Korean shipping company (regardless of the flag of the vessel). Since 30 December 1995 (pursuant to Income Tax Act XII and Presidential Decree XVI and XVII), crew employed on such vessels are exempt from income tax on up to KRW 1 million of earned wages; for those whose monthly wage is less than KRW 1 million, up to KRW 2.4 million of annual income from overtime, night-shift and holiday work is non-taxable; for those whose monthly wage is greater than KRW 1 million, up to KRW 2.4 million of the annual performance allowance is non-taxable.
12. Initially, Spain was also excluded from the waters of the European Community, which included traditional fishing grounds around England, Ireland and France. Neither did Spain's membership in the EEC immediately allow for a full incorporation of its fleet into common fishing resources. (That finally occurred in 1996.)
13. European Commission, "Structural measures for the fishing industry and aquaculture 2000-2006", 17 December 1998. *http://europa.eu.int/comm/dg14/info/ifop2_en.htm*.
14. But they are not distortion-free. See Calmfors (1994).
15. European Commission, "Council Regulation (EC) No. 2719/95 of 20 November 1995 amending Regulation (EC) No. 3699/93 laying down the criteria and arrangements regarding Community structural assistance in the fisheries and aquaculture sector and the processing and marketing of its products", *Official Journal* (Series L) 25 November 1995 at 283.
16. Old-age pension schemes can help provide income support once a fisher has reached the statutory retirement age, but being a form of insurance to deal with normal contingencies they are not well-suited to deal with the needs of structural adjustment.

17. Government of Canada, "Fishery restructuring and adjustment measures for the Atlantic Groundfish Industry", News Release No. 98-60, 19 June 1998.
18. Fisheries and Oceans Canada, "Ministers Announce Canada's Coho Recovery Plan and $400 Million for Pacific Salmon Fishery", News Release, 19 June 1998. S*ee http://www.dfo-mpo.gc.ca/communic/newsrel/*1998/1906*_e.htm*.
19. European Commission, Directorate General IV, XXVII*th Report on competition policy*–1997; Part Two (Report on the application of the competition rules in the European Union), Chapter IV, Brussels and Luxembourg, Commission of the European Communities, 1998, p. 214 *http://europa.eu.int/comm/dg*04*/public/en/*97*part*2*.pdf*.
20. That scheme was replaced in 1996 by a new Employment Insurance (EI) scheme. Under EI, benefits are based on earned income rather than weeks or hours worked, and the benefit period is the same for all who qualify. In addition, frequent users of EI will be penalised under a new "intensity" rule (Gislason, Lam and Mohan, 1996).
21. M. Josselin de Rohan, "Rapport fait au nom de la commission des Affaires économiques et du Plan (1) sur le projet de loi d'orientation sur la pêche maritime et les cultures marines", No. 50, imprimé pour le Sénat par la Société nouvelle des librairies-imprimeries réunies, Paris, France, 1996.
22. The Norwegian administrative structure consists of three levels: the central Government Level, the county level and municipal level. There are 19 counties and 439 municipalities in the country.

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Part 2

POST-HARVESTING PRACTICES AND RESPONSIBLE FISHERIES

POST-HARVESTING PRACTICES AND RESPONSIBLES FISHERIES

I. BACKGROUND AND OUTLINE TO THE STUDY

This document is in response to the Committee for Fisheries' request for work on the implication of responsible post-harvesting practices and policies and responsible fishing. It is one of four studies that form the body of work on the Committee's study on the Transition to Responsible Fisheries.

When, in 1997, the Committee decided to embark on the Transition study, the Committee noted that the post-harvesting sector could contribute to the achievement of responsible and sustainable fisheries. It therefore suggested that a comprehensive collection of information and an analysis of the links between post-harvesting practices and responsible fisheries be undertaken. In doing so the Committee made reference to the FAO Code of Conduct and its Article 11 dealing with the post-harvesting practice and trade.

Country notes to this study were submitted for information by some Member countries.[1] In addition, material from other sources (including web-sites and papers from other international organisations) contributed to develop the information base for this study.

This paper is divided into the following main sections:

I. Background and Outline to the Study.
II. Introduction.
III. Context, Issues and Concerns.
IV. The Post-Harvest Sector.
    A. An Overview of the Post-harvesting Sector.
    B. Country Note Summaries.
    C. Other Information.
V. Conclusions and Policy Implications.

Section III endeavours to provide some background to the issues involved in the post-harvesting sector and presents work carried out in other places regarding the post-harvesting sector. Section IV-A provides an overview of the post-harvesting sector and examines the relative importance of the sector in some of the Member countries' fisheries economies. That section will draw heavily on material submitted by some Member countries and other material that has been summarised in Sections IV-B and IV-C. Section V provides a discussion of possible impacts of the post-harvesting sector on harvesting and identifies areas where future work could be undertaken to accelerate a move towards responsible fisheries, insofar as the post-harvesting sector could have an influence.

II. INTRODUCTION TO THE ISSUES

In many Member countries there has been a growing recognition of the importance of the post-harvesting sector[2] and in particular its ability to influence the harvesting sector outcome. Furthermore, there is now an appreciation that the post-harvesting sector may provide incentives that can facilitate a responsible and sustainable use of the resource base.

This change has taken place against the background of some key developments, in particular:

- Globalisation and increased trade in fish and fish products.
- Improved information and transport technology.
- Changing consumer attitudes in terms of quality (often defined as simple parameters like healthiness, size, colour etc.). But, increasingly, consumers are placing more and more importance on less quantifiable aspects like environmental matters (*e.g.* how the fish was produced).
- Changing distribution and retail patterns.
- Reduced or changed raw material availability/origin due to over-fishing.

Concurrently there has been a call for better understanding of how policies applied to trade in fish and fish products affect the fishing industry with a main focus on effects on the harvesting sector. In this regard the linkages between post-harvesters and harvesters are of major importance in assessing the effects of various policy instruments whether related to trade, management or resource conservation. For example, the link between harvesters and processors (*e.g.* direct landings *vs.* auction sales) has a bearing on how market signals are transmitted through the distribution chain, and concerns both the direction and strength of the signal. It is therefore important to get a better overview of the post-harvesting sector and the way in which fish and fish products move in the distribution chain from fish landings to the final consumer. An extension of that analysis is the assessment of who (and how) benefits from market price support measures and other policy instruments applied by Member countries. In this regard there are clear linkages to the Committee work on financial transfers, as well as its future work on market liberalisation.

Some countries are now pursuing an active policy in engaging post-harvesting in the fisheries policy arena. Furthermore, in line with resource constraint developments, post-harvesting operators have become more actively involved in the public policy debate. Countries where programmes are in place include Australia (SeaQual); Canada (Canadian Code of Conduct for Responsible Fishing Operations, DFO); the United States (United States Fisheries Industry Principles For Responsible Fisheries; National Fisheries Institute); the United Kingdom (activities of SEAFISH); Spain (*"appellation d'origine"* of the National Institute of Denominations of Origin), as well as the EU Commission (*e.g.* "The Future of the Market for Fisheries Products in the EU: Responsibility, Partnership and Competitiveness"). Attempts have been made in other countries or areas, and certain initiatives are underway, including in the Nordic countries (see, for example, "Challenges ahead for the Nordic Fisheries Sector", The Nordic Council of Ministers).

Some of the activities are carried out through private or semi-public bodies and have contributed to the inclusion of the post-harvesting sector in the fisheries debate. It is likely that that process will continue and be reinforced in line with an increasing understanding of the business risks that are involved in fish processing, trade, packaging, retailing etc. The more the industry is coming to grips with how it is to survive within a sustainability context, the more vocal we are likely to see the industry become.

III. CONTEXT, ISSUES AND CONCERNS

When commencing this exercise, the Committee for Fisheries was presented with selected management policies and instruments with an indication of how their use might influence responsible harvesting and post-harvesting practices. Insofar as the post-harvesting sector is concerned, the likely impacts of the following practices and policies were highlighted by the Committee:

- Price-setting mechanisms (*e.g.* future markets, auctions, direct sale).
- Seafood inspection/quality control systems.
- Labelling and consumer information.
- Trade sanctions in response to fisheries management practices.
- Price support.

In this regard it is interesting to take note of the OECD Environment Directorate's forthcoming work on sustainable consumption and production patterns. One of the modules entitled *Policy Instruments for Consumer Demand Management* considers (among other things) the amount and quality of information which policy makers have at their disposal concerning the impacts of consumption of individuals and households on environmental sustainability (see Box 1).

Box 1. Sustainable Consumption and Production

The OECD's Environment Directorate recognises the importance of consumption patterns and their influence on sustainable development and notes in a recent document "that individual consumption choices and social choices (such as a commitment to sustainable development) do not automatically coincide, policy instruments have to be implemented in order to render both compatible. In some instances information, education and participatory decision-making mechanisms are able to bridge this gap, in other instances evidence available to governments about the environmental sustainability of consumption patterns is the basis for attempting to influence individual consumption choices (which do not reflect such evidence) through regulations and economic instruments."

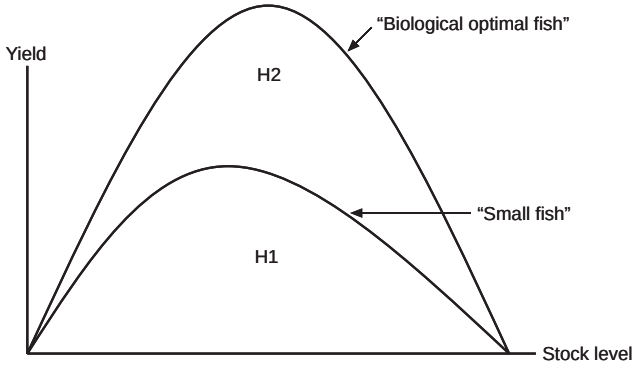
Source: "Sustainable Consumption and Production: Draft Work Plan".

In relation to the work of the Committee for Fisheries on the post-harvest practices and policies and their influence on the harvesting sector, it would seem that the above observation is of considerable importance. Achieving responsible post-harvest practices in fisheries is a sectoral application of the principles underlying the development of sustainable consumption and production patterns for the economy in general.

That post harvesting sector practices may have an influence on the harvesting outcome can be illustrated by reference to the practice by retailers of demanding fish sizes that fit portion-sized packaging requirements. For certain species of fish this means that sales of smaller-sized, immature fish fetch higher prices per kilo than fish that need cutting to size. Another example is fish consumption in the Mediterranean which, for certain species, traditionally has been directed towards smaller-sized fish.

In these cases, the open-access equilibrium for fisheries changes, as the yield/production curve is a function of the weight of the fish at harvest. If the demand is for smaller-sized fish, and smaller-sized fish can be removed from the stock, the yield/production curve will be flatter than for larger-sized fish. By how much will depend on the behaviour of fishers (and must take into account yields at age, the price of fish at each age, the cost of harvesting given age/size groups). This has been graphically illustrated in Box 2, which depicts the relationship between stock level, yields and fish size. The curve H1 "small fish" is the yield curve for fisheries of a species where small mesh size has been used, while H2 depicts a yield curve where a larger mesh size is employed.

Box 2. **Relation between stock level, yields and fish size**



The relationship between fish size, yield and stock level is an important consideration in making management decisions. However, optimal market conditions may not always be the same as optimal biological conditions. In such circumstances public intervention (minimum fish size and gear regulations) may provide a useful means of correcting the market failure.

A. Price-setting mechanisms

As observed in earlier documentation to this study, the price signal to all individuals in the market, from producer to consumers, is essential. Inefficiently determined or non-transparent pricing directly results in misallocation of resources. Therefore, responsible post-harvest practices require the presence of efficient pricing mechanisms.

However, while transparent prices are to be encouraged and price interventions, in general, are to be avoided, there are cases in fisheries where individual and collective (societal) choices and demand schedules do not coincide. In such cases there may be a need to resort to using prices and a price-setting mechanism (intervention) as a corrective instrument. The case of demand for small-sized fish, mentioned above and in Box 2, could be a case where price discrimination (and intervention) may be useful.

Price setting in fisheries takes many forms. In some countries auction systems provide for a clearing-house between harvesters and the post-harvest sector. In other countries, sales are ensured through contracts between harvesters and processors. Finally, in a few countries, a high degree of vertical integration between the two sectors exists. In most OECD Member countries, however, a mixture of all three types of fish exchange co-exists in the market place. Details on the price mechanisms in Member countries are provided in Section III.

Box 3. Sustainable consumption and production

In reference to the globalisation process, where fisheries markets are particularly advanced, the Environment Directorate's work plan on sustainable consumption notes:

"However, globalisation also accelerates technological change, the exchange of information and permits the allocation of resources, including un-priced natural resources, more efficiently, as long as appropriate signals are provided. The provision of appropriate signals is the crucial challenge for policy makers in instances where market failures regard public health, global environmental impacts or un-priced natural resources thus as biodiversity-rich ecosystems."

Source: OECD.

Box 4. Is setting a tax (*e.g.* higher VAT duty on fish products from unsustainable sources) a way forward?

Thus a key factor in an effective pursuit of sustainable development is correcting for "market failures" and removing – as far as possible – distortions caused by inappropriate policies ("government failures"). A number of steps may be required to move in this direction. These include:

- the reform of subsidies that are harmful to the environment,
- the use of other economic instruments, such as taxes, charges,
- the creation of markets where they do not exist, *e.g.* allowing trading in pollution and emission permits,
- and a better appraisal and valuation of external effects.

Source: OECD.

In the EU, the withdrawal price system for plaice contains an interesting feature. During and up to the spawning season, when the plaice are water-rich with low meat yields, plaice command a low price. Consequently, the withdrawal price in the EU for plaice is fixed at two levels, with a lower one applied during the period of low market value and, following the spawning season, a higher withdrawal price comes into effect.

The prevalence of a particular sales method in any market is often a consequence of national historical developments. However, it is likely that the globalisation process (of fisheries), and the general tendency towards vertical integration in food distribution and processing will render auction systems less important in the future. In addition, economies of scale in the post-harvesting sector call for either contract landings or forward integration. More integration will help ensure:

- Improved security of supply.
- Known price.
- Better control of product quality through the chain of custody.

However, the appearance of Internet auction houses has had an important effect on the global fisheries market. Increasing quantities of fish are sold through Internet auctions, which have the advantage of being a "real time" tool, linking fishers directly with processors and consumption markets.

Insofar as processed products are concerned, these are commonly traded through direct negotiations between seller and buyer at various stages in the distribution chain. Certain of these markets are truly international in nature (*e.g.* blocks of groundfish, tuna and shrimp).

The importance of analysing sales mechanisms rests with the recognition that there may be important differences as to how efficient and transparent price signals are transmitted through the chain of custody. This in turn has a bearing on who in the chain of custody captures any economic rent.

B. Seafood inspection/Quality control systems

There are two rationales behind seafood inspection/quality control systems having an interest for the present study; *e.g.*

- Food safety.
- Product information.

While seafood safety requirements have the potential of distorting the market, it can also be argued that commonly agreed standards (*e.g.* HACCP[3]) make product flows easier and requirements more transparent. In this regard it should be noted that national sanitary and phyto-sanitary requirements often form part of a set of buying specifications, and set "minimum" requirements across the product range. Often, larger post-harvest operators (supermarkets, processors) set their own specifications that exceed the requirements of public standards (which then merely serve as a safety net).

There is little evidence to suggest that seafood inspection/quality control systems at the national level render markets inefficient.

Insofar as international movements of fish are concerned, attempts to make HACCP internationally applicable should work towards creating a more transparent and uniform market. Hence transactions are likely to be more efficient. However, the potential use of sanitary and phyto-sanitary regulations as a non-tariff barrier (NTB) should not be underestimated. One case, the Australian-Canadian dispute over salmon (see Box 5) serves to show that phyto-sanitary regulations can have trade effects sufficiently severe to warrant a dispute settlement procedure under WTO/GATT. It is likely that these issues may become more important in the future, as:

- Trade increases and becomes more globalised.
- Trade in final consumer products increases.
- Increased use of medicines and bio-technology.

Box 5. **Dispute Settlement**

In 1995 Canada requested consultations with Australia under GATT's Dispute Settlement Procedures and the provision of the SPS Agreement (Sanitary and Phytosanitary Measures) concerning the Australian prohibition on the importation of untreated fresh, chilled or frozen salmon from Canada. This prohibition was instituted in Australia in 1975 in accordance with its Quarantine Proclamation Act. This measure made it impossible for Canadian exporters to export smoked salmon into Australia. The Dispute Settlement Body of the WTO, in 1998, held that the Australian measures was in violation of the WTO Agreements.

Source: WT/DS18/R of 12 June 1998.

In 1998 the Committee for Fisheries hosted a workshop on Seafood Inspection. One of the arguments for hosting the workshop was the concern that few international organisations, with the notable exception of the Codex Alimentarius of the FAO/WHO, had given consideration to seafood inspection procedures and systems that are vital in assuring access to wholesome food. The report from the workshop[4] also notes that differences in seafood inspection regimes have often caused trade disruption, resulting in financial losses for seafood exporters and higher prices for consumers.

C. Labelling and consumer information

General consumer information and labelling have become increasingly important elements in the global food market. This is partly in response to changing consumer attitudes to food products, and has been fuelled by the increasing contamination that has recently hit a number of food markets. The discussion on food safety and environmental matters has made labelling a popular means of conveying a particular message to consumers, while convincing them to buy a particular product.

As suggested in the Environment Directorate's work on sustainable consumption and production, there are situations where individual consumption patterns are not in line with social choices. In such cases there may be a need to improve information to consumers with a view to correcting the imbalances.

Treated as a somewhat broader set of issues under imperfect information and market inefficiency, the document entitled, *Food Safety and Quality Issues: Trade Considerations* (OECD 1999), provides the following observation:

> "Imperfect information about product quality can cause market dysfunctions affecting the price and quality of traded goods… In order to alleviate these dysfunctions, vendors may signal the quality of their products. For an experience good, this signal may be communicated through the price. In the case of moral hazard, Shapiro (1983) has shown that a higher price than the perfect information price could encourage producers to offer high quality on a lasting basis. This price supplement constitutes the information rent, which enables quality to be maintained over time and creates an incentive not to cheat on quality.[5] This can be a way of segmenting the market and informing consumers. However, there is a cost to society in comparison with a situation of perfect information, since consumers have to pay the higher price needed to signal quality."

However, the same study also notes that there may be an inverse relation between information and demand:

> "In some cases, it is conceivable that more information could reduce sales by making consumers aware that a certain practice exists (typically, one of the reasons that few people object to irradiated or genetically modified food in some countries, is that they do not realise that products they consume are affected). When consumers know that they do not have complete information, markets are affected in a way that reduces transactions."

Box 6. **Labelling**

Eco-labelling and certification schemes have also been used to allow consumers to choose between products with different production or disposal processes. In several countries, labels and standards are used to indicate the energy efficiency of electrical equipment, the nature of agricultural processes (*e.g.* levels of organic farming, free-range animal production), and the sustainability of harvesting wood. The success of these schemes is often dependent on consumers' trust in these schemes and awareness of the differences between products. Future OECD work will consider options for creating markets for biodiversity products and services, particularly in the form of eco-tourism opportunities.

Source: Interim Report on the OECD Three Year Project on Sustainable Development.

Labelling in fisheries, as an instrument to provide more information to consumers, has received increasing attention over the last couple of years. Among Member countries, the Spanish case study highlights the use of an "*appellation d'origine*" label for fish and fish products to increase consumer awareness of specific attributes of fish in the market place. While mainly used for farmed fish products, there is a drive to extend the Spanish labelling schemes to cover fish from other origins as well.

In Korea, a labelling scheme is used to prevent sales fraud. It appears that in that particular market there is a price premium for fish products of domestic origin and hence an economic incentive to mis-label the origin of the fish. To prevent fraudulent practices, the Food Sanitary Law and its regulations define information required on product labels.

Similarly, the Technical Guideline No. 7 to the Code of Conduct reports that there is an issue with labelling fraud. The multitude of processing possibilities for fish, the variety of species and the difficulties in identifying fish once processed (in particular by consumers) makes it "easy" to mis-label products.

In the Nordic Council, in the EU as well as in the FAO, discussions on eco-labelling schemes have been going on for some time. At this stage it is too early to predict the result of these discussions. However, the proliferation of private schemes (*e.g.* Marine Stewardship Council, Global Aquaculture Alliance, US National Fisheries Institute), for either labelling or information campaigns, suggests that this is an area that needs to be monitored.

Eco-labelling of fish and fish products is a difficult area, because of links to public management policies and because of problems in defining a certification basis (*e.g.* sustainable resource management) and a claim while ensuring that consumers are not being presented with deceptive information.

Recent discussion in the FAO, initiated by Nordic co-operation, has concluded that eco-labelling schemes should be voluntary, transparent, market-oriented, non-discriminatory, be established on best scientific information available and should not, by their application, create barriers to trade.

Within the WTO, the Committee on Trade and Environment (CTE) has examined, in detail, the issues involved in eco-labelling. CTE has observed that well designed eco-labelling programmes can be effective and important instruments of environmental policy. Insofar as WTO rules are concerned, the only requirement *vis-à-vis* eco-label programmes is that they be applied in a non-discriminatory way (*i.e.* that they do not discriminate between imported or domestically produced goods).

There is an important issue related to deceptive environmental claims and labels. At least one country has issued a code to improve the standard of environmental claims in products. The United Kingdom's Department of the Environment, Transport and the Regions has issued a "Green Claims Code", the objective of which is to ensure that consumers are protected against false or misleading claims. The Code suggests that green claims should be:

- Clear, accurate and capable of being supported by scientific evidence.
- Relevant to the product or service.
- Clear about the aspect the claim refers to.
- Significant claim.
- Legal, decent, honest and truthful.

D. Trade

Trade and trade policies have an important interface with responsible fisheries, as trade will transfer (distorted or undistorted) signals across borders. However, its impact is difficult to discern from the impact of (or lack of) proper fisheries management and enforcement. In the meantime, trade liberalisation should lead to a more rational use of the resources – provided an effective environmental policy is implemented – and hence a move to more responsible fisheries, when implemented in an environment of efficient resource management.[6]

There is growing recognition of the value of using trade measures in achieving environmental (resource conservation) objectives, suggesting that trade measures may contribute to responsible fisheries. For example, the FAO Code of Conduct recognises that "International trade in fish and fish products should not compromise the sustainable development of fisheries and responsible utilisation of living aquatic resources" (Article 11.2.2). And, furthermore, that "Fish trade measures adopted by States to protect… the interest of consumers or the environment, should not be discriminatory and should be in accordance with internationally agreed trade rule…" (Article 11.2.4).

Trade measures may have an influence on consumption patterns and hence influence signals that are transmitted to the harvesting sector. For example, import measures (tariffs, quotas etc.) may re-direct consumption towards a particular species of fish, thus increasing the fishing pressure on that stock.

Likewise, tariff escalation (which may influence the location of processing) tends to make processing more economically viable in the country that applies the tariff escalation. However, one may legitimately ask whether the location of processing is where the environmental externalities are lowest, or whether other policies are in place that internalise production externalities.

Trade measures may be used to encourage more responsible resource utilisation. For example, the European Union uses its General System of Preferences (by granting tariff concessions) on the condition that the country benefiting from the reduced tariff rate respects the rules of Regional Fisheries Organisations (RFO).

A special case is the use of trade measures (*e.g.* sanctions, embargoes) to achieve environmental objectives. A few cases of unilateral action by countries have been brought to GATT/WTO. Cases that GATT/WTO have examined include tuna-dolphin import prohibition and shrimp import prohibition. As noted in a recent WTO Appellate Body Report,[7] WTO members have endorsed and supported:

> "… multilateral solutions based on international co-operation and consensus as the best and most effective way for governments to tackle environmental problems of a transboundary or global nature. WTO Agreements and multilateral environmental agreements (MEAs) are representative of efforts of the international community to pursue shared goals, and in the development of a mutually supportive relationship between them, due respect must be afforded to both."

While no empirical work has yet been undertaken to assess the effectiveness of these measures when applied in fisheries, it is an area that needs further elaboration and discussion. Based on the above quote it would seem that MEAs (Multilateral Environmental Agreements) containing trade measures in support of environmental/conservation efforts are tolerated by the WTO system. The only condition is that the MEA (and in the fisheries context, the Regional Fisheries Organisation) is an open body that accepts membership without discrimination.

At least two multilateral fisheries conservation arrangements provide for the use of trade measures *vis-à-vis* non-contracting parties. The Northwest Atlantic Fisheries Organisation (NAFO) has adopted a scheme that provides for the possibility of prohibiting landings and transhipments of fish from non-contracting vessels found to be fishing in contravention of the provisions of NAFO. The International Convention for the Conservation of Atlantic Tuna (ICCAT) has adopted two Action Plan resolutions with respect to blue-fin tuna and swordfish. Accordingly, the contracting parties to ICCAT may use non-discriminatory trade restrictive measures *vis-à-vis* non-contracting parties found to be fishing in violation of the Convention.

In support of the ICCAT measures mentioned above, the EU introduced, in 1998, an import prohibition of Atlantic blue-fin tuna originating in Belize, Honduras and Panama [Council Reg. (EC) No. 1435/98 of 29 June 1998]. This has been followed by similar measures in the United States and Japan. Consequently, the export of tuna from the contravening nations to the most important world markets for tuna has been blocked.

A special case of an international environmental agreement is the Convention on International Trade in Endangered Species[8] (CITES). CITES provides for the prohibition of trade in a particular endangered species of animal or plant. For fish, eight species have been listed in Appendix 1 (species that are threatened with extinction and may be, or are, affected by trade, and for which, generally, commercial trade is prohibited) and 28 species in Appendix 2 (species that may become threatened unless subject to trade restrictions – trade requires an export permit from the exporting country). For OECD countries none of the species is of commercial importance. Unsuccessful attempts have been made to include Atlantic blue-fin tuna and certain species of whales in the CITES Appendix 1.

Within the OECD, work has been undertaken on these issues by the Joint Working Party (JWP) on Trade and Environment of the Trade and Environment Directorates. A recent report by the JWP entitled T*rade*

Measures in Multilateral Environmental Agreements: Synthesis Report of Three Case Studies[9] [COM/ENV/TD(98)127 FINAL] notes that:

"In general, trade measures can be an appropriate policy measure to use in multilateral environmental agreements, *inter alia*:

a) when the international community agrees to tackle and manage collectively international trade as a part of the environmental problem;

b) when trade controls are required to make regulatory systems comprehensive in their coverage;

c) to discourage free-riding which can often be a barrier to effective international co-operation; and

d) to ensure compliance with the MEA."

And, furthermore, that "Trade officials and environment policy officials should work in close co-ordination in national capitals, and the WTO, UNEP and MEA Secretariats should continue to develop their dialogue on these issues."

E. Price intervention and support mechanisms

Price support mechanisms in fisheries are only applied in a few OECD countries. The systems vary from market to market, reflecting the objectives of different pricing policies. Most schemes have an element of intervention that involves buying at a prefixed price, and one scheme is supplemented with a reference price mechanism applied to imports.

In a few of the country notes that follow, the argument is brought forward that minimum price setting has a positive effect insofar as prices are not inducing fishers to compensate poor income with increased harvests. In the Korean chapter this is considered to be the "poverty supply dilemma", which has been a problem for particular squid fisheries.

However, in general, price mechanisms are not working in a vacuum but rather as a supplementary measure to general management of the fish stocks through input or output controls. Depending on how the intervention prices are set, these systems may have a rather limited impact (if any) on the market. For example, in the EU the withdrawal prices are generally far below the practised market price. Furthermore, the fact that demand for fish in many markets outstrips supply will have a limit on the use of intervention schemes.

While intervention schemes may have an influence on the harvesting sector, their impact on the post-harvesting sector is less evident. The impacts depend on the programme specifics and the elasticities of supply and demand schedules. However, the price-setting mechanics of the market, and in particular the manner in which goods are traded between the harvest and post-harvest sector (*e.g.* auctions, contract landings, the degree of forward integration), substitution possibilities between domestic and imported raw material and processed products will all influence the final outcome.

IV. THE POST-HARVEST SECTOR

The following two sections present some key features of the post-harvest sector. The first section discusses the importance of the post-harvest sector in relation to the primary harvesting sector. Furthermore, Section A will present some evidence of changing retailing and distribution of fish and fish products. The second section presents summaries of country information that have been made available to the Secretariat.

This is the first time that comprehensive information has been sought from Member countries regarding the status of the post-harvest sector of the fishing industry. As a general note of caution it should be mentioned that statistics and information regarding the processing, handling, distribution and retailing of fish and fish products are scarce, at best. Most Member countries appear to place more emphasis on the harvesting rather than the post-harvest sector. Perhaps one reason is that the post-harvest sector is viewed as a private sector with little need for government interference.

However, and as noted above in the discussion on sustainable consumption patterns, it is likely that post-harvest policies and measures could have an additional impact and help achieve sustainable and responsible fisheries. Post-harvest policies and practices can play an important role for public authorities seeking a move towards responsible fisheries.

The FAO Code of conduct for responsible fisheries

The importance of the post-harvest sectors and its potential contribution to responsible fisheries was recognised by the FAO Code of Conduct. Article 11 of the Code, entitled "Post-harvest Practices and Trade" (see Annex 1), deals with the post-harvest sector in three sub-headings:

- Responsible fish utilisation.
- Responsible international trade.
- Laws and regulations relating to fish trade.

The main objectives for responsible fish utilisation are: *i*) that consumers have access to safe fish; *ii*) that post-harvest practices incorporate social and environmental factors (*i.e.* get more out of the landed fish through reduction in waste); and *iii*) that fish consumption is promoted. An important inclusion under this heading is also that states should ensure that international and domestic trade in fish and fishery products accords with sound conservation and management practices.

The responsible international trade section (see also Annex 2 for a comment on the development of this Article of the Code) establishes that international trade should be carried out in accordance with rules as codified in the WTO/GATT. Nevertheless, it also makes the point that states should co-operate to promote adherence to, and effective implementation of, relevant international standards for trade in fish and fishery products, and that conservation measures should not be undermined in the search for trade or investment gains.

The third main heading for Article 11 deals with laws and regulations relating to fish trade – domestic and international. While laws should be transparent and simple, they should be developed through consultation with relevant stakeholder groups. Furthermore, states should harmonise international trade standards for fish and fish products.

Technical guidelines for Article 11 have only been published for the part dealing with responsible fish utilization. Guidelines for Articles 11.2 and 11.3 are in preparation and will be published in 2000.

A. The post-harvest sector: an overview of its structure and relative importance in national fisheries economies

In some countries, excess processing capacity may be a factor contributing to unsustainable fishing practices. Such excess processing capacity may have been created through public intervention schemes that, as a primary objective, may have been focussed on employment. This observation highlights the need for a coherent policy; *i.e.* one that, *inter alia*, assesses its down- and up-stream impact when adding capacity to the processing industry.

The quality and availability of statistics on the post-harvest sector vary considerably between Member countries. The most comprehensive studies are carried out in the United Kingdom and the United States, while other countries have more sparse information. Most countries carry out statistical surveys of the post-harvesting sector on an *ad hoc* basis. A summary of key statistics is provided in Annex 3.

It is not always clear who is responsible for the collection of statistics relevant to post-harvest activities. In some countries statistics are the responsibility of central agencies, while in others the industry organisations are the main supplier of statistics. Needless to say, coverage may be, in some cases, dependent on membership of trade or processing organisations. These aspects add some confusion to the data, which in some cases are different depending on the source. Care should therefore be taken in interpreting these data and in using them for cross-country comparisons.

The available statistics are selective and often not very complete. For example, anecdotal evidence suggests that rather small family-run enterprises carry out smoking and drying of fish in the UK. However, industry statistics for most countries are only collected from companies exceeding a certain number of employees (mostly 20 per processing facility). In addition, for large processors, complementary processing lines (vegetables) may place the part of the turnover that is linked to fish into another category, and finally variable definitions across countries cause problems of comparison.

Nevertheless, it is clear that the post-harvest sector is of particular importance in a number of countries. For the few countries where the turnover of the post-harvesting sector is known (mostly limited to processing), the value of the post-harvest sector relative to the harvesting sector is quite large. With the exception of the EU, the same observation applies to the number of employees. But caution should be taken in making comparisons, and more work is needed to collect better statistics for the post-harvest sector.

The best data available (*i.e.* those from the United States), suggest that, of the overall USD 24.4 billion value-added created in the seafood business in 1997, approximately:

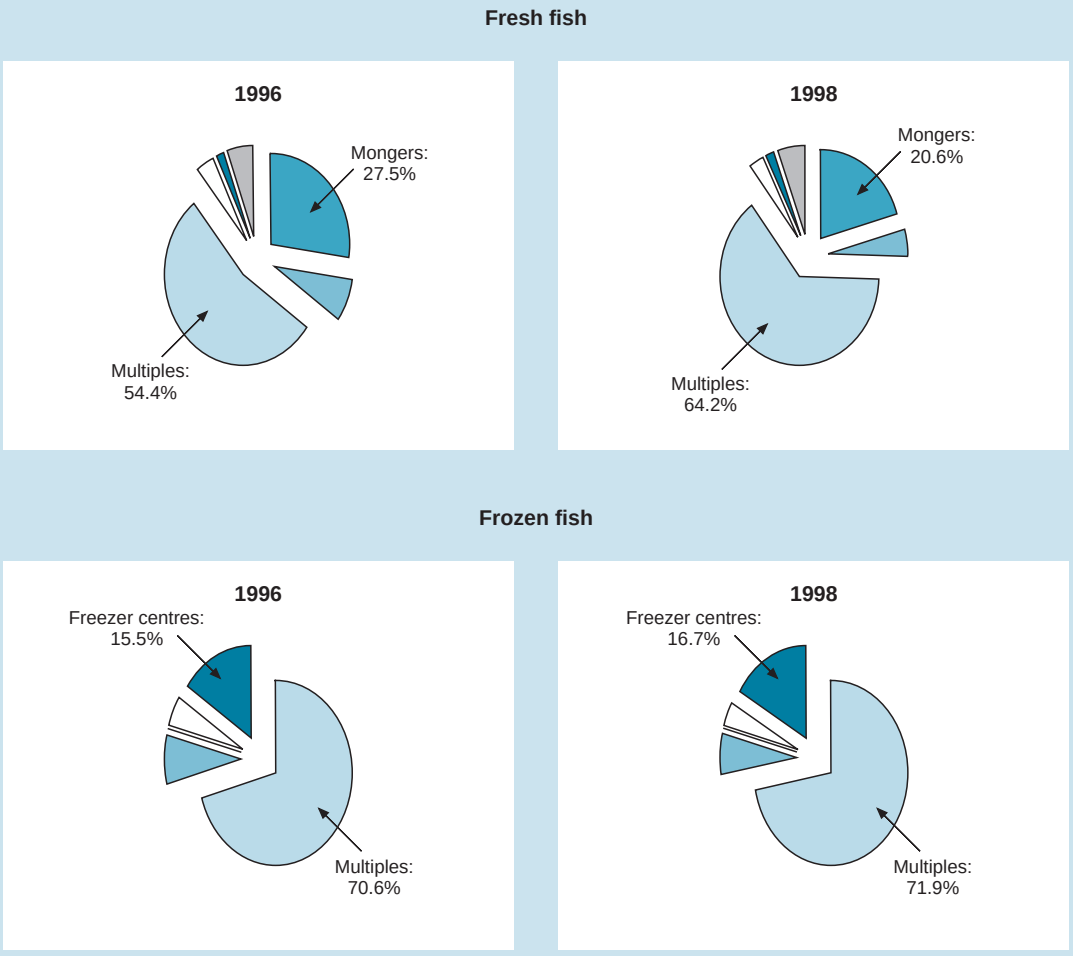
- USD 2.1 billion was from harvesting activities.
- USD 5.6 billion was created in processing (primary and secondary).
- USD 16.5 billion was created in food retailing (either through shops or through catering).

That is, USD 22.2 billion was created after the harvesting sector. In 1997 the post harvesting sector, *i.e.* processing and retailing, was responsible for the 91% of total value-added in the seafood sector.

In the United Kingdom the latest survey of the processing sector (1995 Sea Fish Industry Authority) provides the following insight into the post-harvest sector. Total sales in 1994 by primary and secondary processors amounted to GBP 1.5 billion, with GBP 250 million from primary processing and GBP 1.25 billion from secondary processing. A total of GBP 254.7 million was produced in value-added in 1994. Value-added in this context (see Sea Fish Industry Authority, 1995, *Survey of the* UK *Sea Fish Processing Industry*, p. 94) is "net value-added" – the sum of wages, salaries and profits, but after deduction of depreciation and interest. A large proportion of sales from primary processors came from small-scale enterprises, while the opposite is the case for secondary processing, which has fewer firms and is more concentrated and capital-intensive.

The statistics from the United Kingdom also illustrate the trend of increased sales to consumers through super- or hypermarkets. The tendency depicted in the following diagram has been reported by a number of countries. Sales to supermarkets have increased sharply, as has the direct purchase by caterers from fishers. Purchasing has concurrently become more centralised.

Changes in relative sales of United Kingdom retail outlets



Source: OECD.

B. Country note summaries

European Union

Within the European Union the Common Market Organisation for Fish and Fish Products (CMO) has established a number of features that have implications for the post-harvest sector. National legislation, policies and practices complement the rules applied at EU level.

The objective of the CMO is to stabilise the market for fish and fish products, to guarantee security of supplies and to ensure that the price to consumers is reasonable. The features of the CMO are:

- Common marketing standards.
- Producers' organisations.
- Market intervention mechanisms.
- Trade arrangement with non-member countries.

Common marketing standards have been set for a number of species widely traded within the EU. The standards relate to size and quality. Applying to both EU and imported products, the standards are meant to keep the market free from unwanted and low-quality products.

On a voluntary basis, fishers wishing to better manage supplies to the market can set up producer organisations (POs). The objective of this measure is to help ensure that fishing is carried out along rational lines and that conditions for the sale of (PO) products are improved. Only members of POs qualify for market stabilisation measures through market intervention. Financial assistance is provided for a limited period of time to assist the formation and setting up of PO.

Two principle axes are in place for market intervention mechanisms: *i*) withdrawals following market volatility, including a system that discourages the sale of small-sized and low-quality fish and *ii*) carry-over premiums. The withdrawal price system is complemented with a reference price system for supplies from abroad.

The function of the intervention price mechanism is to prevent market collapses and to provide a safety net for fishers (as opposed to using a direct income-support mechanism). The intervention price is situated at 70 to 90% of the guide price, where the guide prices fixed for a range of species reflect the previous season's international prices for the fish. Compensation for the withdrawn fish is graduated according to the amount of fish taken out according to the following scale:

- 87.5% of the withdrawal price for the first 7% of the annual quantity withdrawn.
- 75% of the withdrawal price for 7-14% of the quantity withdrawn.
- No compensation is paid if the withdrawn fish exceeds 14% of the annual landings of the species.

Only members of a recognised producer organisation can receive compensation for this measure.

The degressive compensation encourages members of producer organisations to better plan harvest and landings according to market demand. Furthermore, as withdrawal prices are graduated according to quality aspects as well (size and freshness), there is an additional incentive not to market fish that are not suited to the market place. In addition, the withdrawal prices for smaller fish have been reduced with a goal of discouraging their capture.

Withdrawn fish have to be taken out of the normal market channels and are reduced to fishmeal and oil or are eligible for the carry-over premium. According to the latter, and limited to a maximum of 6% of the landed quantities, assistance may be provided for limited transformation (stabilisation of the product) and for storage.

To help ensure that the internal market mechanisms work, supplies from external sources (imports) are also subject to certain rules. These rules include in particular, the observation of reference prices (for the most important products equal to the withdrawal prices). These measures have only been used on rare occasions. Measures apply to fish imported over land as well as fish landed directly from vessels from third countries, for which there are no quantitative restrictions.

To help the processing sector have access to sufficient quantities of raw material for processing, the EU has opened a series of autonomous tariff quotas and tariff suspensions for certain fish species. These are mostly opened on a yearly basis and operate on a first-come first-served basis.

The EU is a signatory to, and member of, several international conservation organisations. With a view to ensuring compliance with international conservation arrangements, the EU has, in support of the ICCAT, introduced a ban on the imports of Atlantic blue-fin tuna originating in Belize, Honduras and Panama [Council Regulation (EC) No. 1435/98 of 29 June 1998].

To respond to changing market conditions (globalisation, information routes, changing consumer demand and perception etc.) the EU Commission has proposed a thorough overhaul of its current market organisation. The proposal [COM (1999) 55 final of 16 February 1999] evokes the following principles underlying this overhaul:

- To contribute to responsible management of resources.
- To improve transparency and knowledge of the market and its products, including among consumers.

Box 7. **Suggestion for extending the use of common marketing standards**

In a global market for fisheries products, local rules on the minimum sizes used to restrict the over-exploitation of local species can only have a limited effect, particularly when similar species can be imported that are not subject to the same minimum size limits. International agreement on minimum sizes is the only way to ensure the full effectiveness of this market measure. Setting minimum size standards, which take into account the specific biology of different stocks, would improve the success of regional policies on responsible fishing. This is a new area for fisheries co-operation agreements to explore.

See: AGR/FI (2000)9/FINAL.

- To transfer greater responsibility to operators, particularly to producer organisations and their members, as a way of achieving optimal management of resources as well as optimal returns.
- To encourage partnerships between different operators in the industry, in order to maximise the efficiency of their market activity.
- To encourage the use of forecasting by producer organisations to adjust supply to demand.
- To contribute to market stability by encouraging planned marketing under contract.
- To overhaul the intervention arrangements so as to reduce permanent withdrawals from the market to a minimum and encourage temporary withdrawal and optimal utilisation of products.
- To ensure that the market and the processing industry are supplied in conditions which enable them to be competitive at the world level.

In particular, the proposals for change include:

- A reinforcement of the role of producer organisations in managing the market.
- A reduction in withdrawals.
- Improved market access for fish from third countries.
- Improved consumer information.

Once adopted by the Council, the proposal will be implemented beginning 2001.

Spain

Spain is one of the world's largest markets for fish and fish products, fish being a traditional mainstay of the Spanish diet. While 75 000 jobs are directly linked to the fish capture, at least half a million more jobs are in associated professions concerning transport, processing, trade, etc.

The distribution of fish in Spain is highly developed, flowing mainly through two channels:

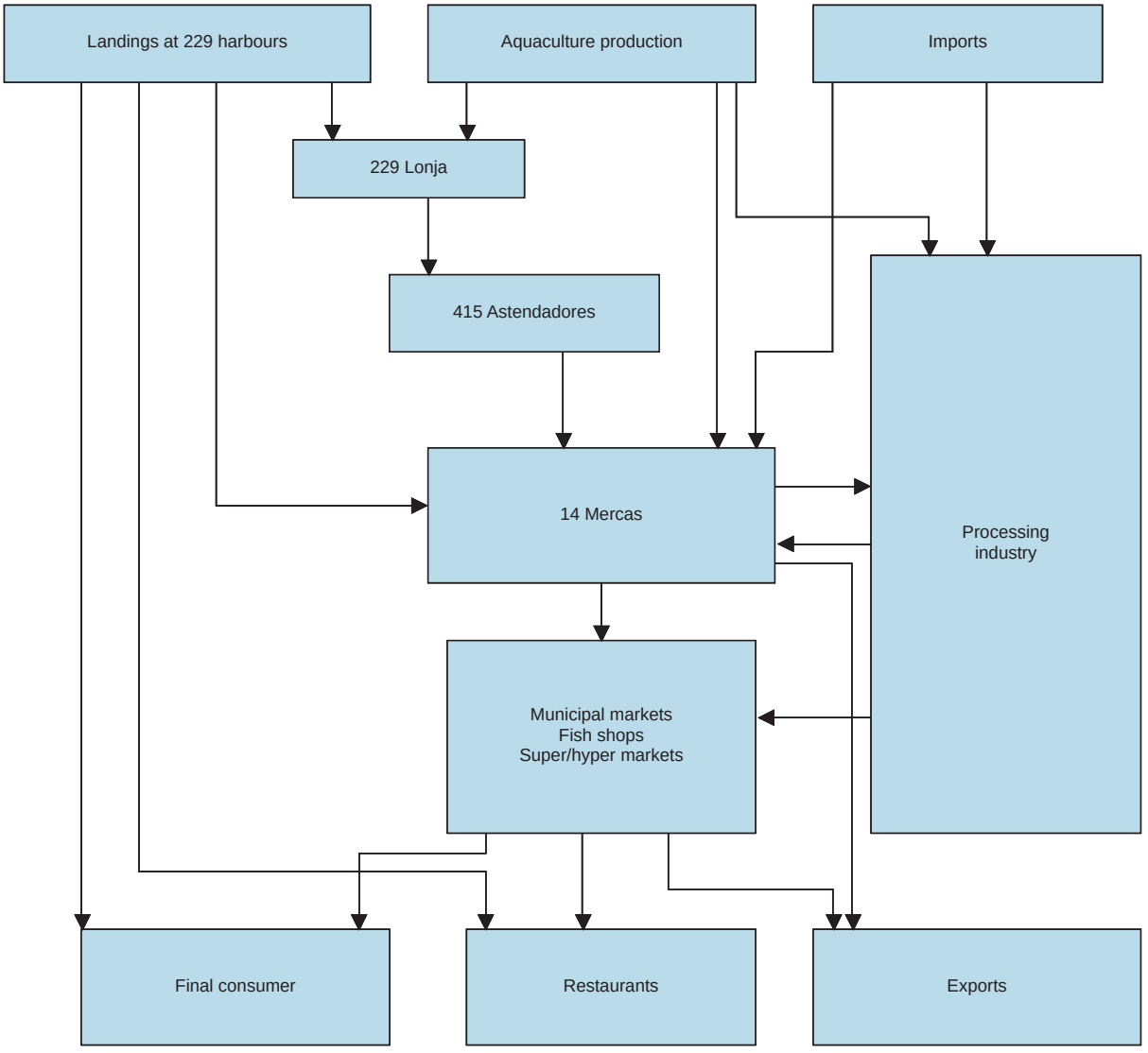
- a relatively small amount of fish is sold directly to the catering market and retail outlets through the 225 fish auctions of various sizes in the main landing sites, while
- most fish are sold through wholesale merchants ("*asentadores*") to 14 wholesale markets ("*Mercas*") for subsequent distribution to processors, retailers, etc. Imported fish are also handled by the *Mercas*.

Figure 1 provides an overview of the Spanish distribution system.

There is a high degree of market concentration in Spain, with the three biggest wholesale markets (Madrid, Barcelona and Valencia) accounting for almost three-quarters of the handled volume, and with the Madrid wholesale market being the single most important market (handling 40% of all fish traded in Spain).

Fresh fish and shellfish account for 77% of all fish handled, while frozen products account for the remaining 23%. The market share of frozen products is growing.

Figure 1. **Distribution channels for fish and fish products in Spain**



Source: OECD.

The highly concentrated and short distribution chain helps ensure that products are fresh and of good quality when bought by the final consumer.

The market in Spain is regulated according to the EU Common Market Organisation. Hence the EU market organisation applies there, as does the foreign trade regime. Further information on this is provided in the chapter on the EU.

In Spain the administration promotes the use of denominations adjusted to certain standards. As part of the Ministry of Agriculture, Fisheries and Livestock, the National Institute of Denominations of Origin (INDO) is charged with registering these denominations. The administration believes that the use of these labels as a source of information serves both consumers and harvesters well. The purpose of these labels is to increase consumer awareness and to advance the use of fishing techniques and gear that respect the marine environment.

The globalisation of fishing markets has had both positive and negative effects for Spanish consumers and fishers. It has allowed consumers to gain access to a wider range of products during longer seasons and with lower prices – contributing to a reduction in prices. However, concurrently the globalisation process has brought along some negative effects. The Spanish chapter in this study highlights the following points:

- The income of Spanish fishers has decreased as a result of overall price reductions.
- Production control has become more complex due to the possibility of marketing products whose capture is forbidden. In this way, species subject to minimum sizes are difficult to control.
- The relatively attractive prices on the Spanish market have led to non-sustainable exploitation levels world-wide that may endanger regular supplies to consumers and the processing industry. For example, the canning industry is experiencing difficulties in obtaining sardines or anchovies of a proper size.
- Consumers are finding it increasingly difficult to identify the product that they purchase (freshness, origin, species).

As argued in the Spanish country note, these developments make it particularly appropriate to develop an identification system of fish products. In this respect labelling is seen as a necessary tool.

Japan

Most fish caught by Japanese vessels are processed on land; in 1997 a total of 6 654 000 tonnes of fish were processed, of which 821 000 tonnes were processed at sea. Almost the entire at-sea processing is through freezing. The number of management units of processed fishery products stood at just below 15 000 in 1997 and has been decreasing for many years. This reflects changing raw material availability, from domestic harvest to imported produce. Most fish processing enterprises are small-scale (family) businesses, with 74% of all processing facilities employing less than 20 persons. The number of people working at fish processing facilities (with more than 4 workers employed) stood at 201 940 in 1997.

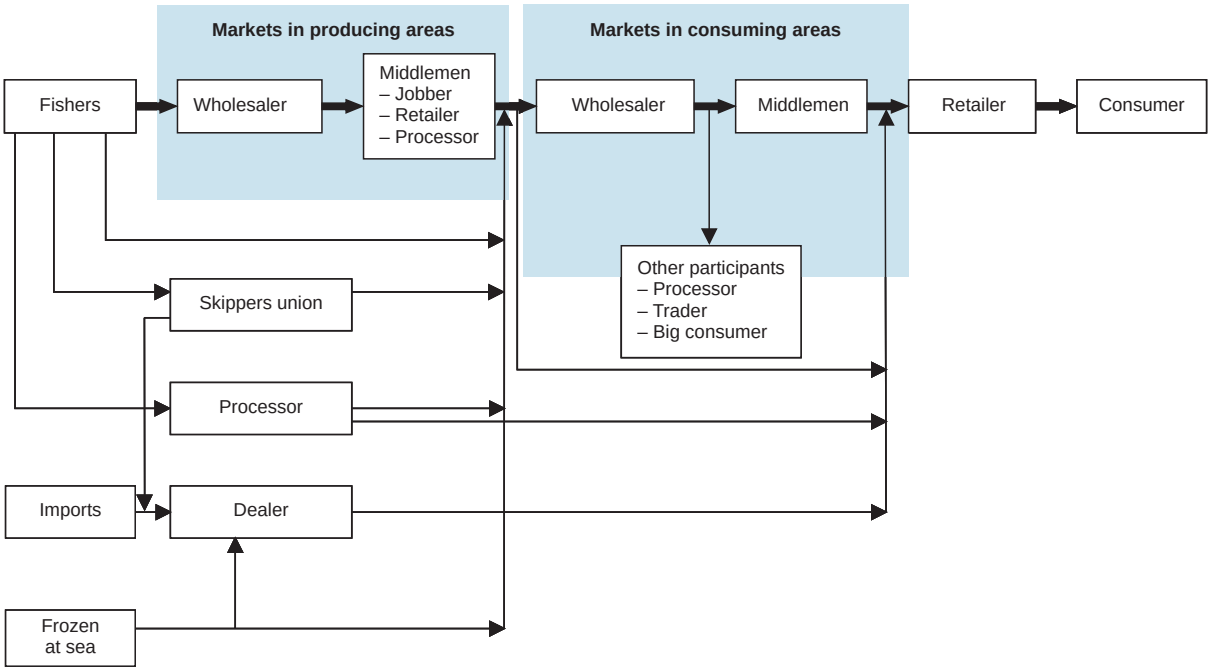
Processed products are subject to the Product Liability Act and new sanitary and quality control methods involving HACCP. Food safety is the responsibility of the Veterinary Sanitation Division, of the Environmental Health Bureau of the Ministry of Health and Welfare. Labelling standards have been established for foods intended for sale. HACCP has been introduced gradually and the "Law of Temporary Measures for Loans of Improvement Funds for Fishery Processing Facilities in line with changes Occurring with Supply of Fishery Products and Fisheries Processing Trade" has been amended to cope with improving processing facilities. This has included the establishment of a fund that provides loans to help processing facilities upgrade to meet the HACCP system.

Most fish are sold through auctions at the wholesale level and prices are freely determined. In 1996 Japan had 733 wholesale markets handling fisheries products. The Japanese Government is planning to merge some of these markets in order to make distribution of fish and fish products smoother. The distribution channels are depicted in Figure 2.

Table 1 provides an historic account of developments in processed fish production (source is Japanese report for the Workshop on Seafood Inspection, OECD 1998). Some significant changes should be noted in explaining the drop in processing in Japan from 10.9 million tonnes in 1985 to 7.6 million tonnes in 1995 – a decrease of 30%. First, the amount of fish being used for fishmeal and oil has been reduced dramatically, from 1.7 million tonnes in 1985 to 673 000 tonnes by 1995; this change reflects a large drop in national landings of Japanese pilchards. Second, reduced high seas fisheries caused a large decrease in the production of frozen products, from 4.2 million tonnes in 1985 to 3.2 million tonnes in 1995.

Concurrently with the decrease in domestic processing, Japan has been forced to revert to increasing imports to satisfy consumer demand. Table 2 (also from the Workshop on Seafood Inspection) depicts changes in seafood consumption, indicating the amount originating from domestic sources. It will be noted that, while total domestic consumption of fish increased slightly to 8.9 million tonnes (+0.5 million tonnes) in the ten years to 1995, the domestic contribution decreased by 2 million tonnes to 5.2 million.

Figure 2. **Distribution channels for fish and fish products in Japan**



Source: OECD.

Table 1. **Changes in major processed fish production (000 tonnes)**[1]

	1985	1991	1992	1993	1994	1995
Salted dried products	899	909	840	844	806	831
Dried products	37	44	42	44	46	40
Salted and dried products	278	259	254	247	227	233
Boiled and dried products	110	111	94	91	92	90
Smoked products	15	18	14	13	12	14
Fushi[4]	121	134	135	130	125	127
Salted products[3]	339	343	300	319	304	327
Surimi-based products	984	874	845	830	823	801
Frozen food	242	365	382	377	370	359
Oil and fats feed	1 678	1 310	1 007	947	786	673
Oil and fats	404	315	146	107	71	47
Feed	1 275	995	861	840	715	626
Frozen fishery products[2]	4 173	3 999	3 925	3 878	3 608	3 227
Canned	322	194	198	189	176	158

1. All figures are expressed in terms of the weight of the product. There is one exception: figures for canned fish are expressed in terms of the weight of contents.
2. Frozen Fishery Products include products for raw materials.
3. Frozen Fishery Products include Salted and other processed products (salted and dried, surimi-based products and so on).
4. Fushi means boiled, smoked-dried and moulded fish fillet.

Source: "Annual Statistics of Fishery Products Marketing" (Ministry of Agriculture, Forestry and Fisheries and "A Time Signal of Canned" (Japan Canners' Association).

Table 2. **Changes in fish and shellfish domestic consumption[1,2] (000 tonnes)**

	1985	1991	1992	1993	1994	1995[3]
Food	8 416	8 277	8 265	8 464	8 874	8 904
	(7 268)	(5 857)	(5 779)	(5 417)	(5 232)	(5 231)
Live, fresh, frozen	3 342	3 098	3 154	3 320	4 033	4 143
	(2 100)	(1 182)	(1 159)	(1 106)	(1 123)	(1 181)
Salted, dried, smoked, others	2 734	3 100	3 147	3 218	3 203	3 250
	(2 620)	(2 901)	(2 883)	(2 913)	(2 819)	(2 813)
Surimi-Based product	1 983	1 634	1 535	1 507	1 260	1 179
(including fish ham and sausage)	(1 793)	(1 324)	(1 283)	(968)	(893)	(869)
Canned	357	445	429	419	378	332
	(755)	(450)	(454)	(430)	(397)	(368)
Non food	3 847	3 925	3 512	3 566	3 449	3 031
	(4 196)	(3 411)	(2 698)	(2 596)	(2 093)	(1 491)
Feed (excluding feed	2 017	2 026	1 783	1 848	1 845	1 967
for fisheries)	(2 372)	(1 494)	(964)	(888)	(513)	(453)
Feed for fisheries	1 830	1 899	1 729	1 718	1 604	1 064
	(1 824)	(1 917)	(1 734)	(1 708)	(1 580)	(1 038)

1. Figures are converted into raw material and do not include whale and seaweed.
2. Figures in brackets are domestic production.
3. 1995 figures are provisional figures.

