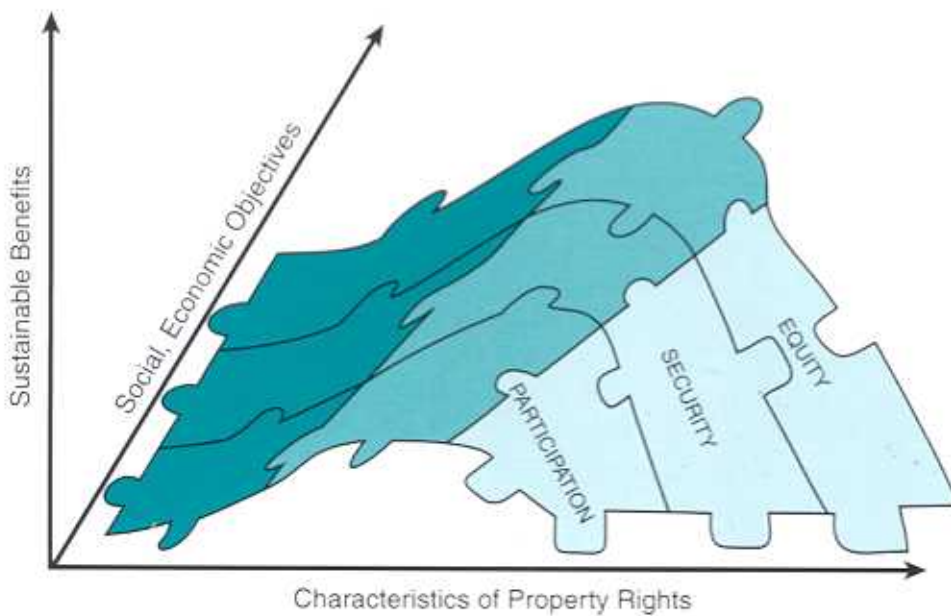


Use of property rights in fisheries management

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WESTERN AUSTRALIA

Food
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Edited by

Ross Shotton

Fishery Resources Officer
Marine Resources Service
Fishery Resources Division
FAO Fisheries Department

Proceedings of the FishRights99 Conference
Fremantle, Western Australia
11-19 November 1999
Mini-course lectures and Core Conference presentations



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PREFACE

The FishRights99 Conference, Use of Property Rights in Fisheries Management, was held from 11 to 19 November 1999 in Fremantle, Western Australia in cooperation with the Food and Agriculture Organization of the United Nations (FAO). Thanks to the efforts of the 352 participants from 49 countries, the conference was a marvellous success. I believe that we all learned more about the spectrum of rights-based management strategies and how these strategies may be used, and I am convinced that this knowledge will help us to better meet our obligations as stewards of the fish resources, part of the common heritage of mankind.

I believe the conference provided the perfect opportunity to address a challenge facing us all – the sharing or allocating of our finite fisheries resources through means that are equitable, socially acceptable, and efficient. As the executive director of Fisheries Western Australia (FWA), one of Australia's larger fisheries management agencies, I am constantly aware of the importance of developing management mechanisms to ensure that the exploitation of our marine resources is ecologically sustainable and accommodates the increasing resource demands from increasing diverse stakeholders. Issues of security, durability, exclusivity, and transferability are at the heart of our daily fisheries management activities, regardless of whether we are managing few or many fishermen, regardless of whether their harvest is of a few or many species and regardless of whether this occurs in low or high-valued fisheries.

The conference benefited from financial support of many organizations, including: The Government of Western Australia, Primary Industries and Resources, The Fisheries Research & Development Corporation, Pearl Producers Association, NSW Fisheries, Agriculture Fisheries Forestry, Australian Fisheries Management Authority, M G Kailis Group, Western Australia Fishing Industry Council Inc., Queensland Department of Primary Industries, Austral Fisheries Pty, Lobster Australia (Kailis and France), Queensland Fisheries Management Authority, Nor-West Seafoods Pty Ltd, The New Zealand Seafood Industry Council and Sealanes Food Services. A number of national governments also contributed to the success of the conference by sponsoring speakers. These included: Fisheries and Oceans Canada, the Ministry of Fisheries, Iceland, the Ministry of Agriculture, Nature Management and Fisheries, Netherlands, the Ministry of Fisheries, New Zealand, Sea Fisheries, Environmental Affairs and Tourism, South Africa. Other sponsoring agencies were The World Bank and the International Centre for Living Aquatic Resource Management.