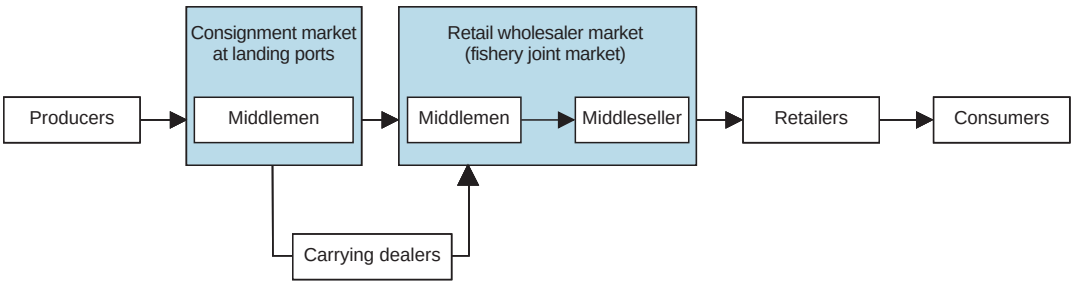
Source: "Balance Sheet of Food" (Ministry of Agriculture, Forestry and Fisheries and Fisheries Agency, Japan).

Korea

Korea has a high per capita consumption of fish and fish products (43.7 kg/per capita/year). Total supplies to the Korean market amounted to 1 988 700 tonnes in 1996. To meet domestic demand Korea imports substantial amounts of fish, but at the same time exports those fish that are not in domestic demand.

Distribution of fish and fish products in Korea is complex. Landings are mostly sold through co-operative auctions and common fish markets (Pusan). A total of 330 official fish markets operate in Korea. Distribution to the final consumer goes through regular marketing systems, a fisheries co-operative distribution system, or via distant water fisheries. The most common of these distributions systems (*i.e.* the regular fisheries distribution system) is depicted in Figure 3.

Figure 3. **Regular marketing system in Korea**



Source: OECD.

There are several types of fish markets in Korea, including wholesale markets, joint markets, auction markets, common fishery markets and direct sale markets. However, the majority of these markets are auctions, as is shown in the following table. Markets are highly concentrated in Cheonnam (66), Kyongnam (58), Kangwon (38) and Kyungbuk (32).

Table 3. **Major market systems in Korea**

	Total	Wholesale corporation	Joint market	Auction market	Common fishery market	Direct sale market
Total (numbers)	330	20	6	232	1	71

In 1996, 1 730 000 tonnes of processed fish were marketed in Korea: 289 000 tonnes (17%) were marketed as highly processed (*e.g.* fish paste, canned) while the remainder was frozen, dried and/or salted. About 87 percent of total raw fish supplies are utilised for processing purposes. A low degree of processing accounts for a much larger proportion than highly processed production. However, Korean consumers are changing their preference toward highly processed fish products. This phenomenon seems to be attributed to advanced processing and packaging technologies related to convenience, safety and nutritional factors.

Main species include tuna, mackerel, croakers, sardines and the like. Fish paste-based products like "*kamaboku*" are increasingly popular. Canned fish (including tuna, oyster, Bai top shell) have shown increasing market shares.

Post-harvest policies consist of price policies, measures applied to distribution and trade quality certification and labelling of the origin of the produce.

The objectives of the *fish price polices* are price stabilisation and income distribution. The main species involved in recent years has been squid. The Government has purchased substantial amounts of squid to support the price of squid and later, when supplies became insufficient, re-sold the squid. The aim has been to stabilise producer prices.

The principal concern for the *distribution and trade* is the wholesomeness of fish and fish products and food safety in general. The Ministry of Health and Welfare manages sanitary and food safety regulations. HACCP is used in order to meet the international sanitary standards. Furthermore, a Quality Certification System ("Pum Qualified") is applied to traditional and geographically specific fisheries products. These include dried, salted and seasoned products. As for sanitary and safety controls, an increasing number of seafood inspections are taking place. In 1996 more than 23 000 seafood inspections took place, involving roughly 473 000 tonnes of fish products.

A system of *product origin labelling* is in operation in Korea, aiming to provide consumers with accurate information about provenance. This system ensures that consumers are not mislead between domestic and foreign originated seafood. Domestic produce commands a higher price.

Insofar as trade in concerned, on 1 July 1997, Korea liberalised imports of fish products so that all fish products could be imported, subject only to some necessary safety inspections. However, the import liberalisation contributed to the creation of some structural adjustment problems for the small-scale fisheries segment – which have given rise to very sensitive political implications. Korea was therefore allowed another 8-year delay before the full market liberalisation plan will come into force.

Korea has paid much attention to the dramatic increase in the exploitation of living marine resources and the subsequent threats to the sustainability of these resources throughout the world. In response, Korea, as one of the CITES member countries, is taking both unilateral and multilateral fishery resources management measures that impose restrictions on trade; directly or indirectly. Such measures include prohibition of, or restrictions on, trade in endangered or threatened species; restrictions on incidental impacts on protected species; restrictions on commercially harvested species to ensure compliance with conservation and management measures relating to that species; and protection of ecosystems.

Iceland

Economic welfare in Iceland depends heavily on the fisheries and its ability to compete in international markets. About 10% (12 520 persons) of the Icelandic workforce is employed in fishing. Of this, 5 840 persons work in the harvesting, and 6 680 in the processing sector.

Iceland operates an ITQ fisheries management system. A total of 98% of the 1997 harvest, in tonnage terms, was subject to the ITQ system. In addition to TACs, vessel licences, area closures, seasonal closures, gear restrictions, and minimum sizes are used to protect juvenile fish. Details on landing composition are provided in Table 4.

Table 4. **Icelandic fisheries**

	Average catch (000 tonnes) 1992-1997	Estimated catch values[1] (USDM)
Demersal species		
Cod	208.1	217.6
Haddock	51.8	59.7
Saithe	55.7	37.1
Redfish	117.9	114.0
Other[2]	60.4	106.6
Total	493.9	535.1
Pelagic species		
Capelin	947.4	77.9
Herring	204.0	26.8
Total	1 151.4	104.7
Crustaceans		
Shrimp	65.5	101.7
Lobster	1.8	5.9
Total	67.3	107.6
Shellfish		
Scallop	8.0	3.8
Grand Total	1 720.7	751.3

1. At 1997 average unit catch prices and exchange rate (1USD=70.98 ISK, Hagtölur mánaðarins)
2. Mainly Greenland halibut, wolffish, tusk, ling and plaice.

Source: Fisheries Association of Iceland, Utvegur 1992-1997.

Most processing takes place on land (90 to 93% of the harvest). However, the value of the at-sea processed fish is remarkably high; 10-13% of the harvest processed at sea accounts for around one-third of the overall turnover. Principal processing at sea is freezing.

The majority of fish landed directly to processing plants is from vessels owned and operated by those plants. About 81% of landed volume (44% by value) takes place in a forward-integrated system. A small amount, 15% by volume, is marketed through auction.

The heavy dependence on overseas markets has created a concentration of activity in a small number of large sales organisations. The processors own the sales organisations. The main companies are the Icelandic Freezing Plants Corporation, Iceland Seafood International plc and the Union of Icelandic Fish Processors. In addition to these sales organisations, which specialise in particular production areas (frozen, value-added products, saltfish), there are numerous smaller operators.

Besides improving the economy for the harvesting sector, the introduction of the ITQ system in Iceland could have a positive effect on the processing as well. Better planning and a smoother utilisation of processing capacity should be feasible. Furthermore, the high degree of forward integration (which has steadily continued following the ITQ introduction) should result in a better capacity utilisation. The Icelandic country note to this study emphasises that the ITQ system has provided the economically appropriate signals and incentives for the fishing industry. However, the country note also mentions that some problems are observed in terms of final demand adjustment under the TAC and ITQ systems, in that the aggregate supply and species composition of the catch are fairly inflexible over the harvesting season.

Post-harvest policies in Iceland changed dramatically in 1991 with the abolition of the Fish Price Determination Board. Since then, fish prices have been freely determined by either auction or through internal (transfer) pricing in integrated companies. Concurrently, licences to export are now generally granted to reputable applicants. As for the domestic market, it is open to foreign landings and imports of fish and fish products. Since 1987, fresh fish auction has been allowed to operate in Iceland. However, in spite of no officially determined fish price, the actual fresh fish price is not always competitively determined – as most of the catch is not sold in competitive markets. Instead, the fish is transacted between the harvesting and processing departments of the vertically integrated fishing firms.

Iceland's Marine Research Institute and Icelandic Fisheries Laboratories are working on reducing post-harvesting losses and waste, improving by-catch utilisation and reducing the environmental effects of processing activities. This has included the adoption by the Parliament of a law making any abusive practices the liability of all parties involved in the trade. An innovative project, taking place on a trial basis, is the "By-catch Bank" where by-catches (of unwanted species) are processed and marketed.

In response to consumer concerns, labelling for the export markets (*e.g.* origin, quality and eco-labels) has increasingly become part of the post-harvest practices.

Argentina

Argentina, an observer to the OECD Fisheries Committee, has submitted a country case study. Argentinean landings amounted to approximately 1.4 million tonnes in 1997 with two species (hake and squid) accounting for three-quarters of all landings. About 584 000 tonnes of hake and 412 000 tonnes of squid were produced in that year.

Argentinean per capita consumption stood at 8.5 kg per year; a fairly low level compared to general OECD standards. Consequently, there is a fair amount of foreign trade with Argentina in hake and squid. In 1997 Argentina exported 690 000 tonnes of fish (mainly to Spain, Taiwan and Japan) and imported 150 000 tonnes (mainly shrimp from Ecuador and Brazil).

Based on 1997 information, 60% of the fleet landed and processed 40% of the total catch on-shore. The fleets that have their catches processed on-shore work mainly in the following cities: Mar del Plata, Puerto Madryn and Comodoro Rivadavia. The freezer trawlers land their production in Puerto Madryn, Puerto Deseado, Ushuaia, Punta Quilla and Mar del Plata.

On-board processing vessels produce headed and gutted whole fish, fillets and surimi, while red shrimp and squid are processed in different ways. The on-shore factories process the fish landed by ice trawlers, although they can also process on-board frozen fish.

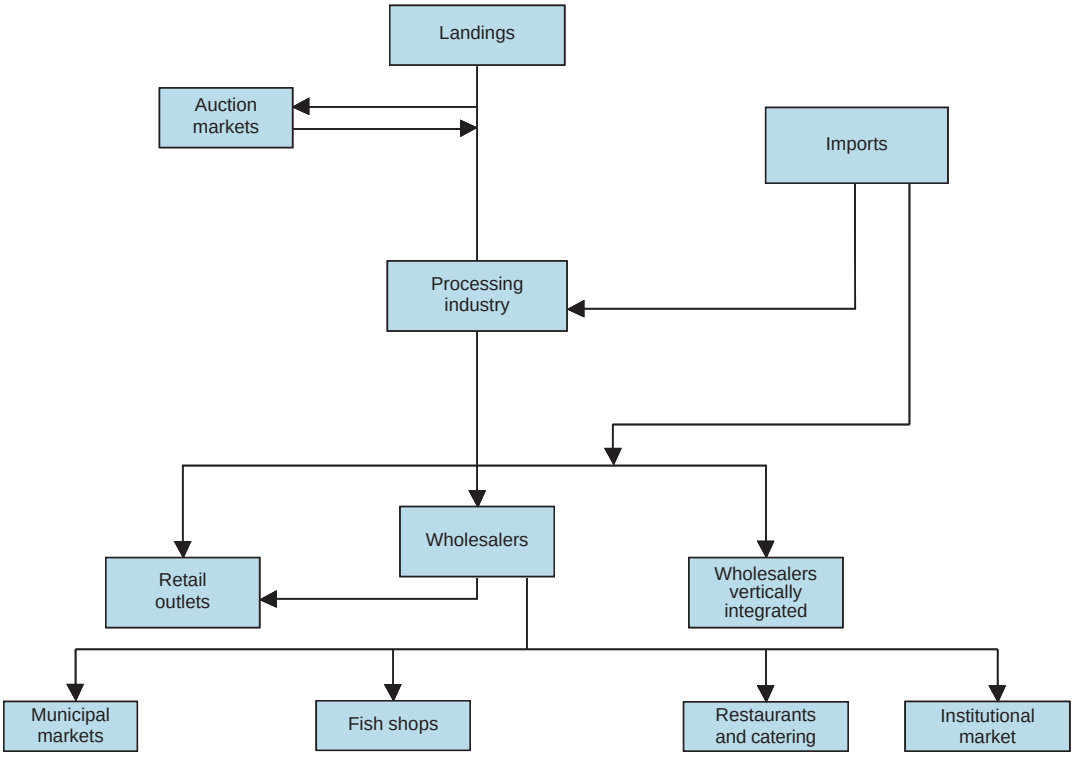
The landings of the coastal artisan fleet are mainly destined for the domestic fresh fish market and indirectly as raw material for on-shore processors. A part of the catch is processed for export.

There were 172 factories registered in 1996 to carry out processing on-shore. The production of the freezer fleet is mainly destined for export. A large part of the fleet is commercially related to on-shore processing plants through various kinds of association.

In recent years there has been an important transformation of the domestic retail market, resulting in an increased concentration of seafood sales in supermarkets. Figure 4 provides an overview of the Argentinean domestic commercial flow of fish. In 1970, traditional retailers accounted for 90% of sales, while supermarkets and self-service shops accounted for 10% of retail sales. In 1990 supermarkets and self-service retailing accounted for 56%, and five years later in 1995, they accounted for 63% of total sales. The Capital City and the Buenos Aires surroundings account for 33.6% of the population, but for 59.2% of fish and shellfish consumption. In these areas, distribution of fresh and frozen products is mainly done through street or municipal markets.

The main wholesalers have a strong presence through the distribution chain. They import directly, they distribute frozen products, have retail outlets and sometimes restaurants. Wholesalers have an important function in the determination of market behaviour. Wholesalers that are not vertically integrated face more difficulties, especially with the appearance of supermarkets.

Figure 4. **Argentina domestic commercial flow**



Source: OECD.

Seafood prices are freely determined in Argentina. In the domestic market, with a limited number of small enterprises operating, there is a dependence on the auction system for price determination.

Insofar as external trade is concerned, Argentina is a member of Mercosur[10] which has a common external tariff. Also within Mercosur, a Common Market Group has been set up to approve common technical rules for species identification and for determining the quality of fresh fish. The purpose is to avoid discriminatory treatment within the Mercosur area for trade among its member countries.

Argentina requires high quality levels for seafood. It is important to underline that the on-shore processing facilities and processing vessels must take into account the Hazard Analysis of Control Critical Points (HACCP), approved by SENASA (National Service of Food Safety and Quality). Argentina does not have any requirements related to product labelling.

C. Other information

France

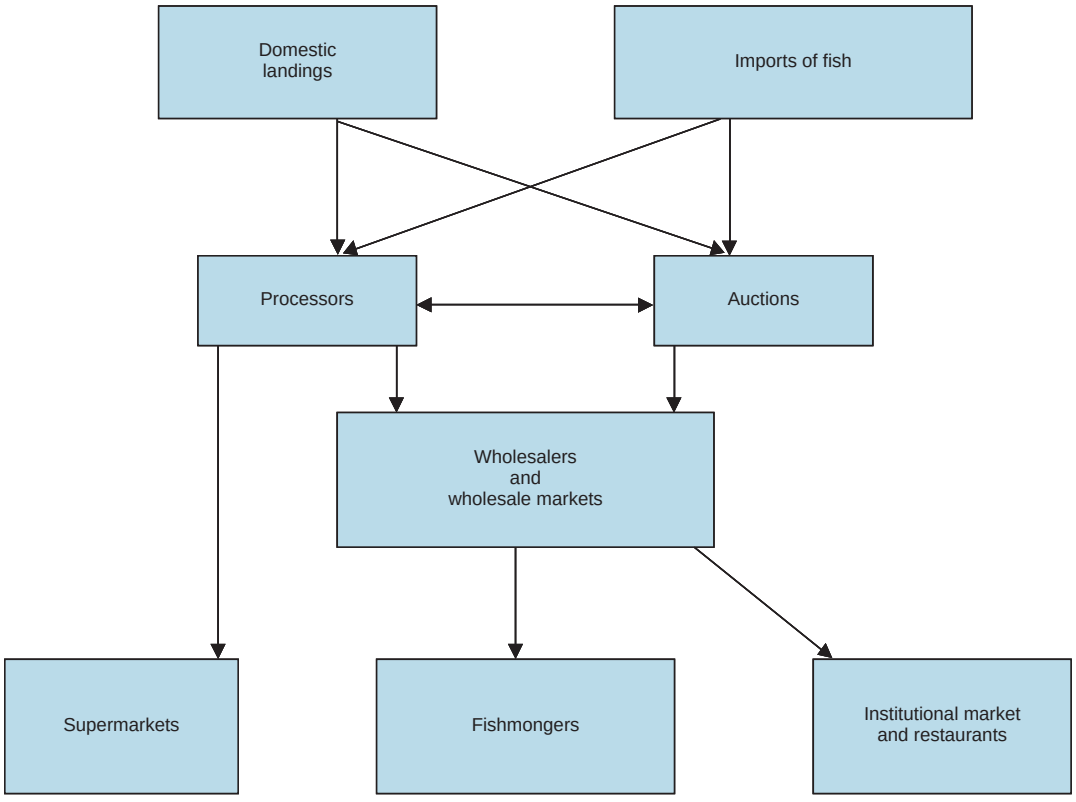
In France some 100 000 people are employed in the fisheries sector; of these about 60 000 are employed in sales, transport and processing, while there are about 17 500 fishers and 14 000 in the aquaculture sector. Consumption in 1995 amounted to 19 kg/per capita/year, corresponding to a total fish consumption (including processed) of 1.1 million tonnes.

According to IAA (AGRESTE annual survey), 173 fish processing enterprises (with ten or more employees) were operating in France in 1997. With 11 900 employees they had a combined turnover of 14.9 billion FRF with 216 million FRF in value-added.

OFIMER (*Office national interprofessionel des produits de la mer et de l'aquaculture*) is the French institution that co-ordinates developments and interrelations between market and the resource. Members of the OFIMER are all in the distribution chain of fish and fish products or producers (*i.e.* fishers and fish farmers). The basic principle of the OFIMER is to help create more value-added to products throughout the distribution chain.

In collaboration with producer organisations in France (set up in accordance with the common market organisation of the EU) OFIMER has set up a network to follow market developments. This system should help ensure a better match between landings and market needs. OFIMER is also working for the standardisation of trade names and sizes and for the improvement of traceability.

Figure 5. **Distribution of fish in France**



Source: OECD and OFIMER.

The total French market for processed fish and fish products had an estimated turnover of FRF 13 billion in 1998. The most important is frozen fish with a turnover of FRF 5.4 billion. The fastest growth area is for smoked products and for catering style products. Most of the latter products are sold through super- and hypermarkets (*source*: *Les Marchés* No. 4, June 1999).

Sweden

In 1996 a total of 44 fish processing plants operated in Sweden. Turnover of the industry was just above SEK 3 billion producing a value-added of SEK 617 million. The Swedish accession to the EU initially slimmed the industry in terms of employment, from 2 218 in 1990 to 1 573 in 1995. After adjustment in the sector, the number of employees reached 2 011 persons in 1997.

Due to low productivity of domestic waters, 55% of raw material for the processing industry is imported. There is a high dependency on export markets, with at least 40% of the processed produce being exported – mainly to other EU countries.

In 1997 Swedish consumers spent SEK 9.4 billion on fish and fish products, which corresponds to some 5.6% of total food consumption. Svensk Fisk (Swedish Fish) is an institution (part of the Fiskeriverket or National Board of Fisheries) working for the development of fish consumption in Sweden through information and marketing campaigns. Some of the projects are financed by the EU (PESCA). The objective of Svensk Fisk is to double the consumption of fish over the next five years from one meal a week.

Australia

The total gross value of Australian fisheries production was about AUD 1.8 billion in 1997 according to ABARE Fisheries Statistics. Furthermore, it is estimated that the industry generates in the order of AUD 9 billion into the Australian economy annually.

The Australian Seafood Industry Council is the industry body representing commercial fishing, aquaculture and post-harvest seafood industries in Australia. The seafood industry needs to adjust constantly to changing consumer preferences and expectations, and to changing market conditions. The seafood industry also has to contend with changes in the availability of the resource. To maintain and increase the competitiveness of Australia's seafood industry, governments and industry work together in the SeaQual project.

The SeaQual project is a joint initiative of the Australian Seafood Industry Council, the Department of Agriculture, Fisheries and Forestry and the Fisheries Research and Development Corporation. The project and its funding were developed through consultation among the three agencies.

The objectives for SeaQual are to:

- Identify, implement and expand on existing quality management strategies to achieve agreed seafood quality goals.
- Encourage governments and industry to develop policies and programmes that build on existing systems and create an industry-wide quality management ethos.

The Australian Seafood Industry Council has also adopted a Code of Conduct for a Responsible Seafood Industry. The Code sets out the principles and standards of behaviour for responsible practices with a goal to help ensure the effective conservation, management and development of living aquatic resources. Post-harvest practices are included in the Code. The Code makes reference to the importance of promoting trade in seafood that is in conformity with conservation principles. It seeks to enhance seafood quality assurance and food safety. In this regard the seafood industry is urged to reduce post-harvest losses and waste, improve the utilisation of by-catch, optimise the use of resources (especially water and energy within all activities) and minimise waste and discharge of pollutants in handling and production processes. Furthermore, the seafood industry will only market products known to be in compliance with all applicable fishery conservation and food safety laws and regulations.

Canada

The total annual production value of the Canadian commercial fishing and aquaculture sector is estimated at CAD 4.1 billion, composed of approximately CAD 2.7 billion from the Atlantic fishing industry, CAD 1 billion from the Pacific fishing industry, and CAD 0.4 billion from aquaculture. More than 80% of Canadian fish products are destined for other countries. In 1996, a total of 67 000 fishers were registered,

and approximately 75 000 were working in fish processing plants. Fishing and aquaculture are the main income sources for hundreds of communities on Canada's coasts.

Under the guidance of the Department of Fisheries and Oceans (DFO), the Canadian fishing industry has developed a "Canadian Code of Conduct for Responsible Fishing Operations". The Canadian Code is one of three initiatives developed to promote responsible fishing conservation and harvesting technology and sustainable development. The two other aspects covered by the programme are responsible fishing initiatives to address conservation issues and industrial training in responsible fishing.

The Canadian Code was developed through a multi-stakeholder consultation process among Canadian fisheries interests. The Code is going through a ratification process among representative fishing organisations across Canada. Once ratified, the Code will form an integral part of management plans for the fisheries who have agreed to participate. Adherence to the provisions of the Code will be part of the fishing conditions.

Nordic Council

Through an initiative taken by the Nordic Council of Ministers, the Nordic countries have discussed and embarked on an information programme. Following a series of meetings and a consultant's report on the status of the Nordic post-harvest industry and consumer attitudes towards fish, the Nordic Ministers for Fisheries decided, in 1998, to launch an information programme about fisheries sustainability.

The consultancy report (by Mandag Morgen) published in English and entitled "The Nordic Fisheries in the New Consumer Era" concluded, *inter alia*, that:

- The sector needs to take an initiative to ensure long-term biological, economic and social sustainability.
- The sector must continue to pursue strategies for increasing efficiency in processes.
- The sector needs to review its marketing and provide guarantees for quality.

The key consideration of the consultant's report, and which sparked the information drive, was an observation that consumers' attitudes towards fish are changing. The report observed that "consumers want more information, but the fishing sector does not at present possess a reliable medium for communicating information about quality and sustainability to consumers".

United States

In the United States, a total of 1 316 processing plants were in operation in 1996 with a total (annual average) employment of 55 000. At the wholesale level another 3 472 plants employed 29 760 persons. The combined sales of primary processing and wholesale stood at USD 11.3 billion in 1997.

Total consumer expenditure on fishery products amounted to USD 46.5 billion in 1997. This made it possible for the seafood industry to produce a value-added of USD 24.4 billion.

In the United States the industry and trade is grouped in various associations. One of these, the National Fisheries Institute, has developed a Code of Conduct for Responsible Fisheries.

The principles of the Code outline standards of conduct for commercial fishers, aquaculture producers, processors and buyers in the US fish and seafood industry.

The Responsible Fisheries Society of the United States, who are the subscribers to the Code among the NFI membership, provides individuals, groups and firms with a means to:

- Further improve the way fish and seafood are harvested, processed and distributed to safeguard and ensure responsible use of fishery resources and aquatic environments.
- Co-operate with officials in the development and implementation of measures to address specific issues in the fisheries in which they participate.
- Promote public awareness and understanding of the issues surrounding responsible fishing and the efforts of the industry to conserve fishery resources and protect the environment.

The Magnuson Fishery Conservation and Management Act prohibits the trade (interstate and foreign) of American lobsters smaller than 3¼ inch carapace length and egg-bearing lobsters. Also the Magnuson Act has made it unlawful to strip pollock of its roe. Both these measures have been introduced in support of domestic conservation and management effort. In particular the prohibition of lobster trade is accompanied by similar measures making it unlawful to fish small lobsters.

Table 5. **Key statistics on the United States, 1997**[1,2]
(USD billion)

Sector	Purchase of fishery inputs	Value added within sector	Value of sales by sector
Domestic harvest		2.1	3.3
Imports unprocessed	3.5		0.2
Exports unprocessed			3.5
Primary wholesale and processing	6	3.2	11.3
Imports processed	4.4		4.4
Exprots processed			
Secondary wholesale and processing	13.7	2.4	22.2
Retail trade from Food Services	11.1	14.1	31.3
Retail trade from Stores	11.1	2.4	14.8
Total US Value Added Activy		24.4	
Consumer expenditure for Fishery Products			46.5

1. Edible products only.
2. May not add up due to rounding.

V. CONCLUSIONS AND POLICY IMPLICATIONS

A couple of key changes to the market place that have occurred over the past decades should be recalled.

First, spending on food (including fish) as a percentage of overall consumer expenditure has decreased. Furthermore, consumers are also better educated. Concurrently the media (written press, radio, television) has attracted consumer attention to food quality issues by translating possible or potential fears into easy-to-understand language. In particular this phenomenon has happened for food products and has been fuelled by a number of incidents (*e.g.* the link between CJD and BSE in cows). The combination of these developments has led to an increased importance on qualitative aspects of consumer purchases rather than on quantity.

Second, the nature of retailing (access to food) has changed rapidly over the last two decades. The small street shop is being replaced by large retail outlets (super-/hypermarkets), thus improving shopping convenience. In the competition for market share, the retail sector has become increasingly responsive to consumers' views. Retailers are the part in the post-harvest chain that is most sensitive to consumers' wants, much more so than processors or fishers. The subsequent concentration of market share has increased bargaining power *vis-à-vis* suppliers.

Third, the food processing technology of today provides a multitude of opportunities. Food and processing technologies have developed rapidly and made certain products available far from the fishing grounds and in shapes and forms that cater to the present-day consumer. Modified atmospheric packaging, ready-to-eat meals and freezer centres have all contributed to this development. It has been accelerated by a desire to create value-added products. Surimi and its derivatives are examples of successful products with consumer appeal.

These developments have led some observers to conclude that the future market for fish and fish products will be shaped around five key parameters of consumer demand:

- Health: high nutritional values and low fat.
- Quality: subjective and includes taste, luxury, freshness, natural product.
- Safety: free from contamination and diseases.
- Convenience: ready-to-eat products, ease of preparation.
- Natural and unspoilt products: environmental and ethical considerations.

The introduction of post-harvest practices and policies that reinforce such consumer preferences and consumption patterns is likely to speed up these developments. When designed appropriately, these practices and policies can facilitate a move towards responsible and sustainable fisheries.

In this light, the following discussion has been ordered around three headings:

A. Areas where further international co-operation could be advanced.

B. Areas where (national) policy reform possibilities could be undertaken.

C. Practices that could be further facilitated.

A. Areas where further international co-operation could be advanced

Statistics

While country notes submitted to this study from Member countries do not offer possibilities for an in-depth statistical analysis, it would seem that the post-harvest sector, at least in some countries, does make a significant economic contribution. The evidence suggests that many post-harvest sectors are much larger than their corresponding harvesting sectors, both in terms of value-added created to the total fishing economy and employment. In this regard, if the figures from the United States are an indication of the situation in other OECD countries, it can be inferred that processing and retailing, in particular, are the parts of the fisheries distribution chain that contribute most to the fisheries economy.

In the meantime it is important that better statistics be collected on the post-harvest sector both at the national and the international level.

At the national level, improved information on the post-harvest sector would help inform fisheries management and policy decisions. Far too often management decisions are taken on the grounds of their first-round effects on the harvesting sector, disregarding the post-harvesting repercussions. Being, in many cases, a large contributor to coastal zone economy, an understanding of effects and implications of policy changes for the post-harvest sector could be improved through better statistical coverage.

An international effort is needed to improve coverage and make statistics more comparable across countries. As a first step, OECD countries could make an effort in covering the post-harvest sector and its activities more in depth in the Committee for Fisheries' biennial monitoring exercise (*Review of Fisheries*). Furthermore, the CWP (Co-ordinated Working Party on Fisheries Statistics) could bring about an important harmonisation of definitions and facilitate the dissemination of data for the post-harvest sector.

FAO *Code of Conduct*

An increasing number of countries and observers are referring to the post-harvest sector as an important contributor in moving towards responsible fisheries. This was also recognised by the FAO Code of Conduct insofar as special emphasis was put on responsible post-harvest practices and trade. Article 11 of the Code deals with post-harvest practices and trade in three sub-headings: responsible fish utilisation, responsible international trade, and laws and regulations relating to fish trade. Annexes 1 and 2 provide some insight on FAO Code of Conduct Article 11 on post-harvest practices.

In the meantime more could be done to encourage the implementation of the provisions of the Code and, in an accessible way, translate the Code into practical suggestions for policies and measures. For example, the FAO has not yet[11] issued a Technical Guideline for Responsible Fisheries dealing comprehensively with all the post-harvest practices mentioned in Article 11 of the Code. The development of such guidelines could be a useful first step towards integrating the post-harvest sector in the overall management of the industry. In doing so it would seem important that the five key parameters of consumer demand mentioned above be incorporated. That would make policy and practices more likely to succeed, as the sector would be framed explicitly to consumer preferences.

Trade measures

The Code of Conduct for responsible fisheries establishes the principle that international trade in fish and fish products should not compromise the sustainable development of fisheries and the responsible utilisation of aquatic resources.[12] Meanwhile, trade measures implemented in support of responsible fisheries remain an issue of discussion.

The European Union uses its autonomous trade arrangements to encourage a more responsible use of resources. Preferential trade arrangements extended to developing countries, such as GSP, are granted on the condition that the countries involved respect the rules of regional fisheries organisations. Under the new GSP regulation[13] that came into force 1 July 1999, the Community's powers in this respect have been increased. As from 1 July 1999, the Commission will be able to initiate a procedure against a third

country that does not respect the rules of regional fisheries organisations, rather than only being able to act when requested.

Multilateral Environmental Agreements, in particular, the UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks, have relevance to fisheries. The entry into force of the UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks will provide a stronger basis for fishing nations and members of RFOs to adopt regulations empowering the relevant national authorities to prohibit landings and transhipments where it has been established that the catch has been taken in a manner which undermines the effectiveness of sub-regional, regional or global conservation and management measures on the high seas. Further discussion and work is needed on MEAs and the way they could be applied in fisheries.

However there may be instances where, for conservation and management reasons, markets may be regulated. Examples of undersized fish and roe-bearing fish may be cases in point. Such measures, if implemented on sound conservation grounds and in accordance with WTO rules, could also address rules for spawning fish as well as for sales of fish originating from vessels flying flags of convenience. Such a measure, if implemented in the most important consuming nations, could have an important impact on the market and could contribute to the achievement of responsible fisheries.

A special case of an international environmental agreement is the Convention on International Trade in Endangered Species.

In this regard it should be noted that the FAO Code of Conduct, in its Article 11.2.11, calls for "States to co-operate to promote adherence to, and effective implementation of relevant international standards for trade in fish and fishery products…". The difficulty for policy makers is to balance the need for an open multilateral trading system while ensuring that conservation goals are not being undermined.

B. Areas where (national) policy reform possibilities could be undertaken

Market intervention mechanisms

In the country notes there are examples of price and market intervention schemes that result in a more responsible use of the resource base. Differential withdrawal prices for fish in the spawning season (plaice in the EU), differential intervention prices according to size and freshness of the fish (EU) and intervention at market gluts for subsequent selling (Korea) are examples of practices that may encourage the fishing industry to adopt more responsible practices.

When applied in a non-discriminatory fashion, such measures could contribute to correcting market signals and sustain a move to more responsible and sustainable practices. Cases have been noted in a few countries wishing to restrict trade (of imported as well as domestic produce) to certain sizes of fish (carapace length of lobster in the United States) or fish with roe. In the case study submitted by the European Union, special emphasis is placed on the suggestion to extend the use of common marketing standards to cover traded products (see Box 7).

However, national policy reform with regard to both market intervention and marketing standards could benefit from discussion at international level, in particular, as there may be repercussions for trade.

C. Practices which could be further facilitated

Marketing practices

Most countries reporting to this study have left the post-harvest sector to develop its own sales practices. These have developed in response to particular market conditions (*e.g.* concentration of consumers, distances from sea). The main sales mechanism continues to be auctions in countries with high fresh fish consumption (*e.g.* Spain, France, Japan and Korea). In countries where processing and subsequent sales are mainly destined for export markets, it seems that direct sales between fishers and processors are predominant (*e.g.* Denmark, Argentina, Iceland). It is likely that modern information technology (Internet) may provide the technical platform for a more global auction market in the future.

While many countries recognise that the practices of the post-harvest sector can have potentially significant importance in sustaining a move towards responsible fisheries, only a few countries report on having implemented an active policy that could underpin such developments. Furthermore, very few countries are reporting on any support to the post-harvest sector in moving towards a more active and constructive role.

One reason for a limited active role of the post-harvest sector could be its level of organisation. In most countries, post-harvest activities are carried out in atomistic individual business units with no (or limited) collective organisation. In this regard, Article 11.3.2 of the Code of Conduct could be a reflection of this situation, when noting that "States, in accordance with their national laws, should facilitate appropriate consultation with and participation of industry as well as environmental and consumer groups in the development and implementation of laws and regulations related to trade in fish and fishery products".

That the post-harvesting sector could play a more active role is also highlighted in the study on "The Economic Impact of Responsible Fisheries on Production and Management: Evaluation of the Potential Costs and Gains Involved".

The Australian Southern Shark case study suggests that the impact on the industry performance of a top-quality product that earns higher prices could be profound. Improved market promotion and consumer awareness (as well as ensuring delivery of a top-quality product) would also enhance the returns from these products.

These observations suggest that a move towards responsible fisheries will achieve its full potential only if the post-harvest sector pursues an active role. In turn, this implies that policy makers should take a more holistic approach to the fishing industry. All aspects of fishing – from harvesting to consumers – should be considered in a comprehensive way for responsible fisheries to succeed. In this regard it would seem that more effort is needed in consulting and involving a broader set of fishing industry stakeholders.

Consumer information

Consumer information has recently taken on a new dimension, with the emergence of a multitude of labelling and certification schemes for food products. These have appeared in response to consumer concerns regarding origin, harvesting methods, product content and processing methods. In addition, product information supported by chain of custody verification is a central component of being able to trace products through distribution channels. In the fisheries sector these initiatives have received particular attention because of their innovative character.

As reported above, the market reality is one of understanding consumer behaviour, the driving force in the food market. Recent consumer reactions to food issues are evidence suggesting that public authorities and private operators have to listen more carefully and respond to consumers' perceptions.

There may be a role for public authorities in providing information on fish and fish products as a healthy food. In addition, the sustainable and responsible management of the resource base is a primary concern for society and there are limits to the quantities that can be harvested. Information programmes may improve the level of information and should consider the links between quality, health and sustainability.

As for environmental labelling schemes and their operation, more discussion on how to integrate the respective roles of the market, private initiatives and the public sector is needed. Meanwhile, ensuring non-deceptive and accurate information and the protection of consumers in general remains within the purview of the public authorities.

The evidence in the country notes suggests that a number of private and institutional operators are operating schemes that seek to inform consumers about the products they buy. The creation of the regulatory machinery and the infrastructures of the market place (*e.g.* consumer protection laws, marketing laws), the subsequent role of ensuring compliance with the rules that govern the market are largely the responsibility of public authorities. However, public policies and practices, endorsements etc. do have a bearing on the signals that are being sent to the harvesting sector. These and other public incentives help frame the actions and decisions operators in the markets will take.

Summary and future work

There are three areas where changes to post-harvest policy frameworks and practices can potentially encourage a move towards more responsible fisheries.

Areas which require further international co-operation include statistics on the post-harvest sector, further implementing the FAO Code of Conduct, and taking a fresh look on the use of selective trade measures and market intervention mechanisms. For these areas, the study has shown that there is ample room for public authorities and policy makers to improve on the present-day policy framework. At the national level, marketing standards and intervention mechanisms may also be useful instruments in moving towards responsible fisheries.

The Committee for Fisheries could undertake a discussion of the areas where policy reform may be the way forward. However, changes are likely to be slow, in particular when they involve trade considerations. In the meantime, the Committee's future work on Market Liberalisation offers an opportunity to revisit suggestions with trade implications.

At the national level, there is potential for creating frameworks that encourage market practices to facilitate a move towards responsible fisheries. The key is to promote a more holistic view of fisheries, from harvesting to consumer, and ensure that sustainable consumption patterns are encouraged through marketing and consumer information. While marketing and consumer information activities normally originate in the private sector, public authorities have an important role in creating an accommodating framework that facilitate their development and implementation.

However, it still remains that the post-harvesters are heavily dependent on the harvesting sector outcome. Hence, post-harvest operators should have a vested interest in seeing a sustainable fisheries resource utilisation. Post-harvest practices and initiatives taken in recent years may be nothing less than a reaction to the enduring problem of poor harvesting sector performance.

Whilst the ability of the post-harvest sector to continue to prosper is very much linked to the success of the fisheries management system, there is ample evidence to suggest that the post-harvest sector has an ability to influence the harvesting sector. As a complement to a public policy framework, post-harvest practices can be a powerful tool to help encourage responsible fisheries and sustainable fisheries management solutions.

NOTES

1. The European Union, Spain, Japan, Korea, Iceland and Argentina.
2. The post-harvest sector includes all activities related to fish and fish products following the harvest by fishers. It includes activities related to processing at sea, on land, landing of the fish, distribution, sales, retailing and final consumption.
3. Hazard Analysis and Critical Control Point.
4. AGR/FI(98)10/FINAL.
5. A high-quality producer has an economic interest in preserving his reputation. If he sold a poor quality product with a high-quality price ticket, buyers detecting the quality after consuming the product would not buy from the same producer again. The cost of establishing a reputation, which can be amortised only by the information rent, acts as an incentive and prevents low-quality producers from signalling their products as high-quality products.
6. A more in-depth discussion of this issue is found in "The Environmental Effects of Trade" OECD, Paris, 1994.
7. U*nited States – Import prohibition of certain shrimp and Shrimp products*, report of the Appellate Body, WT/DS58/AB/R, quoting the Report of the Committee on Trade and Environment, forming part of the Report of the General Council to Ministers on the occasion of the Singapore Ministerial Conference.
8. The Convention on International Trade in Endangered Species was signed in Washington on 3 March 1973. By May 1997 there were 138 parties to the Convention. Further information can be found on the CITES web-site (*www.wcmc.org.uk*/CITES/).
9. The case studies analysed in the report are CITES, the Basel Convention and the Montreal Protocol.
10. The Treaty of A*sunción*, signed by Argentina, Brazil, Paraguay and Uruguay on 26 March 1991, created MERCOSUR. Chile and Bolivia became associate members in 1996 and 1997, respectively.
    In 1997 MERCOSUR had a population of 220 million and a GDP of USD 1.3 trillion.
11. In 1998 FAO issued the Technical Guidelines for Responsible Fisheries No. 7, "Responsible Fish Utilisation". That guideline only covers the first part of Article 11 dealing with responsible fish utilisation and not parts two and three dealing with responsible international trade and laws and regulations.
12. Article 11.2.2 of the Code.
13. Council Regulation (EC) No. 2820/98 of 21 December 1998 applying a multi-annual scheme of generalised tariff preferences for the period 1 July 1999 to 31 December 2001.

Annex 1

FAO CODE OF CONDUCT FOR RESPONSIBLE FISHERIES

Article 11 – POST-HARVEST PRACTICES AND TRADE

11.1 ***Responsible fish utilisation***

11.1.1 States should adopt appropriate measures to ensure the right of consumers to safe, wholesome and unadulterated fish and fishery products.

11.1.2 States should establish and maintain effective national safety and quality assurance systems to protect consumer health and prevent commercial fraud.

11.1.3 States should set minimum standards for safety and quality assurance and make sure that these standards are effectively applied throughout the industry. They should promote the implementation of quality standards agreed within the context of the FAO/WHO Codex Alimentarius Commission and other relevant organisations or arrangements.

11.1.4 States should co-operate to achieve harmonisation, or mutual recognition, or both, of national sanitary measures and certification programmes as appropriate and explore possibilities for the establishment of mutually recognised control and certification agencies.

11.1.5 States should give due consideration to the economic and social role of the post-harvest fisheries sector when formulating national policies for the sustainable development and utilisation of fishery resources.

11.1.6 States and relevant organisations should sponsor research in fish technology and quality assurance and support projects to improve post-harvest handling of fish, taking into account the economic, social, environmental and nutritional impact of such projects.

11.1.7 States, noting the existence of different production methods, should through co-operation and by facilitating the development and transfer of appropriate technologies, ensure that processing, transporting and storage methods are environmentally sound.

11.1.8 States should encourage those involved in fish processing, distribution and marketing to:

a) reduce post-harvest losses and waste;

b) improve the use of by-catch to the extent that this is consistent with responsible fisheries management practices; and

c) use the resources, especially water and energy, in particular wood, in an environmentally sound manner.

11.1.9 States should encourage the use of fish for human consumption and promote consumption of fish whenever appropriate.

11.1.10 States should co-operate in order to facilitate the production of value-added products by developing countries.

11.1.11 States should ensure that international and domestic trade in fish and fishery products accords with sound conservation and management practices through improving the identification of the origin of fish and fishery products traded.

11.1.12 States should ensure that environmental effects of post-harvest activities are considered in the development of related laws, regulations and policies without creating any market distortions.

11.2 ***Responsible international trade***

11.2.1 The provisions of this Code should be interpreted and applied in accordance with the principles, rights and obligations established in the World Trade Organisation (WTO) Agreement.

11.2.2 International trade in fish and fishery products should not compromise the sustainable development of fisheries and responsible utilisation of living aquatic resources.

11.2.3 States should ensure that measures affecting international trade in fish and fishery products are transparent, based, when applicable, on scientific evidence, and are in accordance with internationally agreed rules.

11.2.4 Fish trade measures adopted by States to protect human or animal life or health, the interests of consumers or the environment, should not be discriminatory and should be in accordance with internationally agreed trade rules, in particular the principles, rights and obligations established in the Agreement on the Application of Sanitary and Phytosanitary Measures and the Agreement on Technical Barriers to Trade of the WTO.

11.2.5 States should further liberalise trade in fish and fishery products and eliminate barriers and distortions to trade such as duties, quotas and non-tariff barriers in accordance with the principles, rights and obligations of the WTO Agreement.

11.2.6 States should not directly or indirectly create unnecessary or hidden barriers to trade which limit the consumer's freedom of choice of supplier or that restrict market access.

11.2.7 States should not condition access to markets to access to resources. This principle does not preclude the possibility of fishing agreements between States which include provisions referring to access to resources, trade and access to markets, transfer of technology, scientific research, training and other relevant elements.

11.2.8 States should not link access to markets to the purchase of specific technology or sale of other products.

11.2.9 States should co-operate in complying with relevant international agreements regulating trade in endangered species.

11.2.10 States should develop international agreements for trade in live specimens where there is a risk of environmental damage in importing or exporting States.

11.2.11 States should co-operate to promote adherence to, and effective implementation of relevant international standards for trade in fish and fishery products and living aquatic resource conservation.

11.2.12 States should not undermine conservation measures for living aquatic resources in order to gain trade or investment benefits.

11.2.13 States should co-operate to develop internationally acceptable rules or standards for trade in fish and fishery products in accordance with the principles, rights, and obligations established in the WTO Agreement.

11.2.14 States should co-operate with each other and actively participate in relevant regional and multilateral fora, such as the WTO, in order to ensure equitable, non-discriminatory trade in fish and fishery products as well as wide adherence to multilaterally agreed fishery conservation measures.

11.2.15 States, aid agencies, multilateral development banks and other relevant international organisations should ensure that their policies and practices related to the promotion of international fish trade and export production do not result in environmental degradation or adversely impact the nutritional rights and needs of people for whom fish is critical to their health and well being and for whom other comparable sources of food are not readily available or affordable.

11.3 *Laws and regulations relating to fish trade*

11.3.1 Laws, regulations and administrative procedures applicable to international trade in fish and fishery products should be transparent, as simple as possible, comprehensible and, when appropriate, based on scientific evidence.

11.3.2 States, in accordance with their national laws, should facilitate appropriate consultation with and participation of industry as well as environmental and consumer groups in the development and implementation of laws and regulations related to trade in fish and fishery products.

11.3.3 States should simplify their laws, regulations and administrative procedures applicable to trade in fish and fishery products without jeopardising their effectiveness.

11.3.4 When a State introduces changes to its legal requirements affecting trade in fish and fishery products with other States, sufficient information and time should be given to allow the States and producers affected to introduce, as appropriate, the changes needed in their processes and procedures. In this connection, consultation with affected States on the time frame for implementation of the changes would be desirable. Due consideration should be given to requests from developing countries for temporary derogations from obligations.

11.3.5 States should periodically review laws and regulations applicable to international trade in fish and fishery products in order to determine whether the conditions that gave rise to their introduction continue to exist.

11.3.6 States should harmonise as far as possible the standards applicable to international trade in fish and fishery products in accordance with relevant internationally recognised provisions.

11.3.7 States should collect, disseminate and exchange timely, accurate and pertinent statistical information on international trade in fish and fishery products through relevant national institutions and international organisations.

11.3.8 States should promptly notify interested States, WTO and other appropriate international organisations on the development of and changes to laws, regulations and administrative procedures applicable to international trade in fish and fishery products.

Annex 2

A NOTE ON THE CODE OF CONDUCT AND POST-HARVEST PRACTICES AND TRADE

Responsible fish utilisation is one of the main chapters of this article (11), claiming the consumers' right to safe, wholesome and unadulterated fish and fishery products. Those involved in the processing and marketing of fish and fishery products are encouraged to reduce post-harvest losses and waste, to improve the use of by-catch to the extent that this is consistent with responsible fisheries management practices and to use resources such as water and energy (wood in particular) in an environmentally sound manner.

The manufacture of value-added fishery products by developing countries is advocated and States are requested to ensure that domestic and international trade in fishery products accord with sound conservation and management practices. This latter remark points towards the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The Convention can limit, regulate and prohibit trade in these species and products therefrom if they are listed in one of the Annexes.

The debate of the FAO membership related to the remaining two chapters of Article 11 (Responsible International Trade, and Laws and Regulations relating to Fish Trade) was strongly influenced by the intention to not create clauses which would contrast with provisions issued under the Agreements leading to the Establishment of the World Trade Organisation (WTO) and to make it clear that the formulation of trade rules is the prerogative of the WTO.

The Code also states that policies and practices related to the promotion of international fish trade and export production should not result in environmental degradation or adversely impact the nutritional rights and needs of people for whom fish is critical to their health and well-being and for whom other comparable sources of food are not readily available or affordable.

According to the Code, laws, regulations and administrative procedures applicable to international fish trade should be transparent, as simple as possible, comprehensible and, when appropriate, based on scientific evidence. They should be reviewed periodically and simplified without jeopardising their effectiveness. In cases where regulations are changed, sufficient time should be allowed for preparing the implementation of the Code and consultation with affected countries would be desirable. In this connection the Code stipulates that due consideration be given to requests from developing countries for temporary derogations from obligations.

Source: Erhard Ruckes, "The Code of Conduct for Responsible Fisheries and Post-harvest Practices and Trade", FAO web-site.

Annex 3

KEY STATISTICS FOR THE OECD POST-HARVEST SECTOR

	Harvesting sector			Post-harvest sector				
	Fishers-full time	Landings		Plants	Workers	Turnover million USD	Consumption[2] Live weight kilo/pers/year	Consumer Expenditure million USD
		000 tonnes[1]	Values million USD					
EU (1990 and 1991[3])								
Belgium	818	23.5	83.8	50	1 242		19.2	
Denmark	6 886	1 992.8	514.4	212	6 014	1 290[4]	20	
Germany	4 291	137.6	116.1	177	16 195	1 830[5]	12.7	
Greece	40 164	158.9	446.1	95	2 205		25	
Spain	84 838	1 311.6	2 449.4	387[6]	14 740		42.7	
Finland	2 946[7]	103.9	26.8				33	
France	30 971	616	1 117.1	380	8 807		27.1	
Ireland	4 919	333.1	161.9	85[8]	2 217		19.2	
Italy	49 766	367.6	1 204.1	504	8 160		21.6	
Netherlands	3 932	463.1	545.5	46	3 344		14	
Portugal	38 507	242	373.6	81[9]	7 340		58.8	
Sweden	3 400[10]	170	88.3	44	2 011[11]	395.8[12]	28.5	1 240
United Kingdom	24 230	725.6	754.7	284	21 000	603.8[13]	19.1	3 744
Total EEC	295 668	6 645.7	7 881.8	2 345	93 275		n.a.	
Australia	20 000[14]	201.1	1 043.4		80 000[15]	1 334[16]	19.2	
Canada	22 268[17]	827.8	12 59.7				23.2	
Iceland	5 840[27]	2 512	870		6 680[27]		91.2	
Japan	287 380[18]	6 099	16 813.1				69.9	
Korea		2 322.4	4 943.7				58.9	
Mexico	235 345[19]	1 264.6	967.5				11	
New Zealand	4 697[20]	654.7	460				22.2	
Norway	16 442[21]	2 563.9	1 235.3	493[22]	12 540		47.5	
Poland		137.9	78.4				14.2	
Turkey	18 406[23]	582.6	901.3		2 350[24]		8.4	
United States		5 401.7	3 880.6	4788[25]	85 120	22 212[26]	21.9	46 471
Total OECD		29 213.4	40 334.8					

n.a. Not applicable.
1. OECD *Review of Fisheries* 1996, excludes landings in foreign ports.
2. Estimated live weight equivalent, kilo per person per year, 1993-95 average. FAO figures reported in Fisheries of the United States.
3. Figure refers to 1991 for the harvesting sector and for 1990 for the processing sector. *Towards Sustainable Fisheries, Country Reports*, p. 118.
4. 1997 Fiskeristatistisk Aarbog; million USD.
5. 1995 Production of fish, fishery products and other seafood DEM 2.6 billion. BMELF in Jahresbericht Deutsche Fischwirtschaft, 1996.
6. 1989.
7. 1997.
8 and 9. 1989.
10. 1995.
11. 1997.
12. SEK 3 022 million in operating income in 1996.
13. 1996, gross value-added for fish processing (and not turnover).
14. and 15. ASIC web-site; broad-based definition of processing sector.
16. AUD 1.8 billion for 1997, reported by ABARE.
17. and 20. and 21. and 23. 1994, reported in 1997 edition of *Review of Fisheries*.
18. Number of marine fishery workers, 1996.
19. 1997 for capture fisheries and aquaculture.
22. 1995 figure from personal observations of Norwegian expert.
24. May increase to 2 500 on a seasonal basis.
25. Includes processing and wholesale.
26. Processing and secondary wholesale of edible products.
27. See country chapter on Iceland; 1997 figures.

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Part 3

GOVERNMENT FINANCIAL TRANSFERS AND RESOURCE SUSTAINABILITY

GOVERNMENT FINANCIAL TRANSFERS AND RESOURCE SUSTAINABILITY

EXECUTIVE SUMMARY

Government financial transfers to the marine capture fishery sectors in OECD Member countries represent a significant policy intervention. These transfers have a variety of objectives and employ a number of means to achieve them. Most represent general services, of which the largest proportion is spent on fisheries infrastructure, the remainder funding activities that are designed to assure the sustainable use of fish stocks. A significant amount of expenditure is also spent on transfers that attempt to ease current transition, modernise fleets and provide access to other countries' waters. In this study the OECD Fisheries Committee started to explore a number of transfers and attempted to assess their impacts on fishing capacity and activity, and on fish stock sustainability.

It is estimated that at least USD 4.9 billion (77% of all transfers) was spent on general services in 1997 – 13% of the value of the landings. Common examples of general services are expenditures on fisheries research, enforcement, management, enhancement and infrastructure. Many of these expenditures fund services that are important for ensuring the sustainable use of fish stocks and the aquatic ecosystem, in accordance with international obligations. For some of these services, some OECD countries consider that fishers are the primary beneficiaries as they own the fishing vessels and thus are the primary users of the fishing rights. As a consequence, these countries operate cost recovery programmes whereby the costs associated with providing these services – normally fisheries management and research – are recovered from fishers. Other countries take the view that such services benefit society as a whole and should therefore be paid for from general tax revenues. A further USD 1.4 billion was spent on support in the form of direct payments and cost reducing transfers to the sector in 1997 – 4% of the value of landings. Common examples include modernisation grants, decommissioning payments, tax exemptions and income support. Transfers arising from market price support – *i.e.* the difference between the domestic price and the world price of fisheries products due to a government intervention – are not included in any of these figures.

Many cases documented the use of direct payments and cost reducing transfers that are targeted at reducing fishing capacity. These policies were either intended to boost profitability of the remaining fishers, reduce dependency on the fishery, meet international obligations or reduce pressure on stocks. In some situations, capacity reducing transfers were used in conjunction with resource conservation measures. The evidence presented indicates that these transfers were successful in improving the profitability of the fishery. Even when this was not a policy objective there appeared to be improved performance by the remaining fishers. Although in many countries resource conservation policies are treated separately from transfers policies, some cases demonstrated the value of such policies working together. Government financial transfers have been used to effectively lubricate the introduction of stricter management policies. These findings underlined the value of coherence between resource management policies and transfers policies.

The presented evidence suggests that some direct payments and cost reducing transfers can encourage a build-up of capacity and an expansion of fishing activity. However, many of these effects can be avoided if there are adequate management systems in place. While some cases showed that over-fishing had contributed to resource sustainability problems, few demonstrated the linkage between these problems and government financial transfers.

Capacity reducing transfers were observed to have other effects. By creating opportunities for economic rent to be generated, these policies provided the means for more efficient effort to enter the fishery (in the absence of adequate effort controls). Other transfers, such as those provided by renewal and mod-

ernisation programmes, which encourage the infusion of new technology, may also work against the objectives of the capacity reduction programmes. Furthermore the difference between measured capacity (*e.g.* fleet tonnage and engine power) and effective capacity complicates the design of policies that have the objective of reducing fishing effort. Capacity reducing transfers also have the potential to create spillover effects in other fisheries. If these other fisheries are not adequately managed, the net contribution to resource sustainability could be negative. In a few cases the costs of capacity reduction programmes were covered by funds collected from fishers. The positive aspects of such an approach include its effect on the incentive structure of fishers when they request adjustment assistance, and the reduced costs for taxpayers.

The evidence presented to this study suggests that a significant proportion of transfers, when combined with sound management policies, can contribute to resource sustainability. Some direct payments and cost reducing transfers, however, may have a negative impact on the governance of fisheries. Transfers can imbed expectations about capacity and activity levels that can be expensive and costly for governments to remove. Excess capacity, primarily due to the lack of appropriate management and transfers policies, can lead to increased pressures on fisheries management decisions that favour short term requirements at the expense of long term sustainability.

Some countries consider that reform of their government financial transfers policies, combined with other management measures, has been successful with respect to their resource management objectives. While the reforms reflect the unique characteristics of each situation, they contribute to the possibility of having an economically profitable and biologically sustainable fishery that internalises its own adjustment risks and functions without direct payments and cost reducing transfers

Capacity reducing transfers can reduce pressure on overfished stocks. The available evidence suggests that improvements in resource sustainability are possible when capacity reducing transfers are accompanied by appropriate management measures.

The Committee recognised the difficulties in isolating the impact on fisheries sustainability of government financial transfers. Nevertheless, the study advanced the understanding of the impacts of transfers on the fisheries sector and some useful general statements and assessments can be made. The study touched upon topics that will be part of the Committee's next work programme. The Committee will be conducting further work to improve its understanding of the general services transfers, especially those provided by fisheries research, management and enforcement expenditures. The potential relationship between transfers and trade will also be a topic for the Committee's future programme of work.

Key Finding of the Study

- The nature of government financial transfers in OECD Member countries has changed since the 1970s and 1980s, when they were aimed at developing fisheries.
- Government financial transfers to the fisheries sector in OECD Member countries amounted to USD 6.3 billion in 1997.
- Most transfers (USD 4.9 billion or 77%) are general services that are devoted to fisheries infrastructure and expenditure on activities, such as research and enforcement, that are essential for ensuring the sustainable use of fish stocks and the aquatic ecosystem.
- The effect of transfers on resource sustainability is difficult to determine, as there are many influences on fish stock health that are difficult to disentangle.
- The possible negative effects of some kinds of transfers can be reduced or minimised when transfer policies and resource management policies are coherent.
- Scope exists for industry funding of adjustment programs and programs that ensure sustainable fisheries.
- Some transfers can imbed industry expectations that may complicate future adjustment efforts.
- Some countries condider that the reform of their financial transfers policies, combined with other management measures, have been successful with respect to their resource management objectives.
- Capacity reducing transfers and dependency reducing transfers, combined with appropriate management measures, can reduce pressure on fish stocks.

I. INTRODUCTION

A. Mandate for the study

At its 79th Session, held on 2-4 April 1997, the Fisheries Committee decided to study government financial transfers and their impact on fisheries resource sustainability. The Committee agreed that government financial transfers to the fishing industry impacts fisheries resource sustainability and that the impacts of these transfers need to be carefully and systematically analysed. This document presents the results of the Committee's study.

The OECD study on the *Economic Aspects of the Management of Marine Living Resources* noted that in many Member countries marine resources are overexploited due mainly to failures in fisheries management policies. The study also noted that the problems associated with open access to fisheries resources have contributed to fleet over-capacity. Incentives for increased participation in the fisheries sector, particularly the use of inappropriate assistance measures, have aggravated this problem.[1] The need for intervention by governments to correct the common property problems in fisheries is clear, but some forms of intervention, like inappropriate assistance measures, can be counterproductive and can exacerbate fisheries problems.

The United Nations Convention on the Law of the Sea (UNCLOS) requires that countries take proper measures to ensure that the maintenance of living resources in their exclusive economic zones is not endangered by over-exploitation. The policy relevance of examining the impact on fisheries resource sustainability of government financial transfers can be clearly inferred from the FAO Code of Conduct for Responsible Fisheries. Article 7.1.8 of the Code recognises the need to ensure that fishing capacity does not reach a size where harvest levels negatively effect the sustainability of the resource. "States should take measures to prevent or eliminate excess fishing capacity and should ensure that levels of fishing capacity are commensurate with the sustainable use of fishery resources as a means of ensuring the effectiveness of conservation and management measures."

Article 7.2.2 of the Code further states that:

- "Such measures should provide *inter alia* that:
- excess fishing capacity is avoided and exploitation of fish stocks remains economically viable;
- the economic conditions under which fishing industries operate promote responsible fisheries...".

The Committee for Fisheries therefore considered that analysing the relationship between fisheries resource sustainability and government financial transfers could facilitate the implementation of the Code.

B. Study purpose

The purpose of this study is to review the government financial transfers in OECD Member countries and to assess the impacts of those transfers on fisheries resource sustainability.

C. Study method

The study method involved two stages: *i*) information collection and *ii*) analysis. Three streams of information were collected from the participating Member countries. Countries were asked to provide information on government financial transfers, fishing capacity and activity, and fish stock status. Annex 1 specifies the information that was requested of Member countries. Analysis was conducted in two stages.

The first stage involved determining the relationship between government financial transfers on one hand, and fishing capacity and activity on the other. The second stage involved determining a relationship between fishing capacity and activity on one hand, and fish stock status on the other.

Fishing is one of many factors affecting the state of fish stocks. Some of the other factors are well known, such as changes in temperature, salinity, pollution, and currents. But others are yet unknown, as is shown by a number of stock developments which scientists have not been able to explain. This makes analysis of the effects of government financial transfers on resource sustainability particularly difficult. A further complication stems from the fact that different forms of government financial transfers affect fishing capacity to varying degrees and it is likely that some do not affect fishing capacity at all since, for example, management policies are also based on several other factors. In addition, increased capacity does not automatically mean an increase in fishing effort. These considerations need to be borne in mind throughout this study and especially in evaluating its results.

D. Study scope

The study scope was limited to government financial transfers and their effects on resource sustainability. Other effects of transfers were not explored in the study. The most important of these were:

- The effect on trade flows of transfer-induced changes in capacity and activity.
- The effect of transfers in distorting investment decisions within the economy, leading to losses in net national welfare.
- The effect of transfer-induced changes in fishing capacity and activity on the high seas stocks and the stocks in other countries exclusive economic zones (EEZs).

The limited number of Member countries that participated also affected the scope of the study. Those that provided case studies were Australia, Canada, the European Community, Iceland, Japan, New Zealand, Norway and the United States. Although these case studies were supplemented by additional information from the literature, coverage tended to be uneven and incomplete.

E. Policy implications

Clarity in understanding the impacts of government financial transfers can help guide policy makers who design and implement them. The consequences of government financial transfers will depend on how they are implemented and how they interact with other government policies.

Governments are faced with increasing pressures to ensure that the use of their fishery resources is sustainable. Often pressures originate from national interests, but in many cases can also come from international obligations like UNCLOS, the United Nations Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks and the FAO Code of Conduct for Responsible Fisheries. Management instruments are introduced and aligned, often involving considerable costs in financial and social terms. The incorporation of the precautionary approach into TAC advice provides a pertinent example of the tensions involved when management authorities move toward more conservative stewardship policies. Governments expend large sums of money in conducting research, making management decisions and enforcing those decisions. At the same time, significant sums of money are spent on enhancing the revenues or reducing the costs faced by the sector. Often these policies have complimentary objectives. In other cases, there may be the potential for conflicts. Governments recognise the importance of achieving coherence and alignment between the impacts of transfers and management policies.

II. TRANSFERS TO FISHERIES IN OECD COUNTRIES

A. Definition and categorisation of government financial transfers

Government financial transfers (GFTs) alter the incentive structure faced by participants in a sector. This alteration affects the returns received and the costs faced by sector participants so they are encouraged to act in a way desired by the transfer scheme's architects, normally governments. For the purposes of this study, a transfer is defined as the monetary value of government interventions associated with fisheries policies. In the context of this study, government financial transfers are the monetary value of interventions associated with fishery policies, whether they are from central, regional or local governments.

Classification

In order begin considering how some of these transfers may affect fishers' behaviour, it is useful to classify them. Classification according to how a transfer is implemented, as it is the eligibility conditions that might affect fishers' behaviours. From this, impacts on fishing, production and sustainability can then begin to be considered. For a given policy measure, implementation criteria are defined as the conditions under which the associated transfers are provided to fishers, or the conditions of eligibility for payment (OECD, 1999*a*).

Consistent with the objectives of this study, which are to analyse the effects of government support policies on resource sustainability, an effort is made to classify transfers to the fishing industry under one of the following headings:

iii) Transfers in the form of *direct payments* from governments' budgets (*i.e.* financed by taxpayers) to fishers, including payments based on the level of catches, sales or on a per vessel basis; overall fishing income; fishers' historical interest. Box 1 provides examples of this type of transfer.

iv) *Cost reducing transfers* such as those that reduce the costs of fixed capital and variable inputs. Box 1 provides examples of this type of transfer.

v) *General services* such as transfers paid from governments' budgets for fisheries management, enforcement and research costs, stock enhancement, development of fishing ports, free berthing at ports. Box 1 provides examples of this type of transfer.

In the first two of these categories the transfers are received by fishers. The final category – general services – involves transfers that are not received by fishers, but they reduce the costs faced by fishers and an implicit transfer thus occurs to some extent. Some countries consider that, while the level of the transfers is not contingent on fishers' behaviour, it does represent a transfer to the extent that a service for which they are the primary, but not sole, beneficiaries. Other countries also consider that these transfers are not contingent on fisher's behaviour, and in addition view society as a whole as the beneficiaries of these services. Many of these services are seen as a pre-requisite for sustainable use of fisheries. Research into fish stock health and effects of different gear on catch and by-catch are examples of government supported research activities that are important for ensuring the sustainable use of fisheries resources. Management and enforcement includes national fisheries administration, at-sea inspection and policing, fishing vessel observer programmes and international co-operation. These matters are to be explored in the Committee's forthcoming study on the costs of managing fisheries.

A form of transfer that is not discussed in this study is that arising from *market price support* (*i.e.* transfers that influence both producer and consumer prices). Market price support occurs when, as a result of government policy, the domestic price of a product is greater than the world price. This support to fishers is

Box 1. **Examples of different categories of transfers to the marine capture fisheries sector in OECD countries**

Direct payments

Price support payments to fishers, grants to small fisheries, direct aid to participants in particular fisheries, grants for new vessels, grants for modernisation, grants to purchase second hand vessels, grants to set up temporary joint ventures in other countries, payments to set up permanent joint ventures in other countries, grants for temporary withdrawal of fishing vessels, temporary grants to fishers and vessel owners, vessel decommissioning payments, buyouts of licences and permits, buyouts of quota and catch history, compensation for closed or reduced seasons, compensation for damage from predators on fish stocks, disaster relief payments, income support, unemployment insurance, retirement grants for fisheries, income guarantee compensation, vacation support payments.

Cost reducing transfers

Subsidised loans for vessel construction, subsidised loans for vessel modernisation, loan guarantees, low cost loans to young fishers, low cost loans to specific fisheries, interest subsidies for the purchase of machines and equipment for fishing vessels, interest rebates, interest subsidies for the purchase of second-hand vessels, underwriting of insurance costs, low cost insurance, payments to reduce accounting costs, contributions to match private sector investments, transport subsidies, fuel tax exemptions, income tax deduction for fishers, tax exemptions for deep-sea vessels, support for crew insurance, support for development of deep-sea fisheries, support to improve economic efficiency, government payment of access to other countries' waters, reduced charges by government agencies, support to build facilities for commercial fishers at ports, provision of bait services.

General services

Management expenditure, enforcement expenditure, research expenditure, funding of information dissemination, funding for the promotion and development of fisheries, expenditure for information collection and analysis, expenditure on exploratory fishing, fisheries enhancement expenditure, support for artificial reefs, expenditure on research of deep-sea fisheries, expenditure on the protection of marine areas, aid for restocking of fish resources, payments to support community based management, payments to producer organisations, regional development grants, support to build port facilities for commercial fishers, grants to local authorities for retraining of fishers into other activities, support to enhance the fisheries community environment, expenditure on research and development on fishing technologies, expenditure to promote international fisheries co-operation, support to improve the management of co-operatives, support to improve fishing villages, market intervention.

***Notes*:** Market price support not included. The descriptions of the transfers come from a variety of sources. They are for illustrative purposes and the box does not contain a comprehensive listing. Some descriptions appear in more than one category. This is because, although the programs have the same descriptor, the available information indicates that they are implemented in different ways.

The box does not reflect any assessment of whether individual transfers programs have positive or negative implications for fisheries resource sustainability. Therefore, proper care should be applied in interpreting this summary information to consult the country case studies provided in the following section that discusses these implications.

normally created by trade restrictions. Among other issues, the Committee's forthcoming study on market liberalisation study will examine this form of transfer.

B. Government financial transfers in OECD Countries

Until early 1980s, a large proportion of government financial transfers was provided to develop fishery industries. These policies stemmed from a desire for stable food supplies and the common pool nature of much of the world's fisheries resources at that time. OECD (1965) notes that transfers during the late 1950s and early 1960s were mainly in the form of non-repayable subsidies and grants, concessionary loans and services provided free of charge.

The introduction of extended jurisdictions in the late 1970s provided new opportunities for improved fisheries management, but also led to a change in the nature of transfer policies used by Member countries. The available resources for distant water fleets began to shrink as coastal states expanded their capacity to match the available resources. Faced with declining opportunities, distant water fishing nations used a combination of policies, including: *i*) purchasing access rights in coastal state waters; *ii*) providing transfers to improve the fleet profitability; and *iii*) paying for the reduction of high seas fishing capacity. Coastal states used support policies to develop their own fishing capacity. Generally speaking, most transfers continued to be aimed at sustaining and developing fisheries capacity. It was not until the early 1980s that support policies began to be substantively directed at reducing fishing capacity.

OECD countries today spend large sums of money on government financial transfers. In 1997 an estimated USD 4.9 billion was spent on general services (77% of all transfers). Expenditure on direct payments and cost reducing transfers was an estimated USD 1.4 billion (23% of all transfers). The total government financial transfers figure – USD 6.3 billion – is equivalent to 17% of the landed value of marine capture fishery products. Expenditures on direct payments and cost reducing transfers are equivalent to 4% of the landed value of fishery products. The estimated total is probably too low as it does not include significant support items for some countries such as market price support (mentioned above), tax concessions, non-payment of fishing port berthing fees, support to builders of fishing vessels and regional and local government expenditures. Table 1 provides an indication of how transfers to fisheries compare with transfers to agriculture. Even when market price support is excluded, transfers to fisheries are a lower percentage of production value than that of transfers to agriculture. In fisheries the majority of the transfers fund general services (77%), whereas for agriculture support to producers represents a larger proportion.

Table 1. **Government financial transfers for agriculture and for fisheries: 1997**

	Producer support estimate[1]		General services estimate[2]	Total	
	USD billion	Percentage of farm-gate/ landed value	USD billion	USD billion	Percentage of farm-gate/ landed value
Total agriculture (including market price support)[3]	245.6	36%	66.5	312.0	45%
Total agriculture (excluding market price support)[3]	82.7	12%	66.5	149.2	22%
Total fisheries (excluding market price support)	1.4[4]	4%[4]	4.9[4]	6.3[4]	17%[4]

1. The Producer Support Estimate (PSE) is defined in OECD (1999*b*) as "an indicator of the annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at farm gate level, arising from policy measures which support agriculture, regardless of their nature, objectives or impacts on farm production or income".
2. The General Services Support Estimate (GSSE) is defined in OECD (1999*b*) as "an indicator of the annual monetary value of gross transfers to general services provided to agriculture collectively, arising from policy measures which support agriculture, regardless of their nature, objectives and impacts on farm production, income, or consumption of farm products".
3. *Source*: OECD (1999*a*).
4. Uses slightly different method of calculation and is unlikely to be as comprehensive in coverage as other figures in the column.

The information collected in this study suggests that extent of the use of transfers vary considerably between countries. Current information indicates that the total value of transfers ranges from over 90% of the value of the landings in some countries to less than 3% in others. Tables 2 and 3 provide an overview of the estimated value of transfers in OECD countries.

Tables 2 and 3 summarise expenditures under three of the categories discussed above – direct payments, cost reducing transfers and general services. Common examples of each of these categories can be found in Box 1. In order to provide a context for these figures, these have been presented as a proportion of landed value. Landed value has been used to place the magnitude of transfers in context for

Table 2. **Estimates of government financial transfers to marine capture fisheries in OECD Countries: 1996**[1]
(USD million)

	Direct payments (A)	Cost reducing transfers (B)	General services (C)	Total transfers (D)	Total landed value (TL)	(A + B)/TL	D/TL
Australia[2]	–	8	8	16	244	3%	7%
Canada	339	17	152	509	1 107	32%	46%
European Union[3]	428	397	738	1 562	9 466	9%	16%
Belgium	–	3	2[4]	5	103	3%	5%
Denmark	12	–	73[4]	86	525	2%	16%
Finland	3	2	24[4]	30	32	18%	92%
France	25[4]	15	119[4]	160	866[5]	5%	19%
Germany	19	4	61[4]	84	210	11%	40%
Greece	14	–	43[4]	57	441	3%	13%
Ireland	5[4]	3	104[4]	137	231	4%	59%
Italy	101	5	56	161	1 937	5%	8%
Netherlands	5	–	37[4]	41	500	1%	8%
Portugal	36[4]	–	38[4]	74	359[5]	10%	21%
Spain	172	40	44[4]	256	3 129[5]	7%	8%
Sweden	18[4]	–	44[4]	62	140	13%	44%
United Kingdom	16	6	93	115	992	2%	12%
Iceland	–	22	19	41	877	3%	5%
Japan	28	27	3 132	3 187	14 117	0%	23%
Korea	20	65	283	368	4 929	2%	7%
Mexico	–	–	14	14	1 017[6]	–%	1%
New Zealand	–	–	15	15	475[7]	–%	3%
Norway	6	59	107[4]	173	1 343	5%	13%
Poland	–	–	8	8	215	–%	4%
Turkey	–	0	28	29	212	–%	14%
United States of America	17	194	665	877	3 644	6%	24%
OECD Total	**838**	**789**	**5 171**	**6 799**	**37 646**	**4%**	**18%**

– Zero.
0. Value less than 0.5 of the unit of measure.
1. The table does not reflect any assessment of whether individual transfers programs have positive or negative implications for fisheries resource sustainability. Therefore, proper care should be applied in interpreting this summary information to consult the country case studies provided in the following section that discusses these implications.
2. Commonwealth fisheries only.
3. European Union values are the sum of all EU Member State values. The exception to this is cost reducing transfers, where payments for access for third country waters are not allocated to each Member State. In this case, the value is added to the EU total figure.
4. Figure includes estimates based on 1997 data.
5. Does not include national landings in foreign ports.
6. 1997 figure.
7. Estimate.

Source: Country tables in Annex 2.

each OECD country. Landed value was chosen as the transfers presented relate to those arising from policies in the marine capture fisheries sector.

It should be noted that the figures provided within each of the three categories of financial transfers represent the sum of all expenditures made by a country on different types of programs. These programs may have substantially different policy objectives. Tables 4 and 5 classify these transfers under broad categories relating to their program objectives.

It should be noted that the total of USD 6.3 billion for government financial transfers in OECD Member countries is lower than the estimates of global subsidies calculated by other institutions and in other contexts, though such comparisons should be viewed with caution.[2] However, the method employed in calculating the OECD figures differs from that employed in earlier studies.

Table 3. **Estimates of government financial transfers to marine capture fisheries in OECD Countries: 1997**[1]
(USD million)

	Direct payments (A)	Cost reducing transfers (B)	General services (C)	Total transfers (D)	Total landed value (TL)	(A+B)/ TL	D / TL
Australia[2]	5	7	11	24	259	5%	9%
Canada	252	18	135	405	1621	17%	25%
European Union[3]	366	358	710	1 434	9 324	8%	15%
Belgium	–	3	2	5	99	3%	5%
Denmark	20	–	62	82	521	4%	16%
Finland	3	2	21	26	29	18%	90%
France	22	14	104	139	756[4]	5%	18%
Germany	8	3	52	63	194	5%	32%
Greece	12	–	38	50	387	3%	13%
Ireland	5	3	96	104	220	3%	47%
Italy	24	5	64	92	1 749	2%	5%
Netherlands	4	–	32	36	466	1%	8%
Portugal	32	0	34	66	319[4]	10%	21%
Spain	205	81	59	345	3 443[4]	8%	10%
Sweden	9	–	45	54	129	7%	42%
United Kingdom	23	4	101	128	1 012	3%	13%
Iceland	–	18	18	36	877	2%	4%
Japan	25	22	2 899	2 946	14 117	0%	21%
Korea	30	59	253	342	4 929	2%	7%
Mexico	–	–	17	17	1 017	–%	1%
New Zealand	–	–	17	17	475[5]	–%	4%
Norway	3	62	98	163	1 343	5%	12%
Poland	–	–	8	8	215	–%	4%
Turkey	–	1	27	29	212	1%	13%
United States of America	21	194	662	877	3 644	6%	24%
OECD Total	**702**	**740**	**4 856**	**6 298**	**38 032**	**4%**	**17%**

– Zero.
0. Value less than 0.5 of the unit of measure.
1. The table does not reflect any assessment of whether individual transfers programs have positive or negative implications for fisheries resource sustainability. Therefore, proper care should be applied in interpreting this summary information to consult the country case studies provided in the following section that discusses these implications.
2. Commonwealth fisheries only.
3. European Union values are the sum of all EU Member State values. The exception to this is cost reducing transfers, where payments for access for third country waters are not allocated among each Member State. In this case, the value is added to the EU total figure.
4. Does not include national landings in foreign ports.
5. 1996 figure.

Source: Country tables in Annex 2.

Table 4. **Estimates of government financial transfers to marine capture fisheries in OECD Countries Classification by program objectives: 1996**[1]

(USD million)

	Fisheries infrastructure	Management, research, enforcement and enhancement	Access to other countries' waters	Decommissioning of vessels and licence retirement	Investment and modernisation	Income support and unemployment insurance	Taxation exemptions	Other	TOTAL
Australia[2]	–	8	–	–	–	–	8	–	16
Canada	37	118	–	80	–	259	–	15	509
European Union[3]	61	618	318	283	128	6	3	146	1 562
Belgium	0	2[4]	–	–	3	–	–	0	5
Denmark	3	56[4]	–	12	–	–	–	14	86
Finland	1	23[4]	–	2	1	–	–	3	30
France	7	84[4]	–	6	15	–	–	48[4]	160
Germany	7	52[4]	–	1	11	–	–	12	84
Greece	2	41[4]	–	10	4	–	–	1	57
Ireland	2	97[4]	–	1	3	–	3	5[4]	112
Italy	7	48	–	40	25	–	–	41	161
Netherlands	8	28[4]	–	4	1	–	–	0	41
Portugal	7	28[4]	–	23	10	–	–	4[4]	74
Spain	2	42[4]	–	164	40	–	–	9	256
Sweden	1	39[4]	–	4	8	6	–	4[4]	62
United Kingdom	13	76	–	16	6	–	–	4	115
Iceland	–	19	–	–	–	–	22	–	41
Japan	2 601	414	–	28	26	–	–	119	3 187
Korea	175	76	–	20	–	–	1	95	368
Mexico	–	14	–	–	–	–	–	–	14
New Zealand	–	15	–	–	–	–	–	–	15
Norway	–	107[4]	–	0	14	4	37	10	173
Poland	–	8	–	–	–	–	–	–	8
Turkey	28	0	–	–	–	–	–	0	29
United States of America	11	658	–	–	31	–	150	27	877
OECD Total	**2 913**	**2 056**	**318**	**411**	**198**	**269**	**221**	**412**	**6 799**

– Zero.
0: Value less than 0.5 of the unit of measure.
1. The table does not reflect any assessment of whether individual transfers programs have positive or negative implications for fisheries resource sustainability. Therefore, proper care should be applied in interpreting this summary information to consult the country case studies provided in the following section that discusses these implications.
2. Commonwealth fisheries only.
3. European Union values are the sum of all EU Member State values. The exception to this payments for access for third country waters; these are not allocated to each Member State. In this case, the value is added to the EU total figure.
4. Figure includes estimates based on 1997 data

Source: Country tables in Annex 2.

Table 5. **Estimates of government financial transfers to marine capture fisheries in OECD Countries Classification by program objectives 1997**[1]

(USD million)

	Fisheries infrastructure	Management, research, enforcement and enhancement	Access to other countries' waters	Decommissioning of vessels and licence retirement	Investment and modernisation	Income support and unemployment insurance	Taxation exemptions	Other	TOTAL
Australia[2]	–	11	–	3	–	–	7	2	24
Canada	35	100	–	0	–	248	–	22	405
European Union[3]	67	592	245	288	144	4	3	91	1 434
Belgium	–	2	–	–	3	–	–	0	5
Denmark	3	49	–	8	12	–	–	10	82
Finland	0	21	–	1	1	–	–	3	26
France	6	74	–	5	13	–	–	41	139
Germany	6	46	–	2	2	–	–	8	63
Greece	1	36	–	9	4	–	–	1	50
Ireland	2	92	–	1	3	–	3	2	104
Italy	2	62	–	17	9	–	–	2	92
Netherlands	7	25	–	3	1	–	–	0	36
Portugal	7	25	–	21	9	–	–	4	66
Spain	16	37	–	196	80	–	–	15	345
Sweden	1	42	–	2	3	4	–	1	54
United Kingdom	15	83	–	23	4	–	–	4	128
Iceland	–	18	–	–	–	–	18	0	36
Japan	2 165	628	–	25	21	–	–	107	2 946
Korea	164	73	–	30	–	–	–	75	342
Mexico	–	17	–	–	–	–	–	0	106
New Zealand	–	17	–	–	–	–	–	0	17
Norway	–	98	–	0	14	3	34	14	163
Poland	–	8	–	–	–	–	–	0	8
Turkey	27	–	–	–	–	–	–	1	29
United States of America	11	664	–	4	30	–	150	18	877
OECD Total	**2 470**	**2 227**	**245**	**350**	**206**	**255**	**213**	**330**	**6 298**

– Zero.
0. Value less than 0.5 of the unit of measure.
1. The table does not reflect any assessment of whether individual transfers programs have positive or negative implications for fisheries resource sustainability. Therefore, proper care should be applied in interpreting this summary information to consult the country case studies provided in the following section that discusses these implications.
2. Commonwealth fisheries only.
3. European Union values are the sum of all EU Member State values. The exception to this are payments for access for third country waters; these are not allocated to each Member State. In this case, the value is added to the EU total figure.

Source: Country tables in Annex 2.

III. CASE STUDY SUMMARIES

This section provides brief summaries of the case studies provided by Australia, Canada, European Community, Iceland, Japan, New Zealand, Norway and the United States. The summaries provide only a brief overview and should therefore be read in conjunction with the case studies.

A. Australia – The Southeast fishery

The Southeast fishery is Australia's most important trawl fishery for fish. The fishery is managed under a combination of input and output controls. Quota species can be caught by other methods, outside the trawl and Danish seine sectors. Table 6 provides information on the catch from, and the transfers to, the fishery.

Table 6. **Australian Southeast trawl fishery: catch and transfers: 1987-88 to 1996-97**

	1987-88	1989-90	1991-92	1993-94	1996-97
Catch					
Quantity (tonnes)	20 896	38 364	39 832	27 332	24 211
Value (1990 AUD million)	48.0	74.2	65.3	57.8	41.9
Value-Added (1990 AUD million)	0.5	16.3	20.3	14.2	2.8
Transfers (1990 AUD million)[1]	1.3	1.0	2.2	3.0	3.6

1. Figures before 1991-92 do not include government expenditure on research services.

Using the classification system outlined in the previous chapter, transfers are provided to the fishery mainly as cost reducing transfers and general services. The main form of cost reducing transfers are tax exemptions (see Box 2), especially rebates on diesel fuel. Fuel costs as a proportion of total business costs are higher for the wild capture fishing industry than almost any other industry category. In the Southeast fishery fuel costs averaged AUD 80 700 per vessel in 1996-97, almost 20% of total costs. The value of the rebate for the entire fishery was estimated at AUD 1.93 million in 1996-97.

Box 2. **Policies that reduce fishers' tax costs**

- Capital expenditures and some structural improvements are tax deductible in the current year.
- Investment allowances in the form of a special tax deduction available for capital expenditure.
- Income averaging where a fisher's tax rate is based on average income over the current and preceding four years.
- Income equalisation deposits – deposits into the scheme are tax deductible, while withdrawals are taxable.
- Tax losses incurred in one income year may be carried forward for deduction against income in future years.
- Diesel fuel used is eligible for an excise rebate.

With regard to general services, the fishing industry pays a significant proportion of management and research costs. The commercial fishing industry pays for costs directly attributed to fishing activity, while the government pays for activities that may benefit the broader community as well as the industry. In 1996-97, the cost of managing the fishery was AUD 1.8 million, of which the industry contributed 74%. In the same year research costs were AUD 2.0 million, of which the industry contributed 6%.

There were no changes in support policies in the period 1986-1996. The more important determinants of the economic performance of the fishery appear to have been the change in management instruments and the short-lived boom in the orange roughy fishery. The return on capital invested in the offshore trawl fishery dropped sharply following the reduction in TACs for this species in the early 1990s. The introduction of ITQs in 1992 was associated with improved returns on capital in the fishery. These returns were short-lived, suggesting the capitalisation of economic rent into quota values.

In 1997 an adjustment assistance package was implemented in the fishery that involved *i*) compensating fishers who were unfairly treated in the 1992 transition to ITQs (AUD 2.3 million) and *ii*) buying out fishing permits at a premium to the market price, to reduce capacity (AUD 1.7 million). In 1996-97, the imminent introduction of the adjustment package halted the decline in capital value that had been occurring since 1993-94.

It is not possible to discern any trends in terms of changes in fish stock health in the period under review. There is a wide divergence in the knowledge and level of information available for management decisions. While the time series data cover many years in the case of some species, for many other species the stock structure is unknown and, for management purposes, the fishery is viewed as a single stock. The most recent survey of the status of the stocks in the fishery found that 11 stocks were fully fished, one was under-fished, one was over-fished and the status of 7 was uncertain (Bureau of Resource Sciences, 1994).

Some spillover effects were documented following the adjustment scheme. Of the 28 fishers in the Southeast fishery that elected to sell their fishing permits under the buy-out, around seven moved into the East Coast tuna and billfish fishery. The others elected to retire from fishing or to continue their operations in other fisheries at a similar level to before the buy-out. The spillover effects on resource sustainability are not considered to be significant at this time, as most stock assessments suggest that yellowfin tuna stocks are under-exploited and that there is considerable scope for expansion of effort.

B. Canada – National fishery

Catch from Canada's commercial fishery climbed steadily after the introduction of the 200-mile limit in 1977, peaking at around 1.7 million tonnes in the late 1980s. In the 1990s, commercial landings declined rapidly to the current level of 965 000 tonnes, due to the collapse of the Atlantic groundfish fishery in the early 1990s followed by the record low harvest of Pacific salmon in 1995 and 1996. In terms of catch value the decline was not as pronounced. Table 7 provides an overview of the catch from, and transfers to, Canadian fisheries over the last decade.

Table 7. **Canadian fishery: catch and transfers: 1986 to 1996**

	1986	1988	1990	1992	1994	1996
Catch						
Quantity (000 tonnes)	1 546	1 704	1 691	1 363	1 072	965
Value (1990 CAD million)[1]	3 668	3 821	3 253	2 843	3 263	3 027
Transfers (1990 CAD million)[2]	310[3]	670	627	833	941	843

1. Value of output from fish processing. Does not represent the landed value of the fish (c.f. Tables 1 to 5) and does not include aquaculture.
2. Includes transfers the fish processing sub-sector, as well as the marine capture fisheries and aquaculture sectors.
3. Does not include transfers associated with fisheries management and research.

Government support to the Canadian fisheries sector has grown substantially in recent years, primarily in response to problems in the Atlantic groundfish and Pacific salmon fisheries. In real terms the value of support grew by 26% between 1988 and 1996. In pursuit of objectives involving meeting fishers' income needs, facilitating adjustment (re-training, early retirement) and reducing dependency and capacity, a significant proportion of transfers have been in the form of direct payments. Transfers grew sharply between 1991 and 1996, mainly due to the introduction of income support and adjustment measures under the Atlantic Groundfish Adjustment Programme (AGAP), the Northern Cod Adjustment and Recovery Programme (NCARP), the Atlantic Groundfish Strategy (TAGS) and the Pacific Salmon Revitalisation Strategy (PSRS). In 1988 transfers comprised 18% of the value of the catch; by 1996 they comprised 28%. Out of the CAD 468 million direct payments to individuals in 1996, CAD 270 million (55%) were used for the purpose of restructuring and adjustment.

Fishers have traditionally been charged for the issuing of licences, permits and other privileges. In the period 1986-1995, cost recovery from commercial fishers amounted to about CAD 20 million a year. A new charging policy was adopted in 1996 in an effort to make licence fees more accurately reflect the value of the fishery to the licence holder. The principle now applied is that those who benefit from access to a public resource, managed at the public's expense, should pay a fee that reflects the value of that privilege. In 1996, CAD 49 million was recovered from the sector, equivalent to 21% of the government fisheries management and research costs, or 1.3% of the value of the catch.

The NCARP/AGAP and TAGS policies and the Unemployment Insurance (UI) programme dominated the transfers to the Atlantic groundfish fishery for the period under review. During this time, the most striking trend is the reduction in the catch from the groundfish fishery. Catches dropped by some 88% from 1986 figures, to bottom out at around 140 000 tonnes in 1995 and 1996. During the initial period of the falling catch rates, the number of registered fishers continued to grow. After 1988 the number of registered fishers followed a similar trend to that of the declining catches.

The number of vessel licences trended upwards in seven of the ten years under review. In the face of a 40% fall in the groundfish catches between 1986 and 1992, the number of licences in the fishery increased by 9%. The 1993 licence retirement initiative, which cost CAD 23 million (1990 dollars) resulted in the removal of 876 licences. The TAGS removed a further 545 licences under licence retirement [costing CAD 53 million (1990 dollars)] and fishers early retirement programmes. Between 1992 and 1996, NCARP and TAGS along with other licensing measures reduced the number of Atlantic groundfish licences by 23%.

Licence buyback programmes were used in the Atlantic salmon fishery to assist in conservation of the stock. The policy commenced in 1986 and major buybacks took place during the 1992-1994 period. Some CAD 27.2 million was spent on buying out licences. Between 1986 and 1991 the Canadian catch from the fishery declined by 54% to 711 tonnes, primarily due to stringent quotas applied in 1990 and 1991. Since the 1992-1994 buyback programmes, catches have since fallen by a further 200 tonnes a year to stabilise at around 300 tonnes in 1996.

The licence retirement programme was effective in reducing the number of licences in the Pacific salmon fishery in 1996. Despite fluctuating catches in the years up until 1995, the number of licences stayed constant at around 4 400. In 1996, CAD 69 million was spent retiring 18% of existing licences. The licence reduction coincided with a continuation in the fall in catches in 1996 – although at a slower rate than in previous years.

Capital stocks in the Canadian fishery steadily declined from 1986 to 1996 with the value of capital employed falling by almost 50%. This was due to a combination of factors: lack of new capital infusion, declining fishing opportunities and a strict government policy on vessel replacement. A different pattern is evident with investments in fish processing; between 1986 and 1990 capital stocks grew by 20%. The growth was primarily due to a generous plant expansion policy (mainly under provincial jurisdiction). Extensive plant closures in the 1990s saw a reversal of this trend and the value of capital stocks in the processing sector fell back by almost 30% by 1996.

After falling by almost a third since 1986, capital employed per vessel has remained relatively constant since 1991. Value-added per vessel has followed an increasing trend since 1991. The high values

were recorded in 1994 and 1995 due to the strong performance of the Atlantic shellfish fisheries, notably shrimp and snow crab. In 1996 the value-added per vessel was some 16% above that recorded in 1986. In general, the economic performance by the participants in the sector in 1996 was superior to that at the beginning of the decade.

In the 1990s *groundfish* catches fell rapidly and have stayed at a low level because of conservation measures such as reduced Total Allowable Catches and moratoria on fishing of several stocks. In 1992 record low stocks and concern over the low abundance of the spawning stock led to a moratorium on fishing northern cod. Other cod stocks have also declined and most species are at, or close to, the lowest levels observed. Some stocks have virtually disappeared from parts of their normal range. For many stocks, there are few fish available of commercial size for harvest. Over-fishing has been an important factor in the decline. Other possible contributing factors include changes in migration and geographical distributions, increases in natural mortality due to harsh climatic conditions, poor feeding and predation by seals.

There was a decline in *herring* fisheries in recent years. C*apelin* stocks declined rapidly in the 1990s. The decline was not due to harvest levels, as catches were lower than the productivity of the stocks. Harsh environmental conditions affected capelin abundance, their migration, and their availability in offshore areas. L*obster* and *shrimp* landings increased in the late 1980s owing to environmental changes and, in the case of shrimp, reduction in predation by groundfish stocks. Since 1991 lobster landings have declined, but it is not known if this is due to a reduction in productivity. Although recruitment to *snow crab* fisheries has decreased in recent years, these stocks are considered to be abundant.

With regard to Pacific *salmon*, there is some opportunity to restore stocks through harvest controls, but marine environment conditions may not permit full rebuilding given recent trends in survival rates. The marine survival conditions for chinook and coho salmon have generally been unfavourable in the 1990s. Stocks of chinook salmon on the west coast of Vancouver Island and some parts of the Strait of Georgia are at low levels and severe conservation measures will be required for their restoration.

On the Atlantic coast, there was little evidence that the fishing capacity has shifted to other fisheries. However, between 1991 and 1996 there has been a noticeable increase in the number of limited species licences for mackerel, squid and crab fisheries. The increase in licences for mackerel and squid did not substantially increase the utilisation rate in those fisheries.

C. European Community – The Common Fisheries Policy

The European Community has competence over the conservation and the management of marine fish stocks in the waters of Member states. Under the auspices of the Common Fisheries Policy (CFP), it adopts rules and regulations that are then applied by the Member states. Member states can take measures in relation to local stocks found within 12 miles of the coastline, provided those measures apply only to their nationals and are in accordance with the objectives of the CFP. Table 8 provides an overview of the catch from, and transfers to, Community fishers, for 1992-1997.

In 1997 it is estimated that ECU 1.3 billion was spent on government financial transfers associated with the Member States fishery policies and CFP. This is equivalent to 15% of the landed value of the catch in that year. These figures include *i*) Member State-only transfers and *ii*) transfers that are provided by Member States to co-finance projects with the Community. By one or other of these methods, Member States provide 46% of the transfers to the sector. The Community budget provided the other 54%. Three elements characterise the Community approach to support to the fisheries sector:

i) The need for restructuring so as to adapt fishing capacity to the conservation of resources.

ii) There are still a number of European coastal regions that are economically dependant on the fisheries sector and communities with few, if any, economic alternatives to fishing.

iii) The principle of "Community preference" which seeks to supply the European market with Community products while respecting all bilateral and multilateral international obligations,

The main vehicle for providing support to the fishing industry under the CFP is the Financial Instrument for Fisheries Guidance (FIFG), which forms part of the Community's general system of Structural

Table 8. **European Community fisheries: 1992 to 1997**

	1992	1993	1994	1995	1996	1997
Catch[1,2]						
Quantity (000 tonnes)	6 420	6 113	6 518	7 430	6 748	6 753
Landings[2,3]						
Quantity (000 tonnes)	5 657	5 456	6 816	6 963	6 338	6 377
Value (ECU million)[4]	7 370	6 215	6 845	6637	7 460	8 224
Transfers (ECU million)						
Cost reducing and direct payments	n.a.	n.a.	n.a.	n.a.	649	639
General services	n.a.	n.a.	n.a.	n.a.	581	626

n.a. Not available.
1. *Source*: EUROSTAT. Figures for Finland and Sweden included from 1995.
2. Catch figures denote the total catch of EU fishing vessels world-wide; landings denote landings by EU and non-EU vessels within the territory of the EU.
3. *Source*: OECD (2000*a*) for 1996 and 1997, Member States, estimates. Figures for Finland and Sweden included from 1995.
4. Exchange rates – annual data. *Source*: EUROSTAT.

Funds. Measures funded by the FIFG are intended to contribute to the adaptation of fisheries structures for the economic and social cohesion of the European Union. The Community may cover up to 75% of the cost of projects in Objective 1 regions (regions lagging behind in their development) and 50% in the other regions. For investments in production (*e.g.* product marketing) the corresponding rates are 50% and 30%.

ECU 2 767 million is budgeted for structural assistance under the FIFG during 1994-1999. As the funds are disbursed under joint financing arrangements, Member States are budgeted to provide ECU 1 298 million over 1994-1999. As well as funds for the capture fisheries sector, these totals also include payments to aquaculture, marketing and processing sectors. Member States also provide government financial transfers to their fisheries independent of Community programs. In 1997 ECU 64 million was provided as national aids to the fisheries, aquaculture and marketing sectors.

Measures to promote socio-economic conversion also qualify for assistance under the Community's PESCA Initiative. It aims to help the fishing industry make a successful transition, deal with economic and social impacts of transition and contribute to the diversification of littoral regions. PESCA projects require joint financing from the Member State and, if necessary, by private beneficiaries. In the period 1994-1999 approximately ECU 290 million is budgeted under this initiative.

The EU's internal market is regulated through a price support system, based on intervention mechanisms (withdrawal prices, carry-over aid and private storage aid for certain fresh/chilled and frozen fishery products) or compensation mechanisms (tuna for canning). Based on guide prices, the Commission fixes the withdrawal prices, the amount of carry-over aid, and the amount of the fixed premiums and the reference prices. Reference prices are used as a basis for the adoption of safeguard measures – minimum prices and countervailing duties. Market mechanisms are implemented by officially recognised producers' organisations that, in the three years following their establishment, receive aid to assist their operations. EU market intervention serves to protect fishers against occasional market failure. In 1997 ECU 22 million was spent on these support mechanisms, or about 0.3% of the total landed value of the EU catch.

Producers' organisations (POs) can also qualify for financial support to improve the quality and marketing of their products. Up to 50% of the support that is provided by Member states can be refunded by the Community. In 1997 refunds to Member States totalled ECU 0.25 million.

The Community has bilateral fisheries agreements that provide for access for Community vessels with a number of countries. Many of these agreements with third countries contain conditions that involve access to stocks in return for financial compensation. Member states are responsible for identifying individual vessels wishing to obtain a fishing licence from a third country. In most cases a fee has to be paid by the ship-owners in order to obtaining such a licence; the amount of the fee normally varies in accordance with the type of fishing and the duration of this licence. During the period 1994 to 1998 the

Community budget has provided ECU 280 million a year, on average, for the fisheries agreements policy. These funds are paid to third countries' governments and are not directly received by EU ship-owners. Part of the EU financial compensation is usually earmarked for the development of local fisheries infrastructure. These fishery agreements – in particular those with developing countries – seek to utilise surplus available resources (as defined in article 62 of UNCLOS).

Funds are provided from the Community budget for research projects in the marine and aquaculture area. During the 1991-1994 programme, ECU 48 million was made available for 75 marine and aquaculture projects. In the 1995-98 programme, ECU 115 million was made available for the projects. Community funds are also provided to help Member States' efforts to improve inspection, monitoring and enforcement infrastructure. For the period 1996 to 2000, ECU 205 million has been made available for these activities. In 1997 an estimated ECU 671 million was spent on fisheries research, management and enforcement – equivalent to 41% of total Community transfers to the fishery sector.

Structural funds are made available under the FIFG for the modernisation and renewal of the fishing fleet. For the period 1994 to 1999, about ECU 660 million has been allocated from the Community's FIFG budget for these activities. These aids have the objectives of improving operating conditions on board fishing vessels, improving the selectivity of gear and supporting Community standards on health and safety. Member States that do not meet their capacity reduction objectives under the Multi-Annual Guidance Programmes (MAGPs) do not receive these aids.

For the period 1994 to 1999, almost ECU 700 million – more than one quarter of Community's FIFG budget to the fisheries sector – has been allocated for the adjustment of fishing effort. For the period 1994 to 1997, physical scrapping of vessels has accounted for around 94% of the total number of the vessels and two-thirds of total tonnage and engine power withdrawn with the assistance from the FIFG. The remaining part has been withdrawn through assistance to joint enterprises (involving re-flagging of vessels) or export of vessels to third countries. Whether expressed in terms of kilowatts of engine power or in terms of tonnage, capacity has fallen since 1992 (by the end of 1996, a reduction of 15% in tonnage and 10% in engine power). Box 3 contains specific examples of capacity reductions facilitated by FIFG funding.

Box 3. Examples of capacity reductions in EU Member States

Denmark: Fleet reduction initiatives in late 1980s and early 1990s that were sustained under the FIFG that commenced in 1994. Since 1988 almost 30% of Danish fishing capacity has been withdrawn.

Spain: One quarter of the total tonnage in the fleet was removed between 1992 and 1998.

Portugal: One third of the total tonnage in the fleet was removed between 1992 and 1998.

Germany: One quarter of the total tonnage in the fleet was removed between 1992 and 1998.

As stated previously, an important element in the Community's approach to support the fishing industry is the restructuring of fishing capacity so as to adapt it to the conservation of the resources. Its intent is to assist in aligning capacity with the resources that are available. The Community policy has been successful in reducing capacity. Capacity of the EU-12 fleet contracted between 1992 and 1996 (down 10% in total engine power). The capacity reduction targets are long term objectives and do not attempt to track short-term changes in stock abundance. They are therefore fixed independently of the annual TACs. During the same period the catch of these Member States remained at about the same level, thus providing improved economic opportunities for fishermen. The catch per vessel was 10% higher in 1996 than in 1992.

D. Iceland – National fishery

The fishing industry is the mainstay of Iceland's economy, earning some 70 to 80% of merchandise export receipts and directly contributing to 15% of Gross Domestic Product. The fisheries consist of operators utilising demersal, pelagic, and crustacean and mollusc stocks. The fishery is managed with ITQs and a range of other controls. Table 9 provides an overview of catch from, and transfers to, the sector during 1988-1996.

Table 9. **Icelandic fishery: catch and transfers: 1988 to 1996**

	1988	1990	1992	1994	1996
Catch					
Quantity (000 tonnes)	1 752	1 502	1 568	1 511	2 004
Value (1990 ISK billion)	42.9	47.8	44.2	44.0	48.0
Value added (1990 ISK billion)	26.6	27.8	27.6	27.5	30.5
Transfers (1990 ISK billion)	3.0	2.2	2.2	2.1	2.3

In 1996 ISK 2.9 billion (USD 41 million), or 8% of value added, was provided as transfers to the sector. Between 1988 and 1996, transfers have ranged between about 11 and 8% of value added and 7 to 5% of the value of catch.

A Fisheries Price Equalisation Fund operated in Iceland between 1970 and 1993. The Fund's objective was to minimise the impacts of price fluctuations throughout the national economy. To do so, it operated a system of minimum prices for landed fish products. When prices were relatively good, payments were made into the Fund by fishers. When prices fell below the minimum price, the Fund would use the accumulated deposits from fishers to supplement returns. From time to time, the government stepped in to support the Fund by granting it loans. In 1988 and 1989 the Fund obtained loans from the Government of ISK 800 million and ISK 400 million, respectively. These loans were not paid back. In 1992 the Fund was altered so that individual fishers could withdraw their own balances. Some ISK 2.5 million was paid out to fishers in that year. These funds were mainly built up during the years of relatively high prices that were experienced in 1990 and 1991. The Fund was abolished in 1993.

A special tax deduction is available for fishers and is based on the number of days they spend at sea.[3] It currently constitutes the largest transfer to the sector, accounting for ISK 1.5 billion in 1996. In the period 1988 to 1996, ISK 11.2 billion (1990 kròna) was transferred to the sector through this policy.

The Government funds general services such as research, enforcement and management activities. In 1996, the costs of these activities totalled ISK 1.5 billion. The costs of certain services are recovered from the industry. For example, since 1990 costs associated with monitoring and enforcing the ITQ system have been recovered from a levy on quota owners. In 1997 about ISK 120 million was recovered by the levy.

Although not transfers from the government, there were *intra-industry transfers* that have facilitated restructuring of the fishing fleet. In 1992 and 1995 a Restructuring Fund operated that was funded by an annual levy on all vessels 10 GRT or larger. The levy was progressive according to the size of the vessel. Owners wishing to remove their vessels from use, either by scrapping it or selling it abroad, applied to the Fund for cessation premiums. Premiums were paid on up to 30% of the comprehensive insurance valuation of the vessel, up to ISK 50 million. After 1993, the Fund was renamed the Development Fund and the cessation premiums were increased to 45% of the vessel's hull insurance value. Rent-seeking behaviour was evident in the reduction in applications immediately before the new Fund arrangements came into effect. In the 1992-1996 period, vessels accounting for 9 995 GRT (equivalent to 7.6% of the 1996 fleet tonnage) were removed from the fleet under these funds. The Development Fund is supported by industry levies based on vessel size and on quota.

E. Japan – Vessel reduction programmes

Japan has used vessel reduction programmes in a number of fisheries. Case study examples were provided for programmes used in the Akita, Mie and Shimane Prefectures.

Akita prefecture: 1986 *and* 1992-1993

In 1986 a vessel reduction programme was implemented to improve the profitability of fishing operations in the Akita Prefecture. It removed nine offshore trawling vessels and ten small-type trawling vessels at a total cost of JPY 278.4 million (USD 2.6 million). The vessels were either scrapped or sunk to create artificial reefs. Funding came from the central government, prefecture government, municipal offices, fisheries co-operative associations, Federation of Fisheries Co-operative Associations, and remaining fishers. Fishing capacity was reduced by 30%, measured in terms of gross tonnage and engine power of the fleet. An increase in the landed value per vessel was observed.

An important contributor to the improved performance was the decline in labour and fuel costs (due to fewer days at sea). Those vessels leaving the fishery were associated with relatively poorer financial performance than those that remained. Older vessels tended to be scrapped, leading to improved efficiencies for the remaining fishers. The primary beneficiaries of the programme were fishers' creditors in fisheries co-operative associations and finance corporations. Only a small percentage of vessel owners could completely repay debts using vessel reduction grants, and there are some that are still paying off debts. While the improvement in the status of the stocks was not the primary objective of this policy, stocks did not recover (as was originally planned) to the 1977-1982 levels. The age structure of labour in the fishery changed: younger crew from retired vessels found their way onto the remaining vessels and older crew left the fishery. There was no evidence of spillover effects into other fisheries.

The 1992-93 programme was implemented in response to severe biological problems in the sandfish fishery. The programme, which included a total moratorium on catch, involved scrapping ten vessels. The total cost of the programme was JPY 222 million (USD 2 million). Unlike the 1986 reduction programme, all the funds came from central government, prefecture government and the fisheries co-operative associations. Concessional loans were also provided to supplement the fall in income levels caused by the moratorium. Subsidies were also given to some co-operative associations to offset the effects of any declining catches.

At the time of the programme, both sectors of the trawl fishery were generating profits. Further, even though there was a three-year moratorium on sandfish harvesting, fishers were able to diversify into other species and the total landed value in the prefecture did not drop substantially. The reduction in competition over fishing grounds due to reduced vessel numbers led to shorter trips and therefore fuel savings and lower labour costs. The overall tonnage of fishing vessels declined 32% and the total number of fishing days declined. In contrast, the average horsepower per vessel rose due to improvements in engines. In terms of resource conservation, the sandfish stock did recover, enabling the re-opening of the fishery in 1995. An important factor in securing the agreement of industry to the three-year moratorium was the concessional loans to fishers and subsidies to co-operative organisations. In this context, the co-management structure of the community-based management facilitated the conservation program. Vessel owners' creditors were the primary beneficiaries of the support, although consumers received benefits from having a more stable supply of fish in the long run. There was also evidence of the programme supporting a reduction in the average age of the crew in the prefecture's fisheries.

Mie prefecture: 1991

A vessel reduction programme was implemented for mid-size purse-seine fisheries (major species: sardine, mackerel, horse mackerel) to improve profitability in the fishery by reducing fishing effort. The programme, which was funded by the prefecture, central government and remaining fishers, cost JPY 160.7 million (USD 1.2 million). The programme scrapped 26% of the number of vessels in the fishery. There were few positive impacts on economic performance. Although catch rates improved for larger vessels, the opposite was the case for smaller vessels. Profitability fell for all vessels, especially the larger

ones, primarily due to lower prices and lower overall catch quantities. It can be conjectured that, in the absence of the programme, the performance would have been far worse. Although fish stock conservation was not an objective of this policy, it can be inferred by continued fall in catches that a reduction in the stock size may have occurred. The case illustrates the difficulty of managing resources (*e.g.* pelagics) that move between management jurisdictions. There were no drastic changes in the labour structure, although some crew from scrapped vessels did move onto the remaining vessels.

Shimane prefecture: 1990-1991

A vessel reduction programme was implemented in the trawl fishery (major species: squid and flatfish) to improve the state of fish stocks, especially flatfish. The total cost of the programme, JPY 1.24 billion (USD 8.6 million), was funded by the central government, prefecture government and remaining fishers. The programme resulted in a 22% reduction in the number of fishing vessels. However, while the programme accelerated the reduction in vessel numbers, the rationalisation of the fleet was occurring in any case. The fleet was ageing and the vessel reduction programme may have halted this trend for a time.

Catch values and catch volumes declined, primarily due to the vessel reduction programme but also due to other management measures. For flatfish – the target of conservation efforts – catch per unit of effort remained constant but catches declined. Catch value rose in small-type trawling but declined for offshore trawling and, as a result, for the total fishery. Catch quantity per fishing unit fell. The reduction in the number of fishing vessels did not result in an increase in catch quantity by remaining fishing vessels; in fact, it caused a decline in total catch, which rising prices just managed to offset. There were performance improvements in one part of the fishery where catch value per unit and average productivity increased (due to the fact that more competent vessels remained in the fishery). In another part of the fishery, average prices increased, primarily due to the change in the species composition in the catch. All operators within that part of the fleet had consistently posted profits – maintaining this performance was partially due to the fact that it was difficult for vessels from other districts to access these fishing grounds.

As with the other vessel reduction programmes, fishers' creditors were the primary beneficiaries of the support. The funds offered for vessel reduction was normally sufficient to cover the debts of fishers leaving the fishery. The funds that remaining fishers were required to contribute were often significant (JPY 16-17 million) and in most cases involved incurring new debts. In some cases crews of the scrapped vessels were employed on the remaining vessels.

It is not possible to discern whether or not the decline in the status of the stocks, especially that of flatfish, has been checked. Overall, catches were largely influenced by a sharp reduction in the stock of squid, for which it is difficult to make management estimates. If the decline in the squid stock is excluded, it appears that the decline in the state of these stocks may be slowing. Catch quantities are now increasing for some species and declining for others. These trends may be due to other management measures as well as the voluntary vessel reduction programme.

F. New Zealand – National fishery

The New Zealand fishery has grown substantially since it declared a 200-mile EZZ in 1978. In 1995, 650 000 tonnes of fish and fish products were harvested from the zone by domestic, foreign-owned chartered vessels and foreign licensed vessels. The fishery is managed under a combination of output controls and technical measures. Table 10 provides information on catch from, and transfers to, the New Zealand fishery.

The management of fisheries up until the 1980s mainly consisted of policies aimed at developing the resources. Between 1963 and 1983 period, concessionary loans were provided to harvesting (NZD 50.5 million), processing (NZD 15 million) and for export incentives (NZD 1.5 million) (Sharp, 1997). These development policies were successful, and combined with a policy that facilitated the free trade in fisheries services (*e.g.* chartering foreign-flagged fishing vessels), catch levels by New Zealand operators rose. While targeted at developing deepwater fisheries, there is evidence that the transfers did not have their intended effect. To a certain extent deepwater fisheries were developed – although the policy

of free trade in fisheries services is likely to have been far more influential than government support – but most of the effort expansion occurred in the inshore fisheries.

Table 10. **New Zealand fishery: catch and transfers: 1986 to 1996**

	1986	1988	1990	1992	1994	1996
Catch						
Quantity (000 tonnes)	412	571	578	657	602	655[1]
Value (1990 NZD million)	590	559	557	668	629	633[1]
Transfers (1990 NZD million)[2]	99	41	83	53	4	12

1. 1995 figure.
2. Figures presented are for 1 July to 30 June years. Matching is done by relating transfers to the previous calendar year (*e.g.* transfers figures presented for 1986 relate to the 1986-87 fiscal year).

Concerns about excess capacity[4] and over-fishing of the inshore stocks led to the introduction of an ITQ system in 1986. Introducing the new system was not without problems: removing the imbedded expectations created by previous management and support policies was expensive, and NZD 48.3 million (USD 22.1 million) was spent to purchase catch history rights so that TACs could be set at sustainable levels. Reform involving the return of catches to acceptable sustainable levels required severe cuts in catches for some high-value inshore fisheries, and fishers argued that the problems of overcapitalisation and over-fishing were due to erroneous government policies of the past (Sharp, *op. cit.*). Industry acceptance of the new management system was contingent upon the government compensating fishers for the incorrect investment decisions its previous policies had encouraged. This was the first of many payments that slowly saw adjustment risk transferred from the government to fishers – the final payment to compensate for a reduction in a TAC was made in 1993-94.

There was a strong acceleration in catches immediately after the buyout scheme, suggesting that fishers may have used buyback funds to invest in other fisheries. The trend is borne out in catch statistics: despite the TAC reductions associated in the inshore stocks, there was a dramatic rise in total catch due to an expansion into the deepwater fisheries.

Transfers also flowed back from the industry to the government: resource rentals were charged between 1986 and 1994 and since then a policy of cost recovery has been in operation. Fishers are charged for costs associated with fisheries management services, fisheries research services, conflict resolution, and detection of offences. Approximately NZD 35 million (USD 23 million) was recovered from the industry to fund these services in 1996-97. Where costs of providing a service to industry can be clearly identified, the current government policy is that industry should bear the costs of management that arise from the existence of the industry.

The removal of support and the introduction of a new management regime do not appear to have harmed employment in the harvesting and processing sectors. Between 1983 and 1997 employment in the harvesting and processing sectors increased significantly. The introduction of cost recovery in 1994, accompanied by the cessation of compensation for TAC reductions, may be associated with a drop in employment in the harvesting sector between 1995 and 1997. The decline in employment was offset by the increases observed in the processing sector over the same period. These trends suggest that cost recovery encouraged a round of rationalisation in the harvesting sector, with quota use perhaps moving into the hands of agents more vertically integrated into the processing sector.

Assessing the impact of changes in transfers and management policies on the biological status of fish stocks is difficult due to the dearth of information before 1986. At the time there was a problem with obtaining a mandate to conduct stock assessments, and research consisted of gathering basic information on a few commercially important species (Annala, 1996). Nevertheless, ITQs were introduced in response to the problems of over-fishing of inshore stocks. In 1983 reductions in catch were proposed for nine inshore species. For the deepwater species, most were still considered to be in a development phase.

More detailed information is available on the current state of fish stocks (Annala, *op. cit.*). In 1993 it was estimated that 13 fish stocks were below B_{MSY}, 13 were above B_{MSY}, 48 were at or near B_{MSY}, and the status of the remaining 75 relative to B_{MSY} was unknown. Many of the inshore stocks that experienced TAC reductions in 1986 are in this final category.

G. Norway – National fishery

Norway's fishery catch has fallen significantly in volume terms since the introduction of EEZs in the North Atlantic in the late 1970s. Due to the effect of extended jurisdictions and declining North east Arctic cod and Barents Sea capelin stocks, catch almost halved between 1977 and 1990. Norway's two main fisheries can be group under the headings "herring" fisheries (herring, capelin and mackerel) and "cod" (cod, haddock and saithe) fisheries. Combinations of output controls, input controls and technical measures regulate access to stocks. Table 11 provides an overview of the catch from, and the transfers to, the fishery for 1977-1996.

Table 11. **Norwegian fishery: catch and transfers: 1977 to 1996**

	1977	1981	1984	1987	1990	1993	1996
Catch							
Quantity (000 tonnes)	3 403	2 539	2 440	1 893	1 592	2 415	2 633
Value (1990 NOK million)	8 654	7 890	6 661	7 245	5 428	6 163	8 004
Value added (1990 NOK million)	4 979	4 941	3 809	4 510	3 101	3 829	5 434
Transfers (1990 NOK million)[1]	1 412	2 300	1 387	971	1 070	459	346

1. Does not include government expenditures on research, enforcement and management services.

Support levels are set each year in the context of the annual agreement negotiated between the government and the Norwegian Fishermen's Association (NFA). The provisions of the agreement emphasise the importance of introducing measures that can promote more efficiency in harvesting, processing and trade and, as a result, increase the profitability in the industry and thereby make it independent of government support. Another objective of the agreement was to discourage people from moving away from the northern and western parts of Norway. The text box provides information on the main transfers available to fishers in 1977-1996.

Generally speaking, there has been a shift in emphasis toward transfers provided through the National Fishery Bank and tax refunds and exemptions. The proportion of support provided by other transfers to intermediate inputs, price support, decommissioning and social schemes has fallen.

It could be expected that movements in price support would be closely related to movements in fishery catch. Price support is provided to fishers on the basis of landed value – fishers can increase the amount of support they receive in any given year by harvesting more fish. Price support has tended to move in the same direction, in aggregate terms, as catch. However, the process of setting price support in the context of the annual agreement negotiations brings an additional dimension to the relationship between price support and catch. The primary factor for setting the total value of available price support under the agreement was the expectations of profitability in the year to come. It is evident that in some years price support and other transfers – as a percentage of the value of catch – followed a distinctly counter-cyclical pattern in comparison with the movements in catch.

The decline in catch in 1977-1980, primarily due to the fall in cod and capelin landings, appears to have prompted a sharp rise in price support and transfers to intermediate inputs (especially support to operational costs). The downturn in landings therefore appears to have created profitability problems that required increased transfers in subsequent years. The economic effect of the downturn in catch from key stocks was effectively masked by a surge in government support. Between 1977 and 1981, net value added fell by NOK 925 million (1990 kroner), while transfers increased by NOK 890 million (1990 kroner).

Box 4. **Examples of government transfers available to Norwegian fishers: 1977-1996**

- Price support – involving fixing the first-point-of-sale price of the fish (the subsidy element equivalent to the difference between the fixed price and the border price).
- Low interest loans from the National Fishery Bank – for the purchase of new and used vessels.
- Decommissioning schemes – for the removal of vessels from a particular fishery.
- Income guarantee compensation – to assure incomes for fishers when fisheries fail.
- Unemployment insurance.
- Transfers for intermediate inputs – compensation for excise duty on petrol, insurance subsidies, bait services.
- Tax Exemptions – refund and exemption of mineral oils taxes.

The effect of these transfers in de-linking the decline in landings and net valued added from economic decisions had flow-on effects. Despite the declining trends for landings and returns from the fishery, the size of the fleet continued to expand.

Landings from cod fisheries grew strongly in the 1984-1987 period. However, this growth was more than offset by the collapse of the capelin fishery, which ended with the declaration of a moratorium in 1987. In response, transfers were increased in 1984 and 1985, primarily using price support. In 1987 and 1988, price support fell dramatically, primarily due to a breakdown in negotiations between the Government and the Fishermen's Association. Another contributing factor would have been the favourable effect on profitability of strong growth in the cod fisheries.

The period of support reduction has been characterised by improved stability in the sector. The variability in catch levels, value and value-added have all decreased since 1993. Certain cost reducing transfers are closely related to the level of investment and activity in the fishery. There is a strong positive correlation between the interest transfers provided by the National Fishery Bank and the number of newly built vessels entering the fleet. Furthermore, there is a strong correlation between mineral tax refunds and exemptions and landings of cod, herring and capelin for the years 1989 to 1996 (especially after 1993).

The regular pattern of transfers to ensure profitability suggests that the annual agreement process did not achieve one of its primary objectives – to make the industry independent of government support. On the contrary, the removal of significant parts of the support policy seems to be associated with a significant growth in profitability in the sector. According to the annual survey of Norwegian fishing vessels, operating profits for larger fishing vessels (13 metres in overall length and above) increased by 40% between 1994 and 1996. While this trend can be attributed to the improved health of the cod and herring fisheries, better management systems and the reform of the transfers policy will have contributed to this positive development.

At first sight, there seems to be a clear correspondence between the removal of support and the improvement in the health of key fish stocks. Between 1981 and 1996 support to the sector fell by 85%. At the same time there have been remarkable improvements in size of cod and herring fish stocks, up 110 and 1 040%, respectively. However, in the same period more effective management measures were introduced for managing the most important fish stocks. It is therefore difficult to isolate the relationship between reduction in transfers and the improvement in fish stocks.

ICES notes that in the Norwegian spring-spawning herring fishery a "large increase in fishing effort, new technology and environmental conditions contributed to the collapse of this stock around 1970" (ICES, 1998). The role of transfers in this collapse could therefore be found by investigating the effects of transfers on fishing effort and the uptake of new technology. Information is not available to explore that linkage, but given the fact that this was primarily a high seas fishery (and therefore without output controls and effort limitations) at that time, it is expected that government support would have been a

contributing factor. The size of the cod fish stock was at low levels in the 1980s. In the period immediately preceding the introduction of vessel quotas in the distant water fleet in 1979 – *i.e.* when output was not constrained and significant support was available – landings were between 500 000 and 1 000 000 tonnes, possibly contributing to a decline in the biomass (ICES, 1998).

H. United States of America – National fishery

Until the mid-1970s fisheries management focussed upon the development and promotion of the USA's fishing industry. With the declaration of extended jurisdiction in March 1997, the effort to Americanise the USA's EEZ involved policies that provided support and assistance to domestic operators. However, the increase in economic activity, especially in the harvesting sector, in the absence of sound management policies, contributed to problems with fish stocks. As a consequence the application of support policies began to be revised in the late 1980s. Table 12 provides information on current catches from, and transfers to, the fishery sector.

The revision of support policies began to direct efforts more towards the limiting, rather than promoting, levels of effort in capacity, particularly in stressed fisheries. A large proportion of transfers in table 12 is for research, management and enforcement services (75% in 1997). Support is also provided for vessel buyout schemes. In 1997 USD 3.5 million was spent on withdrawing vessels from the fleet. Specific schemes also exist, administered by the Department of Agriculture, to fund export promotion and to support domestic prices.

The National Marine Fisheries Service operates specific schemes that have some impact on the development of the fishing fleet:

- Fisheries Obligation Guarantee Program which operated as a loan guarantee program up until 1996. After 1996 it became the Fisheries Finance Program (FPP) and now operates as a direct loan program. The practical effect of both programs has been to reduce the industry's costs of borrowing. The FPP is used for a number of purposes, but its main uses are to support industry-funded vessel buybacks and purchases of Individual Fishery Quota (IFQ) shares in specific fisheries by crewmembers and small boat fishers.
- Capital Construction Fund, which operates as an income tax deferral program that is primarily designed to benefit the USA's shipbuilding industry. It reduces current tax liabilities and thus reduces industry costs. Annual deposits have averaged around USD 25 to USD 30 million in recent years. The current aggregate balance is about USD 320 million.

The USA imposes an excise tax on fuel on operators of vehicles that use the nation's highway system. As the intention of the policy is to collect revenues to fund the highway system, fishing vessel operators are exempt from paying this tax. It has been estimated that this tax exemption is worth about USD 150 million annually. The fishing industry pays for access to other countries' waters. It pays USD 4 million for licences for purse seine vessels to fish in the EEZs of certain countries in western and central Pacific, in accordance with the terms of the South Pacific Tuna Treaty (OECD, 2000*a*).

The impact of government financial transfers on effort, capacity and stock status was not documented in the case study. Nevertheless, the move in the late 1980s to realign financial support policies suggests that, without sound management policies in place, direct assistance that supported the economic expansion of capacity and effort in the sector was having a detrimental effect on fish stocks.

Table 12. **United States fishery: catch and transfers: 1993 to 1998**

	1993	1994	1995	1996	1997	1998
Catch						
Quantity (000 tonnes)	4 745	4 493	4 809	4 507	4 635	n.a.
Value (USD 1990 million)	3 466	3 350	3 317	3 071	2 995	n.a.
Transfers (USD 1990 million)	715	707	721	714	724	695

n.a. Not available.

IV. INTERPRETATION OF THE RESULTS

Government financial transfers to the marine capture fisheries sectors of OECD countries were estimated to be in the order of USD 6.3 billion in 1997. As outlined in Tables 2 to 5, three quarters of these transfers relate to expenditures on general services like fisheries infrastructure, management, research, enforcement and enhancement. Programs designed to bring about adjustment, modernise fleets and to acquire access to other countries' waters are also large users of government financial transfers.

A range of impacts on the use of government financial transfers is presented in the case studies in the previous chapter. Case study information was limited to a few Member countries and this affects the extent of the analysis that is possible. Drawing from the information presented and other sources, this chapter interprets the evidence on the impacts of transfers on the resource, the sector and on governance.

A. Resource impacts

Government financial transfers in OECD countries are dominated by general services. One of the largest expenditure items in the general services category are the funding of fisheries research, management, enforcement and enhancement. In some countries spending on these items represented 100% of total government financial transfers. At the other extreme some countries spend around 20% – still a significant percentage. Expenditure on research, management and enforcement activities are important requirements for ensuring the sustainable use of fish stocks and the aquatic ecosystem. Most Member countries have legislation that compels decision-makers to manage the fishery in a sustainable manner. In some countries, government management authorities have had legal action taken against them for allegedly not meeting the sustainability requirements in their legislation.

Without adequate funding of research, fisheries managers could be faced with insufficient basic stock information, thereby increasing the risk of making decisions that could adversely affect the health of the stock. As noted in other parts of the Committee's Transition Study, uncertainty is inherent in the biological component of the fishery system. However, information can be considered an investment towards ensuring that the stock is utilised at levels that maximises its long-term yield – to the benefit of the industry and consumers of seafood. Expenditure on enforcement is also important for ensuring that harvest levels are respected.

Most OECD countries have experienced, or are experiencing, economic or biological over-fishing of stocks. In New Zealand the decline in inshore fish stocks in the late 1970s and early 1980s was attributed to over-fishing encouraged by a combination of support and a management policy with relatively free access to resources. In the United States the fisheries development transfer policies contributed to an increase in activity in the harvesting sector in the late 1970s and 1980s and consequently to problems with fish stocks.

In general however, the contribution of government financial transfers to this problem is far from clear and other factors appear to have played an important role in contributing to over-fishing and stock declines. Some countries presented examples of over-fishing, but the linkage between it, stock declines and transfers was not explored in their case studies. In Canada, over fishing was one of several factors – such as changes in environmental conditions (*e.g.* water temperature) – that contributed to the decline in groundfish stocks in the 1990s. The decline in Norway's spring-spawning herring fishery in 1970 was due to increases in fishing effort, new technology and environmental conditions. High catches in the late 1970s may have contributed to the decline in the cod fish stocks up to 1980. Given the common pool nature of

these high seas stocks at the time, some transfers may have had a role in encouraging high levels of exploitation.

The reduction of support coincided with the improvement in the health of herring and cod stocks in Norway. However, the improvement in these stocks was mainly caused by strong effort reducing measures introduced. So it is not clear that the transfer reduction contributed to the improvement in the health of the fish stocks.

Capacity reducing transfers have been used in the Member States of the European Union, Japan, Australia, Norway, Canada and New Zealand. In many of these cases, payments aimed at reducing fishing effort have had little relationship with changes in resource sustainability. Management arrangements, such as TAC-setting, are the primary means used to deliver resource conservation outcomes. Although effort is made to ensure that transfers policies do not undermine these conservation policies, capacity reducing transfers are usually not intended to deliver resource conservation improvements. Rather, the support was designed to improve profitability of the sector, reduce dependency on the fishery or to meet obligations in international or bilateral arrangements. There may be some evidence, however, that capacity reduction may also reduce the pressure on over fished stocks.

Some adjustment policies have the stated objective of complementing resource conservation policies. The available evidence suggests improvements in fish stocks are possible when accompanying resource conservation policies are set at correct levels and are effectively enforced. In one case presented by Japan (Akita 1992-93) it was acknowledged that vessel reduction programmes (which included vessel buybacks and payments to fishers) required financial transfers so that conservation measures could be implemented in that fishery's co-management context.

B. Sector impacts

Several cases illustrated the link between some direct payments and cost reducing transfers and the growth in fishing capacity in certain situations. These transfers have tended to encourage the build up of new capacity and the infusion of new technology into fishing fleets. There is also evidence of other direct payments that do not appear to have had a direct impact on capacity or catches, due to the constraints of management instruments.

In the 1970s and early 1980s, New Zealand used concessional loans, in conjunction with relatively free access to resources, to develop capacity and catches. This led to over-capacity in the inshore fisheries – even though offshore fisheries were the intended target for development. In the United States, government support played an important role in expanding the capacity and harvest of the domestic fleet in the late 1970s and 1980s.

Some transfers had a role in creating over-capacity in the Norwegian fishing fleet (OECD, 1997*b*). Overcapacity was considered to be a major problem in cod fisheries (cod, haddock and saithe), primarily in the trawler fleet. In the early 1990s it was estimated that the over-capacity in the cod fleet would be 40% if the catch were 300 000 tonnes (in 1997 the catch was actually 312 000 tonnes). With regard to Norway's herring fisheries, in 1992 the capacity of the fleet was reckoned to be too high – even after 15 years of vessel retirement programmes. Capacity in the herring fishery needed to be reduced by 25% if the industry was to generate any form of economic rent at the time. As an overall measure, under 1990 conditions it was estimated that in order to cover capital costs, the capacity of the fleet should be reduced by 56%.

During the 1980s the renewal and modernisation programme of the EU also encouraged the expansion of capacity of the fishing fleet. However, since 1993 the Common Fisheries Policy has included control systems designed to avoid the expansion of capacity in the fishing fleet. Furthermore, in the period 1994-1999 only 20% of EU aid to the fisheries sector was targeted at fleet renewal and modernisation. Community rules seek to prevent negative impacts of these transfers from occurring by requiring that MAGP capacity reduction targets be met before any transfers are provided. In Spain, transfers are acknowledged as having contributed to the build-up in capacity in Galician fisheries in the 1980s, but used with other management instruments (MAGP) have contributed to reduced capacity in the 1990s

(Iglesias-Malvido *et al.*, 1999). According to a study based on a small sample of the French fishing fleet operating in the English channel, overcapitalisation at the end of the 1980s would likely have been less if support had not been made available for the purchase of new vessels (Boncoeur *et al.*, 1999). However other management instruments (MAGP) contributed to a reduction in capacity since the beginning of the 1990s.

There was some evidence of a close relationship between some forms of cost reducing transfers and actual fishing levels in open access regimes. Few case studies provided information on cost reducing transfers. Norway and Australia presented information on favourable tax treatment associated with energy use. Norwegian catches of cod, herring and capelin closely correlate with the value of exemptions from mineral oil tax and refunds of CO_2 taxes.

As would be expected from their programme objectives, some types of direct payments have not had any impact on fishing activity. Some of these are discussed below (*e.g.* the Canadian East Coast adjustment programmes). Price support provided in Norwegian fisheries seemed to have a countercyclical relationship with catches. This was due to the way price support was fixed each year – *i.e.* based on expectations of profitability. If fishers were expecting a good year in terms of sufficient catches then their demand for price support was likely to be relatively lower. However, these transfers were still considered to be sufficiently trade – and therefore production – distorting to result in their phase out under Norway's EFTA commitments.

Some types of direct payments and cost reducing transfers have been successful in removing capacity – measured in traditional terms (*e.g.* vessel numbers) – from fisheries. Transfers targeted at buying out vessels or forms of effort entitlements (*e.g.* licenses) have been used in just about every OECD Member country.

The European Community has reduced capacity in its fishing fleet through decommissioning schemes, which accounted for nearly 25% of the EU aid to the fisheries sector in 1994-1999. Capacity of the EU-12 fleet contracted between 1992 and 1996 (down 10% in total engine power). The capacity reduction targets, which are implemented in the context of the Multi-Annual Guidance programs, are long term objectives and they are developed independently of the annual TAC setting process. Between 1992 and 1996 the catch of these Member States remained at about the same level, thus providing improved economic opportunities for fishers. The catch per vessel was 10% higher in 1996 than in 1992.

The decommissioning scheme applied in the United Kingdom illustrates the possibilities for improved economic performance. Between 1992 and 1998, the fishing capacity of the entire UK fleet has steadily shrunk. Compared with 1992: *i*) the "average vessel" in 1997 was catching 47% more fish; *ii*) each tonne of capacity employed was associated with a catch of 19% more fish; and *iii*) each kilowatt of engine power employed was associated with a catch of 30% more fish. As there were no remarkable improvements in the status of fish stocks harvested by UK fishing vessels during this time period, it can be inferred that the performance of the fleet improved considerably. While interventions have sought to reduce capacity, the remaining and new capacity has been relatively more efficient at catching fish. Another study has noted that, while the scheme was successful in reducing capacity (vessel numbers, tonnage, engine power) it did not achieve significant reductions in effort (Nautilus, 1997).

The results of the decommissioning schemes that were used to reduce capacity in the Netherlands in 1987-1991 also highlight the apparent disconnection between some measures of capacity and actual effort. In most cases the reduction in capacity was offset by increases in days-at-sea or by introducing new, larger vessels into the fishery (Holland *et al.*, 1998).

All four of the cases presented by Japan showed that the vessel reduction programmes resulted in a fall in the number of vessels. In two cases (Akita, 1992-93 and Shimane, 1990-91) these were also associated with reductions in catch and stock recovery (for Akita). In the case of Akita, a vessel reduction programme that included government financial transfers improved the sustainability of the resource. The transfers were required to enable the implementation of resource conservation measures. In two of the cases (Akita, 1986 and Mie 1991) the primary objective of the policies was to improve the economic performance of the fisheries. Economic performance improved in all four cases, even if it involved preventing profits from falling as far as they otherwise might have in the absence of the programme. Other cases

have noted that even when capacity is removed,[5] fishers increase their effort by other means (Hirasawa, 1982), in the context of the open access fishery of the time.

Improving profitability was the objective of the vessel buyback programme in Norway's purse seine fishery. Capacity was reduced although no effect on catches was evident, as quotas continued to be fully utilised (Holland *op. cit.*). The benefits to fishers, in terms of improved performance, appear to be greater than the costs that were incurred by the taxpayer in funding the programme (Hannesson, 1986).

The New Zealand buyout of catch entitlements was effective in reducing the number of vessels in the fleet, but catches from the fishery only fell in the year of the policy. Catches grew strongly in subsequent years, suggesting a spillover effect (discussed below). The Australian northern prawn fishery had its vessel numbers reduced by almost half as a result of various buyback schemes. The policy appears to have had little effect on catches, which have in fact increased since the buyback schemes. Researchers noted at the time that the longevity of any benefits depended on the management systems that were to be applied (ABARE, 1993).

The vessel retirement programme in Denmark does appear to have been associated with a reduction in catches. Reductions in vessel numbers, tonnage and engine power have been of roughly the same magnitude as the fall in catches. However, although the capacity fell it was not to the same extent as the amount removed by the decommissioning schemes. But the programme was accompanied by a restrictive licensing system that prevented the decommissioned tonnage from being replaced by new and more effective capacity. Even though catches did not fall as much as the capacity, the programme was considered a good alternative to the stronger management and control measures which would have otherwise been necessary to keep the fleet within TACs and quotas. Licence buyouts in the Canadian Atlantic and Pacific salmon fisheries also have been associated with declines in catches. However, catches were already declining in the fisheries beforehand. Furthermore, the rate of decline in catches appears to have slowed during and after the buyouts.

The results associated with capacity reduction initiatives suggest they are often effective at reducing measured capacity, although the impact upon catches may be limited. In many cases this is because the transfer policies are not designed to reduce catches. For example, the intention of some capacity reduction programmes is to reduce dependency on the fishery. In other cases, it was to improve the structure and performance of the fleet.

Several cases documented instances of spillover effects where capacity removed from one fishery found its way into another. In some cases this was a stated policy objective, in others it was not.

Fishers leaving the Australia's Southeast trawl fishery under the adjustment package shifted into other fisheries. In the years following its buyback scheme, catches increased considerably. As restrictions had been placed on inshore stocks, the catch increase is likely to have come from deepwater species. The United Kingdom decommissioning scheme resulted in the reinvestment of some GBP 14 million into the fishery sector. Fishers surveyed who had been involved in the scheme commented that it was beneficial in that it "facilitated new investment" (Nautilus, 1997). Decommissioning schemes in the Netherlands resulted in capacity shifting from the groundfish to the shrimp fishery (Holland *et al.*, 1998).

Deliberate policies have been used to shift capacity into other fisheries. The European Community supports the exports of vessels to other countries. The Community also funds a "joint enterprise" scheme where a capital subsidy is paid to vessel owners to relocate their vessel to a third country's waters. The vessel is permanently transferred to the third country. Between 1990 and 1997, ECU 298 million (excluding Member State contributions) was been spent under this scheme by the Community. However, it does not appear to have led to any significant relocation of vessels from Community waters. Most of the vessels removed by joint enterprises (some 90%) were not fishing in Community waters but under EU access agreements negotiated with third countries (EU Court of Auditors, 1998). In Japan, reducing vessels in one fishery involved paying money to shift them to another. Government support was provided to convert vessels from offshore trawlers to tuna longliners in 1963 (Asada, 1985).

Government financial transfers have the potential to ease adjustment for all those involved in the sector. Some direct payments and cost reducing transfers tend to be received by the owners of the

conventional capital – normally vessel owners and owners of the access rights. Even within this select group, the distribution of benefits may not always be equal. In the process of adjustment, the cases demonstrate that vessel owners and owners of access rights are significant beneficiaries. This is not altogether surprising, as it is their assets (fishing vessels) that are the cause of the problem that governments are trying to address. This was the case for all the buyback programmes discussed above for Australia, Canada, New Zealand, Denmark, Netherlands, United Kingdom, Norway and Japan. In the case of Japan, vessel owners' creditors were the significant beneficiaries of the programmes.

Countries have sought to provide for people other that vessel owners affected by the burden of structural adjustment (see Part I of this study). The major adjustment programmes that Canada operates (in the Atlantic groundfish fishery and the Pacific Salmon fishery) on both coasts provide for income maintenance, retraining and early retirement for all direct participants in the sector. The European Community's PESCA initiative aims to facilitate transition in the sector and to provide for retraining and the development of other employment opportunities. Although not related to adjustment, Norway provides special income maintenance for fishers when their fisheries fail. In one fishery, Japan provided transfers to fisheries co-operative associations to offset the effects of declining commissions expected on reduced landed values (which did not materialise).

Although profitability of the sector may improve in the short-run, there is little evidence that direct payments or cost reducing transfers improve the performance or stability the sector in the long run. In the short run many of these transfers were successful in meeting their objectives of improved profitability. The evidence presented indicates that transfers aimed at reducing capacity appear to create space for improved economic performance by the remaining fishers. Appropriate management controls, such as restrictions on entry to the fishery, can contribute to making such gains permanent.

While the government support was designed to ensure profitability in the Norwegian fisheries, by the early 1990s it was evident that this was not being achieved (OECD, 1997*b*). In 1991 it is estimated that all fisheries actually earned insufficient revenue, after deducting other costs, to cover wages. The owners of capital would have absorbed these losses. Since reducing its transfers, there has been improved stability in the sector. The variability of changes in catches, value and value-added have all decreased since 1993.

Some government financial transfers also increase the vulnerability of fishers to the changes in the economic conditions that are faced by the sector. Those vessels most affected by the crisis in the French fishing industry tended to be recently built. These vessels had been bought with the help of bank credits (Ministère de l'Agriculture et de la Pêche, 1995). Until the end of the 1980s, transfers also played a role in financing this building, leading to levels of debt that were difficult to service when prices dropped on the French market in 1990 (Boncœur, *et al.*, 1998). However, other management instruments (MAGP) contributed to a reduction in capacity since the beginning of the 1990s.

There is evidence that some direct payments and cost reducing transfers disconnect fishers from the economic imperatives of the fisheries on which they depend. In Norway the effect of catch declines on fishers was masked by increased support from the government. In 1978-1981 the decline in net value-added was almost completely offset by a NOK 890 million (1990 kroner) increase in government support. The de-linking effect of these transfers was obvious: despite declining net value-added and catches, the number of vessels, fishers and fleet engine power increased.

The Canadian experience also shows that the adjustment decisions of fishers are affected by transfers policies, expectations about the future state of the fishery and the prevalence of other economic opportunities in remote areas. Despite having the objective of adjustment, the large proportion of the funds devoted under these programmes to income maintenance meant that factors of production had an incentive to remain in the fishery (Schrank, 1997). Fishers, lacking up to date information, also believed that the groundfish stocks would rebuild quickly. Furthermore, the fact that factors of production – particularly labour – remained in the fishery may also have been due to the lack of alternative economic development activities.

The cases demonstrate the two ways that investment signals can be dulled. Some direct payments and cost reducing transfers can distort the signals received by economic agents, normally fishers or

prospective fishers. A decision to leave or enter a fishery will be based upon the returns that can be generated by using the available factors of production. If returns to these factors of production are inflated in any way, exit and entry decisions by fishers are distorted in favour of staying in the fishery.

C. Governance impacts

Government financial transfers play an important role in today's fisheries governance. Expenditures on research, management and enforcement give fisheries authorities the ability to govern the use of the resource. Direct payments and cost reducing transfers also provide an additional policy instrument for authorities in governing the fishery sector. Transfers are often used as a supplement to management policies in order to accelerate the achievement of management objectives. Traditionally this has involved encouraging development of fisheries. Although this policy still exists for some fisheries, many transfers are also now used to ease transition pressures.

Direct payments and cost reducing transfers aimed at encouraging the development of a fishery create a legacy of *de facto* rights that can be costly to remove. These rights can be recognised and verified by the capacity buyback programmes used in many OECD countries. In New Zealand the introduction of ITQs and the reduction in catch rights required substantial government expenditures. The industry argued that as the government had created the incentives that lead to the problem (of over-fishing), then the government could pay for the removal of that problem. So the taxpayers not only assisted the development of the fishery, they also assisted its adjustment. A similar situation exists in other countries whereby the costs of buying out capacity are inflated by transfers that have been, and are being, applied. Direct payments and cost reducing transfers that inflate the value of a vessel – *e.g.* by assisting the application of new technology – can also inflate the price of removing that vessel from the fleet in any adjustment scheme.

The existence of excess capacity in a fleet can create pressures for fisheries managers. Faced with sunk capital costs, fishers are likely to seek to ensure returns on this capital are maximised. The above discussion suggests that some transfers, in conjunction with poor management, can contribute to the build-up of capacity in a fishery. Excess capacity is observed to create additional pressures for fisheries managers. Fishers may seek increases, or try to avoid the decreases, in catch limits. For example, the recent announcement of the government-funded renewal of the Irish whitefish fleet prompted industry calls for increased fishing opportunities within the European Community's TAC system. In situations of excess capacity in the fleet, expenditures on fisheries enforcement may have to be expanded to ensure compliance with management decisions. So circumstances may arise where one transfer policy contributes to the build up of capacity which in turn, to prevent negative impacts, requires additional expenditures by government.

In addition to providing a way to lubricate the introduction of new management measures, transfers that aim at reducing capacity often have the objective of reducing some of the pressures on fisheries managers. Paying for the reduction of capacity represents a way of obtaining industry acceptance for change (*e.g.* the New Zealand buyback scheme) as well as creating short-term profitability (*e.g.* two of Japan's vessel reduction programmes). Whatever objective is stated, there is the possibility that an expectation becomes imbedded that governments will provide the funds to support the sector when adjustment is required or when profitability is low (Holland *et al.*, 1999).

V. POLICY IMPLICATIONS AND RECOMMENDATIONS

This section assembles the empirical evidence and theory on the impacts of government financial transfers. In doing so, an attempt is made to derive some conclusions for policy makers. Fisheries managers and other stakeholders still face a number of challenges in ensuring the sustainable use of fish stocks. The correct use of government financial transfers may have a role in bringing that about. Financial transfers in the order of USD 6.3 billion are used to achieve a variety of objectives in OECD Member country fisheries. From the available evidence, the main uses of transfers are: providing fisheries infrastructure, ensuring sustainable use of fish stocks, dealing with fishery adjustment pressures, modernising fleets and acquiring access to fisheries in other countries' waters.

Most government financial transfers fund the provision of general services, of which the largest proportion is spent on fisheries infrastructure, the remainder funding activities that are designed to assure the sustainable use of fish stocks. In some OECD countries expenditure on research, management, enforcement and enhancement represents almost all government financial transfers to the fishery sector. In others, it is as low as one quarter of total transfers. Most research activities represent an investment towards ensuring the sustainable use of fish stocks. If used correctly by fisheries managers, the results from fisheries research can contribute towards improved yields from the resource. Benefits of improved yields accrue to fishers, processors and consumers of seafood. The same applies to expenditures on management and enforcement services, which are also important for sustainable use. Adequate enforcement is important for protecting the resource. The benefits of general services extend beyond fishers to consumers and society as a whole.

OECD countries operate systems of management that control the inputs and outputs from most of their fisheries. At the heart of fisheries management problems lies the absence of well-defined access rights to the fishery (OECD, 1997*a*). The available evidence indicates that the negative impacts of some transfers have been most prevalent in open access fisheries, which are now rare in OECD countries. Management regimes without appropriate output and input controls – which may be the case for some developing, high seas, straddling and migratory fisheries – could be most susceptible to the negative effects of some government transfers. Increases in fishing capacity and activity due to direct payments and cost reducing transfers were documented in some fisheries. As fisheries managers consider issues associated with the access of their fishers to stocks that may not be subject to adequate management controls, the effect of these transfers could be taken into account.

Capacity reducing transfers are used to facilitate fisheries adjustment in many OECD countries. In many cases they are used to provide an injection of profitability into a struggling fishery and in most cases, they are not linked to specific resource conservation outcomes. In other cases they are used to reduce dependence on fisheries or are required to meet obligations in international or bilateral arrangements. For two cases, the reduction in capacity was associated with programmes to restore the productivity of fish stocks and avoiding over-exploitation risks. Some countries have transferred this adjustment risk to fishers – *e.g.* in Iceland and New Zealand.

If transfers are used to bring about adjustment in order to achieve resource conservation objectives, they need to be closely aligned with resource management policies. Hirasawa (1982) notes that restructuring measures only offer a short-term option, and additional measures with a long-term focus are required. Transfers that seek to remove effort should be backed up by adequate adjustments to other management policies if desired effects on resource sustainability are to be achieved.

Coherence between transfers policies may also be important. As the evidence indicates that the capacity leaving the fishery under these programmes tends to be the least efficient, effort expansion is

likely to be applied by more efficient vessels. But some direct payments and cost reducing transfer policies also have the potential to create a tension with capacity reduction initiatives. Renewal and modernisation policies can encourage the infusion of new technologies that markedly increase the productivity of capacity.

Policies aimed at reducing fishing effort in one fishery can lead to spillover effects into other fisheries. In some cases this was the direct policy objective, in others it was an unplanned side effect. If, as is the case in most fisheries in OECD countries, there are controls on inputs and outputs, it can be expected that participants will temporarily benefit from cheaper capital and the fishery will not, to most intents and purposes, be worse off (although economic problems like race-to-fish may intensify). However, if the capacity shifts to a fishery where there is ineffective management then there can be problems. Temporarily solving the capacity problem in one fishery may be at the expense of another fishery.

Policy makers may wish to consider the following matters when employing capacity reducing transfers to achieve resource conservation outcomes:

i) Capacity reducing transfers are likely to be effective when accompanied in management controls that restrain overall effort.

ii) The effects of other policies (*e.g.* those that encourage the diffusion of technology) can offset the impact of capacity reducing transfers.

iii) Care should be taken to ensure that capacity reducing transfers do not intensify problems in other fisheries.

iv) Capacity reducing transfers are likely to be more effective when they are not regular and are announced in a way that gives little opportunity for rent-seeking behaviour.

In most countries capacity-reducing transfers can benefit both those that are leaving the fishery and those that stay. As discussed above, the latter can receive economic rent generation possibilities due to reduced competition for the resource. Those that leave the fishery receive funds for doing so and, in addition, often have the opportunity to move to other fisheries or sectors. Although the rent generation possibilities for those that remain in the fishery may be short-lived, these have the potential to be utilised in funding the capacity reducing transfer. Some countries (*e.g.* Iceland, Japan, Netherlands, and the United States) have already used industry funds to support such programmes. In Iceland, an industry levy funded the removal of capacity from the fishing fleet.

From a policy perspective this approach can have two attractive incentives. First, it will encourage a more rational approach from industry in its demands for adjustment assistance. Second, it enables the government to recoup the windfall gains accruing to fishers while at the same time reducing the burden on taxpayers.

Other government financial transfers are also funded by industry. Canada uses co-management agreements with industry where additional management measures (*e.g.* stock assessment, enforcement and habitat enhancement) are carried out in partnership through voluntary industry contributions. Along with Iceland, New Zealand, Australia, and the United States, Canada also recovers the costs of some general services (*e.g.* management and research expenditures).

Some government financial transfers are important for ensuring that fisheries are used in a sustainable manner (*e.g.* research, management and enforcement expenditures). But transfers that lead to the build-up of capacity may lead to the generation of additional pressures regarding resource management decisions. The available evidence suggests that expectations regarding these transfers can become imbedded and expensive to remove. Policy makers may wish to take into account the costs of some direct payments and cost reducing transfers over the longer term. If these transfers result in the build-up of capacity then later effects may be just as expensive as the initial intervention.

Reform of transfer policies was documented in two cases: Norway and New Zealand. In both cases the reduction or removal of direct payments and cost reducing transfers appears to have been associated with a degree of success in terms of economic performance and resource conservation. The reduction of these forms of transfers in Norway coincided with the resurgence in the health of the cod and herring stocks. The impact of the removal of direct payments and cost reducing transfers is not well documented

in New Zealand. However, the available evidence suggests that economic performance has not been harmed and that fisheries managers have improved flexibility to manage fish stocks. Other countries (*e.g.* Australia, Iceland) have fishery sectors that are functioning, largely unassisted by direct payments and cost reducing transfers, and making contributions to the wider economy.

Some countries consider that reform of their government financial transfers policies, combined with other management measures, has been successful with respect to their resource management objectives. While the reforms reflect the unique characteristics of each situation, they contribute to the possibility of having an economically profitable and biologically sustainable fishery that internalises its own adjustment risks and functions without direct payments and cost reducing transfers.

NOTES

1. Statement on the Study on Economic Aspects of Management of Living Marine Resources, OECD Fisheries Committee, October 1996.
2. While earlier FAO estimates (FAO, 1992) suggested that global subsidies amounted to more than USD 54 billion annually, a more recent estimate shows that "global fisheries sector subsidies are, to use round numbers, USD 15 billion to USD 20 billion, or between 20 to 25% of the value of the world catch" (Milazzo, 1998).
3. The tax deduction is available to all persons working on sea-going vessels. About 95% of those persons receiving the tax deduction are fishers.
4. The combination of relatively free access and financial transfers resulted in an industry overcapitalised by an estimated NZD 60 million (1990 dollars).
5. The cases are *i*) 1951-53 restructuring of fishing effort small-scale trawl fishery in the Seto Inland Sea and *ii*) 1955-60 restructuring of fishing effort in the offshore trawl off Hokkaido and Sanriku.

Annex 1

QUESTIONNAIRES FOR THE STUDY ON THE IMPACT OF GOVERNMENT FINANCIAL TRANSFERS ON FISHERIES RESOURCE SUSTAINABILITY

Questionnaire 1: Government financial transfers

Fishery or sector production value

1. What has been the total sale value of production from the fishery or sector? Please provide information on the total sale value of product from the fishery or sector.

2. What has been the value added in the fishery or sector? Please provide information on the value added in the fishery or sector. Value added is the difference between the sale value of the product from the fishery or sector less the cost of inputs.

Revenue enhancing transfers (from consumers):

Market price support (optional)

3. What revenue enhancing transfers have been provided to the fishery or sector in the form of market price support? Market price support is normally measured as the difference between the world price for a particular fish product and the domestic price for that fish product. In the absence of a suitable reference price, the applied tariff rate may be used as an estimate of market price support. When answering these questions, please provide information to explain how the market price support data is calculated.

4. If revenue enhancing transfers have been provided to the fishery or sector in the form of market price support, what is their monetary value (by transfer type)? For each transfer instrument described in answer to question 3 above, provide the monetary value of the transfer to the fishery or sector.

Revenue enhancing transfers (from government budgets):

Direct payments

For each form of direct payment, please identify the program and the amount of transfers provided to the fishery or sector.

5. What revenue enhancing transfers have been provided to the fishery or sector in the form of direct payments? When answering this question please categorise the transfers used into one of the following four categories.

- *Payments based on the level of production or sales.* Examples: payments for the purchase of fishing quotas, payments to compensate for a reduction in total allowable catches, and deficiency payments.
- *Per-vessel payments.* Examples: direct payments per vessel, and payments for the temporary or permanent withdrawal of vessels or vessel licenses.
- *Income-based direct payments.* Examples: deferred taxation on fishing income, income tax averaging, income supplement schemes, and payments (including tax concessions) based on income.
- *Other direct payments.* Direct payments that do not fall into above categories.

Cost reducing transfers

6. What cost reducing transfers have been provided to the fishery or sector? For each form of cost reducing transfer, please identify the program and the amount of transfers provided to the fishery or sector and categorise the transfers used into one of the following three categories.

- *Transfers related to productive capital*. Examples: capital grants, interest concessions and subsidies, loan guarantees, and special tax treatment for capital used in fisheries (*e.g.* accelerated depreciation).
- *Transfers related to intermediate inputs*. Examples: fuel tax exemptions and rebates, wage subsidies for hired help, bait services, harbour services, insurance subsidies, and interest concessions for operating credit.
- *Other cost reducing transfers*. Cost reducing transfers that do not fall into above categories.

General services

7. What general services have been provided to the fishery or sector? Please provide the monetary values for each of the transfers and categorise into one of the following three categories.

- Fisheries management costs paid by central, regional or local governments.
- Fisheries research costs paid by central, regional or local governments.
- *Other general services*. Those services not covered above.

Questionnaire 2: Fishing capacity and activity

Fishing capacity

1. Please provide information on the capacity that has been employed in the fishery or sector. Examples of useful indicators of fishing capacity are:

- *number of fishing vessels*;
- *number of fishers*;
- *gross registered tonnage*; *and*
- *kilowatts of engine power.*

2. Please provide monetary values for the capital and labour which have been employed in the fishery or sector.

3. Please provide information on fishing capacity in fisheries where capacity may have shifted to as a result of the government financial transfer. Member countries will have to decide which fisheries they should submit information for in answering this question. Information should be provided on capacity in similar fisheries where there may be a transfer of capacity to from the fishery where the government financial transfer has been used.

Fishing activity

4. Please provide information on fishing activity in the fishery. Examples of useful indicators of fishing activity are:

- *harvest levels* (*landings*);
- *season length*;
- *length of average fishing voyage*; *and*
- *other indicators of fishing activity.*

5. Please provide information on fishing activity in fisheries where activity may have shifted to as a result of the government financial transfer. Member countries will have to decide which fisheries they should submit information for in answering this question. Information should be provided on activity in similar fisheries where there may be a transfer of activity to from the fishery where the government financial transfer has been used.

Questionnaire 3: Fish stock status

1. Please provide information on the status of the fish stock. Examples of useful indicators include:

- *the biomass size of fish stock relative to the size that will produce the maximum sustainable yield*; *and*
- *the economic performance of the harvesting sector in the form of catch per unit effort information.*

2. Please provide information on the status of fish stocks identified as likely to be affected in answers to the "Questionnaire on Fishing Activity and Capacity", questions 3 and 5. Please provide information on fish stock status for fisheries that Member countries have identified as indirectly affected by the government financial transfer.

Annex 2

GOVERNMENT FINANCIAL TRANSFERS TO MARINE CAPTURE FISHERIES IN OECD COUNTRIES: COUNTRY TABLES

Australia
(AUD million)

Type of transfer	1996	1997
TOTAL[1]	**20.36**	**31.76**
Direct payments	**0.00**	**6.70**
Support for permanent withdrawal[2]	0.00	4.40
Support to compensate for losses[3]	0.00	2.30
Cost reducing transfers	**9.96**	**9.96**
Fuel Tax Exemption	9.96	9.96[4]
General services	**37.90**	**39.00**
Market Intervention	0.00	0.00
Management Costs[5]	21.30	26.20
Research Costs[6]	16.60	12.80
Cost recovery charges	**–27.50**	**–23.90**
Management costs	–13.00	–13.10
Research costs	–14.50	–10.80

1. Transfers only relate to Commonwealth fisheries.
2. Adjustment in the South-East Fishery: buyout of fishing permits.
3. Adjustment in the South-East Fishery: compensation to fishers who suffered financial losses due to the introduction of ITQs.
4. 1996 figure.
5. Funds provided for Fisheries Management – funding for fisheries management provided to the Australian Fisheries Management Authority (AUD 19.1 million in 1996-97) and the Department of Primary Industries and Energy (AUD 2.2 million in 1996-97). Includes enforcement expenditure.
6. Funds for Fisheries Research and Development (AUD 14.5 million in 1996-97) and for Fisheries Resources Research (AUD 2.1 million in 1996-97).

Sources: OECD (2000*a*) and OECD (2000*d*)

Belgium
(BEF million)

Type of transfer	1996		1997	
	National	EU	National	EU
TOTAL	**91.66**	**66.69**	**115.54**	**60.11**
Direct payments	**0.00**	**0.00**	**0.00**	**0.00**
Cost reducing transfers	**43.63**	**52.36**	**54.09**	**52.36**
Fixed salaries for apprentices	3.86[1]	0.00	2.85[1]	0.00
Grants and subsidised loans for new vessel construction	29.83[1]	52.36[2]	45.49[1]	52.36[2]
Subsidies for the modernisation of vessels	9.72[1]	(3)	5.57[1]	(3)
Book-keeping premiums	0.22[1]	0.00	0.18[1]	0.00
General services	**48.03**	**14.34**	**61.45**	**7.76**
Market intervention	0.00	5.47	0.00	2.97
Regional development grants	0.95[1]	0.00	0.00	0.00
Support for the Nautical Centre	n.a.	0.00	7.00[1]	0.00
Management expenditure	n.a.	0.00	n.a.	0.00
Enforcement expenditure	4.51	2.02[5]	12.50	2.02[5]
Research expenditure	40.53[4]	0.00	40.53[6]	0.00
Fishing Port Facilities	0.82	5.16	0.20	1.08
Unclassified Support	1.22[7]	1.69[8]	1.22[7]	1.69[8]

n.a. Information not available
1. *Source*: OECD (2000*a*)
2. Average of FIFG expenditure for 1994 to 1999 under "Renewal and Modernisation of the fishing fleet". OECD (2000*d*)
3. Included in new vessel construction figure.
4. 1997 figure.
5. Refunds from the EU for enforcement expenditure – average for the period 1991-1995. OECD (2000*d*)
6. *Source*: OECD (2000*d*)
7. Average of national aid for 1994-1999 under "Other". *Source*: OECD (2000*d*).
8. Average of FIFG expenditure for 1994-1999 under "Other". *Source*: OECD (2000*d*).

Sources: OECD (2000*a*) and OECD (2000*d*)

Canada
(CAD million)

Type of transfer	1996	1997
TOTAL	**693.87**	**552.80**
Direct payments	**462.80**	**343.70**
Licence retirement in the Atlantic Groundfishery	30.70	0.00
Licence retirement in the Pacific Salmon Fishery	78.50	0.00
Licence retirement in the Atlantic Salmon Fishery	0.00	0.40
Income Support[1]	127.30	97.90
Fishers unemployment insurance[2]	193.30	231.40
Vessel compensation	0.00	5.70
Older workers adjustment programs	10.70	6.20
Active participation measures	22.30	2.10
Cost reducing transfers	**23.18**	**24.60**
Bait services[3]	1.30	0.00
Loan guarantees[4]	7.34	12.00
Vessel insurance plan	1.24	0.00
Contributions[5]	13.30	12.60
General services	**255.63**	**234.00**
Market intervention	0.00	0.00
Fisheries research	66.70	55.70
Fisheries management	141.50	130.40
Harbour facilities	47.43	47.90
User charges[6]	**–47.74**	**–49.50**

1. Income support provided to displaced fishers.
2. Special income support provided to self-employed fishers and wage earning fishers.
3. Government costs of administering the Newfoundland bait service.
4. Loans provided by private lenders and guaranteed by the government under the Small Business Loans Act.
5. Federal regional assistance – includes some matching expenditure but most is repaid to the government.
6. Charges paid by fishery licence-holders.

Sources: OECD (2000*a*) and OECD (2000*d*)

Denmark
(DKK million)

Type of transfer	1996		1997	
	National	EU	National	EU
TOTAL	**371.76**	**125.00**	**388.97**	**152.43**
Direct payments	**35.80**	**35.20**	**41.60**	**91.10**
Grants for permanent cessation[1]	35.10	35.20	26.10	26.10
Grants for renewal of the fishing fleet[1]	0.00	0.00	3.50	12.30
Grants for modernisation of the fishing fleet[1]	0.00	0.00	10.50	52.60
Grants for retirement of fishers[1]	0.70	0.00	1.50	0.10
Cost reducing transfers	**0.00**	**0.00**	**0.00**	**2.00**
Low cost loans to young fishers[1]	0.00	0.00	0.00	2.00
General services	**335.96**	**89.80**	**347.37**	**59.33**
Market Intervention[2]	0.00	61.82	0.00	25.44
Aid for consultants	2.40[4]	0.00	2.40[3]	0.00
PESCA grants[1]	0.30	2.70	11.70	8.60
Protection of marine areas	1.90[5]	3.49[6]	1.90[5]	3.49[6]
Fishing port facilities	6.64[7]	12.22[8]	6.64[7]	12.22[8]
Management expenditure	46.90[4]	0.00	46.90[3]	0.00
Enforcement expenditure	89.60[4]	4.83[9]	89.60[3]	4.83[9]
Research expenditure	179.50[4]	0.00	179.50[3]	0.00
Unclassified transfers	8.73[10]	4.74[11]	8.73[10]	4.74[11]

1. *Source*: WTO Subsidy Notification figure.
2. EU market intervention scheme. *Source*: OECD (2000*d*).
3. *Source*: OECD (2000*d*).
4. 1997 figure.
5. Average of national aid for 1994-1999 under "Protected Marine Areas". *Source*: OECD (2000*d*).
6. Average of FIFG expenditure for 1994-1999 under "Protected Marine Areas". *Source*: OECD (2000*d*).
7. Average of national aid for 1994-1999 under "Fishing Port Facilities". *Source*: OECD (2000*d*).
8. Average of FIFG expenditure for 1994-1999 under "Fishing Port Facilities". *Source*: OECD (2000*d*).
9. Refunds from the EU for enforcement expenditure – average for the period 1991-1995. *Source*: OECD (2000*d*).
10. Average of national aid for 1994-1999 under "Other". *Source*: OECD (2000*d*).
11. Average of FIFG expenditure for 1994-1999 under "Other". *Source*: OECD (2000*d*).

Sources: OECD (2000*d*) and notifications under the WTO Agreement on Subsidies and Countervailing Measures.

Finland
(FIM million)

Type of transfer	1996		1997	
	National	EU	National	EU
TOTAL	**125.64**	**10.50**	**126.58**	**10.50**
Direct payments	**9.10**	**6.87**	**9.27**	**6.87**
Payments for the permanent decommissioning of fishing vessels	3.14[1]	4.23[2]	3.14[1]	4.23[2]
Payments for renewal and modernisation of the fleet	1.96[3]	2.64[4]	1.96[3]	2.64[4]
Compensation for introducing closed seasons in the salmon fishery	3.80[5]	0.00	4.00[6]	0.00
Compensation for damage from seals[7]	0.20	0.00	0.18	0.00
Cost reducing transfers	**9.98**	**0.00**	**10.75**	**0.00**
Interest rebates[8]	0.08	0.00	0.02	0.00
Insurance[9]	6.30	0.00	7.63	0.00
Transport subsidies[5]	3.60	0.00	3.10	0.00
General services	**106.56**	**3.62**	**106.56**	**3.62**
Market intervention[10]	0.00	0.00	0.00	0.00
Fishing port facilities	0.98[11]	1.32[12]	0.98[11]	1.32[12]
Research expenditure	75.00[13]	0.00	75.00[6]	0.00
Management expenditure	20.70[13]	0.00	20.70[6]	0.00
Enforcement expenditure	9.00[13]	0.33[14]	9.00[6]	0.33[14]
Protection of marine areas	0.59[15]	0.79[16]	0.59[15]	0.79[16]
Unclassified transfers	0.26[17]	1.18[18]	0.26[17]	1.18[18]

1. Average of national aid for 1994-1999 under "Adjustment of Fishing Effort". *Source*: OECD (2000*d*).
2. Average of FIFG expenditure for 1994-1999 under "Adjustment of Fishing Effort". *Source*: OECD (2000*d*).
3. Average of national aid for 1994-1999 under "Renewal and Modernisation of the Fleet". *Source*: OECD (2000*d*).
4. Average of FIFG expenditure for 1994-1999 under "Renewal and Modernisation of the Fleet". *Source*: OECD (2000*d*).
5. Source: OECD (2000*a*).
6. Source: OECD (2000*d*).
7. Compensation to Aland County salmon fishers for damage to the fishery caused by seals. *Source*: OECD (2000*a*).
8. This scheme was ended in 1995. Payments refer to the Governments remaining commitments on outstanding loans. *Source*: OECD (2000*a*).
9. Government's indemnification, and additional subsidies to the Aland County scheme. *Source*: OECD (2000*a*).
10. EU market intervention scheme. *Source* OECD (2000*d*).
11. Average of national aid under "Fishing Port Facilities" for 1994-1999. *Source*: OECD (2000*d*).
12. Average of FIFG Expenditure under "Fishing Port Facilities" for 1994-1999. *Source*: OECD (2000*d*).
13. 1997 figure.
14. Refunds from the EU for enforcement expenditure – average for the period 1991-1995. *Source*: OECD (2000*d*).
15. Average of national aid for 1994-1999 under "Protected Marine Areas". *Source*: OECD (2000*d*).
16. Average of FIFG expenditure for 1994-1999 under "Protected Marine Areas". *Source*: OECD (2000*d*).
17. Average of national aid for 1994-1999 under "Other". *Source*: OECD (2000*d*).
18. Average of FIFG expenditure for 1994-1999 under "Other". *Source*: OECD (2000*d*).

Sources: OECD (2000*a*) and OECD (2000*d*).

France
(FRF million)

Type of transfer	1996		1997	
	National	EU	National	EU
TOTAL	**630.81**	**187.62**	**630.81**	**181.59**
Direct payments	**69.55**	**60.31**	**69.55**	**60.31**
Temporary stop[1]	23.00[2]	0.00	23.00	0.00
Adjustment of fishing effort	13.58[3]	17.59[4]	13.58[3]	17.59[4]
Renewal and modernisation of the fleet	32.97[5]	42.72[6]	32.97[5]	42.72[6]
Cost reducing transfers	**79.00**	**0.00**	**79.00**	**0.00**
Interest rebates	79.00[2]	0.00	79.00	0.00
General services	**482.26**	**127.32**	**482.26**	**121.29**
Market intervention[7]	0.00	42.40	0.00	36.37
Fisheries research	347.99[2]	0.00	347.99[8]	0.00
Management and enforcement	74.13[2]	7.02[9]	74.13[8]	7.02[9]
Fishing port facilities	15.52[10]	20.10[11]	15.52[10]	20.10[11]
Unclassified transfers	44.61[12]	57.79[13]	44.61[12]	57.79[13]

1. Allowances for partial employment.
2. 1997 figure.
3. Average of national expenditure for 1994-1999 under "Adjustment of Fishing Effort". *Source*: OECD (2000*d*).
4. Average of FIFG expenditure for 1994-1999 under "Adjustment of Fishing Effort". *Source*: OECD (2000*d*).
5. Average of national aid for 1994-1999 under "Renewal and Modernisation of the Fleet *Source*: OECD (2000*d*).
6. Average of FIFG expenditure for 1994-1999 under "Renewal and Modernisation of the Fleet". *Source*: OECD (2000*d*).
7. EU market intervention scheme. *Source*: OECD (2000*d*).
8. *Source*: OECD (2000*d*)
9. Refunds from the EU for enforcement expenditure – average for the period 1991-1995. *Source*: OECD (2000*d*).
10. Average of national aid under "Fishing Port Facilities" for 1994-1999. *Source*: OECD (2000*d*).
11. Average of FIFG Expenditure under "Fishing Port Facilities" for 1994-1999. *Source*: OECD (2000*d*).
12. Average of national aid for 1994-1999 under "Other". *Source*: OECD (2000*d*).
13. Average of FIFG expenditure for 1994-1999 under "Other". *Source*: OECD (2000*d*).

Source: OECD (2000*d*).

Germany
(DEM million)

Type of transfer	1996		1997	
	National	EU	National	EU
TOTAL	**102.86**	**23.17**	**96.70**	**12.10**
Direct payments	**16.10**	**13.10**	**11.00**	**2.60**
Payments for the temporary withdrawal of fishing vessels[1]	10.50	0.00	7.00	0.00
Payments for the permanent withdrawal of fishing vessels[1]	1.00	0.60	1.90	1.10
Grants for purchase of new fishing vessels[1]	2.40	1.70	0.10	0.00
Grants for purchase of second hand cutters[1]	0.50	0.00	0.60	0.00
Grants for modernisation of fishing vessels[1]	1.70	10.80	1.40	1.50
Cost reducing transfers	**5.70**	**0.00**	**4.64**	**0.00**
Loans to cutter fisheries[1]	4.60	0.00	3.84	0.00
Support to reduce the costs of capital (interest subsidies)[1]	1.10	0.00	0.80	0.00
General services	**81.06**	**10.07**	**81.06**	**9.50**
Market intervention[2]	0.00	0.57	0.00	0.00
Research	33.50[3]	0.00	33.50[4]	0.00
Management	8.00[3]	0.00	8.00[4]	0.00
Enforcement	36.00[3]	0.71[5]	36.00[4]	0.71[5]
Fishing port facilities	2.93[6]	7.24[7]	2.93[6]	7.24[7]
Protection of marine areas	0.21[8]	0.52[9]	0.21[8]	0.52[9]
Unclassified transfers	0.42[10]	1.03[11]	0.42[10]	1.03[11]

1. *Source*: OECD (2000*a*).
2. EU market intervention scheme. *Source*: OECD (2000*d*).
3. 1997 figure.
4. *Source*: OECD (2000*d*).
5. Refunds from the EU for enforcement expenditure – average for the period 1991-1995. *Source*: OECD (2000*d*).
6. Average of national aid for 1994-1999 under "Fishing Port Facilities". *Source*: OECD (2000*d*).
7. Average of FIFG expenditure for 1994-1999 under "Fishing Port Facilities". *Source*: OECD (2000*d*).
8. Average of national aid for 1994-1999 under "Protected Marine Areas". *Source*: OECD (2000*d*).
9. Average of FIFG expenditure for 1994-1999 under "Protected Marine Areas". *Source*: OECD (2000*d*).
10. Average of national aid for 1994-1999 under "Other". *Source*: OECD (2000*d*).
11. Average of FIFG expenditure for 1994-1999 under "Other". *Source*: OECD (2000*d*).

Sources: OECD (2000*a*) and OECD (2000*d*).

Greece
(GRD million)

Type of transfer	1996		1997	
	National	EU	National	EU
TOTAL	**10526.90**	**3247.32**	**10526.90**	**3247.32**
Direct payments	**946.63**	**2412.97**	**946.63**	**2412.97**
Grants for adjustment of fishing effort	657.38[1]	1675.67[2]	657.38[1]	1675.67[2]
Grants for renewal and modernisation of the fleet	289.25[3]	737.30[4]	289.25[3]	737.30[4]
Cost reducing transfers	**0.00**	**0.00**	**0.00**	**0.00**
General services	**9580.27**	**834.35**	**9580.27**	**834.35**
Market intervention[5]	0.00	0.00	0.00	0.00
Management expenditure	1212.67[6]	0.00	1212.67[7]	0.00
Enforcement expenditure	6417.12[6]	365.16[8]	6417.12[7]	365.16[8]
Research expenditure	1766.42[6]	0.00	1766.42[7]	0.00
Protection of marine areas	26.30[9]	67.03[10]	26.30[9]	67.03[10]
Fishing port facilities	105.18[11]	268.11[12]	105.18[11]	268.11[12]
Unclassified transfers	52.59[13]	134.05[14]	52.59[13]	134.05[14]

1. Average of national aid for 1994-1999 under "Adjustment of Fishing Effort". *Source*: OECD (2000*d*).
2. Average of FIFG expenditure for 1994-1999 under "Adjustment of Fishing Effort". *Source*: OECD (2000*d*).
3. Average of national aid for 1994-1999 under "Renewal and Modernisation of the Fleet". *Source*: OECD (2000*d*).
4. Average of FIFG expenditure for 1994-1999 under "Renewal and Modernisation of the Fleet". *Source*: OECD (2000*d*).
5. EU market intervention scheme. *Source*: OECD (2000*d*).
6. 1997 figure.
7. *Source*: OECD (2000*d*).
8. Refunds from the EU for enforcement expenditure – average for the period 1991-1995. *Source*: OECD (2000*d*).
9. Average of national aid for 1994-1999 under "Protected Marine Areas". *Source*: OECD (2000*d*).
10. Average of FIFG expenditure for 1994-1999 under "Protected Marine Areas". *Source*: OECD (2000*d*).
11. Average of national aid for 1994-1999 under "Fishing Port Facilities". *Source*: OECD (2000*d*).
12. Average of FIFG expenditure for 1994-1999 under "Fishing Port Facilities". *Source*: OECD (2000*d*).
13. Average of national aid for 1994-1999 under "Other". *Source*: OECD (2000*d*).
14. Average of FIFG expenditure for 1994-1999 under "Other". *Source*: OECD (2000*d*).

Source: OECD (2000*d*).

Iceland
(ISK million)

Type of transfer	1996	1997
TOTAL	**2757.30**	**2563.30**
Direct Payments	**0.00**	**0.00**
Cost reducing transfers	**1466.00**	**1274.00**
Income tax deduction for fishers	1466.00	1274.00
General services	**1453.10**	**1461.30**
Market intervention	0.00	0.00
Management costs (Directorate of Fisheries)	277.00	254.60
Coast guard	559.10	536.30
Fisheries research costs (Marine Research Institute)	617.00	670.40
Management cost recovery	**–161.80**	**–172.00**

Source: Ministry of Fisheries, Iceland.

Ireland
(IEP million)

Type of transfer	1996		1997	
	National	EU	National	EU
TOTAL	**61.41**	**8.69**	**61.19**	**7.34**
Direct payments	**1.14**	**2.17**	**0.91**	**2.17**
Small fisheries	0.27[1]	0.00	0.27[2]	0.00
Decommissioning	0.21[3]	0.70[4]	0.21[3]	4
Direct Aid[5]	0.22	0.00	0.00	0.00
Renewal and modernisation	0.44[6]	1.46[7]	0.44[6]	1.46[7]
Cost-reducing Transfers	**1.79**	**0.00**	**1.80**	**0.00**
Fuel tax exemptions[8]	1.79	0.00	1.80	0.00
General services	**58.48**	**6.53**	**58.48**	**5.17**
Market intervention[10]	0.00	2.26	0.00	1.05
Research expenditure	6.36[1]	0.00	6.36[2]	0.00
Enforcement expenditure	50.00[1]	3.95[10]	50.00[2]	3.95[10]
Management expenditure	0.51[1]	0.00	0.51[2]	0.00
Grants for fishing port development	1.56[1]	0.00	1.56[2]	0.00
Unclassified Transfers	0.05[11]	0.18[12]	0.05[11]	0.18[12]

1. 1997 figure.
2. *Source*: OECD (2000*d*).
3. Average of national aid for 1994-1999 under "Adjustment of Fishing Effort". *Source*: OECD (2000*d*).
4. Average of FIFG expenditure for 1994-1999 under "Adjustment of Fishing Effort". *Source*: OECD (2000*d*).
5. *Source*: OECD (2000*a*).
6. Average of national aid for 1994-1999 under "Renewal and Modernisation of the Fleet". *Source*: OECD (2000*d*).
7. Average of FIFG expenditure for 1994-1999 under "Renewal and Modernisation of the Fleet". *Source*: OECD (2000*d*).
8. WTO notification figure.
9. EU market intervention scheme. *Source*: OECD (2000*d*).
10. Refunds from the EU for enforcement expenditure – average for the period 1991-1995. *Source*: OECD (2000*d*).
11. Average of national aid for 1994-1999 under "Other". *Source*: OECD (2000*d*).
12. Average of FIFG expenditure for 1994-1999 under "Other". *Source*: OECD (2000*d*).

Sources: OECD (2000*a*), OECD (2000*d*) and notifications under the WTO Agreement on Subsidies and Countervailing Measures.

Italy
(ITL billion)

Type of transfer	1996		1997	
	National	EU	National	EU
TOTAL	**146.39**	**102.37**	**114.04**	**42.40**
Direct payments	**89.00**	**66.42**	**17.30**	**22.90**
Vessel decommissioning payments	6.16	13.48	6.80	7.50
Permanent and temporary joint ventures	14.91	27.29	7.10	7.60
Renewal of vessels	2.62	11.96	1.60	7.80
Modernisation of vessels	4.44	13.69	0.00[1]	0.00[1]
Support for small fisheries	0.77[2]	0.00	1.65	0.00
Support for temporary withdrawal of vessels[4]	60.10[3]	0.00	0.15[3]	0.00
Cost-reducing transfers	**7.40**	**0.00**	**7.80**	**0.00**
Grants for renewal and modernisation of vessels	5.60	0.00	5.80	0.00
Interest rebates	1.80	0.00	2.00	0.00
General services	**49.99**	**35.95**	**88.94**	**19.50**
Market Intervention	0.00	0.00	0.00	0.00
Management expenditure (personnel, goods and services)	5.14	0.00	5.36	0.00
Enforcement expenditure enforcement and navigation security	5.44	5.44	3.70	14.60
Provisions for Law no.72/92[1]	4.00	0.00	3.90[5]	0.00
Provisions for Law no.72/92[2]	0.00	0.00	60.00	0.00
Enforcement protected marine areas	0.00	0.00	0.40	0.40
Research expenditure	0.54	0.00	8.58	0.00
Fishing port facilities	5.52	5.70	1.10	2.60
Support for information collection data expenditure	5.73	5.73	1.50	1.90
Support to establish and improve producer organisations[6]	22.68	19.08	3.70	0.00
Support to fishermen professional formation	0.94	0.00	0.70	0.00

1. Support for modernisation of vessels during 1997 was subordinated to naval security enforcement rules. The 1997 amounts for modernisation are included in item "enforcement expenditure".
2. Grants to small fisheries during 1996 relate to small-scale fisheries in Sardinia. Grants to mollusc fisheries were not allocated for 1996 and 1997.
3. Includes regional support for temporary withdrawal of vessels in Sicily (ITL 0.1 billion in 1996 and ITL 0.15 billion in 1997)
4. Grants for temporary withdrawal of vessels were eliminated from 1997.
5. Of which ITL 1.7 billion for mollusc co-operative consortiums.
6. Includes support to improve co-operative management, of which national contribution of ITL 3.6 billion in 1996 and ITL 3.7 billion in 1997.

Sources: Italian Ministry of Agricultural and Forestry Policy – Report of Annual Activities Accounting and Italian Ministry of treasure – Annual Report Accounting and National Institute for Economics Agriculture (INEA) and IREPA databases.

Japan
(JPY billion)

Type of transfer	1996	1997
TOTAL	**346.74**	**356.44**
Direct payments	**3.00**	**3.00**
Payments for fleet reduction[1]	3.00	3.00
Cost reducing transfers	**2.94**	**2.64**
Re-insurance for damage of fishing vessels and mutual-aid insurance for fisheries disasters	0.14[2]	0.14[3]
Support for introduction of new vessel and gear (support for improvement of the functioning of production, distribution, processing and marketing)	2.80	2.50
General services	**340.80**	**350.80**
Market intervention	0.00	0.00
Reduction in interest costs for fisheries co-operatives	2.80[1]	2.80[3]
Resource and management costs[4]	29.00	62.00
Support for fisheries facilities and infrastructure, enhancement of fishery communities environment[5]	283.00	262.00
Research and development of new fishery technologies[1]	10.00	10.00
Research on deep-sea fisheries resources and the promotion of international fisheries co-operation[1]	16.00	14.00

1. *Source*: OECD (2000*a*).
2. WTO notification figure.
3. 1996 figure.
4. *Source*: OECD (2000*a*). Includes support for strengthening community-based fisheries management, surveillance and enforcement, support for the improvement of national and prefectural fish farming centres/development and release of seedlings.
5. *Source*: OECD (2000*a*). Includes support for construction of fishing ports, artificial reefs and aquaculture.

Sources: OECD (2000*a*) and notifications under the WTO Agreement on Subsidies and Countervailing Measures.

Korea
(KRW billion)

Type of transfer	1996	1997
TOTAL	**295.87**	**325.09**
Direct payments	**16.25**	**28.43**
Support for decreasing the number of fishing vessels	16.25	28.43
Cost reducing transfers	**51.90**	**55.88**
Support for crew insurance	1.84	2.91
Tax exemption for deep-sea vessels	0.52	0.44
Support for development of the deep-sea fishery	4.70	9.02
Support to reduce interest costs	26.35	30.11
Other cost-reducing transfers	18.49	13.39
General services	**227.71**	**240.79**
Market intervention	25.24	15.79
Support to improve fishing ports and promote fishing villages	141.00	156.00
Support to enhance fishery resources	55.19	62.95
Fisheries research and development	6.28	4.848
Support for improving management of co-operatives	0.00	1.20
Management costs	n.a.	n.a.
Enforcement costs	n.a.	n.a.

n.a. Information not available.
Source: OECD (2000*a*).

Mexico
(MXN million)

Type of transfer	1996	1997
TOTAL	**107.93**	**133.12**
Direct payments	**0.00**	**0.00**
Cost reducing transfers	**0.00**	**0.00**
General services	**107.93**	**133.12**
Market intervention	0.00	0.00
Research expenditure	80.57	85.58
Management expenditure	25.08	42.79
Enforcement expenditure	2.28	4.75

Source: OECD (2000*a*).

Netherlands
(NLG million)

Type of transfer	1996		1997	
	National	EU	National	EU
TOTAL	**56.92**	**12.60**	**56.92**	**12.60**
Direct payments	**3.48**	**4.26**	**3.48**	**4.26**
Grants for adjustment of fishing effort	2.82[1]	3.45[2]	2.82[1]	3.45[2]
Grants for renewal and modernisation of the fleet	0.66[3]	0.81[4]	0.66[3]	0.81[4]
Cost reducing transfers	**0.00**	**0.00**	**0.00**	**0.00**
General services	**53.43**	**8.34**	**53.43**	**8.35**
Market intervention[5]	0.00	0.21	0.00	0.22
Management expenditure	5.30[6]	0.00	5.30[7]	0.00
Enforcement expenditure	10.00[6]	0.63[8]	10.00[7]	0.63[8]
Research expenditure	32.00[6]	0.00	32.00[7]	0.00
Fishing port facilities	6.13[9]	7.50[10]	6.13[9]	7.5[10]

1. Average of national aid for 1994-1999 under "Adjustment of Fishing Effort". *Source*: OECD (2000*d*).
2. Average of FIFG expenditure for 1994-1999 under "Adjustment of Fishing Effort". *Source*: OECD (2000*d*).
3. Average of national aid for 1994-1999 under "Renewal and Modernisation of the Fleet". *Source*: OECD (2000*d*).
4. Average of FIFG expenditure for 1994-1999 under "Renewal and Modernisation of the Fleet". *Source*: OECD (2000*d*).
5. EU market intervention scheme. *Source*: OECD (2000*d*)
6. 1997 figure.
7. *Source*: OECD (2000*d*).
8. Refunds from the EU for enforcement expenditure – average for the period 1991-1995. *Source*: OECD (2000*d*).
9. Average of national aid for 1994-1999 under "Fishing Port Facilities". *Source*: OECD (2000*d*).
10. Average of FIFG expenditure for 1994-1999 under "Fishing Port Facilities". *Source*: OECD (2000*d*).

Source: OECD (2000*d*).

New Zealand
(NZD million)

Type of transfer	1996	1997
TOTAL	**22.00**	**26.00**
Direct payments	**0.00**	**0.00**
Cost reducing transfers	**0.00**	**0.00**
General services	**54.00**	**61.00**
Market intervention	0.00	0.00
Administration	2.00	3.00
Fisheries policy advice	7.00	11.00
Enforcement of fisheries policy	14.00	17.00
Prosecution of offences	2.00	3.00
Fisheries services	10.00	9.00
Fisheries research	19.00	18.00
Cost recovery levies	**–32.00**	**–35.00**

Source: OECD (2000*a*).

Norway
(NOK million)

Type of transfer	1996	1997
TOTAL	**1 115.60**	**1 155.50**
Direct payments	**37.90**	**22.70**
Price support	7.10[1]	0.90[2]
Decommissioning	1.80	1.80
Income guarantee compensation, vacation support, unemployment insurance	25.00	20.00
Grants for vessel building[3]	4.00	0.00
Cost Reducing Transfers	**383.80**	**438.90**
Interest subsidies and support for the building of vessels[4]	87.00	102.00
Reduction in transport costs[5]	28.80	35.50
Tax refunds and exemptions	241.00	241.00[6]
Support to improve efficiency[7]	12.90	12.90[6]
Other cost reducing support[8]	14.10	47.50
General Services	**693.90**	**693.90**
Ministry of Fisheries	21.10[9]	21.10
Membership of international organisations	3.50[9]	3.50
Institute of Marine Research	95.40[9]	95.40
Operations of research vessels	71.00[9]	71.00
Directorate of Fisheries	95.30[9]	95.30
Coast Guard	407.60[9]	407.60

1. Price support for the crab, coastal prawn, coastal sprat, fjord herring and coastal mackerel fisheries.
2. Price support for the crab and coastal sprat fisheries.
3. Grants for the purchase and building of vessels in Finnmark.
4. Transfers through the National Fishery Bank, in the form of interest rate subsidies and construction loan subsidies, to support the modernisation of the fleet.
5. Support to reduce transport costs to facilitate fisheries activities in certain regions.
6. 1996 figure.
7. Support to improve fleet efficiency, for market support, for energy conservation measures and for joint venture companies in the coastal fleet.
8. Support provided for, *i.a.*, centres for baiting of long lines, for sealing for measures to improve safety on board vessels.
9. 1997 figure.

Source: OECD (2000*d*).

Poland
(PLN million)

	1996	1997
TOTAL	**22.00**	**26.00**
Direct payments	**0.00**	**0.00**
Cost reducing transfers	**0.00**	**0.00**
General services	**22.00**	**26.00**
Market intervention	0.00	0.00
Research costs[1]	8.00	10.00
Management costs	14.00	16.00

1. Estimate.

Source: OECD (2000*a*).

Portugal
(PTE million)

Type of transfer	1996		1997	
	National	EU	National	EU
TOTAL	**5 546.38**	**5 832.71**	**5 546.38**	**5 943.83**
Direct payments	**1 700.38**	**3 877.45**	**1 700.38**	**3 877.45**
Grants for adjustment of fishing effort	930.72[1]	2 678.97[2]	930.72[1]	2 678.97[2]
Grants for renewal and modernisation of the fleet	416.37[3]	1 198.48[4]	416.37[3]	1 198.48[4]
Regional aid	64.54[5]	0.00	64.54[6]	0.00
Aid for small fisheries	288.75[5]	0.00	288.75[6]	0.00
Cost reducing transfers	**0.00**	**0.00**	**0.00**	**0.00**
General services	**3 845.99**	**1 955.26**	**3 845.99**	**2 057.38**
Market intervention	0.00	195.76[7]	0.00	297.88[7]
Management expenditure	1 570.24[5]	0.00	1 570.24[6]	0.00
Enforcement expenditure	392.61[5]	761.51[8]	392.61[6]	772.51[8]
Research expenditure	1 540.25[5]	0.00	1 540.25[6]	0.00
Protection of marine areas	24.49[9]	70.50[10]	24.49[9]	70.50[10]
Fishing port facilities	2 93.91[11]	845.99[12]	293.91[11]	845.99[12]
Unclassified transfers	24.49[13]	70.50[14]	24.49[13]	70.50[14]

1. Average of national aid for 1994-1999 under "Adjustment of Fishing Effort". *Source*: OECD (2000*d*).
2. Average of FIFG expenditure for 1994-1999 under "Adjustment of Fishing Effort". *Source*: OECD (2000*d*).
3. Average of national aid for 1994-1999 under "Renewal and Modernisation of the Fleet". *Source*: OECD (2000*d*).
4. Average of FIFG expenditure for 1994-1999 under "Renewal and Modernisation of the Fleet". *Source*: OECD (2000*d*).
5. 1997 figure.
6. *Source*: OECD (2000*d*).
7. EU market intervention scheme. *Source*: OECD (2000*d*).
8. Refunds from the EU for enforcement expenditure – average for the period 1991-1995. *Source*: OECD (2000*d*).
9. Average of national aid for 1994-1999 under "Protected Marine Areas". *Source*: OECD (2000*d*).
10. Average of FIFG expenditure for 1994-1999 under "Protected Marine Areas". *Source*: OECD (2000*d*).
11. Average of national aid for 1994-1999 under "Fishing Port Facilities". *Source*: OECD (2000*d*).
12. Average of FIFG expenditure for 1994-1999 under "Fishing Port Facilities". *Source*: OECD (2000*d*).
13. Average of national aid for 1994-1999 under "Other". *Source*: OECD (2000*d*).
14. Average of FIFG expenditure for 1994-1999 under "Other". *Source*: OECD (2000*d*).

Source: OECD (2000*d*).

Spain
(ESP million)

Type of transfer	1996		1997	
	National	EU	National	EU
TOTAL	**13 134.26**	**19 263.57**	**18 022.92**	**32 445.96**
Direct payments	**7 388.18**	**14 429.92**	**10 428.22**	**19 520.49**
Temporary payments to vessel owners[1]	1 060.60[2]	0.00	768.19	0.00
Temporary payments to fishers[3]	0.00	0.00	142.86	0.00
Regional aid for temporary stop	0.00	0.00	348.10	0.00
Payments for the permanent withdrawal of fishing vessels	3 822.84	5 279.16	6 726.45	13 599.15
Payments for temporary joint ventures in third country waters[4]	505.80	1 658.20	491.94	1 093.80
Payments for permanent joint ventures in third country waters[5]	1 998.94[6]	7 492.56[6]	1 950.68[7]	4 827.54[7]
Cost-reducing transfers	**899.71**	**4 127.70**	**1 812.15**	**10 008.77**
Support for new vessel construction	479.12	2 392.94	1 467.15	8 058.86
Support for vessel modernisation	420.59	1 734.76	290.00	1 949.91
Regional aid for port facilities	0.00	0.00	55.00	0.00
General services	**4 846.37**	**705.95**	**5 782.55**	**2 916.70**
Market intervention[8]	0.00	32.15	0.00	987.86
Exploratory fishing	55.60	129.73	197.10	N.A.
Other research expenditure	1 502.77[9]	0.00	1 502.77	0.00
Management expenditure	2 328.22[9]	0.00	2 328.22	0.00
Enforcement expenditure	842.54[9]	383.86[10]	842.54	383.86[10]
Artificial reefs	32.45	97.35	61.00	180.00
Marine reserves	31.85	18.15	94.32	75.68
Support for port facilities	52.94	44.71	741.10	1 289.30
Regional aid for port facilities	0.00	0.00	15.50	0.00

n.a. Information not available.
1. Special assistance for the temporary cessation of fishing activities paid to vessel owners who were obliged to lay up their vessels in the Moroccan fishing zone.
2. Includes payments in 1996 that correspond to preceding years.
3. Special assistance for the temporary cessation of fishing activities paid to fishers during the laying up of vessels in the Moroccan fishing zone.
4. These vessels retain the Spanish flag.
5. These vessels are exported to a third country and adopt that country's flag. Often referred to as joint enterprise arrangements.
6. Includes payments in 1996 that correspond to preceding years.
7. Includes payments in 1997 that correspond to preceding years.
8. EU market intervention scheme. *Source*: OECD (2000*d*).
9. 1997 figure.
10. Refunds from the EU for enforcement expenditure – average for the period 1991-1995. *Source*: OECD (2000*d*).

Sources: OECD (2000*a*) and OECD (2000*d*).

Sweden
(SEK million)

Type of transfer	1995-96 (18 months)		1997	
	National	EU	National	EU
TOTAL	**313.26**	**104.91**	**326.65**	**83.15**
Direct payments	**63.05**	**59.46**	**38.85**	**28.56**
Unemployment insurance payments[1]	32.36	0.00	25.09	0.00
Regional aid	1.76[2]	0.00	1.76[3]	0.00
Grants for fleet renewal and modernisation[4]	12.30	42.30	4.65	20.87
Grants for adjustment in fishing effort[4]	13.50	13.50	6.97	6.97
Grants for temporary cessation of fishing activities[4]	3.13	3.65	0.39	0.72
Cost reducing transfers	**0.00**	**0.00**	**0.00**	**0.00**
General services	**250.21**	**45.45**	**287.79**	**54.59**
Market intervention[5]	0.00	19.92[6]	0.00	4.33
PESCA funds[4]	3.13	3.58	3.13	3.58
Grants to producers' organisations[7]	13.46	0.00	3.60	0.00
Research	75.78[1]	11.07[1]	121.12[3]	26.82[1]
Protection of marine areas[8]	3.41	3.41	5.19	4.33
Information[1]	0.00	0.00	0.00	6.06
Management costs	53.65[1]	0.00	53.65[3]	0.00
Enforcement costs	96.12[2]	42.18[10]	96.12[3]	2.18[10]
Support for fishing ports[11]	0.00	0.85	0.87	3.46
Support for fishing port facilities[4]	3.01	4.45	2.48	3.85
Aid for fish restocking[4]	1.65	0.00	1.65	0.00

1. *Source*: OECD (2000*a*).
2. 1997 figure.
3. *Source*: OECD (2000*d*).
4. WTO notification figure.
5. EU market intervention scheme. *Source*: OECD (2000*d*).
6. 1996 calendar year.
7. Financial compensation to producers' organisations for losses when fish are withdrawn from the market. *Source*: WTO notification figure.
8. Expenses connected with the rearing and distribution of salmon smolt and juvenile eels.
9. Refunds from the EU for enforcement expenditure – average for the period 1991-1995. *Source*: OECD (2000*d*).
10. Includes expenditures in area 6 (Northern Sweden).

Sources: OECD (2000*a*), OECD (2000*d*) and notifications under the WTO Agreement on Subsidies and Countervailing Measures

Turkey
(TRL billion)

Type of transfer	1996	1997
TOTAL	**2 329.89**	**4 331.14**
Direct payments	**0.00**	**0.00**
Cost reducing transfers	**31.89**	**166.14**
Interest concessions[1]	31.89	166.14
Reduction in payments to public corporations[2]	n.a.	n.a.
General services	**2 298.00**	**4 165.00**
Market intervention	0.00	0.00
Research costs	n.a.	n.a.
Management costs	n.a.	n.a.
Enforcement costs	n.a.	n.a.
Development projects[3]	398.00	225.00
Building fishing harbours[4]	1 900.00	3 940.00

n.a. Information not available.
1. Concessional loans to the fisheries sector by Turkey's Agricultural Bank.
2. Export subsidy programme.
3. Projects financed through the Ministry of Agriculture and Rural Affairs.
4. Financed by the Ministry of Transportation.

Sources: Turkey's Ministry of Agriculture and Rural Affairs.

United Kingdom
(GBP million)

Type of transfer	1996		1997	
	National	EU	National	EU
TOTAL	**59.92**	**13.91**	**60.54**	**17.57**
Direct payments	**4.50**	**5.70**	**8.10**	**5.90**
Payments for the permanent withdrawal of fishing vessels	4.50	5.70	8.10	5.90
Cost reducing transfers	**2.50**	**1.50**	**0.90**	**1.30**
Support for vessel modernisation[1]	1.70	1.00	0.50	0.80
Support for vessel modernisation[2]	0.80	0.50	0.40	0.50
General services	**52.92**	**6.71**	**51.54**	**10.37**
Market intervention[3]	0.00	2.52	0.00	2.15
Support for port facilities for fishers[4]	0.30	0.70	0.20	0.50
Support to reduce restructuring costs[5]	n.a.	n.a.	0.05	0.09
Support for producers' organisations	0.08	0.00	0.05	0.00
Research	15.34[6]	0.00	15.34[6]	0.00
Management	6.92[6]	0.00	6.92[6]	0.00
Enforcement	25.60[6]	0.80[6]	23.50[6]	4.95[6]
Support for port facilities[7]	3.10	0.00	3.90	0.00
Fishing port facilities	1.58[8]	2.69[9]	1.58[8]	2.69[9]

n.a. Information not available.
1. EU and national schemes that provide funds to meet the costs of safety equipment necessary for a vessel to obtain a safety certificate.
2. A vessel modernisation scheme that operates in Northern Ireland and in parts of Scotland. Vessels may be modernised provided such a modernisation does not result in an increase in fishing capacity or fishing effort.
3. EU market intervention scheme. *Source*: OECD (2000*d*).
4. EU scheme to improve the facilities for fishers at ports.
5. EU PESCA scheme – designed to assist restructuring of the fisheries sector and to encourage the diversification of economic activities dependent on fishing.
6. *Source*: Ministry of Agriculture, Fisheries and Food, United Kingdom.
7. UK scheme for the construction, improvement and repair of fishing harbours.
8. Average of national aid for 1994-1999 under "Fishing Port Facilities". *Source*: OECD (2000*d*).
9. Average of FIFG expenditure for 1994-1999 under "Fishing Port Facilities". *Source*: OECD (2000*d*).

Sources: OECD (2000*a*) and OECD (2000*d*).

United States of America
(USD million)

Type of transfer	1996	1997
TOTAL	**877.17**	**876.83**
Direct payments	**17.40**	**20.90**
Market intervention[1]	14.00	14.00
Market Intervention[2]	3.50[3]	3.40[3]
Unemployment insurance payments	n.a.	n.a.
Payments for the permanent withdrawal of fishing vessels[4]	0.00	3.50
Cost Reducing Transfers	**194.46**	**194.38**
Fishery finance program	0.25	0.25
Fishing vessel gear damage program	1.03	0.20
Support the construction and reconstruction of fishing vessels[5]	2.05	2.05
Fisherman's contingency fund	1.00	1.00
Support for fishing ports	10.90	n.a.
Diesel and gasoline tax exemption	150.00	150.00
Marine fisheries initiative	3.00	3.00
State and industry assistance[4]	26.23	26.98
General services	**665.30**	**661.55**
Promotion and development of fisheries[6]	9.89	0.38
Fishery infrastructure[7]	n.a.	n.a.
Research[8]	n.a.	n.a.
Information collection and analysis[4]	156.47	165.73
Conservation and management[4]	98.94	95.44
Enforcement costs[9]	400.00	400.00

n.a. Information not available.
1. Department of Agriculture's Surplus Commodity Removal Program.
2. Department of Agriculture's Market Access Program.
3. 1998 figure.
4. National Marine Fisheries Service budget.
5. Capital Construction Fund.
6. State scientific and management; product quality and seafood inspection program.
7. Fishery infrastructure (including the construction harbours and dredging of ports) supported through the Army Corps of Engineers.
8. Payments to the National Sea Grant College Program. Excludes payments from NMFS budget lines.
9. Includes fisheries enforcement activities by the Coast Guard (about USD 400 million per year).

Sources: OECD (2000*a*) and OECD (2000*d*)

European Community
(ECU million)

	1996	1997
TOTAL	**749.66**	**686.10**
Financial instrument for fisheries guidance (FIFG):		
Objective 1 areas	335.56	250.00
Objective 5(a)	86.03	116.90
Objective 6 areas	0.00	1.00
PESCA	16.87	1.50
Compensation for cephalopods producers in the Canary Islands[1]	0.06	0.00
Compensation for additional marketing costs from remote regions[2]	8.88	9.70
Payments for access to third country waters[3]	250.95	216.30
Intervention for fisheries products[4]	25.32	33.10
Support for producers' organisations[5]	8.79	19.60
Support for artisanal and small-scale coastal fishing[6]	1.00	2.00
Research and technical assistance[7]	0.00	17.55
Inspection and surveillance[8]	16.20	36.00

(NB. Table includes payments to fisheries, aquaculture, marketing and processing. Table does not include any EU Member State transfers).

1. Refers to aid provided under Chapter B1-2620 of the Community's budget
2. 2. Compensation for the additional costs incurred in the marketing of certain fishery products from the Azores, Madeira, the Canary Islands and the French department of Guyana (Chapter B1-2621).
3. 3. International fisheries agreements: Represents payments for access to third country waters, net of industry contribution, and excluding the proportion earmarked for specific development programmes (Chapter B7-8000).
4. 4. Includes flat-rate aid for certain fisheries products, compensation for tuna delivered to EU canning plants, private storage aid for certain fishery products and other expenditures associated with market interventions to stabilise and support fish prices (Chapter B1-261).
5. 5. This appropriation is intended to assist the launching of producers' organisations and to support the financing of studies and projects related to the conservation and management of fishery resources or the protection of marine species (Chapter B2-181).
6. 6. Refers to structural operations in support of small-scale fishing (Chapter B2-521 in 1996) and specific actions in favour of artisanal fisheries (Chapter B2-522 in 1997; Chapter B2-910 in 1998).
7. 7. Refers to the capture fisheries component of Community-sponsored research, technological development and demonstration programmes included under Chapter B6-2143, B6-7123 and B6-7143 of the Community's budget, as well as any Community contribution to Member state R&D programmes funded under the FIFG. Includes some funds for research and technical assistance to aquaculture also.
8. For 1996 refers to expenditures connected with the control and co-ordination of surveillance operations by Member states (Chapter B2-900), financial contributions towards expenditures incurred by the Member states (Chapter B2-901), and the cost of Community inspections in international waters (Chapter B2-902). For 1997 the figures refer to only the second and third items.

Source: European Parliament, "General Budget of the European Union for the Financial Year 1998", Official Journal of the European Communities, No. L 44, 16 February 1998. As detailed in OECD (2000*a*)

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Part 4

MODELLING THE TRANSITION TO RESPONSIBLE FISHERIES*

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MODELLING THE TRANSITION TO RESPONSIBLE FISHERIES

EXECUTIVE SUMMARY

Fisheries managers in OECD countries are addressing issues associated with the transition to responsible or sustainable fisheries. This study explores the possibilities for making the transition to more responsible or sustainable fisheries, documents the experiences of some countries, and draws out policy relevant observations. Although these may not reflect the situations in all fisheries, a certain number of conclusions can be drawn.

The transition of a fishery to a more responsible or sustainable state offers the potential for long-run gains that are beneficial to producers, consumers and society as a whole. These gains, which can stem from rebuilding of stocks and increased catches, are not the primary focus of this study. Instead, it focuses on the short and medium term transition phase. The transition process depends on the unique characteristics of each fishery. The complexity of the fisheries environment does not allow a direct, straightforward transition over time. The path towards restoration, and the length of time it takes to attain specified objectives, depends on the biological, economic, social, and administrative characteristics of each fishery. Furthermore, the measures that embody the notion of responsible fisheries are themselves also subject to change.

There are two important challenges that policy makers are required to address when developing frameworks to bring about the transition of a fishery to a responsible status. One challenge is to deal with the complexity and largely uncontrollable nature of the fishery ecosystem. Another challenge is to manage the effects of change that must inevitably be faced by the participants in the fishery. As with other structural reforms, the fact that the benefits of change may be diffuse, while the costs may be more discernible in the short-run complicates the transition process.

The primary challenge recognises the uncontrollable but often fragile nature of the fish resource subject to exploitation. This means that even the most committed application to a sustainable policy by management authorities and fishery participants does not guarantee a successful outcome. Embracing uncertainty means recognising the uncontrollability inherent in the fishery system and the need for continuous review of performance and management objectives. Complexity and uncertainty appears to be especially manifest in multi-species fisheries, which are important in many parts of the OECD area. For the transition period, the various case studies explored alternative exploitation strategies (*e.g.* constant annual catches, and constant exploitation rates). When set at conservative levels, such strategies may be helpful to buffer the fishery system in the face of external shocks. Moreover, such strategies may be devised to ensure the continued supply of biological and economic information during the transition period while providing a relatively stable fishery.

In dealing with resistance to change, policy makers are faced with trade-offs between the interests of a variety of participants: commercial fishers, artisanal fishers, recreational fishers, fisheries communities and non-governmental organisations. For example, rebuilding of depressed fish stocks may mean that the fishers and their communities may face initially reduced economic opportunities. Some case studies showed however that, in the medium term, an improved state of abundance in fish stocks would be expected to yield an overall improvement in the social and economic performance. When socio-economic performance improves due to improved stock abundance, policy frameworks and management decisions should ensure that economic and resource gains – a result of short-term costs incurred by incumbent fishers – are sustained and not unduly dissipated by the entry of new effort and participants.

While noting the prospects for improved economic and biological performance, some case studies exhibited overcapitalised fisheries that in the medium term would be expected to have appreciably smaller harvest sectors. Managers could therefore consider whether the transition to responsible fisheries is likely to mean a reduction in the number of participants. In this context, the choice of management frameworks and supporting policies should be carefully made. Appropriate management frameworks that enhance industry responsibility can provide for industry self adjustment.

In designing a policy framework that ensures the fishery system is flexible in the face of uncertainty, the integrated actions of fisheries managers, scientists, policy makers and the fishing industry are important. Co-operation is needed to ensure comprehensive decision making that takes into account all the various aspects and trade-offs in the system. Information from some member countries suggests that, where stakeholders are more directly involved in management decision making and have a formalised role with regard to shared responsibility of the resource, there is a clearer identification of system objectives and accordingly a better understanding of the direction required to move the system towards a responsible fishery status. The sense of shared responsibility may be facilitated by approaches by fisheries managers and by the use of management instruments that enhance fisher's sense of shared involvement in solutions (*e.g.* licences, individual quotas, area use rights). This joint responsibility is an important component of the transition to responsible fisheries.

There are no easy ways to smooth the path towards responsible fisheries. It is likely that costs will be incurred in the short run if the decision is made to invest in the biological restoration of fish stocks. Decisions on the rate of desired restoration are also likely to involve trade-offs between economic, social and biological components of the fishery system. The need for serious adjustment in capacity levels may in some cases be unavoidable if economic performance is to be improved and preserved. Dealing with the inherent uncertainties in the fishery system suggests the adoption of prudent and precautionary approaches in setting and executing of management objectives. The possibilities for improved economic performance appear to be enhanced if management frameworks provide the sector with sufficient stability to engage in strategic planning and market development activities.

I. INTRODUCTION

It is widely recognised that many of the world's commercial fish stocks are over-exploited and that corrective measures need to be implemented to restore fish stocks' productivity. Rising market demand, management problems associated with the common property nature of fisheries resources and technical advances in fishing equipment have all contributed to the weakening of traditional fishery management systems.

In response to the problems facing the marine resource sector, the international community has adopted various agreements that provide the background for responsible fisheries. Of particular importance has been the establishment of national total annual allowable catch limits in the 1970s, the introduction of exclusive economic zones (EEZs) and the adoption of the United Nations Law of the Sea (UNCLOS) in 1982. Also of significance was Agenda 21 of the 1992 UN Conference on Environment and Development, the UN Conference on Straddling Stocks and Highly Migratory Fish Stocks, the 1993 Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels in the High Seas. More recently there has been the 1995 Kyoto Declaration, the 1995 FAO Code of Conduct for Responsible Fisheries and the ongoing work within the FAO on action plans for fishing capacity and seabird bycatch.

Despite the many management measures that have been introduced, the ensuing results have not been always been sufficient. On a global scale the FAO has, for example, recently estimated that 44% of the world's known stocks are either fully exploited and 29% are over-exploited or depleted.[1]

The current situation, however, may be reversible. Recent work by the FAO[2] has estimated that marine fisheries production could potentially reach 125 million tonnes – a 40 million tonne increase on the 1990-94 average of 83 million tons. These increases in landings are estimated to be due to better management (+8 million tonnes) and from developing fisheries (+35 million tonnes). On a global level, substantial increases in landings can be achieved through better management and development of fisheries.

If the net benefits of responsible fisheries are positive, such an analysis will provide a powerful economic argument to policy makers attempting to convince politicians and the fishing industry to implement management measures that are consistent with the FAO Code of Conduct. Policy reform has generally been difficult in the fisheries sector due the immediate costs that are incurred during the transition period. By clearly illustrating that transition costs are offset by medium term gains, the adoption of these measures can be argued more effectively.

The objectives of this study are to assess the costs and gains associated with a transition towards responsible fisheries. The study aims to provide Member Countries with a methodology and illustrated assessments of the biological, economic, social, and administrative consequences of adopting policy measures that are consistent with the Code of Conduct. This is done through the analysis of a series of specific case studies provided by Member Countries.

The Code of Conduct is very comprehensive in its scope. It seeks to achieve levels of socio-economic, biological, environmental and institutional objectives that ensure sustainable fisheries. Nevertheless, its prescriptions for putting into effect sustainable and responsible fisheries are not precise. For example, the Code does not attribute any weight to any specific objectives, and its guiding principle is to maintain or restore stocks to levels capable of producing broadly defined responsible fisheries. Moreover, for each fishery, the meaning of these fundamental terms may be quite different depending on the historical experience, the conditions, and the future expectations of the fishery system.

This study examines specific fisheries in order to draw general conclusions about the assessment of the costs and benefits associated with the transition to responsible fisheries. The study examines Member countries' case studies and provides a synthesis of the collective information that these studies provide.

II. STUDY METHOD

This study aims to assess the costs and benefits associated with a transition towards responsible fisheries. In so doing, it aims to provide Member countries with an assessment of the consequences of adopting policy measures that are anticipated to move the fishery toward its targeted responsible state.

A. Conceptual context

Consideration of the transition to responsible fisheries requires reflection on the management objectives of the governments and stakeholders. The Code of Conduct provides a suite of objectives for fisheries managers to work towards. Box 1 is based on the Code but has been reworded into a format that more clearly conveys the objectives that need to be fulfilled.

Box 1. **Code of Conduct for Responsible Fisheries: Objectives**

Maintain or restore stocks at levels capable of producing maximum sustainable yield.
Remove excess fishing capacity.
Introduce economic conditions that promote responsible fisheries.
Establish consultation mechanisms.
Ensure biodiversity of aquatic habitats and ecosystems.
Protect endangered species.
Allow depleted stocks to recover.
Assess and correct adverse environmental impacts of human activities.
Introduce gear and techniques that minimise pollution.
Introduce gear and techniques that minimise waste.
Introduce gear and techniques that minimise discards.
Introduce gear and techniques that minimise catch by lost or abandoned gear.
Introduce gear and techniques that minimise catch of non-target species.

The Code of Conduct is very comprehensive in its scope. It seeks to achieve economic, biological, environmental and institutional objectives and does not ascribe any weight to them; rather its guiding principle is to maintain or restore stocks to levels capable of producing maximum sustainable yield. Maximum sustainable yield maximises the catch that can be obtained from the marine resource over the long run. It is not an accurate figure however. Stock surveys form the basis for estimating the size of fish stocks and their potential yield, and as they are based on samples of the population, they only provide an estimate of the stock size. The rates at which stocks reproduce (the production rate) are furthermore dependent on environmental fluctuations, predation and other biological interactions with other populations. Maximum sustainable yield must therefore be recognised for what it is – an estimate of the potential maximum yields that could be achieved under responsible fisheries qualified by relevant environmental and ecosystem factors.

While yield from a stock may be maximised, economic considerations may mean that profits are not maximised. Fishers generally seek to maximise profits rather than gross revenues. Under maximum sustainable yield it is, for example, unclear whether market prices would even cover the variable costs of operating a vessel. Employment levels in the harvesting sector will be affected by harvesting at maximum sustainable yield. The magnitude of the change in employment levels will depend on the fleet structure prior to change. If the fleet had been over-capitalised beforehand, fishing at maximum sustainable yield may result in fewer employment opportunities. If fishing at maximum sustainable yield requires a larger fleet size than the current one, employment opportunities could increase.

Box 2. Maximum sustainable yield

Maximum sustainable yield is as a measure of the yield that could potentially be extracted from a fish stock in a stable environment. When used as a management objective this measure should be qualified by the appropriate economic and environmental factors. Maximum sustainable yield is determined for individual species and may therefore not be compatible with sustainable development criteria that require a whole ecosystem approach. Some commentators have argued that maximum sustainable yield may be an inappropriate target for fisheries decision makers given its limit as a static, single species and biologically based reference point and that it does not consider the uncertainties involved.

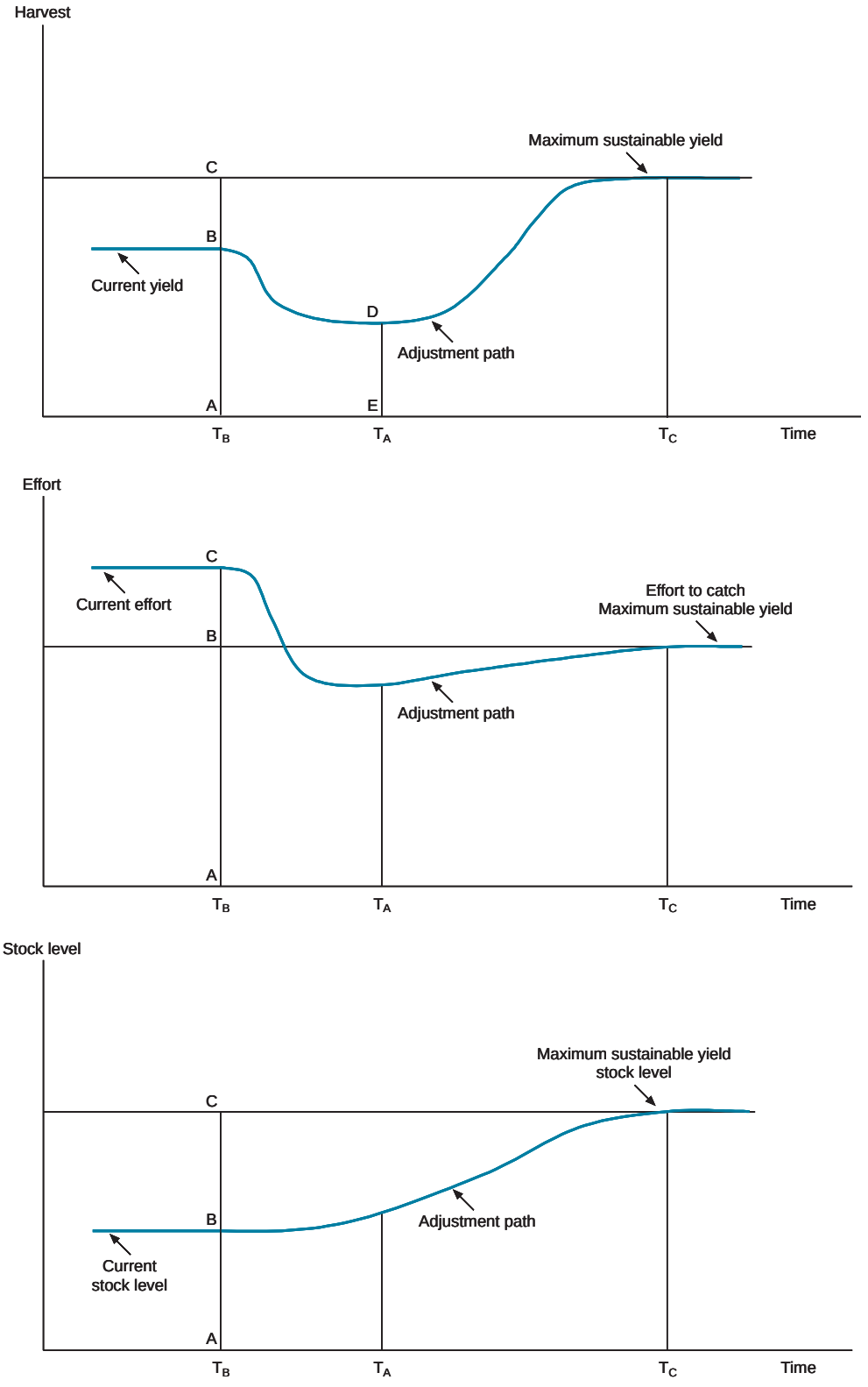
Increased revenues from the harvesting sector should also benefit support industries. Employment linked to, but outside the fish catching sector, may vary and change in nature with higher landing levels. Employment in firms that service boats and supply them with equipment, fuel and stores would increase if fleet sizes increased. Depending on the nature of the administrative services required by the fishery (such as management, research, surveillance and monitoring), sustained increases in catches may result in higher employment. Increased employment opportunities would also be created in processing and marketing the superior and potentially more abundant product.

Fishing close to maximum sustainable yield may also mean a more stable supply of fish and allow wholesalers and retailers to more efficiently supply consumers. In addition to the economic benefits identified above, harvesting at maximum sustainable yield should decrease the chances of stock collapses. By keeping the stocks at healthy levels it is less likely that stock sizes could be depleted. Larger stock sizes should also make it easier for fishers to locate and harvest fish, thus reducing harvesting costs.

Taking the development of the stock towards maximum sustainable yield as a guiding principle, it is possible to consider the gains and costs associated with the transition to responsible fisheries. If a stock is not realising its production potential because it is too small, then yield opportunities are being foregone. Potential yield that could be generated by the stock is not being realised, due to its depleted state. Figure 1 provides a highly stylised illustration of this concept. The first figure shows the yield from the fish stock and the second figure shows the effort levels associated with harvesting the stock over time. The third figure shows the change in the stock level over time. In comparison with a fishery being managed at maximum sustainable yield, time T_B is characterised by lower harvests, smaller stock size and high effort. If the stock were given a chance to rebuild, a larger harvest with lower levels of effort could be realised. The line CB in the first figure shows the "lost" harvest due to the depleted state of the stock.

Figure 1 also illustrates a second aspect of the gains and costs of a transition to responsible fisheries. If governments are to enact remedial measures to allow fish stocks to rebuild, then harvests and effort need to be reduced during the transition period. Instead of continuing to harvest AB in the upper figure, harvests need to de reduced to DE. The middle figure illustrates the reduction in effort that is required. Effort in fact needs to fall below that associated with maximum sustainable yield if the stock is to rebuild.

Figure 1. **Stylised transition to responsible fisheries: current, transitional and potential harvest, effort and stock levels**



Source: OECD.

The movement over time from T_A to T_C illustrates the final stage of the transition process. As the fishery stock size increases to that associated with maximum sustainable yield, harvests can increase. Due to theincreased abundance of the fish stocks, the effort that would be required to harvest this level of yield would be relatively lower than that before the transition period started. A recovered fishery would therefore be characterised by relatively higher catches, larger stocks and lower effort.

One important aspect of the fishery system that has not been discussed thus far is that of uncertainty. At lower stock levels, there is likely to be more uncertainty in the fishery. The stock will be more prone to constant drastic management intervention against the backdrop of a constant concern of significant stock collapse. Should there be a decision to try to rebuild a stock, there are uncertainties as well. Given the biological characteristics of the stock, and its aquatic ecosystem, a rebuilding strategy simply may not work. This risk is an additional cost that policy makers and stakeholders in the resource have to bear during the transition process.

Figure 1 also does not illustrate the variability inherent in a fishery system. A rebuilding strategy is unlikely to follow a smooth path suggested above. Rather it is likely to follow variable path as decision-makers work towards their management objectives of increased yields and improved performance. This is likely to involve lumpy, rather than smooth changes in catch limits and the effort applied.

From this discussion it is evident that there are three categories of cost involved in the transition to responsible fisheries:

i) O*pportunity costs*, for fishers and consumers, from yields foregone from the fishery due to its depleted state.

ii) C*osts incurred by the fishing industry in the transition process*, while a depleted stock is being rebuilt.

iii) U*ncertainty costs* due to constantly changing catch opportunities that often characterise depleted fish stocks and efforts to rebuild them.

The first of these costs represents an incentive for policy makers and stakeholders to undertake the reforms necessary to rebuild stocks. The second represents the costs incurred that makes the transition process difficult and may require other forms of government intervention to facilitate. The costs and benefits associated with a transition to responsible fisheries are functions of the timing of the introduction of the measures leading to responsible fisheries (*i.e.* the length of time between T_B and T_C). Future benefits and costs should be discounted to give correct weighting over time.[3]

The rate at which reforms are introduced will influence the costs and benefits of a transition to responsible fisheries. Governments that introduce drastic measures (such as a moratorium on fishing) will incur higher costs up front but may also generate benefits in the nearer future. Conversely, governments that introduce reforms at a slower rate, thereby reducing the costs incurred by the industry in the short run and easing social disruption, may have to wait longer for the industry to enjoy the full benefits of fishing at maximum sustainable yield. Policymaking involves weighing different biological, economic and social objectives while balancing short-term losses against future gains.

The timing of the introduction is also an important element in the determination of the costs and benefits of a transition to responsible fisheries. If reforms are introduced following the collapse of a fishery (as is often the case), it may take a longer time for stocks to rebuild to larger levels. If reforms are introduced before stock collapse, or in conjunction with favourable environmental conditions, the recuperation period could be much shorter.

The costs and benefits of a transition to responsible fisheries also depend on the resource's characteristics. In the case of short-lived species, stocks that have been overfished may rebound to maximum sustainable yield levels in a relatively short period of time. In the case of species with low fertility or that grow slowly, recovery may take a significant amount of time, in which case the benefits associated with the transition will only be incurred in the more distant future. Indeed it is possible that the costs could outweigh the benefits.

The transition costs and benefits will depend on the goals of policy makers (economic, biological, social, and administrative) and on the nature of the instruments (technical measures, input and output controls) that are used to achieve their goals. Managers may prioritise objectives or may wish to try

to jointly achieve all their goals. The objectives pursued by fishery managers, and the management measures that are used to achieve these objectives will thus play an important role in determining the costs and benefits incurred in a transition to responsible fisheries.

The decision to try to move a fishery towards a more responsible status will create uncertainty costs for the government and stakeholders. The stylised lines shown in Figure 1 belie the reality that the outcomes from management decisions are not certain. The complexity of the fisheries system mean that the response of the stock to reduced effort is unlikely to be straightforward. This uncertainty means that stakeholders will discount future gains, perhaps reducing their willingness to reduce effort in the short run.

B. The case study approach

To examine the consequences of the transition to responsible fisheries, a case study approach has been used. Member Countries contributed representative case studies for specific commercial fisheries that included detailed information on each fishery. An effort was made to cover a representative sample of the different kinds of commercial fisheries. These included examples of demersal, pelagic, mollusc and crustacean fisheries.

A total of twelve case studies have been submitted from Member Countries. These case studies were divided into two groups of six case studies each. In the first grouping, Member Countries submitted their fisheries data to be used in the development and analysis of the model referred to below (Group I Case Studies). In the second grouping, Member Countries developed their own approaches to analyse the transition process (Group II Case Studies).

Box 3. Case studies on the transition to responsible fisheries

Group I case studies

Japan (saury fishery), Canada (Scotia-Fundy herring fishery), Iceland (cod fishery), New Zealand (red spiny rock lobster fishery), Australia (Southern shark fishery), and Germany (Baltic cod fishery).

Group II case studies

Korea (anchovy fishery), Norway (Northeast Arctic cod fishery), Spain (Galician shellfish gathering), United States (Northeast Atlantic groundfish fishery), Mexico (Yucatan red grouper fishery) and European Community (North Sea roundfish fishery)

C. Group I case studies

Model building was necessary for each specific fishery to ensure the specific characteristics and the context of each different case study was respected. The approach for evaluating the transition of the fisheries has five parts: *i*) description of the fishery system, *ii*) setting management objectives, *iii*) system modelling, *iv*) transition period analysis and *v*) presentation of results and evaluation. The model approach is described in detail in OECD (2000*e*).

i) Description of the fishery system

Describing each fishery required the collection of basic fisheries information on its biological, economic, social and administrative characteristics. A spreadsheet model was developed for each case study that linked the components of the fishery system and quantified the changes in the fishery over the planning period. Once the reporting of each component was established, then the target values, or

management objectives, were identified. These management objectives sought to embody the notion of responsible fisheries.

ii) Setting management objectives

Rather than specifying a standardised reference criterion (*e.g.* maximum sustainable yield) to describe responsible fisheries, the case studies that use the model approach recognise multiple fisheries objectives for each fishery under investigation. The model approach quantifies the benefits and costs of the transition to responsible fisheries in three temporal contexts: current, transition and future. The model developed for each fishery:

- Compares the differences in benefits and *costs between the responsible management fishery and the situation in the current fishery.*
- Examines the benefits and costs *during transition to responsible fisheries.*
- Anticipates and compares the impacts of the future management policy options relative to their objectives in the *future and transition planning period.*

iii) System modelling

The model of each fishery has biological, economic, social, and administrative components. Each component describes the historical and current status of the fishery. The model specifies the target annual performance measures for each of the fishery components. These measures permit the comparison of the performance of policy alternatives against specified objectives associated with responsible fisheries.

The model integrates the biological, economic, social, and administrative aspects of a policy to observe the impact on stock dynamics (using traditional stock assessment methods) and fisheries firms (*e.g.* annual costs and earnings). Social analyses use the annual employment (and unemployment) and labour income of the harvesting and processing sectors. The administrative component uses the annual monitoring, enforcement, licensing, scientific research and management contributions of the regulator and the industry.

The fishery system components are linked as follows. First, the top level describes annual projections of the stock for a given catch policy (or TAC) schedule over the transition period. Annual catches are then allocated to the harvesting gear sectors from which annual economic and financial positions are determined. The output from the model provides indicators for evaluating a fishery's benefits and costs of the transition. The comparison of alternative transitional options are measured against these performance measures and provides a direct means of ranking, rejecting, and selecting particular policy options.

iv) Transition period analysis

The historical part of the planning period is used as the point of reference for the fishery. These data are extrapolated to the end of the planning period. Such an extrapolation assumes information on:

- Fisheries input data (*e.g.* cost of licence, carryover debt load).
- Fisheries policy data (*e.g.* annual total allowable catch levels, allocations amongst gears).
- Uncertain input data (*e.g.* stock weight by age class, recruitment, landed unit value and processed fish market prices).

The analysis of the transition period is carried out using two approaches. First, alternative policy analyses are explored under the simple assumption of extension of the *status quo.* This involves using the best estimate of the current status of the fishery system at the beginning of the transition period and includes an extension of the existing policy regime and fixed estimates for all uncertain model parameters. In other words, this approach is a deterministic extrapolation of the impacts of alternative policy regimes. At this stage, alternative policies are judged to be effective or ineffective in moving the fishery toward its pre-specified targets. Effective policies are then considered for further analyses.

Table 1. **Performance measures by model components**

Model component	Description	Performance output and specified objectives
Biological	Age structured population analysis with annual recruitment function; policy parameters for setting annual catch totals	1. Total harvestable stock biomass 2. Spawning stock biomass 3. Fishing mortality levels
Economic	Annual *pro forma* operating performance by harvesting gear type and processing sector; gear type performance is described for an average vessel	1. Annual Profit Statement 2. Annual Cash Calculation 3. Annual Balance Sheet
Social	Annual analysis of workforce demographics for harvesting and processing; annual employment and unemployment based on catch information	1. Level of employment (harvesting, processing) 2. Labour earnings
Administrative	Annual harvesting and processing administrative costs for fisheries management, fees, licenses; costs associated with administrative functions, *e.g.* dockside monitoring, observers, quota transactions costs	1. Number of administrative personnel 2. Annual administrative costs

Second, a simulation analysis is carried out for the fishery over the transition period. The selected policies are subjected to randomised fluctuations on the uncertain variables. The simulation assigns probability distributions to the uncertain data and produces performance output measures that are reported as probability distributions. These simulations take into account two major uncertainties for the fishery: *i*) stock abundance and reproduction and *ii*) market. Random fluctuations in the stock may be due to many independent sources of variability (*e.g.* environmental change, and predator-prey imbalances). These stock changes have a direct effect on the outcome of the biological performance of the system. Similarly, exogenous market uncertainties (*e.g.* forces of supply and demand, changes in consumer preferences, business and economic cycle adjustments) directly effect the economic and social performance of the fishery. The transition analyses explore alternative levels of variability in these two key uncertainties.

v) Presentation of results and evaluation

The performance measures that are specified for the fishery (see Table 1) are used to evaluate policy options for the transition period. The effectiveness of alternative policies for the fishery under consideration is measured by comparing the performance results to (*i*) other policy options, and (*ii*) the fishery targets. Box 4 details the information that comes out of the modelling exercise.

Box 4. **Results from the modelling exercise**

Descriptive performance of the historical and current periods.

Expected performance results from the deterministic analysis over the transition period for alternative management policies.

Probabilistic performance results from the simulation analysis over the transition planning period for the selected set of effective policy options.

Evaluation of the comparative performance of the policy options.

Responsible fisheries in the model approach

The above approach seeks to determine policy options to achieve the socio-economic, biological, environmental and institutional objectives for the fishery. However, it may never be possible to achieve

all fisheries objectives simultaneously. Consequently, trade-offs must be made among the multiple – and often conflicting – objectives of the fishery. The Code of Conduct does not, implicitly or otherwise, attribute weights to specific objectives one over the other for fisheries management. Rather, the historical and current context of each fishery provides information on the extent and the direction of trade-offs among performance measures that may occur. As such, the historical analysis can provide key information on the observed management policy trade-offs as well as the strategic targets for the fishery.

In the context of this particular model approach, a responsible fishery is one that could be described as biologically sustainable, economically viable, socially stable, and administratively efficient. To quantify these general terms in the model, a responsible fishery may be considered to have single (or simplified) measurable indices of performance (b, e, s, a) that denote the level of operation of the fishery for each of its biological, economic, social, and administrative components. The fishery's performance targets for each component can be defined and expressed in absolute terms, relative to the historical and current status of the fishery. For each case study, absolute performance targets are based on stated objectives, and/or historical performance levels. In other words, (B, E, S, A) denotes the fishery targets, where B denotes the desired level of sustainability for the biological component, E denotes the desired level of viability for the economic component, S denotes the desired level of stability for the social component, and A denotes the desired level of efficiency for the administrative component.

Using the performance measures of Table 1, the performance of the system in any annual period t may be described as the relative measure of the actual system compared to simplified targeted ideal points. Algebraically, the relative performance of the fishery in time period t of the planning period, Z_t, under a given policy regime may be expressed as:

$$Z_t(b,e,s,a) = f\{(B - b), (E - e), (S - s), (A - a)\}$$

The costs and benefits of the transition to responsible fisheries will vary from fishery to fishery and depend on each fishery's unique combination of characteristics. These costs and benefits will also depend on the goals of policy makers (B, E, S, A) and on the nature of the management instruments. Managers may prioritise objectives (*e.g.* establish prefixed weights within the f function for a trade-off of biological conservation over economic efficiency) or they may try to jointly achieve all their goals (*i.e.* all the criteria combined into a single function). For fishery evaluation purposes, the model assigns arbitrary weights to each of the performance indicators so that the percentage difference measures can be combined to provide an aggregate total across all components, *i.e.*:

$$Z_t(b, e, s, a) = w_B*[B - b]100\%/B + w_E*[E - e]100\%/E + w_S*[S - s]100\%/S + w_A*[A - a]100\%/A$$

Where the weights, w_I are $w_B + w_E + w_S + w_A = 1{,}0 < w_I < 1$

Where possible the weights are set as a function of the contextual information from the case studies. The case studies are discussed in more detail in the following sections and in the document OECD (2000*e*).

D. Group II case studies

Several countries did not choose to use the model approach and instead submitted case studies on their own experiences with the transition to responsible fisheries. Different methods were used in each case to record and analyse transition experiences. Some chose to use bioeconomic models to predict the likely economic, biological and social consequences of changes in management policies. For example, the submission from Norway models the performance of the Northeast Arctic cod fishery and its results suggest strategies for meeting relevant economic, biological and social objectives. Other submissions detailed the impact of recent changes in management policies. Spain's contribution assesses the results emanating from the *Plan Galicia* that sought to re-organise and re-vitalise the Galician shellfish sector.

In each of the submissions, a unique approach is used for exploring and assessing experiences in the transition to responsible fisheries. These approaches are discussed in more detail in the following sections and in the document OECD (2000*e*).

Table 2. **Group II case studies**

Fishery	Area of study
Korea: anchovy dragnet	Assessment of a move to maximum sustainable yield using the Gordon-Schaefer model.
Norway: Northeast Arctic cod	Identification of strategies that meet stated management objectives.
Spain: Galician shellfish	Assessment of the impacts of new management approaches.
USA: Northeast Atlantic groundfish	Assessment of likely implications of proposed changes in fishery management.
Mexico: Yucatan red grouper	Model approach used to assess the impacts of a move to responsible fisheries.
European Community: North Sea roundfish	A survey and description of issues and possible approaches for modelling the transition to responsible fisheries

III. GROUP I CASE STUDIES

A. Canada: Scotia-Fundy herring

B*ackground and historical context*

The 4WX (Scotian Shelf, Bay of Fundy in Atlantic Canada) herring fishery is the largest herring fishery in the western Atlantic, with annual landings approaching 100 000 tonnes. The commercial fishery involves a variety of gear types, including fixed gears. A purse seine fleet of approximately 35 vessels takes roughly 90% of the annual total allowable catch (TAC). The fixed gear sector (weirs and gillnets) takes the remaining 10% of the annual TAC. An ITQ system formed the foundation the 1983-1992 4WX herring management plan. The plan also has guidelines for the allocation of the TAC among gear sectors and for the transfers of individual quotas among purse seiners.

The stock of harvestable herring is comprised of two major components serving two separate markets. These are:

i) Juvenile stock (ages one to three years) caught in shoreline weirs for canned sardine markets, a bait market and processed into fish meal for fish farming operations.

ii) Adult stock (ages four and over) supplying a food fillets industry and a seasonal roe fishery.

Current status and issues

Projections for the fishery during the early 1980s indicated that a sustained yield in excess 100 000 tonnes was possible, and with the improved stock status during the 1980s the stock was considered to have reached its long-term yield of 150 000 tonnes. However, the 1990s have seen a sharp decline in stock abundance in the traditional 4WX fishing grounds. Although it is now returning to higher values, larval abundance, which used as key index of spawning stock abundance, has fallen off since the mid-1990s. Since 1994, catches have been about 50 000 tonnes annually, well below the expected yield of 100 000 tonnes.

Each autumn the Scotia-Fundy Herring Advisory Committee (SFHAC) recommends the upcoming TAC for the fishing season beginning in mid-October and discusses allocation issues related to the winter fishery. The spring meeting discusses issues related to the upcoming summer and fall fisheries on the spawning aggregations. The SFHAC consists of members from the harvesting and processing sectors and DFO science and fisheries management sectors.

Since 1994, the in-season management-working group (comprised of members of the purse seine and processing sectors only) has been overseeing the activities of the purse seine and gillnet fisheries. The working group also includes members of the scientific staff and the government management operations group. This participation has led to the direct contribution of the industry in management decision making and has in fact improved the conservation ethic of the fishery. This has been borne out in the "survey, review, then fish protocol" that the management-working group has adopted and industry has used. This participatory, in-season, management process is a marked change from the annual, single point, renewal process that has characterised this industry in the past. The concentration of fishing effort on known spawning aggregations of herring requires that information about the status of the spawning group be known in a timely fashion.

This conservation ethic is evidenced by the industry decision to request a closure of the season's first spawning group in Scots Bay in 1995. After the results of poor surveys, industry made the suggestion to close the spawning area to fishing for that year, fearful that the fleet could damage the future produc-

tive capacity of the spawning group. The next year, 1996, the fleet surveyed again, prior to establishing a fishing plan, and was rewarded with very good survey results and a higher than average catch.

Fisheries objectives

The model-specific performance targets for the fishery are defined below and summarised in Table 3. These are based on stated objectives and historical best performance of the fishery.

Table 3. **Scotia-Fundy fishery performance targets**

Performance measures	Targets
Biological	
Total biomass (ages 1+)	500 000 tonnes
Spawning stock biomass (ages 4+)	400 000 tonnes
Economic	
Gillnet net operating income	CAD 10 000 annually/operator
Mobile seiners net operating income	CAD 500 000 annually/operator
Non-mobile seiners net operating income	CAD 200 000 annually/operator
Weirs	CAD 6 000 annually/operator
Processing sector	CAD 30 million annually
Social	
Total labour earnings	CAD 20 million annually
Administrative	
Total administrative costs	CAD 1.5 million annually

Model application-Status quo and alternative policy results

The transition period for this fishery is 1998 to 2001. Two main fishing policies are used for the transition period:

- The immediate $F_{0.1}$ strategy, where the fishing mortality of $F = F_{0.1} = 0.30$ is used to determine annual TACs for all years in the transition period, 1998-2001.
- The increasing F strategy where TACs are fixed based on increasing Fs to $F_{0.1}$ levels in a gradual fashion over the transition period.

Vessel quota allocations are set through the distribution of catch at age by the various gear types. Two allocation scenarios were considered for the transition period to take into account the rather controversial issue of seiner allocations between mobile and non-mobile groups:

- The unequal (*status quo*) option assigns 55% of the TAC to the mobile fleet and 40% to the non-mobile fleet. As well, the non-mobile fleet is restricted from fishing in certain areas and times that are open to the mobile fleet.
- The equal shares option, where non-mobile area restrictions are removed and non-mobile vessels are assumed to divide their catches among areas in the same manner that mobile vessels do.

The transition of the fishery over the projection period requires that assumptions be made regarding the demand and prices of herring products produced by the fishery. Among many different possibilities, this analysis considers two different scenarios:

- The current market trend assumes a continued decline in herring roe prices (landed and processed values), primarily from the fall in demand observed since the early 1990s in the Japanese market. All other (nominal) prices for food, over-the-side-sales (OSS) and other herring products remain stable over the transition period.
- The optimistic market projection assumes that the prices for herring roe, OSS and other food increase to the end of the transition period.

The *status quo* and alternative scenarios can then be defined by combining the harvest policies (2), seiner allocation schemes (2) and market projection scenarios (2). This gives a combination of eight scenarios to be tested.

Deterministic model results

The higher catches and lucrative herring roe market combined to provide good results early in the transition period, 1989-1992, for the *status quo* scenario. However, after 1992 the combined decline in the herring roe market and stock recruitment, moves the fishery away from its management targets up to the end of the current period.

Results from alternative scenarios

- Harvest policy scenarios

In all scenarios, the *immediate* $F_{0.1}$ harvest policy results in a 50% increase in the estimated fishing mortality in 1998 over 1997 (estimated at F = 0.2). The policy yields the highest catches in the first two years (1998-1999) of the transition period. However, even at constant F, the catches decrease in the last two years (2000-2001). At the current levels of the stock, this strategy effectively deteriorates the stock biomass position and moves it away from the higher targets over all years of the transition period. In contrast, the more conservative *increasing* F harvest policy moves the stock toward the biomass targets over the planning period before levelling off in the last year when $F = F_{0.1} = 0.3$. The cost of this strategy is a lower initial catch (and returns to the industry and labour) that rises only gradually over the transition period.

- Seiner allocation scenarios

The *unequal allocation* scenario – which is the *status quo* situation – favours the large, mobile seiner gear sector, especially under an optimistic market setting and the increasing Fs policy over the transition period. This scenario is directly comparable to the scenario with equal allocations among mobile and non-mobile groups. In addition, the *equal allocation scenario* achieves a higher labour wage, reflecting the slightly greater intensity of labour use by the non-mobile vessels.

- Market projections scenarios

The *status quo* scenario depicts a continuing decline in the demand for herring products and a corresponding fall in the landed price. The optimistic market scenario schedules prices to rebound to the higher 1980s nominal price levels. This scenario incorporates an increase in the market price for herring fillets, herring roe, and the OSS markets, as well. This *optimistic market* scenario shows a marked increase in the economic performance of all gears and the processing sector. The sensitivity of the results to these changes suggests that promoting the market for herring would be beneficial to the industry toward attaining its viability goals.

Transition period simulation analysis

The analysis of the transition period for the fishery is from 1998 to 2001 is subject to much uncertainty. In order to test this and evaluate the robustness of alternative policy options, a simulation model was developed. The two scenarios were used to illustrate the main impact of uncertainty. These are *i*) the *status quo* scenario and *ii*) the *increasing* F, *optimistic market and equal share allocation* scenario.

Status quo results

The simulation of the *status quo* scenario with its *immediate* $F_{0.1}$ harvest policy has the effect of decreasing the biomass relative to the target values. The total biomass and the spawning stock biomass will be expected to decline by approximately 5% from start of year 1998 values. The simulation analysis also shows that there is only a 5% chance that the biomass targets may be reached by the end of the transition period (2001). The application of this strategy means that catches are expected to fall over the transition period. There is no chance that the processing net operating income target (CAD 30 million) will be reached by 2001.

Results for the individual gears under this scenario also mimic the results of the processing sector. Although catches are high in the initial years of the transition period (1998-1999), they fall off thereafter and incomes to the harvesting gears fall as well. Since all gears are currently well below their desirable targets, these targets are not attainable over the transition period. In 2001 the non-mobile net operating income shows that the maximum level is still less than 50% of the income levels observed in the fishery's recent history.

For the administrative component of the system, the *status quo* simulation results do not approach target levels. Administrative costs are expected to overrun by approximately 30% each year of the transition period. The fishery's labour earnings are consistent with that expected with a lower catch level and the depressed prices of the *status quo* scenario. Simulated maximum earnings yield approximately CAD 13 million – 35% below the target. On average, simulated labour earnings are roughly 50% below target in the last year of the transition period.

In summary, the *status quo* scenario is judged to be ineffective in moving the system toward its biological, economic, administrative and social targets.

Increasing fishing mortality rate scenario results

The *increasing* F harvest policy results in a slightly increasing trend in the biomass relative to the 1998 start of year estimates. The total biomass and the spawning stock biomass will increase by approximately 2%. There is only a 26.5% chance that the spawning stock biomass target of 400 000 tonnes will be reached by 2001. The application of this strategy means that catches are expected to rise over the transition period. The effect on processing net operating income is slightly positive, especially in the last two years of the transition period. Nevertheless, there is no chance that the relatively high processing targets will be reached during the course of the transition period.

Results for the individual gears under this scenario are similar to the results of the processing sector. Increasing catches result in rising incomes. Since all gears are currently well below their desired targets, these targets are not attainable over the transition period despite the rising income pattern. Harvesting and processing earnings increase by 50% over the transition period to approximately CAD 12 million. However, the social performance is still 40% below the target of CAD 20 million.

This scenario is more effective in moving the system toward its various targets. It is the more appropriate harvest policy pattern with respect to stock biomass measures. A more equitable result occurs among purse seine gears of the "equal" allocation option and, as a consequence, labour earnings are enhanced. Finally, the economic performance of the gears has the greatest propensity to increase if the market for herring products improves.

Policy implications

This section reviews the policy implications of the analyses: *i*) harvest policy; *ii*) harvest allocation issues; *iii*) market considerations; *iv*) management arrangements; and *v*) in-season analysis.

Harvest policy

The initial status of the stock at the beginning of the transition period (1998) is as recovering from being in a low state in the middle part of the decade. The comparison of the two harvest strategies clearly indicates that a gradual increase in the exploitation rate to allow stock growth is a preferred harvest policy. The analysis indicates that this policy is expected to have a positive impact on stock biomass rebuilding over the transition period. Moreover, the gradual increase in stock and annual catch will permit the establishment of a concurrent market strategy to promote herring products.

Allocation issues

On average, small, non-mobile vessels have an operating cost advantage in a rationalised, smaller scale fishery. As well, the larger capital cost of the mobile and processor-owned seiners in this dedicated fishery reduces the likelihood that they would be the vessel of choice in a revitalised fleet. There are eco-

nomic advantages to promoting the development of smaller seiners. These circumstances favour consideration of an equity policy between the allocation to the two seiner groups. In the short run, equity between small and large seiners means a direct gain to the small boats and a loss to the larger seiners for all scenarios. Overall there is a slight net gain in overall operating costs and an increase to labour earnings under an equal allocation policy. From an administrative point of view, the management of the vessel quota system would be made simpler under an equitable allocation policy as small and large seiners would be on an equal footing to buy and sell quotas (this is currently not the case). This may promote rationalisation (*i.e.* further quota trading and permanent withdrawals) in the seiner fleet.

Market considerations

Without a change in the market situation, there is little hope in the fishery returning to its earlier level of earnings in the late 1980s and early 1990s. The optimistic market scenario shows that there is value to the fishery in promoting herring products. This could involve for example generic advertising campaigns supported by the industry (harvesters and processors) and with support from government programs (as has been done with milk and other basic products). In any case, the population of herring is expected to increase and, as production grows with it, there will be a need to market more herring. As a policy consideration, the promotion of existing markets and the development of new markets for herring (*e.g.* in aquaculture feed) could help the fishery move towards its socio-economic objectives.

Management arrangements

Participatory management or co-management has been important in this relatively small and homogeneous fleet fishery. This trend should be continued and expanded to involve all gear types and participants in the active, day-to-day management of the herring resource and the fishery. Although not explicitly modelled in this analysis, the policy has positive indirect social, economic, and biological impacts.

In-season analysis

Although not explored in this analysis, the fishery needs to be monitored on an ongoing basis over the course of each season. The biological structure of discrete spawning aggregations requires that care be taken of the spatial and temporal application of fishing effort in order to avoid unbalanced exploitation of individual stock components. "Real-time" and participatory monitoring of the status of the stock through "survey, review, then fish" will ultimately produce more accurate stock estimates and identify potentially more productive capacity for the fishery.

B. Australia: Southern shark

Background and historical context

The southern shark fishery on the two species of school and gummy sharks is located in Australian Commonwealth managed water adjacent to the states of Victoria, Tasmania and South Australia. The fishery has operated for more than 60 years. Throughout the 1980s, catches of school sharks and gummy sharks were similar. In the 1990s however, school shark catches were a decreasing proportion of the total catch. At the same time, fishing effort has increased dramatically by two to three times over that in the 1970s for a similar catch. Catch rates have declined more than 50%.

Since 1986 the fishery has been managed under input controls. The focus of management has been on reducing gillnet sector effort and catch due to biological concerns, originally about the state of the gummy shark stock, and more recently about the school shark stock. School and gummy sharks are targeted mainly by gillnets and long-line gear, yielding catches currently worth approximately AUD 17 million per year.

Current status and issues

The stock assessment of school shark undertaken by Shark Fisheries Advisory Group ("Shark FAG") in 1996 indicated that the mature biomass at the start of 1995 had fallen to between 15-46% of its virgin size

and that current fishing effort would lead to further depletion. On the recommendation of the Shark Management Advisory Committee ("Shark MAC"), the Australian Fisheries Management Authority ("AFMA") agreed that the conservation objective for the stock would be an 80% probability that the mature biomass would be above the 1996 level in 2011. The Shark MAC is considering three options to reduce catches: *i*) an abrupt reduction in 1998 from the current catch level of around 835 tonnes to 536 tonnes, *ii*) a phased reduction over three years to 509 tonnes and *iii*) a phased reduction over 5 years to 475 tonnes.

The harvesting sector of the southern shark fishery consists of two main gear types: gillnets and long-lines. These gears have a different age selectivity pattern for sharks and therefore they exploit different age classes of school and gummy sharks. Boats in the southern shark fishery can be divided into five categories stemming from the management regime that has been in place since 1988. Commonwealth endorsed boats fall into three categories of gillnets: A10, A6 and B. The A10 boats are limited to fishing with a maximum of ten nets, while A6 boats are limited to six nets. The B class boats are limited to between three and five nets. Two other groups are comprised of state endorsed boats. These boats may use either nets (gillnets) or hooks (long-lines), and the choice of such gear determines the group to which they belong.

The use of individual effort units has had a negative impact on the industry. Despite management attempts to reduce fishing effort, significant excess harvesting capacity exists in the fishery. Moreover, the net reductions of the early 1990s left many operators with an inadequate quantity of gear to operate efficiently in the fishery. In response, some operators started working their gear more intensively to try to overcome the economic effects of this restriction. This increased fishing effort and fishing costs. It is estimated that sustainable harvesting requires a further 50% reduction in current catch, and there is concern in industry that the net reductions required to achieve this catch target would leave many operators economically nonviable.

In an effort to slow the growth in fishing effort, net units have not been freely transferable, and this has effectively locked operators into the fishery since 1986 and prevented industry restructuring. Non-transferability has been the source of a great deal of dissatisfaction within the industry. It has created severe economic hardship for many operators who wish to leave the fishery. Also, because most operators hold their shark entitlement as part of a package of other entitlements on the same licence, the non-transferability of shark entitlements inhibit the sale of the licence package. The impact of this management regime on employment is not known. Some operators have increased crew in an attempt to circumvent the impact of net reductions; others have reduced crew size and worked harder themselves.

Fisheries objectives and responsible fisheries

The fishery objectives for the southern shark fishery are shown in Table 4.

Table 4. **Southern shark fishery performance targets**

Performance measures	Targets
Biological	
School shark total biomass (ages 1+)	3 500 tonnes
School shark adult biomass (ages 9+)	1 000 tonnes
Gummy shark total biomass (ages 1+)	5 000 tonnes
Gummy shark adult biomass (ages 5+)	3 000 tonnes
Economic	
A10 boats net operating income	AUD 60 000 annually/operator
A6 boats net operating income	AUD 25 000 annually/operator
B boats net operating income	AUD 7 500 annually/operator
State hook boats net operating income	AUD 2 500 annually/operator
State net boats net operating income	AUD 1 000 annually/operator
Social	
Total labour earnings from harvesting	AUD 10 million annually
Administrative	
Total administrative costs	AUD 1 million annually

Model application – Status quo *and alternative policy results*

Policy scenarios

Three policy options considered for the period 1998-2001 are *i*) the *status quo*, *ii*) the *status quo* with transferability and *iii*) individual transferable quotas. These are then combined with the three TAC reduction options.

- Status quo

This involves the continuation of the input controls system with restrictive regulation on gear reduction, trip limits, and area and depth closures, but no transferability of effort units. It replicates the current system of input controls with non-transferable entitlements. The 1996-97 budget for the current management system amounted to AUD 1.13 million. Most management costs show little change if gear reductions are used to reduce the catch of school sharks. The introduction of trip limits adds an additional input control and the management costs would rise due to extra costs associated with port catch monitoring. Under area/depth closures management costs would increase due to the introduction of a vessel monitoring system (VMS) and increased aerial surveillance to help enforce the closures.

- Status quo with transferability

An enhanced input control policy will have similar costs to the *status quo* policy with gear restrictions, trip limits and area/depth closures. For the case of input controls with transferability, the relative share of the annual TAC is adjusted toward the more specialist gear sectors (*i.e.* A10, and A6 boats) and away from B boats and the state hook sector over the transition period. This transferability is assumed to take place at the start of the transition period (*i.e.* in 1999).

- Individual transferable quotas

It is estimated that the costs of at-sea, in-port and aerial compliance activities could fall relative to the costs under current management arrangements. To strengthen the integrity of ITQ compliance, this option would be introduced with a Vessel Monitoring System (VMS). Total costs would therefore be higher than under the current input control. The ITQ scheme is expected to engender consolidations and removals from various gear sectors as well as cause a shift in effort similar to that expected with the *status quo* transferability option. Boat removals are anticipated to occur in all sectors, especially in B boats and State hook boats fishing southern sharks.

- TAC Reduction Options

Three school shark harvest reduction options are considered:

i) An abrupt reduction from 835 tonnes to 536 tonnes in 1998 with catches held constant at this level over the transition period.

ii) A phased TAC reduction over three years to 509 tonnes by 2001 (a reduction of approximately 109 tonnes per year for 3 years).

iii) A phased reduction over 5 years to 475 tonnes by 2001 (a reduction of 72 tonnes each year for 5 years).

For gummy sharks, the 1996 catch level of approximately 1 650 tonnes, moving up to 1 800 tonnes over the transition period, is sustainable for this stock. Combined with the three policies above, these TAC reduction schedules provide a possible nine different policy scenarios.

Market scenarios

A single market scenario is applicable to all policy scenarios. Prices for harvested shark catches (school and gummy) are assumed to be unrestricted with ready substitutes and market prices (especially

in Melbourne) that are not effected by a shortage of supply. Prices over the transition period are assumed to be stable.

Deterministic model results

The *status quo* is defined as an abrupt school shark TAC reduction policy with fishers having non-transferable catch entitlements. The relative performance of the fishery has declined since the beginning of the planning period (1992), reaching a large negative level at the beginning of the current year (1998). There is then a growing overall departure from target values, primarily due to the weak performance of the economic sector.

The reduction of school shark TACs in 1998 has an initial, but slightly positive, impact on the overall performance. The effect is to reduce the disproportionately higher effort needed to catch dwindling stocks. By allowing stocks to rebuild, there are immediate payoffs from due to the reduced effort required. Moreover, the opportunity costs of fishing for sharks when other stocks of fish are available may be larger.

Results from alternative scenarios

- *Status quo* with alternative school shark TAC reduction strategies

The results of the alternative *status quo* scenarios under the different TAC strategies favour an abrupt school shark reduction policy. The more gradual decline in school shark TACs pushes the stock's biomass down further and leads to an even slower recovery. The increased fishing effort operating costs associated with a higher school shark TAC more than offsets any additional revenue. The economic performance of the fishery declines, even in the initial transition years, by keeping school shark catches higher. The effect is experienced by all gear sectors and is more pronounced with the slower rate of decline in school shark stocks. The abrupt school shark TAC reduction policy is therefore preferred.

- *Status quo* with effort transferability

The transferability scenario achieves the best results when there is an abrupt TAC reduction. Stock biomass performance is the same as with the *status quo* policy. Transfers lead to an improvement of approximately 10-15% in the annual economic performance. Transfers also result in a shift to less intensive labour harvesting activity and consequently a marginally lower (*i.e.* less than 1%) overall labour bill compared with the *status quo* policy. Total administrative costs increase under a transferability regime to account for the adjustment of effort from gear sector to gear sector and from boat to boat. Management costs are estimated to be 10% higher.

The use of the input controls with transferability could be favoured over the *status quo*, as the improvement in economic performance of the gear sectors outweighs the slight decrease in social performance and the increase in administrative costs.

- ITQs

The option reallocates shark catches by gear type and includes the removal of boats over the transition period. As with other scenarios, the ITQ scenario with an abrupt school shark TAC reduction achieves the best results compared with the status quo scenario. The *status quo* with transferability and the ITQ policies have the same biological performance. In terms of the economic performance of average boats by gear type, the ITQ scenario achieves superior results for the more consolidated certain gear types (*e.g.* A10 vessels). However, ITQs also have a marginally negative impact on less significant gear types (*e.g.* State hook vessels).

Transition period simulation analysis

The analysis of the transition period for the southern shark fishery from 1998 to 2004 is subject to much uncertainty. In order to test this and evaluate the robustness of alternative policy options, a simulation model was developed. The deterministic analyses identified two possible policy scenarios under an abrupt school shark reduction strategy that may lead the fishery towards a responsible status: *i*) *status quo* policy with effort transferability and *ii*) ITQs. The simulation results for each of these scenarios are as follows.

Status quo *with transferability*

The policy moves the fishery towards its various biological, economic, and social targets. However, it cannot be said to achieve those targets with any significant probability. As under the deterministic analysis, this policy gives different views of the two shark stocks. For example, the school shark biomass levels off under the abrupt TAC reduction strategy and little real progress is made in moving towards the target biomass levels. The school shark stock has little likelihood of becoming severely depleted, although there are few reasons to be optimistic. In an effort to move school sharks closer to their target levels, further TAC reductions could be considered. In contrast, the simulation shows the gummy shark stock expanding and growing, especially with respect to total biomass. Analysis of the proxy adult stock biomass (ages 5 +) suggests the target was not achieved. However, the results may be due to an overly optimistic target rather than an insufficient stock growth result.

There is an improved economic performance, primarily from effort transferability to A10 boats. In 2004 there is a 10% chance that the target level of AUD 60 000 in net operating income for each A10 operator may be achieved. The labour earnings in the harvesting sector indicate the social performance over 1998-2004. Its AUD 10 million target has a very small chance of being attained.

ITQ*s*

The ITQ scenario is more effective in moving the system toward its various targets, primarily as a result of the economic performance of the major gear types. The stock biomass results for the ITQ scenario are identical to the stock results for the previous policy. This result is a consequence of the identical TAC schedules.

The economic results of the ITQ policy are expected to be superior compared with the previous policy. The policy offers the opportunity for improved economic results. By the 2002 (and thereafter), it is expected that A10 operators will reach the AUD 60 000 target net operating income. By 2004, there is a greater than 50% chance that the average A10 operator will exceed the net operating target in that year. The results for the social (labour wage bill) component of the system are identical to the results under the previous policy.

Policy implications for the transition to responsible fisheries

This section reviews the policy implications of the analyses: *i*) harvest policy, *ii*) management administration arrangements, *iii*) in-season analysis, *iv*) allocation issues and *v*) market considerations.

H*arvest policy*

The status of both sharks was better at the beginning of the planning period (1992) and has subsequently declined up to the current period (1998). The faster growth rate of the gummy shark stock has kept it from declining dangerously during the period of higher fishing mortality. However, the longer-lived, slower growing school shark has not yet recovered from a protracted period of decline up until 1998, despite management attempts to reduce effort.

The concern for the school shark led AFMA to consider a series of total catch reduction strategies phased in over 1, 3 or 5 years. All indications from this analysis are conclusive in indicating the relative dominance of the abrupt (1-year) adjustment strategy. The impact of the immediate TAC reduction is to

cease the stock decline, as well as to improve the economic position of the gear sectors in the short and long term. Longer school shark adjustment strategies delay stock recovery and may even precipitate further stock decline.

The ineffectiveness of the immediate decline policy in bringing the school shark stock closer to its targets implies that there is a need for further exploration of more reductions in school shark TAC levels. The trade-off between a faster rate of school shark stock recovery and economic performance should be further explored by examining alternative TAC reduction strategies.

Management administrative arrangements

The policies that have been explored all require associated management administration in order to be successful. It is desirable that all adjustment to management administration takes into consideration the jurisdictional and management history of the fishery. Furthermore, the progress of the representational and legislated decision making authority of the Shark MAC under AFMA appears to be significant in the success of co-management in this fishery. Although not explicitly modelled in the above analysis, the trend toward co-management should be continued as it can have indirect social, economic, and biological benefits for the fishery.

In-season analysis

In conjunction with management arrangements, the fishery should be monitored throughout the season. The biological structure of shark aggregations and migration patterns requires that care be taken of the spatial and temporal application of fishing effort in order to avoid unbalanced exploitation of individual stock components. In-season monitoring of the stock, together with the participation and assistance of the industry, will stimulate more analyses to support shark assessment work and produce more accurate stock estimates. Improved estimates will help to identify potentially more productive capacity for the fishery.

Allocation issues

The analysis has made assumptions about the reallocation of the southern shark fishery among five principal gear sectors. These assumptions were assigned in the absence of empirical data on expected transferability of effort or vessel consolidation and removals. Nevertheless, the impact of modest transferability and vessel consolidation has direct, positive, and immediate economic impacts on this overcapitalised fishery. Policies designed to consolidate effort and capital in this fishery could therefore be promoted. Market forces through a transferability mechanism may be effective in achieving this. Based on the economic argument arising from this case analysis, transferable quotas and output controls would be favoured over an extension of existing input controls (*i.e. status quo* with transferability).

Finally, the consolidation of vessels in this fishery moves it towards a state where it is more dedicated to shark fishing. Currently, vessel operators may earn a significant share of their income from other fisheries. Further reduction of the fleet will move more shark fishers into the specialist category. These dedicated fishers are likely to extend their quasi-ownership status into collective and self-enforcing conservation policies for their own benefit.

Market considerations

The dependence of economic performance on market prices places emphasis on marketing and promotion. The impact on the industry performance of a top quality product that earns higher prices could be profound. Improved market promotion and consumer awareness, as well as ensuring delivery of top quality product to buyers would also enhance the returns from these products.

C. Japan: Saury

Background and historical context

The saury fisheries have an annual catch of 200 000 to 300 000 tonnes and are one of the largest fisheries in Japan. Sauries are caught by the stick-held dip net fishing method mainly along the Pacific coast – more than 90% of the harvest is caught this way. The saury fisheries have been managed under a Total Allowable Catch (TAC) scheme since January 1997. Prior to the introduction of the TAC scheme, the saury fisheries had been managed through restrictions on fishing effort. In addition, the saury fishing industry conducted production management tentatively through the Saury Stick-held Fisheries Production Control Association between 1961 and 1997.

Current status and issues

Stock structure

The lifetime of sauries is around two years and the difference in size observed at the time of catching is considered to be due to differences in age. Harvests are directly related to the dynamic state of resource abundance. Judging from the present level of catch quantity, the recent trend of resource abundance is qualitatively estimated to be at a high level. The TAC was set at 300 000 tonnes in 1997 and 1998; 280 000 tonnes was assigned to domestic fisheries and 20 000 tonnes to Russia. Catches in recent years have been stable in the range of 200 000 to 300 000 tonnes, suggesting that resource abundance is relatively stable with this level of fishing.

Fisheries

The stick-held fisheries are the most common fishing method accounting for 93% of the total catch in 1996. The fishing season is seasonally limited to about 120 days in the period from August to December, partly due to the biological characteristics of migration. Those engaged in saury fisheries therefore also catch other species; catches of other species may therefore affect the number of fishing vessels in operation. The number of fishery firms in the fishery changes year by year. The number of fishery firms engaged mainly in saury fisheries[4] was 83 in 1992, 127 in 1994 and 140 in 1995. Set net fisheries are a distant second to the stick-held fisheries in terms of importance. Larger vessels account for a relatively large portion of the catch. Although representing 0.6% of the total number, saury vessels with a tonnage over 100 GT account for 62% of the total catch and thus form the core of the fleet.

Fisheries objectives and responsible fisheries

Table 5 gives the various target values for the fishery. These will be later used to assess and evaluate various policy options. The transition period for the fishery is 1998 to 2001.

Table 5. **Saury fishery performance targets**

System component	1998-2001 target levels
Biological	
Total saury biomass (ages 1 +)	1 100 000 tonnes
Yield (tonnes)	300 000 tonnes
Stick-held economics	
Net operating income per fisheries firm	JPY 60 million annually
Profit (before taxes) per firm	JPY 20 million annually
Social	
Total annual labour income	JPY 8 billion annually
Number of workers (person years)	1500
Annual wages per worker	JPY 5.5 million annually

Model application – Status quo and alternative policy results

Status quo

The results of the *status quo* scenario are compared to alternative policy scenarios for determining improved fisheries system performance related to the meeting of targets over the transition period. Saury fishery policy scenarios are defined in terms of: *i*) the annual catch quantity, *ii*) the number of stick-held fishing firms engaged in the fishery, and *iii*) the total market demand for saury products. The *status quo* scenario is defined by:

- An annual total catch is set at 300 000 tonnes (280 000 tonnes in domestic catch).
- The number of fishery firms is set at 130.
- Social market demand is 280 000 tonnes.

From the *status quo* scenario analysis, the fishery is expected to produce a sustainable, stable supply of saury that meets the anticipated demand. The catch may exceed the social target value of 270 000 tonnes annually. However, in terms of the sustainable resource abundance, the catch quantity should not exceed 280 000 tonnes annually. Thus, under the current circumstances and assumptions, it would appear that an annual domestic harvest policy can be defined between 270 000 tonnes and 280 000 tonnes. This meets resource sustainability and social market targets.[5]

Stock indicators are stable over the transition period at levels just below the target size of 1.1 million tonnes. Similarly, fishing mortality – a proxy indicator of total fishing effort – is steady, although increasing, at F values between 0.44 and 0.46.

The net operating income level for an individual firm is stable near the target level of JPY 60 million per year. Fishery firms are affected not only by catch levels, but also by the number of other firms. The threshold number of fishery firms is about 130. A smaller number gives profits to the remaining firms; a larger number leads to losses. The trend is evident even when catches are greater than 269 000 tonnes. When the number of fishery firms is reduced to about 120, and catches are stable at about 280 000 tonnes, then the saury fisheries can meet annual demand while maintaining economic stability.

Alternative scenarios' results

Thirteen alternative scenarios are considered in the deterministic analysis. These scenarios are derived from altering *i*) assumed catches, *ii*) firm numbers and *iii*) market prices.

- Assumed catches

It is difficult consider transition period changes in the catch quantity due to changes in natural conditions because of the lack of stock biological growth and recruitment data for this stock. To account for possible uncertain changes, a selection of *alternative annual catches* was analysed to compare to the *status quo* scenario results over the transition period 1998-2001. Annual catch quantities of 100 000, 300 000 (*status quo*), and 500 000 tonnes were examined on the assumption that large changes in the resource conditions would cause catch quantities to deviate significantly from the current level. The results take into account the effect of market price on saury as a function of the total annual harvest. The participation of 130 firms in the fishery is assumed.

- Firm numbers

Alternative scenarios are also considered for the *number of stick-held* firms that participate annually in the saury fishery. The greater number of firms (assumed to be each of average size) participating in the fishery, the lower the average revenue earned by each firm for a given total catch. Three firm number possibilities are examined: *i*) 130 firms (status quo), *ii*) 120 firms and *iii*) 140 firms.

• Market prices

Different *market possibilities* are also examined. The pessimistic market scenario represents a potential market slump of 20% over the transition period. The optimistic market scenario envisages a 20% increase in the harvested price of all saury products.

• Catch of 300 000 tonnes

The *status quo* scenario with the 130 stick-held firms and annual total catches of 300 000 tonnes is analysed. The stock abundance impacts for this scenario, and all other scenarios with the same catch level, are identical. It suggests a stable abundance at the designated annual catch of 300 000 tonnes with total biomass near the target level. Accordingly, the following discussion compares and contrasts the results over the transition period for different numbers of firms.

The *status quo* economic indicators for net operating income and profit over the transition period are near the target level but decline slightly. Social impacts of the status quo transition are also at or near the target levels. When the number of firms is reduced to 120, the total revenue from the fixed annual catch is distributed among fewer fishery firms and fewer fishery workers. The effect is to increase the net operating income and profit per firm. At the same time, the total labour bill (a function of the total landings) remains the same (as for the *status quo*) but is distributed over fewer workers, thereby increasing the average wage per worker. The opposite effect occurs when the number of stick-held firms increases to 140. Relative to the *status quo* results, net income and profits per firms fall, as does the average wage per worker.

For a given annual total catch fewer firms would have no effect on the stock status and would be preferable from the standpoint of economic and social performance (with the sole exception of the desirable number of fishery workers). Overall, for the same level of fishing, more firms in the fishery reduce the viability of the average firm; fewer firms in the system increase average profitability.

• Catch of 100 000 tonnes

The reduced catch has a dramatic effect on stock abundance status, economic performance, and social performance measures. Lower catches reduce stock mortality by one-third and push stock abundance 20% over the target by 2001. Lower catch levels drive up the saury unit prices resulting in a near doubling of net operating income and profit over the transition period. As a consequence of high revenues, the total labour bill increases by approximately 20%. However, the results indicate a direct violation of domestic market demand estimated at approximately 270 000 tonnes per year. Under the circumstances, it is not clear whether the proposed harvest reduction would damage the market irreparably. Nevertheless, the analysis suggests that there would be opportunity for the sector in limiting the quantity produced and keeping prices higher than otherwise.

• Catch of 500 000 tonnes

The impact on stock abundance status is very negative – a 30% expected decrease in stock abundance by 2001. At this level the stock must be considered to be in jeopardy of economic extinction. With respect to economic performance, the transition period is characterised by declining stocks, higher costs, and lower relative prices for the market glut (estimated nearly twice annual market demand). Losses are expected in each year as the increase in revenue from supply fails to compensate for higher costs of harvest. Similarly, relative to the *status quo* results, the social performance measures for this scenario are all below comparable *status quo* positions and declining over the transition period. The higher harvest policy is inferior to all other harvest strategies.

• Alternative market projections

Under optimistic market prices (20% above *status quo*) all economic and social measures improve and exceed the target values. In comparison with the *status quo* scenario, economic profit performance by the

sector improves by a factor of four. However, when the market prices are pessimistic (20% below *status quo*), results fall below the *status quo* scenario. Only when the number of firms are slightly lower than 120 will a breakeven profit level be obtained. Alternatively, a restriction of output below 300 000 tonnes will keep prices elevated and compensates for the market slump.

Transition period simulation analysis

The analysis of the transition period for saury fishery from 1998 to 2001 is subject to much uncertainty. To evaluate the robustness of alternative policy options, a simulation model has been developed. The above deterministic analyses identify two possible policy scenarios that may lead the fishery toward a responsible status: *i*) *status quo* and *ii*) reduction in the catch and the number of firms. Each of these scenarios was run in the simulation model.

Status quo

The scenario involves a TAC schedule of 280 000 tonnes with 130 firms in the fishery. The biological performance has stable expectations that are near the target biomass. However, the annual distributions are such that stock trajectories may lead to lower than anticipated stock abundance. With lower market prices, economic and related social income are below target values, suggesting that the *status quo* catch and number of firms are not effective strategies under fluctuating and pessimistic markets. When markets are more optimistic, the *status quo* policy scenario performs much better as economic and social targets are more likely to be reached. The *status quo* scenario has a stabilising effect in moving the fishery toward its various biological, economic, or social targets. However, it cannot be said to achieve those targets with any significant probability when markets and/or stock abundance fluctuates.

Reduced catches and fewer fishery firms

The scenario involves a reduced TAC schedule of 250 000 tonnes with 120 firms in the fishery. It is expected that the total biomass targets will be reached beginning in 1999 with increasing probabilities of exceeding targets out to the end of the transition period. The economic results of the reduced catch policies were better than in the *status quo* scenario. Economic and social measures are marginally positive when associated with the pessimistic market scenario. As such, the reduced catch, and its ensuing increase in unit price, offsets the effects of the market slump. The benefits are countered by underachievement of the target market demand for saury. In the case of improved markets, the price sensitivity at reduced catches more than compensates for the loss of supply. Overall, reducing catches and stickheld participation leads to positive producer surplus and an overall improvement in fishery performance.

Policy implications for the transition to responsible fisheries

The preceding analysis raises three policy matters for discussion: *i*) harvest policy, *ii*) allocation issues, and *iii*) market considerations.

Harvest policy

The economic and social implications of reducing the TAC for saury provides an opportunity for stock growth and protection while further information about stock dynamics and abundance can be investigated. In the absence of stock information a precautionary or reduced harvest level would be a promising strategy to consider. The approach would appear to be attractive to the fishing industry, as decreases in catches will actually improve revenue positions due to the expected increase in prices.

Allocation issues

The anticipated improvement in economic and social performance from TAC cuts over the transition period is further assisted and accentuated when there is a reduction in the number of fishery firms. In a free entry system, firms would be attracted to share the rents thereby reducing the average profit posi-

tion of all firms. In the saury fishery, it would appear that this adjustment is based on historical adjustment and the availability of fishing effort from other fisheries. Limiting participation would maintain higher average profits and ensure more stable viability. Although limited entry fisheries are most often established on the basis of stock issues, in this case longer-term economic viability may be a valid reason to consider a limited entry scheme.

Market considerations

Market price shifts in the order of plus or minus 20% have a direct impact on the profitability of firms in the sector. The noted concern for slumping markets in this seasonal fishery places considerable emphasis on the need to market and promote the product. The impact of new and top quality saury products that earn higher prices could be profound. Further research and development could therefore be considered for promoting and marketing saury.

D. Germany: Baltic cod

Fisheries background and historical context

Baltic cod is fished by countries bordering the Baltic Sea, in particular Germany, Sweden, Denmark, Poland, Finland, Latvia, Lithuania, Estonia and Russia. The International Baltic Sea Fisheries Commission (IBSFC), using advice from ICES' Advisory Committee on Fisheries Management (ACFM), manages the stocks. Advice from the ACFM is used by the IBSFC to assist in fixing the total TAC for the Baltic Sea and allocating country quotas. The German fishing industry has catch quotas for cod in the Baltic Sea for the ICES areas III *b*, *c* and *d*. Up until 1992, the quotas were fixed at levels that exceeded the productive capacity of the stocks. As a consequence, catches were often below quota. In 1993 cod quotas were sharply reduced in the Baltic. Although stocks have subsequently recovered, so quota levels have also been increased.

Current fishery status and issues

Several countries are involved in the multi-species Baltic Sea fisheries. These fisheries primarily focus on herring, sprat, and cod. Many cod trawlers catch a mixture of species. Approximately half of all cod catches reported by German trawlers (mid-water and bottom trawls) include catches of herring. German catches are a relatively small portion of catches in the eastern Baltic – less than 10% each year. In the western Baltic, catches by German trawlers are more significant, amounting to nearly one-quarter of total catches each year.

After an increase in stock size and landings in the beginning of the 1980s, stock abundance declined to the lowest on record in 1992 and has recovered slowly since that time. The drastic decline appears to have been caused by fishing pressure along with a substantial reduction in reproductive success due to high fishing mortality.

Estimated total biomass of the western and eastern Baltic cod stocks decreased from 1.14 million tonnes in 1982 to 175 000 tonnes in 1992 as a result of high fishing intensity. Fishing intensity increased due to the introduction of a gillnet fishery in the late 1980s/early 1990s. Total landings of Baltic cod decreased from 450 000 tonnes in 1983 to 66 400 tonnes in 1993. Since then there has been a small improvement and in 1997 total biomass was estimated to be 340 000 tonnes. In spite of this depleted stock situation, in most years the TACs fixed by the IBSFC were substantially higher than the ACFM's catch quota proposals.

The Baltic cod fishery sector illustrates some of the difficulties faced by Germany's fishery management system. Too many fishing boats in relation to the catch possibilities (illustrated by the TACs and catch prohibition in several weeks during the summer months) result in insufficient income for the fishermen, as well as low and decreasing profitability. The average profitability of the German cutters (>12 metres) in Mecklenburg-Vorpommern fell from DEM 84 000 in 1993 to DEM 35 000 in 1996. To

compensate for this poor profitability, Germany provides assistance for the temporary withdrawal of fishing vessels.

The German vessels that catch Baltic cod stocks mainly come from the harbours of Schleswig-Holstein and Mecklenburg-Vorpommern. There are two main gear types – bottom and mid-water trawl. These vessels catch about 90% of German Baltic cod landings. The German cutter catch of cod fell from 7 339 tonnes in 1991 to 4 407 tonnes in 1993. It increased in the following years and reached 20 122 tonnes in 1996. The relative prices in Denmark and Germany determined where the catches are landed. The price for cod landed in German ports decreased from DEM 3.21 per kilogram in 1991 to DEM 1.87 per kilogram in 1996. In 1997 there was a price increase due to the lower world catch of groundfish.

Cod is the most important fish species for the German cutter vessels in this fishery. In 1997, the share of cod in total landings as targeted species was 45% (in terms of both quantity and value) in the fishing ports of Mecklenburg-Vorpommern and about 80% in Schleswig-Holstein.

Fisheries objectives and responsible fisheries

Table 6 gives the model-based performance targets for the German Baltic cod fishery. These objectives are used to assess and evaluate various policy options.

Table 6. **Baltic cod fishery performance targets**

Performance measures	Targets
Biological	
Cod in divisions 22-24 (Eastern Baltic Sea)	
Total harvestable biomass (ages 1 +)	125 000 tonnes
Adult spawning stock biomass (ages 3 +)	90 000 tonnes
Cod in divisions 25-32 (Western Baltic Sea)	
Total harvestable biomass (ages 1 +)	500 000 tonnes
Adult spawning stock biomass (ages 3 +)	400 000 tonnes
Economic (Net operating income/average operator)	
German trawler fleets	
Bottom otter trawls	DEM 150 000 annually/operator
Mid-water otter trawls	DEM 500 000 annually/operator
Social	
Total harvesting labour earnings	DEM 1 million annually
Employment (harvesting only)	500 full time equivalent workers

Model application – Status quo and alternative policy results

The period from 1998 to 2003 is the transition period for the Baltic cod fishery. The model developed for the Baltic cod fishery case study is applied to the entire planning period from 1991 to 2003. A number of policy options are constructed to review the expected fishery performance.

Policy scenarios

The primary policy options for the Baltic cod fishery over the transition period relate to the TAC schedule. The *status quo* TAC policy involves a constant fishing mortality for the western and eastern Baltic cod stocks.

i) For the western Baltic stock, F is set at the approximate 1997 F value of 0.55. At this rate, catches of cod are expected to be relatively stable at between 53 000 tonnes (1998) and 60 000 tonnes (2000-2001) with no real trend over the period. Population abundance is thus stable year-over-year at this F value.

ii) For the eastern Baltic cod stock, F is set at F = 0.5 to follow on the pattern up to 1997. Total cod catches increase over the transition period from just over 100 000 tonnes in 1998 to nearly 170 000 tonnes in 2003. The trend reflects a rapidly growing stock over the transition period.

An alternative scenario for the TAC schedule involves setting a constant annual catch for the transition period for both stocks. A *constant catch* scenario assigns TACs of 60 000 tonnes in the western Baltic and 140 000 tonnes in the eastern Baltic.

Market scenarios

Alternative market scenarios are constructed as market prices for cod are expected to change over the transition period. Actual prices declined between 1991 and 1997. During the transition period, 1998 to 2003, the *status quo* scenario assumes that the cod price will stay at about 1997 levels. The alternative market scenario involves an optimistic trend, with prices returning to 1991 nominal levels.

Fleet reduction

In accordance with the Multi-Annual Guidance Programme in the Common Fisheries Policy (Holden, 1996), the German trawler fleet is committed to capacity reduction. With respect to fleet reduction, two alternative scenarios are modelled:

i) No change in the current 1998 active fleet composition of German bottom trawls and mid-water trawls (status quo).

ii) A 5% annual reduction in the number of bottom trawlers, year-over-year, throughout the transition period 1998-2003.

Status quo *results*

The expected performance of this fishery under the *status quo* scenario can be considered successful. All stock indicators and harvest sector socio-economic performance measures (with the exception of employment levels) attain their long-term target values by 2003.

Alternative scenarios' results

The *status quo* scenario performance can be compared to the alternative *constant catch* TAC scenario and the market prices and fleet reduction alternatives. The alternative deterministic scenarios examine the impacts of the system subject to alternative TAC policies, alternative market eventualities for fish prices, and a reduction in the size of the smaller bottom trawler fleet.

In response to the apparent surplus production in the eastern Baltic stock, the higher initial constant catch associated with the *constant catch* policy retards the higher growth observed in the *status quo* scenario. As a result, the western Baltic cod stock does not reach its stock targets by the end of the transition period. While the stock is expected to experience continued growth, it would take several more years at this catch level before the stock targets could be attained. For the faster growing western Baltic cod, the stock grows rapidly with the 60 000 tonne annual catch until 1999. After that time, the biomass declines out to the end of the period when the stock targets are barely maintained. The *constant catch* policy – set at the level of 60 000 tonnes – does not appear to be an effective policy to reach and maintain stock targets.

In comparison with the *status quo* scenario, the *constant catch* scenario typically shows improved economic performance for both German trawler fleets. This is especially true when accompanied with optimistic market prices and with fleet reduction programs. It is unclear what entry and exit pressures would occur in Baltic cod fisheries from other potential multipurpose German fishing fleets. The control of fishing effort has traditionally tended to be problematic, especially in periods of perceived market and resource improvements such as those expected for Baltic cod.

The social performance of the fishery under the *constant catch* scenario follows the trend expected to be associated with increased TACs. Labour earnings also grow significantly. However, harvesting employ-

ment actually drops off due to the impact of the fleet reduction programmes. The shift to higher catches with fewer and more efficient bottom trawlers improves average returns to individual trawlers.

Analyses of these scenarios demonstrate the difficulties making trade-offs between exploitation and conservation. Recent history and current stock levels may raise industry expectations for increased catching possibilities. Stock analyses suggest that caution continue to be applied in this fishery to ensure the improving status of the cod stocks. The pressure to increase catches rapidly to desirable long-term levels for economic gain should be tempered by the importance of allowing stocks to grow and thus sustain higher catch levels.

Transition period simulation analysis

The analysis of the transition period for Baltic cod fishery from 1998 to 2001 is subject to much uncertainty. The simulation model investigates the main impact of uncertainty on the fishery system from market price fluctuations, commercial fleet reductions and stock adjustment. The simulation model assumes that the market prices for cod as landed value to fishermen vary randomly – *i.e.* prices may be lower or higher for either Baltic stock in any year of the transition year. It also assumes that the bottom trawler fleet reduction varies over the transition period – *i.e.* fleet reduction occurs randomly year-over-year in any of the simulation trials. These uncertainties are tested in two contexts: *i*) *status quo*, constant F policy and *ii*) constant catch policy.

Status quo, *constant* F *policy*

For the western Baltic, the biomass measures are relatively stable throughout the transition period. There is more than a 90% probability that the biomass targets for the smaller western Baltic cod stock will be met. In the eastern Baltic the stock is expected to steadily increase. By the end of the transition period, the stock will have a 50% or higher probability of achieving the biomass targets. The economic performance for the trawler fleets also meets the target levels over the transition period. The combined impacts of potential price adjustment and fleet reduction appear to promote positive economic performance. Generally speaking, where price adjustments are negative, fleet reductions more than compensate for price losses. The relatively conservative *status quo* policy appears to be effective in continuing to maintain positive fishery performance.

Constant catch policy

The biological performance of the fishery, under constant annual catches of 60 000 tonnes for the western Baltic and 140 000 tonnes for the eastern Baltic, does not appear to be of a long-term sustainable nature. Stock biomass is expected to fall in the west and remain stable below targets in the east. It would appear that the attempt to immediately return to higher catch levels retards growth in the stock. A precautionary approach could involve permitting the continued growth of the stock by gradually increasing catches according to stock growth – similar to the constant exploitation rate associated with the constant fishing mortality policy. The simulation of the *constant catch* scenario results in improved economic performance (net operating income per operator) over the course of the simulation. Social performance is also enhanced with respect to total labour earnings but not, due to the fleet reduction programme, for total employment.

The *constant catch* policy would trade off immediate economic gain for potentially negative stock repercussions. On the basis of this, and the marginal nature of the economic gain envisaged over the results from the *status quo* policy, the *constant catch* policy does not appear to be an acceptable approach for the cod stock complex. Nevertheless, if lower constant catch levels were applied it may be possible to achieve the same stock results as expected under the constant F policy.

Policy implications for the transition to responsible fisheries

This section explores the policy implications associated with *i*) TAC schedule policy *ii*) management issues and *iii*) market considerations.

TAC *schedule policy*

The economic and social implications of increasing the annual TAC for the Baltic cod fishery provide an opportunity for industry to return to the productive, profitable, and stable performance days of the 1960s and 1970s. However, TAC increases could come about gradually over the transition period. It would be helpful to seek industry agreement to more conservative catch limits in the short run while monitoring closely stock growth and recruitment. A constant fishing mortality policy could provide a useful, stock size dependent, feedback mechanism.

M*anagement issues*

The stock continues to be managed through input controls and shared country quota allocations. The experience of entries and exits to the German Baltic cod fishery suggests there is potential for significant adjustment in participation levels. There is an opportunity for the bottom trawl sector to improve its economic performance through rationalisation. In this context, fishing effort control does not appear to provide flexibility to realise these opportunities. Alternatively, and especially in the case of excess capacity, industry self-adjustment could be encouraged. A form of market-based adjustment points to transferable property rights that would allow the industry to rationalise itself, within the boundaries established by the fisheries authority.

M*arket considerations*

Cod has a long and enduring market favour among consumers of white fish (Kurlansky, 1997). As an alternative to increased product supply, the fishing industry could invest in encouraging market growth. The economic benefits to the industry would be enhanced during the expected period of stock growth by promoting good fishing practices and a formal code of conduct for the Baltic as a whole. This would include further research and development on market opportunities for Baltic cod. These investigations could assist in reducing the economic risks associated with any market downturns or TAC decreases, and would thus stabilise fishery performance in the medium term.

E. Iceland: Arctic cod

F*isheries background and historical context*

The Icelandic economy is heavily dependent on fisheries. Approximately 75% of total commodity exports and 50% of foreign exchange earnings are from fish products. The demersal or groundfish fishery is the most important of Iceland's fisheries. The cod fishery alone accounts for 30% to 35% of total landed value.

During the period 1961-70 the total annual catch from this stock averaged 395 000 tonnes. Total catches declined from a peak of 470 000 tonnes in 1970 to 330 000 tonnes in 1978, but subsequently increased to 469 000 tonnes in 1981. The catch fell to 284 000 tonnes in 1984 but subsequently increased to 370 000-390 000 tonnes in 1986-88. Since 1988 the catch of Icelandic Arctic cod dropped to about 170 000 tonnes in 1996 due to declining stocks. After 1996, the catch of cod has gradually increased (1997 catches were just over 200 000 tonnes) and there is optimism that catches are headed to levels nearer to 300 000 tonnes annually.

Current fishery status and issues

The total biomass of cod – "fishable stock" ages 4+ years – was estimated at about 620 000 tonnes for 1993. These estimates show that the biomass has reduced by about 7% to near 550 000 tonnes during 1995. More recent estimates suggest that the total biomass has increased slightly and has been followed by continued pressure from higher catches, which exceeded 200 000 tonnes in 1997.

The Icelandic Arctic cod fishing fleet consists of several vessel types:

- D*eep-sea trawlers*. Large fishing vessels that are between 200 and 1 200 GRT and 40 and 76 metres in length. They are engaged almost exclusively in the demersal fisheries employing bottom and occasionally mid-water trawl.

- *Multipurpose vessels.* For the most part, these are neither specialised with respect to fishing gear nor fishery. Most of the multipurpose fleet is technically able to employ trawl and purse seine.

- *The Part-time open boats.* These are numerous vessels of sizes up to 20 GRT, although most are less than 10 GRT. They are typically operated seasonally by the owner and employ hand-lines, gillnets and long-lines to catch a variety of stocks, predominantly cod.

In order to limit the catches of cod and certain other important demersal species, a comprehensive system of individual transferable quotas (ITQs) was introduced in 1984. The small boats under 6 GRT, operating only with long-lines and hand-lines, were allowed a period of adjustment before being incorporated into the system. In 1991 legislation was passed to make it possible for the permanent transfers of quota shares between vessels with different owners. Previously, trade in quota rights had always been associated with the transfer of ownership of the vessels to which the quotas were attached.

In 1995, the Icelandic government introduced a new formula for determining Total Allowable Catches (TACs) for cod. The government adopted a formula for cod in which the annual TAC should be 25% of the average of the estimated fishable stock at the beginning of the period and the estimated fishable stock at the end of the period, but not less than 155 000 tonnes.

To decrease the risk of regional imbalances, transfers between vessels from different harbours that do not involve exchanges of equally valuable quotas require consultation with the local authorities and the local fishermen's unions before such a transfer can be authorised. There have been very few instances where the transfer of quotas has not been permitted. One reason is that no major regional imbalances have been threatened by the transferability of quotas. There has been relative stability of the regional distribution of landings since the introduction of ITQs.

Fisheries objectives and responsible fisheries

The specific fishery objectives for the Iceland Arctic cod fishery are provided in Table 7.

Model application – Status quo and alternative policy results

The period from 1998 to 2005 is the transition period for this fishery. The entire planning period is from 1993 to 2005. Over the period a combination of policy, market and fleet consolidation rationalisation scenarios are explored.

Table 7. **Arctic cod fishery performance targets**

Performance measures	Targets
Biological	
Total harvestable biomass (ages 4 +)	1 500 000 tonnes
Adult spawning stock biomass (ages 6 +)	900 000 tonnes
Economic (Net operating income)	
Open boats	ISK 400 000 annually/operator
Multipurpose vessels	
0 to 50 GRT	ISK 5 million annually/operator
50 to 200 GRT	ISK 10 million annually/operator
200 + GRT	ISK 30 million annually/operator
Trawlers	
"Small" – 0 to 200 GRT	ISK 30 million annually/operator
"Big" – 200 + GRT	ISK 30 million annually/operator
Processing sector net operating income	ISK 400 million annually
Social	
Total labour earnings	ISK 10 billion annually
Employment (harvesting and processing)	5 000 full time equivalents

Policy scenarios

The primary policy options for the Iceland Arctic cod fishery pertain to the strategic assignment of the TAC schedules for cod over the course of the transition period. The *status quo* TAC policy is defined to conform to the 1995 quota formula for cod whereby the TAC schedule over the transition period is set at the maximum of 155 000 tonnes or 25% of the estimated fishable biomass. Although this policy has not necessarily been followed in practice, it is the stated policy. The *status quo* scenario TAC policy is therefore the maximum of 155 000 tonnes and the equivalent TAC for a constant fishing mortality over the planning period (1998-2005) of F = 0.321, corresponding to an exploitation rate of 0.25. Catches during the transition period under this policy generally increase as the population is expected to grow at a faster rate than the constant fishing mortality.

Alternative scenarios for TAC policies include setting the TAC at constant fishing mortality values (corresponding to the 1997 catches when F = 0.6) with annual TACs of 200 000 tonnes. Alternative values of 150 000 tonnes and 125 000 tonnes are also used. The results of these three TAC strategies are presented below and compared to the *status quo* policy.

Market scenarios

Alternative market scenarios are constructed for the case where market prices for cod are expected to change over the transition period. Market adjustments are modelled by imposing a plus ("optimistic") or minus ("pessimistic") 20% one-time change in cod product prices and final processed product from 1998 to 1999 and then subsequently constant at those prices until 2005.

Fleet consolidation

The management under an ITQ system implies that the commercial fishery sector may undergo fleet consolidation in this fishery sector. With respect to fleet consolidation, alternative scenarios as modelled are "none" (no transfers relative to the current 1998 fleet composition) and "consolidation" (a 5% reduction in numbers of vessels in each gear sector each year for 1998-2005).

Deterministic model results

The *status quo* model is defined in terms of its policy, market, and fleet consolidation scenarios. Alternative scenarios are constructed from selections among these components and analysed relative to the *status quo* scenario results.

The fishery performance under the *status quo* may be considered to be successful over the planning period. All harvest sector economic and social performance indicators are moving toward the long term target values. However, the processing sector, with its elevated cost structure and capital dependency could be improved. While the biological performance of the fishery improves under the *status quo* scenario, the expected status of the stock remains far from the target objectives, even at the end of the transition period.

Alternative scenarios' results

- Low and medium constant catch policies

Lower constant catch policies were examined as alternatives given the problems with the *status quo* scenario in terms of biological performance. Under low catches (125 000 tonnes), the spawning stock biomass target of 900 000 tonnes is expected to be met just before the end of transition period. While the fishable biomass breaks the 1.2 million tonne mark, it falls short of reaching the 1.5 million tonne target by the year 2005. Even at continued – and historically low fishing on cod – approximately three more years (to 2008) would be required before the biomass targets could be expected to be reached. Under a medium constant catch policy (125 000 tonnes), which is near the minimum acceptable level of 155 000 tonnes that is the basis for the cod formula, there is a slower level of biomass growth than under

low catches. But growth is faster than that under the *status quo* scenario. At this constant level of fishing, it would not be until after 2010 that the cod biomass target would be reached. These more restrictive catch policies have negative economic and social implications for harvesting and processing sectors, labour earnings and employment. The familiar trade-off between exploitation for socio-economic gain and conservation for stock enhancement is evident.

- High catch, constant F = 0.6 policy

Under this policy formulation annual catches are close to the 1997 catch of 200 000 tonnes for all years over the transition period. A constant F policy for TAC setting leads to a slightly increasing, but stable, TACs. Constant F and relatively constant TAC are a consequence of the stock exhibiting little growth over the transition period. The equivalent inherent growth of the stock is removed by fishing in each year. The cod biomass performance is expected to remain unchanged over the transition period. The higher relative annual catches improve earnings for the harvesting and processing sectors. With optimistic markets and a fleet consolidation, annual profits associated with this catch policy surpass the previous 1993 high by the year 2001. Correspondingly, the social performance of the system is maximised under high catches and optimistic markets. Fleet consolidation reduces fishing labour as a result of the assumed removal of some vessels from fishing. While the gear sector share remains unchanged, average quota held per vessel increases, improving average vessel performance.

Recent history and current stock levels suggest that a degree of caution should continue to be applied in this fishery with respect to the status of the cod stocks and the propensity for continued growth. The pressure to increase catches rapidly to desirable long-term levels (350 000 tonnes) for demonstrated economic gain in the short run, must be tempered by the requirement to allow the stocks to grow to sustain these higher catch levels.

Simulation analysis

The analysis of the transition period for Icelandic Arctic cod from 1998 to 2005 is subject to much uncertainty. In order to model this aspect of the performance of the system and to evaluate the robustness of alternative policy options, a simulation model of the transition period was developed. The simulation model investigates further the main impact of uncertainty on the fishery system including market price fluctuations and commercial fleet consolidation. The simulation model is applied under the assumption that market prices for landed value to fishermen and final processed product vary randomly – "optimistic" and "pessimistic" prices may occur in any given transition year. Furthermore, it is assumed that sector consolidation occurs randomly in any given year. These scenarios are tested in three TAC/catch policy contexts: *i*) constant catch *ii*) high catch, constant F and *iii*) the cod formula.

Constant catch

The biological performance of the fishery under constant annual catches of 155 000 tonnes from 1998 to 2005 moves the stock toward the target biomass as the fishable stock and the spawning stock biomass are expected to grow over the period. Under continued exploitation it will take longer for the target biomass levels to be attained with any appreciable probability. Under current stock assessment estimates for growth and recruitment, and constant catches of 155 000 tonnes, there are no simulated incidences of the fishable stock attaining the 1.5 million tonne target level. For the spawning stock biomass, the probability of attaining the 900 000 tonne target is less than 5%.

Economic targets should be approached over the course of the period. The growth is attributed to the combined effects of simulated optimistic markets (when they occur) and fleet consolidation. Although growing, the processing sector does not perform as well as the various harvest gear sectors. At the level of relatively lower constant catch, employment and labour earnings fall short of their targets.

Overall, the *constant catch* scenario is a conservative policy with respect to stock growth and it is expected to be effective in moving the system toward its biological targets. Economic performance is expected to be acceptable under this policy at the level of the average vessel. However the economic

performance may not be acceptable when considering the differences within each gear sector that could allow high-liners the opportunity to increase their earnings and potentially expand ownership of cod quota.

High catch, constant F

The F is set at 0.6 over the entire transition period. Taking the 1997 F, catches are about stable at around 200 000 tonnes per year. Larger catches greatly improve the economic performance of the fishing industry. However, the compensatory effect on stock abundance is negative. The stock shows a relatively stable, but non-increasing, biomass. Fishing at this level effectively cancels out year over year growth that the population is expected to show. The economic and social performance associated with the policy is positive. These targeted performance measures should be reached before the end of the planning period.

There are considerable and contrasting risks and payoffs involved with this policy. With respect to all targets in the analysis of the system and the continuation of a responsible fishery, a balance should be sought. If, for example, the current stock status is not felt to be acceptable or sustainable, then any feasible strategy must include measures to move the stock toward its desired targeted levels. The expectation of current growth in this stock should be tempered with a strategic view of moving toward all targets simultaneously.

Cod formula

Under this scenario the exploitation rate is set at 25% of the fishable biomass when TAC estimates exceed 155 000 tonnes. The TAC schedule is expected to start at around 155 000 tonnes before gradually increasing to just over 200 000 tonnes by the end of the planning period. In effect, the cod formula represents a mixture of conservative constant catches and high-sustained catch policies. A fixed exploitation rate moves the fishery toward its biomass targets while permitting exploitation to increase along with the stock size. There is no chance that the biomass targets will be met by the end of the transition period. Several more years of growth are required before these targets will be attained. With respect to economic and social performance, significant growth occurs toward targets although they are reached later than under the high catch policy. The processing sector performance is stable over the planning period.

The *cod formula* policy moderates the relative extremes of the *constant catch* and *high catch, constant* F policies. As such, it effectively deals with the strategic issues of stock rebuilding through adjustments in operational policy. It should be considered as a policy that moves the system in the intended direction without unduly diminishing the viability of the fishing industry.

Policy implications for the transition to responsible fisheries

The policy implications for the 1998-2005 period are *i*) TAC schedule policy, *ii*) management issues and *iii*) market considerations.

TAC *schedule policy*

The economic and social implications of increasing the annual TAC for the Iceland Arctic cod fishery provide an opportunity for industry to return to the productive and profitable days of the 1980s and early 1990s. However, TAC increases would come at the cost of deferred stock growth of the valuable cod stocks.

It may be a precautionary and responsible policy to adopt more conservative catch limits in the short run while monitoring closely stock growth toward meeting short and long term stock growth targets. Signals from stock surveys and subsequent assessments will reflect anticipated stock growth (or decline) and permit a feedback response to potential conservative annual increases (or decreases) to keep long-term targets in sight. The exploitation rate strategy of the cod formula policy provides a useful feedback mechanism for ensuring the movement towards longer-term targets.

Management issues

The Iceland groundfish fishery is noted for its successful implementation of rights-based management principles and the regional and community organisation of its fishing businesses. In an effort to involve these organisations, it is important that the feedback of fishers be formally included in cod fishery analyses. An effort should also be made to demonstrate how such feedback information is used in the cod assessment and TAC decisions. It would be valuable for government scientists and the industry to liase in an effort to support and understand the application of rules such as the cod formula.

With regard to data modelling of this case there appears to be considerable discrepancy with between regard to productivity estimates for Icelandic Arctic cod. Reconciliation of conservative and "positive" differences would help solidify strategic planning and policy development.

Market considerations

Product and product value added has contributed greatly to the profitability of Iceland's domestic fishing industry. As an alternative to increased product supply, the fishing industry could invest in encouraging market growth abroad. In addition, the economic benefits generated during a period of stock growth could be used to promoting good fishing practices and a code of conduct. This could include further research and development on market opportunities for Icelandic Arctic cod, research on stock science and assessment, and harvesting impacts studies (*e.g.* the effects of trawling). These investigations could reduce the risks of a downturn in industry performance when there are market downturns or TAC decreases: in effect acting as a stabilising factor for fishery performance in the medium term.

F. New Zealand: Red (spiny) rock lobster

Background

The red rock lobster, *Jasus edwardsii*, found off New Zealand is a palinurid (spiny) lobster. It supports New Zealand's most valuable inshore fishery, with exports of live and frozen product currently earning about NZD 100 million each year. Small vessels, usually operator-owned, fishing on a daily basis with traps (pots) are typical in the fishery. In the southern part of New Zealand, fishers make longer trips, and lobsters may be frozen at sea.

Current fishery status and issues

Stock structure

The red (spiny) rock lobster is found all around New Zealand. There are differences in biological parameters, such as morphology and size at maturity, suggesting the possibility of sub-stocks. Legislation requires that New Zealand fisheries be managed so that stocks are maintained near the biomass associated with the maximum sustainable yield (B_{MSY}). The Ministry of Fisheries annually advises the Minister of Fisheries whether stocks are at or above B_{MSY} and whether current Total Allowable Commercial Catches (TACCs) are sustainable and likely to move stocks towards B_{MSY}.

Rock lobster sub-stocks are defined in the overall stock assessment. Catch and effort data, total mortality rate estimates are calculated from the results of analyses conducted for the 1996 stock assessment of two sub-stocks, Northern (NSN) and Southern (NSS). This case study focuses on the latter substock (hereafter "the stock"). In 1996, the stock was estimated to be well below B_{MSY}, but appears to have a high probability of rebuild in a reasonable time at the current level of total removals. The current vulnerable biomass is a small percentage (around 6%) of virgin biomass, and is only 20-40% of B_{MSY}. The deterministic equilibrium estimate is greater than estimated total removals, so with average recruitment and environmental conditions the stock should increase. Forward simulations carried out as part of the 1996 stock assessment suggest a high probability of rebuilding if total removals stay at current levels, with a median of 14 years to rebuild to 80% of B_{MSY}. It is noted that these simulations incorporate only the uncertainty about future recruitment: they undoubtedly under-estimate the real uncertainty of the assessment.

The fisheries

The commercial fishery has been managed since 1990 with a system of individual transferable quotas (ITQs). Other management measures involve minimum legal sizes, recreational bag limits, and protection of ovigerous females.

Fisheries objectives and responsible fisheries

Table 8 summarises the biological, economic, and social performance targets for this fishery.

Table 8. **Rock lobster fishery performance targets**

Performance measures	Targets
Biological	
Total biomass (ages 1+), B_{MSY}	9 800 tonnes
Adult biomass (ages 10+)	2 000 tonnes
Economic	
Commercial net operating income	NZD 40 000 annually/operator
Amateur net operating income	NZD 30 000 annually/operator
customary net operating income	NZD 30 000 annually/operator
Processing sector net operating income	NZD 50 million annually
Social	
Total labour earnings	NZD 30 million annually
Employment (harvesting and processing)	3500 full time equivalents

Model application – Status quo scenario and alternative policy results

The period from 1998 to 2002 is the transition period for this fishery. The rock lobster planning model developed for this study is applied to the entire planning period from 1990 to 2002 to examine the historical, current and the transition period under the *status quo* management.

Policy scenarios

The primary policy options are defined through the TACC schedule. The *status quo* policy defines the TACC schedule in terms of the specific targets for exploitation rate (18%) or equivalent fishing mortality (F = 21). The *status quo* scenario applies a decreasing fishing mortality, F in successive years over 1998-2002, reaching the target exploitation rate of 18% by the end of the period. Catches during the period are expected to increase as the population is expected to grow more than enough to compensate for the fall in fishing mortality.

Market scenarios

Alternative market scenarios are constructed for the case where market prices for lobster (especially in the export market) are expected to rise or fall. The anticipated outcome of this scenario is an increase in prices from 1998 to 2002 by 10% for lobster products in the "optimistic" market scenario, and 10% lower prices in the "pessimistic" market scenario.

Fleet consolidation

The ITQ suggests that consolidation may occur in the commercial sector. Alternative scenarios are modelled as "constant" at levels of the 1998 fleet composition, and "consolidation", a 10% annual reduction in numbers of commercial vessels over 1998-2002.

Status quo *model results*

The overall performance of this fishery must be judged as being successful over the planning period. All economic and social performance indicators are near the long term target values. Moreover, the biological performance of the fishery is expected to improve markedly over the course of the transition period under status quo exploitation. By the end of the planning period, overall performance is expected to surpass performance in all previous years.

Alternative scenarios' model results

- Constant F policy

An alternative TACC schedule is found by fixing the annual fishing mortality F over the transition period. The effect of the growing stock and a constant F policy results in increasing TACCs over the period. Compared to the *status quo* scenario (and its decreasing F schedule), the policy shows slower stock growth. The increased yields from F = 0.37, optimistic markets, and assumed commercial sector consolidation greatly improve both the economic and the social performance of the fishery relative to the *status quo*. The social performance is not maximised due to the consolidated commercial sector fleet that decreases the number of harvesting labour positions. Social performance is maximised when markets are optimistic and the TACC schedule set according to a constant F policy.

- Constant catch policy

Set at the level of 1 200 tonnes per year, the TACC is slightly above current annual catches but below the long run desirable annual yield of over 1 700 tonnes. The biological performance is such that stock growth is only slightly below that expected for the *status quo* scenario. The average catch at 1 200 tonnes exceeds the status quo catch level (1 096 to 1 204 tonnes over the transition period). The resulting effects on economic and social performance favour this constant catch policy.

Analyses of the alternative deterministic scenarios suggest that a policy of decreasing Fs with approximately equal annual catch levels over the transition period is an appropriate policy for the stock. Alternative policies for approximately constant catch TACC schedules could vary according to the level of catch and the trade-off between stock considerations and socio-economic performance.

Transition period simulation analysis

The analysis of the transition period for the fishery from 1998 to 2005 is subject to much uncertainty. In order to model this aspect of the performance of the system and to evaluate the robustness of alternative policy options, a simulation model of the transition period was developed. The performance of the alternative policy variables were analysed relative to the specified objectives of the fishery under stochastic changes to key input variables in the biological, economic, and social components of the system.

Three alternative policy scenarios were developed from the analysis of the deterministic results discussed above. The simulation models were selected here to investigate further the main impact of uncertainty on the fishery system in the form of market price fluctuations and commercial fleet consolidation. The scenarios are tested under three catch policies *i*) conservative TACC, *ii*) average TACC and *iii*) aggressive TACC. The simulation model is applied to each policy under the assumption that market prices vary randomly (*i.e.* optimistic and pessimistic prices may occur) and commercial sector consolidation also varies annually over the transition period (*i.e.* consolidation occur randomly year-over-year). The results of each policy simulation are presented below.

Conservative TACC *simulation*

With a TACC schedule of 1 100 tonnes each year for 1998 through 2002, this policy most closely resembles the conservative *status quo* scenario presented in the deterministic analysis. The biological

performance of the fishery under constant catches of 1 100 tonnes moves the stock towards the target biomass size. However, given stock growth under continued exploitation it will take some time before target biomass levels are attained. Moreover, the relatively low state of ages 10+ harvestable biomass in the early 1990s is a sign that the stock needs to rebuild prior to moving toward long-term expected yields of over 1 700 tonnes.

Economic results for the commercial sector move steadily toward the target net operating income per operator of NZD 40 000 per year. However, the wide variance of this estimate reflects the various sources of annual change including market prices, costs of operations, and labour expenses. The trajectory for actual annual incomes may be highly variable under the circumstances. There is slight decline in labour earnings over the transition period relative to the target. The decline is attributed to potential consolidation of the commercial fleet as a result of transferable quotas. This consolidation also improves average economic performance among the commercial sector.

Overall, the scenario has a reasonably stabilising effect in moving the fishery towards its various biological, economic, and social targets.

Average TACC *simulation*

The policy involves a constant TACC schedule of 1 200 tonnes per year for 1998 through 2002. Total biomass targets are not expected to be achieved over the transition period and, consequently, a longer transition beyond 2002 would be required before the biomass targets are reached. Economic and social results are better than for the conservative TACC policy. The commercial sector's net operating income target of NZD 40 000 is expected to be reached by year 2002. As well, even though the slight decline in labour earnings continues, the results are better than the earnings under the conservative TACC policy.

Aggressive TACC *simulation*

The constant TACC schedule results in annual catches of 1 300 tonnes for 1998 through 2002. The increased catches (relative to the above policy options) slow stock growth and the movement toward improved stock status. Beyond some limit, there would be concern for the status especially of the harvestable older biomass. The higher catch level strengthens economic and social performance. Both economic (for the commercial sector) and social (labour earnings) targets are attained with this policy before 2002.

These analyses demonstrate the common trade-off between conservation of stock status and socio-economic gain. More emphasis on stock status relative to socio-economic considerations will move decision making toward lower constant catch strategies.

Policy implications for the transition to responsible fisheries

The policy implications associated with *i*) TACC schedule policy, *ii*) stock management issues and *iii*) market considerations are discussed below.

TACC *schedule policy*

The economic and social implications of increasing the annual TACC for rock lobster provide a welcome opportunity for industry enhancement and growth but come at the cost of stock growth and conservation of a potentially fragile harvestable biomass. Under current conditions, the socio-economic performance associated with the thriving export markets for rock lobster offer a stabilising opportunity for the commercial fishing industry. An announced constant catch policy over the short to medium term would also be helpful to stabilising industry dynamics. At issue is the appropriate level of catch that will maintain socio-economic performance while ensuring positive stock growth, especially for older lobster.

A responsible policy could involve the adoption of more conservative catch limits while continuing stock assessment studies to update stock status over time. Signals from the stock will reflect anticipated

stock growth (or decline) and permit a feedback response to potential conservative annual increases (or decreases) so that long-term targets can be met.

Stock management issues

Concerns for the harvestable biomass and older aged lobster could be addressed through continuing the application of catch regulations on minimum size and returning berried females, and introducing v-notching. These practices have been adopted elsewhere in the world on related commercial stocks of crustaceans and have been successful in protecting potentially endangered stock components. They therefore represent responsible harvesting practices that could be applied to this stock.

Market considerations

The market situation for New Zealand rock lobster is currently enjoying a positive period. The effect of a downturn in this market would dramatically effect the fishery performance. As such, the industry could invest in research and development on markets, research on stock science and assessment, and on harvesting impacts. These investigations could reduce the risk of negative impacts associated with possible market downturns and could be a further stabilising factor in the fishery's performance over time.

IV. GROUP II CASE STUDIES

A. Korea: anchovy

Background

Anchovy dragnets are an important part Korea's fishing sector. Over 99% of catches found in anchovy dragnets are anchovy. Although the annual total catches of anchovy have fluctuated, dragnets catch 55 to 70% of the total annual catch of anchovy. The remaining portion is caught with drift gill nets (10%) and other fishing methods.

Anchovy dragnets were first introduced and operated by small firms in the 1910s, but since then the use of capital in the sector has increased. Since the 1960s, the demand for dried anchovy has increased sharply as the use of flavouring substances has become common. Fleets consisting of six to seven fishing vessels operate anchovy dragnets. After harvesting, the anchovy is immediately boiled on the vessel, transferred to land-based plants where they are dried and packed, and then dispatched to sales outlets.

In 1963 the government established a limit on the number of maximum allowable permissions (a form of individual catch entitlement) to prevent over-investment in the sector. Prohibited periods and zones to fishing were introduced in the same year to prevent over-exploitation. Despite these efforts anchovy fishing with dragnets has experienced a number of crises. These have been due to the oil shock in the late 1970s, the rising fishing costs caused by increasing wage levels, the reduced number of coastal fishing grounds and the damage to fishery resources caused by pollution in the 1980s. As a result, the number of anchovy dragnet fleets has fallen.

This case study aims to analyse the potential improvements in the financial status of the fishers with a view to developing a sustainable fishery. The biological, economic, social, and administrative aspects associated with a move to sustainable fisheries, defined in this context as one that produces maximum sustainable yield, are analysed using the Gordon-Schaefer model.

Current status of the fishery

Biological aspects

Oceanographic factors, particularly currents, greatly affect the anchovy migration routes and hence their fishing grounds. From December to March, anchovies spend the winter season in the warm water area that extends from the south coast of the Korea Strait to the oceanic front of the East Sea. However, the thermal barrier effect of these fronts decreases from March to April due to the increased influx of the Thushima Warm Current and the warming of Korean coastal waters. This encourages winter migration of anchovy to these coastal waters.

Economic aspects

The annual catch of anchovy was 200 000 tonnes in the 1970s, but decreased to 120 000-170 000 tonnes in the late 1980s. Since 1993, it has recovered to over 200 000 tonnes. In the mid-1980s, the number of fleets with anchovy dragnets was approximately 140, but decreased to less than 120 in 1989 and to 114 in 1996. The average tonnage (G/T) and horsepower (HP) of the fleets are increasing. Average tonnage in 1996 was 201.6 G/T and average horsepower was 1 989 HP. Fishing costs have also increased and,

as a consequence, fishing profits have fluctuated on a yearly basis. In 1992, the "average fleet" recorded a net loss.

Social aspects

The average number of employees per fleet has steadily fallen. There were, on average, 68-70 employees per fleet in the late 1980s. In 1996, the average number was 59. The total number of employees has fallen from 9 000 in the mid-1980s to less than 7 000 in 1996. The annual employment period has lengthened from 7.2 months in 1986 to 8.4 months in 1996. The operating period is primarily from July to March of the following year. The average wage per fleet and average salary per employee has increased with an average annual salary per employee of USD 10 048 in 1996.

Administrative aspects

It is difficult to estimate the administrative costs for fishing with anchovy dragnets. Due to the small number of fleets, there is no independent administrative organisation for anchovy dragnets. Furthermore, as the majority of the fishing grounds are in coastal waters, the monitoring costs associated with the regulations are very small. Finally, anchovy dragnet fisher organisations communicate with the national government directly and there is little demand for other administrative and monitoring services.

Fishery objectives

Biological aspects

Based on the analysis by the Gordon-Schaefer Model, the optimal fishing effort and harvest levels for anchovy fishery are 210 000 HP and 195 000 tonnes. Of this catch, 135 000 tonnes would be caught by anchovy dragnets.

Economic aspects

If the Total Allowable Catch (TAC) for fishing with anchovy dragnets is 135 000 tonnes, then the fishing effort should be 164 000 HP. This is equivalent to 82 fleets, which should be the ultimate target for managing the fishing effort. The catch per fleet is 1 646 tonnes, gross revenue is USD 2 951 000 and net income is USD 667 000. Compared to 1996, average revenue per fleet would increase by 54.3%.

Social aspects

A total of 4 840 persons would be employed on dragnet fishing fleets. This is 77.4% of the number employed in 1996. The annual average salary per employee is USD 15 507, a 54.3% increase from 1996.

Administrative aspects

Fishing with anchovy dragnets is a capital-intensive industry. Managers also tend to strongly adhere to the laws. They operate mainly in coastal waters and administrative costs are relatively low.

Transition analysis

The transition in biological terms is shown in Table 9. It is assumed that the management targets are *i*) a reduction in the number of fleets to 82 over five years, *ii*) a harvest of 135 000 tonnes, and *iii*) a stock size of 2 891 000 tonnes. If these management targets are reached, anchovy stocks should exceed their maximum sustainable yield levels. Reducing the number of fleets would improve the catch per fleet and fishing profitability. In this process, the length of the transition period should be taken into account in achieving the target (*e.g.* if the target year is 2003, six fleets should be removed each year). Nevertheless, the length of the transition period needs to be flexible, taking into account the target number for fishermen and fishing fleets as well as fluctuations in the anchovy catch.

Table 9. **Changes resulting from the transition to responsible fisheries**

	Horse power (000)	Fleet (number)	Catches (000 tonnes)	Stock (000 tonnes)
1999	210	105	120	2 373
2000	198	99	124	2 508
2001	186	93	128	2 643
2002	174	87	132	2 778
2003	164	82	135	2 891

The transition level per fleet in economic terms is shown in Table 10. The target catch is 1 646 tonnes, gross fishing revenue is USD 2 951 000, and net fishing income after tax is USD 667 000.

Table 10. **Changes in fleet economic performance resulting from the transition to responsible fisheries**

	Catches (tonnes)	Fishing revenue (USD 000)	Fishing net profit (USD 000)	Added value (USD 000)
1999	1 143	2 049	463	1 258
2000	1 252	2 245	508	1 378
2001	1 376	2 468	558	1 515
2002	1 517	2 720	615	1 670
2003	1 646	2 951	667	1 812

The total number of employees associated with these targets is 4 840 persons – 22% less than in 1996. It is expected that in the transition towards responsible fisheries, the length of the fishing season will remain unchanged. Following the completion of this transition period, the annual salary per employee should average about USD 15 507 – a 54.3% increase as compared to 1996.

The administrative actions required to implement responsible fisheries include regulations on specific fishing, annual monitoring, licensing, and scientific research and management. It was considered, however, that there would be no significant impact on administrative procedures.

Conclusions

Profitability in the fishing industry has decreased over the last ten years due to reduced availability of fish resources, an ageing of the workforce and an inflation of managerial costs. As a result, fishing has become a less attractive industry. Most fishers have tried to improve fishing profitability by increasing catches, which in turn has contributed to the depletion of fishery resources. With the potential gains that could be realised, the implementing responsible fisheries could yield significant returns.

B. Norway: Northeast Arctic cod

Background

The Northeast Arctic cod stock is one of the most economically important species for Norwegian fishers. Even when the catch of cod was at a historically low level in 1990, the (first hand) value of cod was NOK 1.1 billion and constituted approximately 25% of the total value of Norwegian fisheries. In 1997, the first-hand value of this species reached NOK 2.7 billion. Cod are caught off the West Coast of Norway to the Spitzbergen and Novaja Zemlja islands and mainly landed in parts of the country where few other industries exist. The stock is shared between Russia and Norway and managed under annual agreements.

Current fishery status and issues

Stock structure

The total biomass has varied considerably in the period 1946-1997. The highest estimated total biomass in this period was in 1946 and the lowest estimates were in the 1980s. The total biomass decreased from about 1.2 million tonnes in 1986 to about 0.8 million tonnes in 1988. Since then it increased to about 2.5 million tonnes in 1993. The annual growth rate from 1980 to 1993 was therefore about 25%.

The fishery

Each year Russia and Norway establish a Total Allowance Catch (TAC) for Northeast Arctic cod as well as for other important species in the Barents Sea. The TAC has increased from a historically low level of 200 000 tonnes in 1990 to 890 000 tonnes in 1997. These figures include estimated annual catch of 40 000 tonnes from Norwegian coastal cod stocks. Under the quota agreements between Russia and Norway, the national quotas for Russia, Norway and third countries are decided. The TAC has been distributed with approximately 45, 45 and 10% allocated to Russia, Norway and third countries, respectively.

Vessel quotas have regulated the trawler fleet since the 1970s and, to a limited extent, the conventional gear fleet (using gill nets, long line, Danish Seine, etc.) before 1989. Restrictions and vessel quotas were introduced for the first time for the conventional gear fleet in 1990. Although this fleet mainly consists of small and medium sized coastal fishing vessels, it also includes some large ocean going long-liners.

In 1990 the conventional gear fleet was divided into two groups. The first group consisted of about 3 500 vessels operating all year round that were granted guaranteed annual quotas differentiated by the length of the vessel. The second group of vessels was granted a maximum quota according to the length of the vessel – a quota right per vessel that was not guaranteed throughout the year. As a consequence, the fishery could be stopped before individual vessels had exhausted their quota. In addition to the vessel quota measures, other measures have been employed, like periodical quotas and by-catch regulations. The vessel quotas are non-transferable.

Even though the total catch increased in the period 1990-1997, the number of vessels using conventional gear decreased from 7 800 to 6 200 in this period. The most fishing dependent region is North Norway, consisting of the counties of Nordland, Troms and Finnmark. It had 75% of the conventional gear vessels in 1990 and 70% in 1997. Vessels fishing with conventional gear also fish for haddock, saithe and other groundfish species for part of the year, and some participate in the fishing of herring and shrimp.

The fishery for Northeast Arctic cod is of vital importance for the trawler fleet and the processing industry in the northern part of Norway. The trawler fleet in that part of the country is mainly owned by the processing industry. Several of the trawlers have supplementary licenses (mainly shrimp trawler licenses). The trawler fleet licensed to fish cod consisted of approximately 120 vessels in 1997, which represents a modest reduction since 1990.

The total catch of cod from Norwegian trawlers (including catch under Russian quotas) increased by about 235% between 1990 and 1997. The total first-hand value has increased by only approximately 120% during the same period however.

Fisheries objectives

Management objectives

Multiple management objectives reflect fisheries' role as the only source of income in many coastal communities as well as the need for sustainable yields. Fisheries managers take into consideration the importance of fisheries in creating employment, maintaining the existing pattern of settlement, providing job security and increasing the value added from the sector. The main objective in managing stocks therefore tends to be distilled into: a TAC should give a stable and the highest possible sustainable economic yield.

Achieving such an objective still requires fishery managers to furnish decision makers with advice on a range of matters. When giving advice on TAC levels managers therefore:

i) Quantify the most likely consequences of different harvest control rules on stability, economic yield and stock sustainability.

ii) Where possible, quantify the risk of bringing the spawning stock below some limit reference point by applying certain harvesting control rules.

iii) Advise on a TAC level and identify the consequences of various levels.

For transboundary stocks such as Northeast Arctic cod, the actual decision on the level of TAC is an integral part of fishery negotiations between the parties concerned (*i.e.* Norway and Russia).

Biological data and limit reference points used

The scientific advice provided by the International Council for the Exploration of the Sea (ICES) is fundamental for management decisions on total allowable catches (TACs). ICES provide advice necessary to maintain viable fisheries within sustainable ecosystems. For stocks that are below Minimum Biological Acceptable Level (MBAL), or expected to become so in the near future, ICES gives advice on what rectifying measures are needed. For those stocks not in imminent danger of falling below the MBAL it provides options, together with impact statement for each option. The determination of a specific TAC is in the hands of the "owners" of the resource and may therefore be based on additional matters (*e.g.* economic and political). Among other matters, the choice of a management strategy should ideally be made in light of the risk of exceeding some predefined limit reference point.

Model application – Status quo results

The economic model

To calculate the economic benefits that society reaps from Norwegian cod fisheries, estimates are required of the final value of cod products (exported or domestically consumed), as well as the costs of fishing, transporting and processing the catch. Net economic benefits are the total revenue less all costs involved. Due to data difficulties this has not been possible however. Instead, focus is on estimating the economic benefits at the level of the Norwegian fishing fleet – *i.e.* that is, gross revenue less variable costs (including labour costs).

The task is to evaluate the economic benefit of various management strategies during a medium term perspective for Northeast Arctic cod (five years). As the fixed costs are not affected by the size of the TAC, they are not relevant to this question, unless there is a relationship between the size of TAC and investment in the fishing fleet. In the long run it is reasonable to believe that such a relationship exists. Rational investors will adjust investment in order to achieve as large a profit as possible. A larger TAC may therefore prompt an increase in investment and hence fixed costs in the long run. However, as a possible empirical relationship between the size of the TAC and investment has not been investigated, it was decided to exclude fixed costs from the analysis. T*his assumes that during the forecasting period, the fleet is of a fixed size*. Given the level of aggregation and length of forecasting applied in the described model, this is a realistic assumption. It implies that the economic benefit calculated is equal to the contribution margin.

With regard to stock size, information in the initial year and on the development in the stock is based on assessments and prognoses made by ICES. The method elaborated on in this report is based on assessment made by ICES in 1997. Both the stock size for the initial year in the model (1997) and the exploitation pattern, weight at age in the stock and in the catch, natural mortality, maturation and recruitment in the forecasting period (1998-2001) were taken from the ICES Working group reports. Estimates of prices and costs are based on material collected from Norwegian fishing vessels.

To be able to calculate the profitability and the economic consequences of different TACs for the Norwegian fishing fleet it was assumed that the Norwegian share of the TAC in the period 1998-2001 was the same as for 1997 (*i.e.* 43%). Norwegian coastal cod is not included in the analyses.

A price function was estimated from price and quantity data for 1986-96. The price of Northeast Arctic cod decreases by NOK 1.40 per kilogram if the Norwegian landings increase by 100 000 tonnes. About 60% of the variations in the average price over this period are explained by this function; there are other variables that affect the price. Two cost functions, one for cod trawlers and one for vessels using conventional gears, have been developed. Data on costs have been taken from the Directorate of Fisheries' 1996 profitability survey of Norwegian fishing vessels. Both discounted and non-discounted net economic revenues were also calculated in the model. A discount rate of 5% has been used.

Consequences of different harvesting strategies: 1997-2001

Consequences on the catch and spawning stock biomass by various harvesting control rules and the risk of reducing the spawning stock biomass below MBAL are shown in Table 11.

Table 11. **Estimated biological consequences of various exploitation rates in the period 1998-2001**

Exploitation rates 1999–2001	Average TAC in the period 1998-2001 (000 tonnes)	TAC in 1998 (000 tonnes)	The risk of SSB < MBAL in the period 1998-2001 (per cent)	Spawning stock biomass in 2002 (000 tonnes)
F = 0.68	560	689	85	442
F = 0.57	531	603	64	561
F = 0.45	491	507	35	733
F = 0.34	433	401	12	988
F = 0.22	346	282	8	1 373

- Sustainability

In this context, sustainability is defined as "a total catch that can be maintained for a period without jeopardising the stock in the future". The required size of the spawning stock biomass (SSB) is called a biological reference point. The model results suggest that fishing mortality should not be higher than 0.34 if the SSB is to be kept at 1997 levels throughout the period 1998-2001. The risks of bringing the SSB below MBAL are shown in Table 11.

- Profitability

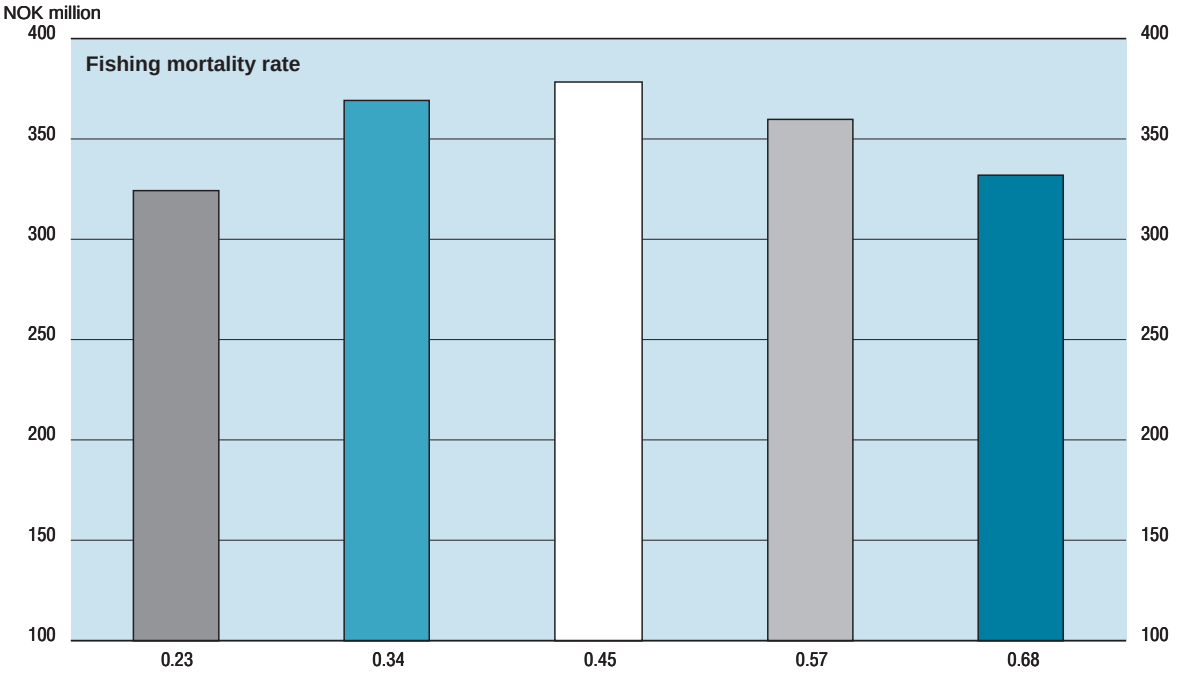
When the stock of Northeast Arctic cod is considered to be within safe biological limits, decision makers have the freedom of establishing a TAC that takes into account other parameters. The economic consequences of various fishing mortalities were calculated for the fishing fleet.

For the owner of a fishing vessel, a major part of variable costs is the share paid to the crew. These costs depend significantly on the catch value and to a lesser extent on efforts to catch a certain amount of fish. For society as a whole, the labour costs used in the fishery are reflected in the opportunity costs of labour. It is reasonable to assume that harvesting costs per unit increase with decreasing biomass size. Fishing mortality was calculated as a linear function of effort (*i.e.* the larger the stock, the lower the rate of exploitation needed to catch a given quantity of cod). The unit cost of harvest increases with decreasing biomass.

The annual net economic revenues equal gross revenues minus operating costs, including opportunity costs of labour. The discounted net economic revenues for 1998-2001 for five different harvest strategies is shown in Figure 2.

A fixed fishing mortality of 0.45 of the SSB gives the highest net economic revenue for society. This indicates that the fixed fishing mortality should not be higher than 0.45 for the period 1998-2001. However, a simulation for a longer period suggests that a fishing mortality between 0.20-0.40 results in the highest net economic revenues.

Figure 2. **Discounted net economic revenues for society at different fishing mortality rates: 1998-2001**



Source: OECD (2000*e*).

Quota stability

The TAC for Northeast Arctic cod was 700 000 tonnes during 1994-1996 and in 1997 was increased to 850 000 tonnes (excluding Norwegian coastal cod allowance) in 1997. The model indicated that the TAC should be reduced from the 1997 level.

In the period 1995-1997, the fishing fleet fishing with conventional gears and the trawler fleet had an average catch of 230 500 tonnes and 118 000 tonnes, respectively. A fishing mortality of F = 0.57 in 1998 results in group quotas[6] for these fleets that are 12% (conventional gears) and 18% (trawlers) less than the average group quotas/catches recorded for the period 1995-1997 (19 and 26% less than that in 1997). The net income is not expected to fall to the same extent due to the expected increase in prices when the catch is reduced.

An important policy objective is ensuring that stability in quotas endures for longer than one year. A fishing mortality of F = 0.45 during the period 1998-2001 results in group quota allocations between the trawler and conventional gear fleets that are relatively stable over the transition period. However, this will result in a sharp reduction in the group quotas compared with 1997 and the average group quotas/catches over 1995-1997. The TAC and the national quota should therefore be higher than F = 0.45 but lower than F = 0.69.

One solution is a stepwise reduction in the fishing mortality from the level in 1997 (F = 0.67) to F_{med} = 0.46 over a 3-year period. This would result in a 1998 fishing mortality of F = 0.60 that corresponds to a TAC like 630 000 tonnes (Norwegian coastal cod not included).

Uncertainty and conditions not quantified

Prognoses on the development of a fish stock and the profitability of fishery include elements of uncertainty. The changes in the assessment by ACFM from one year to another are one example of this

uncertainty. In addition to the elements already mentioned, other elements of uncertainty relevant in the decision on harvesting control rules for the period 1998-2001 and TAC for 1998 will be as follows:

i) Relatively lower catches will result in a larger total stock biomass of cod in the period 1998-2001. The larger biomass will eat other commercially valuable species. Such costs are not dealt with in the analyses. A larger biomass of cod may also result in a lower individual growth of the cod. These conditions favour a higher TAC.

ii) The average weight of cod when fished at F_{med} and F_{low} in a state of equilibrium is 3 and 3.5 kilograms, respectively. Profitability per fish increases if the catch is shifted to older fish. These conditions favour a lower TAC.

Conclusions

Assessments by ACFM in the autumn 1997 indicated that a fishing mortality around 0.40 would result in a TAC for 1998 of 460 000 tonnes – a sharp reduction from the 1997 TAC of 850 000 tonnes (excluding Norwegian coastal cod allowance). Such a reduction in the TAC would not fulfil the requirements of quota stability between the trawler and conventional gear fleets. A stepwise reduction in the fishing mortality would be one solution that would meet the requirements of stability. Under this scenario fishing mortality should be reduced from F = 0.67 in 1997 to F_{med} = 0.46 over a 3-year period. A fishing mortality of 0.60 in 1998 and 0.53 in 1999 would however be higher than the recommended long run fishing mortality. If later assessments and prognoses by ICES were more optimistic, consideration should be given to reducing fishing mortality to 0.20-0.40 faster.

C. Spain: Galician shellfish

Background

Galicia is one of Spain's 17 regional autonomous communities (*Comunidades Autónomas*). It is situated in the Northwest of the Iberian Peninsula where fishing is an important economic activity. Shellfish gathering is a key part of the fishery economy as it creates significant direct employment – due to its manual-intensive nature – and it creates opportunities for support industries (*e.g.* transport, freezer machine industries, fishing tools, etc.). The population is heavily concentrated along the Galician coastline – sometimes reaching 600 inhabitants per square kilometre. This creates tensions for fisheries management due to the dependence of these communities upon fishing.

Shellfish gathering in Galicia is a traditional activity that was considered sustainable up until a few years ago. The high productivity stocks on the Galician coast, due to the fact that it is one of the most productive areas of plankton in the world, created the perception that there was an unlimited supply of shellfish. The preserving industry was the main recipient of the shellfish, acquiring them from individual gatherers at moderate prices.

In recent years catches reached unsustainable levels due to:

- The development of tourism. Attracted by the quality of the shellfish, tourists used to gather small quantities for direct consumption. However, the increasing number of tourists have harvested more and more of the resource, leading to competition with local inhabitants.
- The improvement of transportation inside Spain created opportunities for trade and meant that shellfish can be sold as a high-valued fresh product as well as in the preserved form.

In the late 1980s, production fell in many areas. Some shellfish stocks disappeared altogether. Conflict, often violent, among shellfish gatherers intensified. In addition the fall in incomes prompted shellfish gatherers to seek other ways to expand their activity and increase production.

The fishery

The shellfish gathering concentrates on four targeted species: *Venerupis pullastra* (slug clams), *Venerupis rhomboideus* (blond clams), *Ruditapes decussatus* (soft-shell clams) and *Cerastoderma edule* (cockles). Due to the

poor state of the resource since the 1960s, gatherers have harvested smaller and smaller shellfish (often at illegal sizes). This has contributed to the further overexploitation of stocks.

The social context

Shellfish gathering does not yield substantial economic returns and is primarily considered as a supplement to other forms of income. Gathering is mainly conducted by women who, while the men were at sea, sought means to generate income in addition to agricultural activity. Shellfish gathering was a complementary activity to the agriculture in the coastal areas of Galicia. Government intervention has been required to deal with specific social matters associated with the fishery:

- "Furtive" activity (akin to poaching) that is widespread due to the easy access to the resource and its high economical value.
- The co-existence of different gears due to the vague delimitation between the fishing zones of the two gears. The tides provide the only existing delimitation and this is often not sufficiently clear and has contributed to conflicts.
- Though gatherers are women, historically only men have had the legal status as professionals of the activity. The existence of discrimination in the distribution of timing and setting of zones, impelled women to create their own shellfish gathering organisations; segregation has been total in some cases. Beaches have been divided in one zone for men and another zone for women.
- The training of gatherers has tended not to receive due attention.

Management objectives

Shellfish gathering uses two techniques or gears: "on foot" and "by boat". Both are artisanal techniques. Minimum legal sizes were established some years ago to help conserve the resource. In the shellfish gathering, selectivity is easy and effective. For the "on foot" sector there is also a licensing system. Sustainable natural resource use can involve two strategies: continuous exploitation or discontinuous exploitation. Continuous exploitation keeps the targeted stock at a constant size. The second strategy involves intensive harvesting during some periods and then refraining from doing so for other periods (*e.g.* closed seasons). As it is easier to apply, the latter strategy is more commonly used in Galicia. The discontinuous strategy is applied in several ways. Up until 1992 Galicia used "campaigns" ("*campañas*") that involve dividing a year into two parts: one during which fishing is allowed (October to March); and the rest of the year, coinciding more or less with the spring and summer seasons (April to September), when it is not.

Since 1992 the way of regulating the fishing seasons has changed towards a "self-management approach." Management involves collaboration between Administration and fisher organisations. Each year there must be a closed season of at least two consecutive months sometime during April to June. In addition to the mandatory closed season, they can decide longer periods of non-fishing without restrictions. The way to establish this period must be fixed on a year-by-year basis.

Plan Galicia 1992 to 1996

The Galician Fishing Act 1993 introduced the concept of managing fishing and shellfish gathering in an integrated manner. The law was based on the *Plan de Ordenación dos Recursos Pesqueiros e Marisqueiros de Galicia* that which was published in 1992. The Plan, which ran from 1992 to 1996, describes:

- The relevant shellfish species and refers to production, reproduction, growth and yield.
- Harvesting areas, the state of the stocks, the Administration's management role, the optimum strategy to get highest prices, and the recommended minimum legal sizes.
- The problem of shellfish gathering from biological, technical, social, economic and political perspectives.
- The development of the sector.

Plan Galicia 1997 to 2000

A second *Plan Galicia* was introduced in 1997. Taking the promising results from a pilot study, the plan seeks greater profitability for the sector and to turn it into a full-time professional activity. It seeks to control extraction, provide professional training and increase the potential production of shellfish by promoting its seeding. Furthermore, it seeks to enhance fisher organisations' self-determination. The new organisation of women in the sector, in self-financed and self-managed associations, is a key component of *Plan Galicia*. Aid is provided to support these activities.

The shellfish gathering sector is encouraged to assist the Administration in monitoring. With that near and direct control, more effective results are likely than that realised by external control. For this purpose the transformation of the shellfish gathering organisations into organisations with their own responsibilities was promoted.

Outcomes from the management policies

This section attempts to assess the implications of the management policies applied to the sector between 1989 and 1997. Unfortunately it is not possible to assess the results of the second *Plan Galicia* due to the lack of data.

Biological perspective

The four target species represent approximately 88 to 95% of all shellfish caught in Galicia. The analysis uses registered data and, as such, relates only to final catches. Data on larval or juvenile stages is not included. Furthermore, there are no data on natural stock in the sand. The only available data is that relating to the catch of the adult population. From this it may be possible, in some circumstances, to infer the state of the resource.

In the late 1980s, catches decreased sharply due to the reduction in stock size resulting from uncontrolled exploitation. Between 1989 and 1997 catch volumes were volatile, but trended upwards. The increase in total catches perhaps reflects an improvement in the resource situation in three out of the four target species. Overall production in 1997 was 60% greater than in 1989. This increase in production occurred despite the reduction in gathering effort (less shellfish gatherers and less gathering days). The exception to this trend is the V. *Rhomboideus* – catches have decreased to third of the 1989 levels. As the species is targeted by the "by boat" method, the decrease might indicate *i*) the less effective controls applied to this gathering method (mainly conducted by men) and *ii*) the consequences of the non-cultivation of the specie.

These results indicate the improvement of the production in the major producing zones, except the south part of Galicia: the Pontevedra and Vigo "rías". Even if these zones are potentially rich, with the most industrial developed zones and higher city population density (including Vigo, the economical capital of Galicia), it seems clear that the direct management formulas have better results in the rural zones where the social control is stronger.

Economic perspectives

Due to its manual nature, shellfish gathering also creates numerous jobs, which benefit the industry in particular and the Galician economy in general. This employment exists as long as the stock is preserved and exploited rationally. The value of catch increased by 135% in nominal terms, a faster rate than that observed for volume (62%). Average prices also increased in nominal terms for three of the four target species. On average, across the four species, the price per kilogram increased by 31% between 1989 and 1997. The increase is due to:

- The penetration of new markets, especially in those that appreciate shellfish in fresh form.
- The increased controls on minimum sizes that have yielded positive results. Since there is a positive correlation between shellfish price and size, improved control has resulted in larger animals and therefore increased prices.

The price behaviour also gives information on the complexity of the regulation of this form of exploitation where there is free access. It is often conjectured that a more rational exploitation can lead to a fall in prices due to an increase of product available for the market. On the contrary, a non-rational exploitation might provoke high prices when there is a shortage of the product. Oscillations in prices can threaten the stability of the management systems and stimulate processes of non-rational or unsustainable exploitation.

Social perspectives

The social effects due to the adopted measures are many. Some aspects are difficult to quantify, such as the improvement in the labour security, the decrease of the violent conflicts, or the involvement of women in the labour market. But there are other things that can be quantified more easily, such as shellfish gatherer incomes. These can be deduced by relating the catch value with the employed population. As capital investment in shellfish gathering is nearly non-existent; what is remunerated is basically the work.

Since 1989, the number of people working in the sector has fallen by 50% to 11 641 in 1997. The average catch value per person in 1989 was ESP 106 000. By 1997 it had climbed by almost 300% (in nominal terms) to ESP 401 000.

Conclusions

The Administration has monitored the activity to assure licensed gatherers that they will be the only ones who can harvest catch shellfish. People who earn their living from shellfish gathering now have a more stable life because they can now earn more regular incomes. Moreover, this has a greater sense of stewardship of the resource as a means of preserving their future: an important prerequisite for more responsible fisheries.

The management activities of the Administration over 1989 to 1996 have facilitated:

- The recovery of the most parts of stocks, with an associated increase in production.
- The control and reduction in the number of shellfish gatherers.
- The elevation of shellfish gathering to a professional activity, and the formal integration of women into that activity.

In the future it will be useful to monitor the introduction of semi-cultivation by the shellfish gathering associations, as envisaged in the second P*lan Galicia*. The results of these efforts will be visible in 2000.

D. United States: Northeast Atlantic groundfish

The fishery

Using otter trawl, gillnet, and bottom longline gear, the US groundfish fishery exploits demersal species in EEZ waters of the Gulf of Maine and Georges Bank. From 1977 to 1982, the fishery was managed using quotas for cod, haddock, and yellowtail flounder. During this period, the principal groundfish stocks began rebuilding following historic overfishing by foreign and domestic fleets. Without limited access fishing effort intensified and quotas were filled rapidly, leading to boom and bust market conditions and numerous management and enforcement problems. Growing dissatisfaction with catch quotas led to their removal and replacement with indirect controls on fishing effort in 1982.

The current Multispecies Plan came into effect in 1986 and made a number of regulatory changes. However, the basic format of indirect effort control was retained. Without limiting entry or direct effort controls, groundfish stocks became severely overfished and the resource declined to record low levels. In May 1994, NMFS implemented a major revision to the Plan (Amendment 5) that capped the number of vessels in the fishery through a limited access program, and controlled the amount of time many vessels in the fleet could spend at sea. Gillnet vessels were restricted, due to protection measures for harbour porpoises, and hook vessels were limited in the number of hooks allowed.

Box 5. **Principal species in the US Northeast fishery**

Groundfish: Atlantic cod, haddock, pollack, redfish, silver hake, red hake, white hake, ocean pout.
Flatfish: winter flounder, witch flounder, American plaice, windowpane flounder, yellowtail founder.

Between the time of development of this Plan and its eventual enactment, stocks of haddock, yellowtail founder, and cod were determined to be collapsed or on the verge of collapse and that Amendment 5 would be insufficient to reverse the declining stock status. Following an emergency action (Amendment 6) to protect haddock, development commenced on Amendment 7 to the Multispecies Plan to rebuild the depleted resource. The key components of Amendment 7 were the adoption of a more rigorous days-at-sea (DAS) reduction schedule, the removal of most exemptions from DAS controls and a more flexible adjustment process to respond to specific resource conditions. The following sections provide a detailed discussion of the results of an economics analysis of the impacts that Amendment 7 was expected to have on net economic benefits, individual vessel profitability and on fishing and fishing related sectors.

Analysis method

Proposals to regulate the fishing industry require an economic analysis of the benefits and costs of the Proposed Amendment (PA) compared to what is expected to happen in the future without the action, *i.e.* the Status Quo (SQ). Here, benefits concern the *economic value* that people assign to groundfish and costs are *opportunity costs*, or the economic value of other things that can not be produced by the labour and capital being used in this fishery.

Inputs in the economic analysis are projected landings, fishing costs and a price model is used to predict landings. These inputs are described in turn below. Were complete economic information available, the analytical approach would be to examine the economic behaviour of fishers resulting from proposed regulations and from this, predict the impact on stocks. Because data vital to the link between effort and fishing mortality are lacking, an alternative approach is adopted.

The following analysis assumes that an array of various targets related to stock conditions can be met. Given these assumptions, estimates of gross benefits associated with the possibilities are derived. The costs associated with the expected behavioural changes in the harvest sector that would bring about these targets are then discussed. A significant amount of the information available is qualitative. Use of well-understood assumptions provides enough structure to formulate an overall view of net benefits. Likewise, information on probable differential impacts across fleets lends itself to a discussion of sector impacts. At the individual vessel level, however, little can be said other than to speak in terms of fleet averages.

Simulation results

Future groundfish landings were simulated for eight groundfish stocks for each year during the 10-year planning horizon (1996-2005). The simulation produced likely distributions for gross revenues, costs, and net benefits from input distributions for landings projections, predicted prices and from the cost parameters. Figures reporting projected annual quantities for the SQ and PA show the average (*i.e.* expected value), one standard deviation on each side of the average, and the 95% confidence interval around the average. Values are in constant 1993 dollars.

Landings

On average, total US landings of the 10 large mesh groundfish species under the SQ are projected to hold at about 39 000 tonnes through 1998 and then increase to more than 73 000 tonnes by 2005. In

contrast, average landings under the PA are projected to decrease from 34 000 tonnes in 1996, to 26 000 tonnes in 1997, and then increase to nearly 95 000 tonnes by 2005.

Average landings under the PA are projected to surpass the SQ after five years, but the distributions overlap throughout the 10-year planning period except during the second year. Combined US landings of cod, haddock, and yellowtail flounder show a similar trend.

Gross revenues

Average revenues under the SQ are projected to remain relatively constant during 1996-1998 at around USD 72 million, and then increase with landings to about USD 113 million by 2005. In contrast, average gross revenues under the PA first decrease from USD 64 million to USD 54 million between 1996 and 1997, and then increase to nearly USD 130 million by the year 2005. The PA exceeds the SQ after five years, but as for landings, the distributions overlap throughout the 10-year period except during the second year. Annual gross revenues from combined landings of cod, haddock, and yellowtail flounder follow a similar pattern.

Industry profits

Losses are projected during the first few years of each alternative when revenues cover operating costs and crew shares, but not fixed costs. During these early years, the distributions under both scenarios mostly overlap. After three years the expected value of profits under the PA steadily pulls away from the SQ to be 60% greater by 2005, but their distributions continue to overlap throughout the planning horizon.

Net present values

Present value analysis can be used to compare the time series of benefits and costs as follows:

$$PV_{1995} = \sum_{t=1}^{t=10} \frac{A^t}{(1+r)^t}$$

PV_{1995} is the present value in 1995, A_t is a benefit, cost or net benefit, t is the time period (*e.g.* t = 1 in 1996, 2 in 1997, etc.), and r is the discount rate. Future values (*i.e.* A^t) be expressed in constant dollars – 1993-dollars in this analysis – and that a 7% discount rate (*i.e.* r = 0.07) be used. Table 12 reports statistics which describe the distributions around the average present values of gross revenues, consumers' surplus, total costs (including crew and captain shares), industry profits and net benefits.

Table 12. **Present value results**
(USD million in 1993 dollars; 7% discount rate)

Quantity	Scenario	Average	Standard deviation
Gross revenues	SQ	608	16
	PA	603	16
	PA less SQ	–5	22
Consumers surplus	PA less SQ	–0.4	10
Total costs	SQ	582	6
	PA	558	6
Industry profits	SQ	25	10
	PA	44	12
	PA less SQ	18	8
Net benefits	SQ	182	15
	PA	201	16
	PA less SQ	18	23

The expected value of gross revenues for the PA is USD 5 million less than the SQ after 10 years when a 7% discount rate is used. This amounts to less than 1% of gross revenues under either alternative. There is a 60(40)% probability that the PA will decrease (increase) revenues.

In terms of present value, the PA was estimated to reduce consumers' surplus by USD 0.4 million throughout the 10-year period. That is, early losses of consumers' surplus are nearly compensated for by future gains as landings increase and prices decline. There is a 48(52)% probability that the PA will increase (decrease) net benefits for seafood consumers and industries in the seafood sector other than the fishing industry.

The 10-year average present values of industry profits are positive under both alternatives, but an USD 18 million gain is projected for the PA. This gain is about 3% of the present value of revenues of either alternative, and it amounts to a 70% gain over the SQ. There is a 99(1)% chance that the PA will increase (decrease) profits.

The PA is expected to increase net benefits (over and above those expected from the SQ) by a total of USD 18 million during 1996-2005. This essentially amounts to the estimated gain in industry profits because there is virtually no difference in consumers' surplus between alternatives. The USD 18 million benefit is a 10% gain over the SQ. The probability that there will be an overall gain (loss) in net benefits is 79(21)%. Only industry profits and consumers' surplus are part of these calculations because the opportunity costs of crew income are unknown.

Present values are sensitive to the choice of discount rate. Because there is no single correct discount rate, a sensitivity analysis was performed using discount rates ranging from 0% to 25%. The PA was estimated to increase industry profits at discount rates at least as high as 25%. Break-even for net benefits is 22%.

Value of the groundfish resources

The principal goal of the PA is to rebuild groundfish stocks. Standing stock biomass is projected to increase greatly compared to the SQ. However, it was not possible to place an economic value on the additional biomass. It has been estimated that resource rents attributable to the groundfish resources in New England could potentially amount to nearly USD 130 million a year. However this would require a 70% reduction in fishing effort from 1989 levels and an institutional framework that strictly controls sustainable use of the resources.

Sector impacts

The PA contains few features that are expected to have significant impacts on sector landings/revenue shares. However, the various sectors do face different cost structures and hence have differences in vessel profitability.

For all sectors, the sum of profits plus income to captain and crew is positive in all years under both the SQ and PA. For trawlers, income plus profit is lower under the PA until the year 2001. In every year thereafter, PA income plus profits are greater than the SQ. The gap between the SQ and PA continues to widen beyond the year 2005; years beyond 2005 are not shown, however, since they are beyond the ten-year time horizon for analysis. For gillnet and hook sectors, PA income plus profit exceeds that of the SQ by 1998. For these two gear groups, earlier improvements (as compared to trawlers) under the PA are achieved for three interrelated reasons. First, the fixed and operating cost structure for vessels in these fleets was estimated to be lower than trawl vessels. Thus, on average, operating margins are higher allowing for greater flexibility to operate at lower profit margins, at least in the short run. Second, while there are differences among individual vessels, on average hook and gillnet vessels tend to operate fewer days than trawl vessels. This means that the days-at-sea reductions impact a relatively smaller proportion of the hook and gillnet fleets as compared to trawlers. Last, because the hook and gillnet sectors can operate on lower profit margins, these sectors benefit proportionally more from productivity gains under the PA stock rebuilding plan.

For the trawl sector in particular, the income streams imply that short run sacrifices will have to be made in order to obtain long run gains. This raises the issue as to whether or not cumulative gains will exceed the cumulative losses at the end of the rebuilding period. For trawlers, the break-even year was estimated to be 2004: nine years into the rebuilding period. By contrast, hook and gillnet gear sectors break even no later than 1998; just three years into the rebuilding schedule.

The sector break-even analysis indicates that the PA will have differential impacts primarily across gear groups with trawlers being relatively more disadvantaged than either hook or gillnet vessels. This also means that states (principally Massachusetts) and communities (New Bedford and Gloucester, for example) that have relatively high concentrations of trawl vessels will be more affected than states and ports with more diverse fleets. It should be noted, however, that as a group trawl vessels and the communities within which they are based would be relatively more impacted by any effort reduction plan simply because they represent the largest share of total groundfish landings and have a higher cost structure. Thus, the differential sector and community impacts on trawlers should not be viewed as purely an artefact of the proposed effort reduction measures under the PA.

E. Mexico: Yucatan red grouper

This case study explores the costs and gains associated with the red grouper (E*pinephelus morio*) fishery in Yucatan, Mexico making the transition to a more sustainable state. A modelling approach is employed to identify the biological, economic and social implications of this transition.

The fishery

The Yucatan red grouper fishery began at the end of the last century as an artisanal fishery. A Cuban fleet began to exploit the resource in 1930s, followed by vessels from the United States of America that exploited the grouper and snapper stocks. The first processing plant was established in 1947. In 1968 the Mexican government began to invest in and develop the fishery and the declaration of Mexican EEZ in 1976 ceased catches by USA vessels. Since that time the Mexican fleet has grown rapidly and by 1998 there were 608 industrial vessels and 2 150 small artisanal boats. Mexico also permits 16 Cuban industrial vessels to fish this stock in certain areas.

There were three distinct periods in the fishery's development:

i) Before 1970 when catches were less than 7 000 tonnes.

ii) During the 1970s when catches rapidly increased to 20 000 tonnes in 1972.

iii) A slow decrease from 15 000 to 7 000 tonnes in 1980s and 1990s.

Red grouper is a long-lived species with some living to 20 years of age. It is a *protogynous* hermaphrodite, with females changing their sex to males as they grow. The sex ratio in the stock changes accordingly to changes in the age composition.

Modelling method

A model was constructed to estimate the status of the fishery and to simulate some management strategies. A mathematical non-linear model, age structured and discrete with differential equations – as described in Hilborn and Walters (1992) – was used. Model estimates were dependent on population structure and they consider biomass factors like recruitment, growth, natural mortality and fishing mortality.

Estimation

The analysis shows a decrease in the available biomass of the red grouper stock. The present biomass is less than 30% of the virgin biomass size. Three different abundance indexes show a decrease in biomass during the last 14 years. The low abundance of the resource has led to low catches by small-scale and industrial fleets, indicating that the fishery is overexploited.

Reference points

A limit reference point (LRP) was used to determine the status of the red grouper stock and to analyse management options. Myers, *et al.* (1994) and Caddy and Mahon (1995) recommend 30% of the virgin biomass as a precautionary LRP.

The virgin biomass estimated for the red grouper off the Yucatan Shelf was 240 000 tonnes. Currently the biomass is estimated to be 61 000 tonnes. This level is less than the LRP (72 000 tonnes); evidently the fishery needs to be regulated.

Simulation

An evaluation of the fishery was performed and three management options were used to simulate the future performance. Three catch quotas scenarios were tested as management options. The quotas were calculated as a portion of the average catches for the last three years. The probability of reaching the LRP with the management options proposed was then calculated. The resulting biomass for the next 2, 9 and 14 years was estimated using Montecarlo analysis. The biomass values were taken as the performance variables.

a) A catch quota of 7 650 tonnes: 4 600 tonnes for the industrial Mexican fleet (IMF), 2 750 tonnes for the small-scale fleet (SSF), and 300 tonnes for the Cuban fleet (CF). The quota is the average for the last three years. There is a 0.48 probability that the biomass reaches the LRP in the short run. If this quota is maintained, the probabilities that the LRP are reached in the medium and long run are high (0.99).

b) A catch quota of 9 500 tonnes: 5 700 tonnes for the IMF, 3 420 tonnes for the SSF, and 380 tonnes for the CF. This option has a low probability of reaching the LRP in the short run (0.27). In the medium and long run the probabilities are 0.75 and 0.85 respectively.

c) A catch quota of 11 000 tonnes: 6 600 tonnes for the IMF, 3 960 tonnes for the SSF, and 440 tonnes for the CF. The quota is equivalent to the average catch for the last 10 years. In the short run a quota of 11 000 tonnes has a low probability of reaching the LRP (0.15). The probabilities of having a biomass above the LRP in the medium and long run are 0.30 and 0.31 respectively.

A quota of 7 650 tonnes should allow the biomass to reach the LRP in the short run. The model takes into consideration the recent decrease in the catches and the consequent lowering of the exploitation rates, as well as the reduction of the Cuban fleet.

Transition cost and gains

Analysis of the red grouper fishery from the biological, economic, and social perspectives suggests that the lack of planned exploitation was the main cause of the unsustainable use of the fishery. Because of the high catches, the fishery was highly profitable during the 1970s and 1980s, but the consequence was a dramatic decrease in the stock sizes in the 1990s. Several studies reveal that this fishery has reached its bio-economic equilibrium and that the harvesting sector is no longer profitable. Social sector performance, measured in terms of number of employees generated by harvest activity, increased during the 1970s and 1980s.

The red grouper case study indicates that the stock is over-exploited and requires rebuilding. The Mexican government is therefore pursuing an agreement with all the stakeholders in the fishery that includes setting a minimum size limit, setting a total allowable quota (TAQ) and closing the fishery in some areas and during some times when there is aggregation for reproduction.

Even if these measures produce a recovery of stock size – and achieve the goals of managers and stakeholders – there will be some undesirable economic and social results. Fishery performance has therefore been forecast in a way that considers the biological, economic and social aspects of the transition. The model was run and the following performance variables of fishery were used.

Table 13. **Performance variables for the Yucatan red grouper fishery**

Variable	Subsystem
Stock size	Biological
Catch	Economic
Total revenue	Economic
Net revenue	Economic
Harvesting labour	Social

Results for these variables were recorded for 15 years: 1998 to 2013. Two scenarios were used to compare different management options:

- The Open Access (OA) scenario with a normally distributed exploitation rate for each of the three fleets. The parameters were obtained from exploitation rate trends over the last 15 years.
- The Quota Scenario (Q) scenario, with a constant catch quota of 7 650 tonnes (*i.e.* that previously estimated rebuild the stock size in the medium term (2008).

Biological performance

If OA continues it is highly likely that the stock size will not recover. At best the stock will maintain its current level (B = 63 000 tonnes a year). This situation puts the fishery at risk, considering that its size is less than 30% of the virgin biomass size. With quota management, there is a greater possibility that the stock size will rebuild. In the short term the stock will be 8% larger than with OA in the same year (B_{2003} = 67 500 tonnes). In the medium term the stock will be 30% larger than with OA system (B_{2008} = 84 400 tonnes). In the long term the stock will be 84% higher than with OA system (B_{2013} = 94 500 tonnes).

Economic performance

According to the historical exploitation trend, catches will not be higher than 8 500 tonnes a year in an OA system. Even when the effort increases, the low biomass levels effectively limits catches. However, the effort will be more expensive. Total costs will increase from USD 15 million in 1998 to USD 19 million in 1999. In addition, the average net revenue during that time series will not be above zero, with the harvesting sector trending towards bio-economic equilibrium.

The quota system limits catches to 7 650 tonnes a year – 1 000 tonnes a year less than under OA system. That is an apparent cost, but harvesting is relatively less expensive, thus improving profitability. The effort required to get the quota does not vary greatly year to year. The average total cost in quota system will be USD 14 million a year – USD 4 million a year less than the OA system. On average, net revenue will be USD 4 million a year higher than in the OA system. The net revenue is above the equilibrium. Of course net revenue does not change instantly with introduction of the quota system. In the short term, net revenue will be about USD 2.5 million a year (2005). In the medium term (2008), net revenue will be about USD 4.5 million a year. In long term (2013) net revenue will increase to USD 5.2 million a year.

Social performance

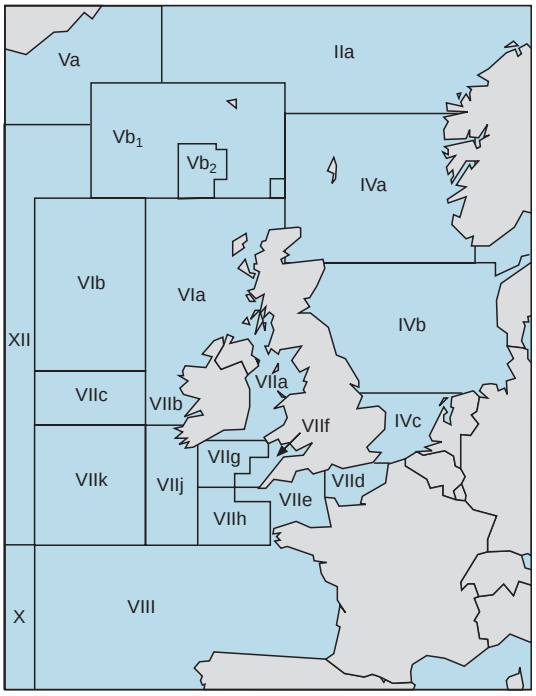
The greatest negative impact from introducing a quota system will be felt by harvesting labour. The red grouper fishery supports a large proportion of the Yucatan coast population. Implementing a quota system will dramatically reduce the labour demanded by the harvesting sector and moderately reduce that demanded in the processing sectors. In the year after implementing quota system, there will be about 2 000 fewer employees than in OA system (down 29%). It may therefore be necessary to implement a social plan along with the quota management strategy. However, this scenario will not be as difficult as it looks. Since the biomass recovers, the quota may be reconsidered and set at a higher level, providing more employees than those initially estimated by the model.

F. European Community: North Sea Roundfish

Background

The North Sea fishery contains a number of interacting multi-species fisheries that are of great importance to many countries. The North Sea is the major fishing ground in European Community waters. Based on the total allowable catches (TACs) and the guide prices for each species, the total value of the allowable catch in 1999 is estimated to be about €1.4 billion. Although this is an underestimate of the true value of landings (as the guide prices are generally lower than market prices), it provides an indication of the order of magnitude of the value of the fishery. Over half of the combined total allowable catches of all species in all EU waters are taken from the North Sea. Commercial activity in the region is mostly undertaken by fishers from the countries bordering the North Sea, *i.e.* United Kingdom, Denmark, Netherlands, France, Germany, Belgium and Norway.[7]

Figure 3. **The North Sea**
ICES Divisions



Source: OECD (2000*e*).

The fishery is managed according to the guidelines of the Common Fisheries Policy as each of the bordering states is a member of the EU, except Norway, which imposes complementary management measures on its fleet. At the time of inception (1983), the method of quota definition amongst the EU member states was based on three main factors: historic catch, compensation for loss of catches in EEZs and sensitive fishing regions. North Sea TACs are assigned on the basis of fixed proportions of each species TAC for each country.

The key principles of the Common Fisheries Policy are:

- Equal access to the resource by all member states (Article 2 of Regulation No. 101/76).
- Improvement of standards and conditions of living in communities that depend on fishing for a living (Article 9).

In addition, the objectives for the resource conservation and management system are embodied in Article 2 of Regulation No. 3760/92 (see text box).

Article 2 of Regulation No. 3760/92

To protect and conserve available and accessible living marine aquatic resources, and to provide for rational exploitation on a sustainable basis, in appropriate economic and social conditions for the sector, taking into account its implications for the marine ecosystem, and in particular taking into account the needs of both producers and consumers.

The existence of multiple objectives is a common feature of many of the world's fisheries management problems (Crutchfield 1973). The broad objective groups of biology, economy, and society are typically relevant. Commonly declared objectives in the field are similar to those encompassed by the Common Fisheries Policy, and include resource conservation, food production, generation of economic wealth and reasonable incomes, maintaining employment and sustaining the community (Charles 1989). The complexity of the natural fish resource and the diversity of interest groups involved dictates that a compromise between such objectives must be sought. This is especially applicable in the North Sea roundfish fishery where stocks are generally considered to be fished up to and beyond their sustainable limits.

Bioeconomic models of the North Sea *fisheries*

A *survey of recent work*

There have been limited attempts at bioeconomic modelling of the North Sea fisheries. Kim (1983) developed a surplus production multi-species model of the demersal fishery to estimate the potential economic rent that could be achieved. Two alternative regimes were investigated: one with an economic objective and another with a biological objective.

Bjørndal and Conrad (1987) and Bjørndal (1988) developed a model of the North Sea herring fishery that included a fleet dynamics function where entry or exit depended on the sign of normalised profit per boat. That is, if profits were positive then boats would enter, whereas if profits were negative then boats would leave. While the model allowed for changes in the fleet size, it did not allow for changes in the fleet structure. The model examined the dynamics of the fishery as it approached the open access level of effort.

Frost *et al.* (1993) developed two bioeconomic models of the North Sea fishery. A linear programming model was used to estimate the optimal allocation of effort of Danish trawlers, from two ports, between three fishing areas. A larger simulation model was used to estimate levels of effort and catches for eight countries by species and gear type. Unfortunately, neither model incorporated stock nor fleet dynamics.

Dol (1996) developed a simulation model of the flatfish (sole and plaice) fishery in the North Sea. The model focused primarily on the Dutch beam trawl fleet and was used to estimate the potential benefit of an area closure for plaice.

In the above models, the objective was to estimate either the maximum level of profits, the optimal effort allocation of a given fleet, or the effects of a given fleet structure on the economic and biological status of the fishery. The models have not been used to estimate the optimal level of catch taking into consideration the multiple objectives of the Common Fisheries Policy.

The European Commission intended to collaborate in producing a bio-economic analysis following the model approach used for Group I case studies. The data required exist or may be estimated, but the model would still require substantial modification to adapt successfully to the North Sea case. The

greatest difficulty found was the allocation of catches across gear types, which is considered constant in the Canadian herring fishery model, whereas in the North Sea case they need to be considered as a function of fleet composition, days fished and TAC constraints.

Multi-criteria modelling

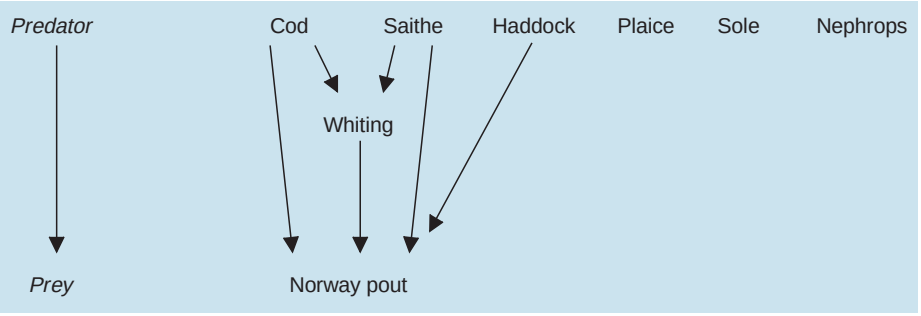
The model developed by Mardle, Pascoe, Tamiz and Jones (1997, 1999) is the first that is developed to analyse multiple objectives in the North Sea. Multi-criteria decision making (MCDM) techniques, especially the subset of multi-objective programming (MOP) techniques, appear to be an ideal set of tools to aid in the task of fisheries management. However, the application of MCDM to fisheries problems is relatively small compared to other fields, such as forestry, water resource planning, and agricultural planning. In a recent review, less than 40 journal publications have been published since the introduction of these techniques (Mardle and Pascoe 1997, 1999). The study developing a multi-objective bioeconomic model of the North Sea demersal fisheries was the first to consider such analysis in the North Sea.

The North Sea demersal fisheries bioeconomic model is essentially a long run equilibrium model. That is, the estimated species' biomass and catch are in an equilibrium state. A feature of these fisheries is that the species are dependent on each other with considerable interaction in the food chain. Stock dynamics are developed using multi-species logistic growth models of the form in equation (1). Non-linear regression analysis was used to estimate the model parameters.

$$G_i = r_i B_i \left(1 - \frac{B_i}{\sum \beta_{s_i} B_{s_i} + K_i} - \sum \alpha_{s_i} B_{s_i} \right) \qquad (1)$$

where G_i is the growth of species i, r_i is the growth rate, K_i is the environmental carrying capacity (excluding the effects of the modelled prey species), B_i is the biomass, $s_i \in S_i$ is the set of predator species and similarly $s_i \in S_i$ is the set of prey species. The predator-prey interactions between the species included in the model are shown in Figure 4. The biomass of Norway Pout, which is a prey of four of the species, is assumed constant, as this species is not explicitly incorporated into the model.

Figure 4. **Species' predator/prey relationships**



Source: OECD (2000*e*).

The structure of the bioeconomic model:

- Considers the seven most important demersal species in the North Sea (cod, haddock, whiting, saithe, plaice, sole and nephrops).
- Includes the North Sea's seven coastal states (Belgium, Denmark, France, Germany, Netherlands, Norway and the United Kingdom).
- Takes account of the four associated major fishing methods or gear types (otter trawl, seine, beam trawl and nephrops trawl).

Price per tonne of fish landed is variable, using price flexibilities based on Jaffry, Pascoe and Robinson (1999) to estimate the effect of changes in the level of landing on price. The average price of each species in each country in 1995 was estimated and used as the base. Fixed costs and running costs of vessels by country and gear type were estimated from 1995 statistics (Concerted Action 1997). Also, crew wages were taken as a proportion of the revenue achieved (Frost *et al.* 1993). The number of boats present in the fishery by country and gear type, and their respective days at sea, were similarly obtained (Concerted Action, 1997). Gear selectivity by species and gear type was taken also from the North Sea simulation model of Frost *et al.* (1993). Differences in catch rates by boats from different countries were estimated as a scaling factor by comparing derived catch from observed catch. Here, catch was assumed to be a linear function of effort (defined in terms of days fished standardised using the scaling factor above), gear selectivity and biomass. The equilibrium biomass was estimated as a function of fishing effort. New boats were acceptable for countries with existing boats containing a gear type, and a landings limit of 400 tonnes of fish per year was imposed on all boats.

Four objectives are included in the model: maximise profit, maintain historic relative quota shares amongst countries, maintain employment in the industry and minimise discards. All of the included species have yearly TACs assigned with historically proportional divisions to the relevant countries. Politically this is considered important for employment and thus boat numbers to remain similar on a yearly basis, or preferably increase slightly, as large labour movement may result in substantial costs on the community (Pascoe, Tamiz and Jones 1997).

The parameters in the model come from a variety of sources, some of which may not be comparable. In a number of cases parameters were not available for some species and/or countries. In these cases, estimates based on comparisons with other countries were used. Therefore, the results of the model need to be viewed as indicative rather than predicative.

Applications of the multi-criteria model

The model of the North Sea demersal fisheries was developed to assist in the assessment of the effects of changes in economic conditions (*e.g.* prices and costs) and different management policies on the long term structure and profitability of the fishery. The model was initially applied to demonstrate the potential usefulness of multi-objective methods in determining an optimal allocation of quota between countries. The optimal allocation in this context is that which best satisfies the multiple objectives of the Common Fisheries Policy.

As in the case of most multiple objective models, the optimal solution differs depending on the relative weights assigned to each objective. A potential advantage of using such a technique in allocating quotas is that the weights implicit in the current decision making have to be made explicit. Straightforward weight modification on the objectives (or goals) provides a "what-if" scenario analysis framework, which should aid discussion. Thus, by agreeing explicitly on the weights to be used in the analysis, fisheries managers can determine the most effective solutions and may be able to overcome some of the problems created by the pluralistic structure of the industry.

This approach allows managers to better identify the costs associated with trade-offs between objectives. For example, the opportunity cost of maintaining employment can be estimated in terms of forgone fishery profits. This opportunity cost can be assessed against other costs that may be incurred in the economy if employment is reduced. In the long run, the potential for displaced labour to find alternative employment is likely to be high. Hence the costs associated with a policy of maintaining employment in some areas may be substantial.

Objectives such as maintenance of employment are often short run in nature rather than long run. An additional objective that may be introduced in the model is short run profit considerations, as well as long run profits. In the short run, potentially high profits can be achieved by fishing at an unsustainable level, although this will result in lower long-term profits than might otherwise be achieved. However, the higher value associated with current benefits compared with discounted future benefits may result in overexploitation being an 'optimal' policy if short run objectives have a greater weighting than long term objectives.

The model provides an indication of the potential benefits of an optimally managed fishery. From the results obtained, potential maximum economic profits may be in excess of ECU 200 million a year. However, this is at the expense of a considerable loss in employment. The analysis of the trade-offs between different scenarios may result in a solution where profits can still be increased significantly with relatively fewer employment losses.

Further developments

A dynamic version of the model has also been produced, as part of the European Union-funded DEMINT project (FAIR-CT96-1814). This extends the capability to allow simulation of events over time, including the effect of changes in TAC or effort levels on the profitability and development of the fishery.

This model could be adapted to incorporate the features needed for the analysis of the transition to responsible fishing. Changes needed would include incorporation of the processing sector and replacement of the multi-species production model by an age-structured model to represent stock dynamics. These are non-trivial tasks and would probably take as much time as modifying the simulation model.

However, this dynamic version has some important advantages. In particular, it incorporates effort dynamics that are consistent with economic theory (*i.e.* effort is only applied if the marginal benefit exceeds the marginal cost). In this way, it also foresees the exit of vessels from the fishery.

V. TRANSITION ANALYSIS RESULTS

This section summarises the results of the Group I and Group II case studies over the transition period for the analysis of the costs and benefits of the transition to responsible fisheries. The results of the studies are presented under the following headings: A. Catch limit policy trade-offs; B. Biological and economic trade-offs; C. Managing transition trade-offs; D. Management arrangements; and E. Management and uncertainty. While these results provide interesting insights into aspects associated with the transition to responsible fisheries, they are made in the context of each fishery and are thus fishery specific. They provide a starting point for considerations on the transition to responsible fisheries.

A. Catch limit policy trade-offs

Almost all case studies explored the implications of more conservative[8] approach in setting catch limits of the management of fish stocks. The Australia southern shark, Japanese saury, German Baltic cod, Icelandic Arctic cod, Norwegian Northeast Arctic cod, Korean anchovy, Mexican Yucatan red grouper and New Zealand red (spiny) rock lobster fisheries explore the implications of alternative annual catch limits over the transition period towards attaining a position as a responsible fishery. In most cases these decisions are projected to reflect an inverse relationship between the medium term biological performance and short term economic/social performance of the fishery. In the long run it could be expected that such policies would have benefits for fishers and consumers due to potentially larger harvests that are possible from rebuilt stocks.

In the Scotia-Fundy herring fishery a more conservative TAC strategy would allow for stock biomass growth, but it would require lower initial catches and hence affects returns to labour and capital. In the case of the German Baltic cod fishery, the opportunity presents itself for larger catches in the short-run. However, these would affect rebuilding of the stock and as a result a more conservative catch limit policy is suggested. With the Icelandic Arctic cod fishery, a reduction in the TAC is projected to have significant short run negative economic and social impacts on the harvesting and processing sectors, labour earnings and employment. New Zealand's red (spiny) rod lobster has the potential for improved economic performance under an increased TACC, but this would come at the costs of stock growth and the conservation of a potentially fragile biomass.

The Korean anchovy fishery has opportunity for significant improvements in biological and economic performance in the long run. However, reaching that potential means incurring economic and social costs in the short-run in reducing effort and hence harvest levels. With the Norwegian Northeast Arctic cod fishery, the move to catch levels that would assure an improvement in long run biological and economic performance was qualified by the desire to ensure stability in quota between years. The envisaged quota reductions, which were projected to be quite sharp, would have violated the quota stability parameters of decision makers. The reforms modelled for the management of the US Northeast Atlantic groundfish fishery, involving tighter restrictions on the number of days-at-sea, suggest that the reforms would result in a decline in landings and in revenue in the short run.

Three exceptions to the need for trade-offs were observed. In the Australian school shark fishery, there was an improvement in economic performance almost immediately when catches were reduced. The improvement was due to reduced harvesting costs. Another exception was the Japanese saury fishery. A decline in catch is more than offset by the resultant increase in price (assuming market adjustments occur as predicted). Economic performance thus improved immediately with reduced catches due to a TAC reduction. In this case however there was a trade-off between the social objective of a target minimum level of supply to the market and the improvement in economic performance. Analysis of the

Mexican red grouper fishery suggests that although the introduction of a quota regime (with conservative catch limits) reduces revenues, profits will actually increase as less effort is expended to harvesting the stock.

B. Biological, economic and social trade-offs

The case studies demonstrated that the increased growth in fish stocks is related to higher sustainable catch levels and the movement toward economic targets. Indeed, in most cases the improvement in fish stocks accompanies improved economic performance. In the medium term, responsible fisheries are characterised by expected joint improvements in the biological and correlated economic components in the fishery. The correlated nature of this relationship over the medium term was explored in the theoretical discussion: improved stock abundance is likely to be associated with an opportunity for larger catches and lower effort costs.

The case studies presented however identify a trade-off in the medium term: between economic and social performance. In several cases (*e.g.* German Baltic cod, Japanese saury), rationalisation and consolidation in the harvesting sector were also accompanied by improvements in economic performance. Consolidated fisheries are more profitable for individual harvesters at the expense of a smaller harvesting sector. In order to improve economic performance for individual operators, it may be necessary to reduce the size of the harvesting sector and thus the corresponding employment possibilities.

Production levels and prices improved in the Galician shellfish fishery between 1989 and 1997. The value of the average catch per person has risen by some 300% in nominal terms. However the number of people working in the sector has fallen by 50%. In the Korean anchovy fishery a similar pattern is evident. In the long-run average revenue per fleet could be increased by 50%, catch could be at near maximal harvest levels over time and the average revenue per fleet would rise by 44%. The social costs would involve a drop in harvest sector employment by 20%, with the retirement of 23 fleets out of the 1999 total of 105.

In the German Baltic cod fishery, more conservative TAC policies are projected to have positive medium term impacts on stock growth and trawler fleet economic performance. Total labour earnings are projected to improve, but total employment is expected to fall. The improvements in economic performance and the shedding of labour are expected to be facilitated by subsidised fleet reduction programmes.

The Japanese saury fishery analysis suggests that economic performance is likely to be further improved by reducing the number of operators. Although the total labour earnings are projected to improve, employment levels would fall if the number of firms were reduced. In the Australian southern shark fishery a conservative TAC strategy will provide improved economic results due to reduced effort costs and the rationalisation of effort due to transferability being introduced to the harvest rights (*e.g.* effort control transferability or ITQs). In this case, transferability is likely to reduce total labour earnings due to a shift to more capital intensive gear sectors. In the Icelandic Arctic cod fishery, although economic performance improves, the impact of fleet rationalisation is expected to reduce the quantity of labour that is demanded by the remaining vessels.

Analysis of Mexico's red grouper fishery suggests that improvements in economic performance are possible if a quota regime (with conservation catch limits) is introduced. However, the analysis also suggests that there would a drop in harvesting sector demand for labour in the short run, perhaps prompting the need for a social plan. But in the longer term a recovery in the stock biomass may provide for increased catches and, consequently, an increase in demand for labour.

Other studies illustrate the existence of social-economic trade-offs. Pascoe and Robinson (1997) prepared a bio-economic model of the fisheries in the English Channel. The model suggests there is potential for an increase in profits from these fisheries by a factor of between 25 and 35 (excluding restructuring costs). However, a profit maximising fleet structure would be significantly smaller than the current one. The number of vessels would need to be reduced by almost two-thirds.

A conservative TACC strategy for New Zealand's red (spiny) rock lobster fishery leads to an improvement in both the economic and biological performance in the medium term. Some consolidation of the

fleet due to the transferable quota regime is expected however, and total earnings for labour are expected to fall. The consolidation of the fleet improves its average performance per operator. Although economic and biological performance both improve with the use of this TACC strategy in the medium term, larger catches under higher TACC strategy are still projected to have better economic results. Such a strategy would be at a cost in terms of biological performance however. The trade-off between economic gain and fish stock health is therefore projected to remain, even in the medium term.

C. Managing transition trade-offs

Almost all case studies point to positive results in the medium term from attempting to adopt more conservative and precautionary approaches to managing fish stocks and fishers. These results point to the fact that steps can be taken to facilitate the movement to responsible fisheries targets. As discussed earlier, decisions that affect the length of time to move towards a responsible fisheries target have costs and gains as well.

The consideration in the Australian case study illustrates gains and costs associated with different TAC reduction strategies. Alternative strategies being considered include three different phase-in periods for TAC reductions in the school shark fishery. The analysis suggests that a gradual decline in the TAC relative to current levels would incur biological costs with little return in terms of economic gain. Accordingly a more abrupt strategy of reducing the TAC in one period could be preferred for this fishery. The stock is in such a state that the benefits of a more conservative TAC strategy can be realised almost immediately in terms of lower effort costs. In other fisheries the situation is not as straightforward.

In the Norwegian Northeast Arctic cod fishery, the modelled results suggest that a sharp reduction in the fishing mortality (from $F = 0.67$ to $F = 0.45$) would generate significant economic profits over the medium term. However, such a drop would compromise the management parameters associated with assuring quota stability between years. A phased reduction in F was therefore proposed as a way of moving towards the desired harvest strategy. Nevertheless, slowing the movement towards a situation that maximises the economic profits to society is not without it costs.

In the Korean anchovy fishery the potential exists for improving stock health and economic performance. As noted in the case study, the length of the transition period would need to be flexible, taking into account the target effort levels, the fluctuations in the abundance of anchovy catch and the social context of the fishery.

Several case studies explored the possibility of using constant exploitation rate policies as a way of managing the transition to responsible fisheries. Under such a policy, catch limits would be set roughly in line with the agreed exploitation rate. If the biomass size improves, then scope exists for raising the catch limit in the future. Alternatively, reductions in the biomass size would be translated into a reduced catch limit. In effect it can be used as a method for the phased movement towards responsible fisheries' targets. Like other transition strategies, the constant exploitation rate strategy has gains and costs associated with it. However, when used by policy makers and understood by stakeholders, it can provide a useful means of balancing competing economic/social and biological objectives during the transition period.

The case studies of the Icelandic Arctic cod (the "cod formula"), Norwegian Northeast Arctic cod and the German Baltic cod fishery illustrate the application of existing constant exploitation rate strategy. Similarly the decision rule applied in the New Zealand red (spiny) rock lobster fishery sets a target rate of fishing mortality, effectively acting as a trigger for more conservative management measures. Some strategies may therefore not be as effective as those that have a built-in response to absolute stock abundance. Strict adherence to relative targets may not allow for feedback and decision adjustment over the transition period. Feedback mechanisms, especially with respect to highly variable parameters such as population estimates may be preferable, as they require engagement and active intervention by decision makers.

D. Management arrangements

The case studies illustrate that the process of managing fish stocks and fishers is a challenging undertaking. Many of the case studies were of fisheries where decisions are made in a co-management context. OECD (1997) pointed to the value of co-management approaches that could be explored by decision makers. Evidence presented appears to confirm the value of such approaches. The design of such approaches can present some challenges however. This highlights the importance of governance issues as part of the transition to responsible fisheries. The Canadian Scotia-Fundy herring case study emphasises the importance of participatory management. In particular the involvement of fishers in the decision making process has tended to improve their conservation ethic. The ethic was illustrated by an industry recommendation to close an area of the fishery in 1995 due to poor results from in-season spawning surveys.

The Australian Fisheries Management Authority uses an advisory committee, which includes industry representatives, to facilitate the management of the southern shark fishery. The committee developed the TAC reduction strategies currently under consideration by AFMA. The case study suggests that the success of future management of this fishery depends on reliance on the committee. In New Zealand a management group, involving all stakeholders, assists in formulating advice for the management of the rock lobster fishery. The group has provided advice that has assisted in formulating management initiatives. One example of such an initiative is the closure of a fishery during certain times of the year to improve economic returns and reduce enforcement costs.

In the Icelandic Arctic cod fishery, the case study suggests that processes for industry feedback be included in the decision making process. The case further suggested that there would be value in industry liaison to facilitate the support and understanding of the application of rules such as the cod formula.

An important part of the *Plan Galicia* was the strengthening of shellfish gathering guilds so that they could assist in the management of the resource. The formal integration of the "on foot" gathering sector into the management decision making and the enhancement of an industry "self-management" approach have been key elements of the reform. Management decisions now involve close collaboration between management authorities and the shellfish gathering guilds. Recognising the importance of social control in the management of fisheries, guilds are encouraged to assist in enforcing decisions. In combination with the limitation on access, these measures have been effective in developing a sense of stewardship towards the resource and in so doing have facilitated its responsible use.

Secure harvest rights are a common feature of the case studies examined in this study. Quota systems are used in the Icelandic Arctic cod, Norwegian Northeast Arctic cod, Canadian Scotia-Fundy herring and New Zealand red (spiny) rock lobster fisheries. Limited access systems operate in the Spanish shellfish fishery, US groundfish fishery and the Australian southern shark fishery. These systems may reinforce a conservation ethic amongst fishers by ensuring that economic gains from a transition to sustainable fisheries are not lost to new entrants to the fishery.

E. Management and uncertainty

The Group I case studies sought to model the impact of uncertainty on each fishery under consideration. The stochastic part of modelling process for the Canadian Scotia-Fundy herring, Australian southern shark, Japanese saury, Icelandic Arctic cod, German Baltic cod and New Zealand red (spiny) rock lobster cases involved assigning probability distributions to the biological, economic, social and administrative components. In other approaches a stochastic approach was used, but certain components were assumed as fixed: Norway's Arctic cod model assumes that the fixed costs and fleet size remain unchanged over the transition period. The US groundfish model assigns probability distributions to landings projections, predicted prices and cost parameters.

While a useful step is recognising the uncertainties, the uncontrollable aspects of the components of the fishery system – especially the biological component – makes movement towards management objectives a difficult task. Decision makers may design instruments to control the harvest of a fishery and to try to meet economic and social objectives. However, the fundamental uncontrollability of the resource base remains. Exploitation can affect the health of the resource dramatically, but predicting the

precise interactions is difficult given the uncontrollable variables that affect its health. In the Peruvian anchovy fishery, overfishing was a significant cause of the economic and biological failure. But its demise was undoubtedly facilitated by the impact of the *El Niño* oceanic condition (warmer water temperature, reduced upwelling) on the fish stock (Hilborn and Walters, 1992).

Recognising biological uncontrollability shifts the attention away from implicit biological or scientific understanding and towards the controllable elements that can be used to achieve management objectives. One author has termed this as moving "beyond the fallacy of controllability" in fisheries management (Charles, 1998). The case study simulations in this study encourage the identification of policy options that manage the variability without trying to control it. The end result tends to be the adoption of more conservative or precautionary policies that dampen negative impacts and are more robust with respect to the uncontrollable biological elements. These include adaptive in-season and spatial-temporal management methods, such as those used in the Galician shellfish fishery, the Canadian Scotia-Fundy herring fishery and New Zealand red (spiny) rock lobster fishery.

As noted in the submission by the European Community on the North Sea roundfish fishery, fisheries systems that involve more than one commercial species or substock and multiple fishing gears are more difficult to analyse than single stock and fisheries systems. This complexity has been explored in Group I case studies where fisheries with multiple gears, multiple species, or both, have been modelled (*e.g.* Australian southern shark fishery, the Canadian Scotia-Fundy herring fishery and the Baltic cod fishery).

Policy approaches that provide sufficient flexibility to deal with the uncontrollable elements of the fishery system are valuable. Improved understanding of these elements can assist in policy design and decision making. Without some form of co-operative data gathering system, it will be very difficult to conduct worthwhile stock assessment and develop appropriate regulations (Hilborn and Walters, 1992). Participatory management approaches that provided for sharing of information on stocks between industry and managers characterised several of the fisheries that were studied (*e.g.* Canadian Scotia-Fundy herring fishery, and Spanish shellfish fishery). Even in situations where fish stocks are at low levels, the continued involvement of fishers, with a strictly controlled exploitation rate strategy, may be preferable to a complete moratorium as it would ensure the continued supply of valuable socio-economic and stock information (Lane and Palsson, 1998).

VI. POLICY IMPLICATIONS AND RECOMMENDATIONS

The methods and results of the study emphasise a number of issues that decision makers could reflect upon when developing policies for achieving a transition to responsible fisheries. The policy implications of the study can be summarised under: A. The path to responsible fisheries; B. Economic costs of the transition; C. Bridging the transition period; D. The precautionary approach; E. Information management; and F. Policies that encourage a strategic outlook.

A. The path to responsible fisheries

The transition path of a fishery to a more responsible or sustainable state depends on the unique characteristics of each fishery and its relation to other fisheries and the wider ecosystem, as well as other socio-economic considerations. The path towards restoration, and the length of time it takes to attain specified objectives, depend on the biological, economic, social, and administrative characteristics of each fishery system. The complexity of the fisheries environment simply does not allow a direct, straightforward transition over time. This complexity is particularly manifest in cases involving multi-species fisheries. Moreover, the measures that embody the notion of responsible fisheries are themselves subject to change. For example, social objectives for a fishery may change over time due to changes in exogenous economic influences (*e.g.* development or attraction of other industrial sectors such as eco-tourism, or an ocean mining industry), or demographic shifts of fishing communities (*e.g.* ageing populations).

The choice of appropriate policies may nevertheless lead to a more direct transition towards a more responsible fishery. Appropriate policies are those that are robust with respect to shocks to the fishery system. Such shocks could include changes to stock status, market impacts, and social and political adjustments. The adjustment to responsible fisheries should involve regular review mechanisms for evaluating performance that can be fed back to management decision makers.

B. Economic costs of the transition

During the transition of a fishery to a more responsible or sustainable state, conservative management policies may offer the best scope for minimising the variability in short and medium term economic and social costs. Continual year over year adjustments – such as fine tuning TACs – will incur industry and government transaction costs. For strategic reasons fishers may prefer the relative certainties associated with a lower catch limit or constant exploitation rate, compared with the continual uncertainties associated with a higher, constantly changing, catch limit. Such uncertainties mean relatively higher transaction costs and can impede the ability of the industry to plan its productive activities.

C. Bridging the transition period

The biological restoration of a fishery has economic, social, and administrative implications. During a period of stock rebuilding, policy-makers can create four forms of incentive structure for fishers. The first form encourages complete cessation of fishing activity in the fishery concerned, and any other fisheries. This can involve retiring capital (*e.g.* vessel buyouts) and encouraging the reallocation of labour into other sectors (*e.g.* retraining). The second form involves encouraging the diversion of fishing effort into other fisheries. It can involve just retiring the access right to the fishery under biological pressure (*e.g.* licence buyout) and encouraging the transfer of technologies to other stocks. The third form involves a management framework that facilitates industry self-adjustment over the transition period (*e.g.* transferable licences, and transferable quotas). The fourth form involves facilitating the development of value-added

activities that create additional revenue generating possibilities within the fishery or alternative development opportunities outside the fisheries.

The choice of policy objectives will depend on whether decision makers consider that a fundamental long-term adjustment in fishing effort is required, as appears to be the case in most of the fisheries examined, or that the time period required for fishery restoration and capital displacement will be short If long term adjustment is involved, consideration could be given to the impact of policies that move fishers into other parts of the fisheries sector or other marine-based industries.

D. Managing uncertainty

Developing conservative management approaches for the transition to responsible fisheries includes identifying the probable outcomes for the range of policies being considered. This is likely to involve a significant commitment to information collection and research, as well as an examination of undesirable outcomes that may be associated with various policies. It is therefore important to quantify the likelihood that acceptable as well as undesirable outcomes may be associated with each of these policies. Quantifying the "risks" of policies – including acceptable minimum thresholds for the various performance measures – provides decision makers with the opportunity to evaluate the implications of different management policies. The selection or ranking of alternative policies would then follow. This is effectively a process of "managing for risk" that embodies the notion of the precautionary approach.

E. Information management

In a complex fisheries system, information is the key to managing the fishery. Combined with a strategic social and administrative policy approach, adequate information (*e.g.* on markets, stocks and fisheries activity) provides what is needed for measuring the adjustment to responsible fisheries. The value of information can be measured by the reduction in the "risk" that is associated with having that information available (*e.g.* research vessel surveys of the stock, year-over-year price fluctuations). The value of information is derived from an assessment of the sensitivities of output measures (*e.g.* variations in estimates of spawning stock biomass) to changes in the input data (*e.g.* fishing mortality at age data). The more sensitive that outputs are relative to a particular input, the more potential value there is in investing in improving the reliability of input data. Inasmuch as it effects the risks of alternative management approaches, this notion of the value of additional information has implications for market research, stock assessment and policy development.

F. Policies that encourage a strategic outlook

Some countries have experienced the benefits associated with the fishing industry being given the opportunity to become more strategic in its outlook and productivity potential. These experiences therefore suggest that the industry can become more resilient in the face of adjustment problems and issues and it can be given it the incentive to deal more responsibly with longer-term considerations. Similarly, in the experience of some countries, Government processes may facilitate the development of a strategic outlook by facilitating, for example, renewable fisheries access and catch allocation commitments to local communities or gear types, surveying and fisheries monitoring agreements, government-industry fisheries co-management and partnership arrangements. While there may be transaction costs to constructing a more forward-looking partnership system between the Government and industry in the short term, costs could fall in the medium to long term and lead to planning economies.

NOTES

1. FAO (1999), *The State of World Fisheries and Aquaculture* 1998, FAO, Rome.
2. FAO (1996), *Chronicles of Marine Fishery Landings* (1950-1994): *Trend analysis and fisheries potential*, FAO Fisheries Technical Paper No. 359, Rome.
3. Economists use a range of discount rates. Private discount rates reflect the cost of capital and are generally based on market rates. Social discount rates in addition, among other things reflect the value society places on the costs and benefits incurred by future generations. The former is usually higher than the latter, reflecting that the uncertainties are greater for a single firm that for society at large, and that single firms are likely to be less concerned about the welfare of future generations that society at large is.
4. An operator for whom sauries account for the largest share of his or her total sales.
5. It is assumed that the Russian allocation will remain at 20 000 tonnes each year.
6. Group quotas refer to the quotas allocated to a fleet, be it the trawler fleet or conventional gears fleet.
7. Norway is not a member of the European Union (EU). However, it has a significant impact on the North Sea fisheries and has entered into formal agreements with the EU for management of the fisheries.
8. In this context "conservative" means the use of management options that involve relatively lower initial rates of fishing mortality than the other options under consideration.

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