I would like to take this opportunity to thank all have contributed to the success of the conference. Special mention goes to those who supported and drove the content and quality of the conference through their roles on the Organizing Committee: Mr Peter Millington (FWA), Chair; Mr Ulf Wijkström (FAO); Dr Gary Morgan (PISA); Dr Jim Penn (FWA); Mr Guy Leyland (Western Australian Fishing Industry Council); Mr George Kailis (M G Kailis Pty Ltd); and the Program Co-Chairs, Drs Rebecca Metzner (FWA) and Ross Shotton (FAO). Furthermore, it is only with the support of the FAO and the dedication of Dr Ross Shotton that we have these proceedings volumes in addition to the papers found on the FWA-maintained FishRights99 web site (<http://www.FishRights.com.au>). Finally, I must thank the FWA staff for their generous contributions of time and energy, which helped to keep the conference running in a timely and smooth manner.

As we look back at FishRights99, Use of Property Rights in Fisheries Management, I hope that we are standing on a more durable and secure platform from which to base our fisheries management. It is also my hope that we will continue to build on the information exchanged at the conference so that, half a decade later, when we revisit the subject, we have pushed the boundaries of how we use property rights to manage our fisheries in ways that are ecologically sustainable and that we are closer than ever to ensuring that we have Fish for the Future.

Peter Rogers
Executive Director
Fisheries Western Australia

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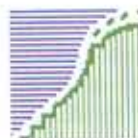
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FISHRIGHTS99
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FOREWORD

Preparation of this Foreword, my final task in editing the proceedings of the FishRights99 conference, completes a cycle that started when Gary Morgan, then Research Program Co-ordinator for the Western Australia Fisheries Department, was in Rome in May 1997 as a Visiting Fellow through FAO's Academic and Profession Partnership Programme. I had invited him there to work on issues related to individual quotas in fisheries management¹. The use of Property Rights in fisheries management was becoming an ever more topical issue as use of this dynamic approach to fisheries management reached a stage of maturity in many countries. As such, I felt that sufficient experience existed to justify an international gathering to exchange these experiences and consequent views on the merits and failings of this management approach and record how the management practices were evolving. FAO itself has had somewhat of a start-stop involvement in rights-based approaches to fisheries management. Francis Christy, author of perhaps the seminal work on the topic², had been a Senior Fisheries Officer in the Fisheries Department at FAO. And prior to his recruitment to FAO, the Department's interest in this form of management had begun with Jean-Paul Troadec, one of the Fisheries Department's early Service Chiefs. Subsequently, FAO together with Japan organized a conference on community-based fisheries management³. My own involvement in property rights had begun in the early 1980s in Nova Scotia. I was aware that rights-based fisheries management had become widely used in Australia and of particular interest to me was the pioneering work in the Northern Prawn Fisheries. So, it was on these foundations that the conference was built.

Once the idea was put to Gary, a quick telephone call on his part to his boss, the Hon. Monty House, Minister for Primary Industries and Fisheries, Western Australia, confirmed the willingness of Fisheries Western Australia to host the conference and co-organize it with the FAO Fisheries Department. A follow-up letter to the Minister from Dr Mori Hayashi, then Assistant Director-General of the Fisheries Department quickly resulted, and to use the cliché, the rest is history. A joint FAO-Fisheries Western Australia Conference Programme Committee was established, chaired by Peter Millington in Perth and supported by a FAO Fisheries Department Conference Committee in Rome. Then, staff at Fisheries Western Australia were left to confront the enormous organizational task they had accepted.

Many important decisions had to be quickly addressed. First, deciding at what time of the year to hold the conference - there was no time ideal for all - and how much lead-time was required. It was later agreed that there could never be enough. Second was where to have the conference. This was an urgent decision given that suitable venues get booked years in advance and at that point less than two years remained until the date that had been agreed upon. It was only after a visit by Ulf Wijkström, also of FAO, and myself that jointly with Peter Millington, Rebecca Metzner and Guy Leyland, we made one of our best decisions and with unanimous agreement Fremantle was chosen as the conference venue. I should note that at that time we had little, if any, idea how many people would come to the conference. The Esplanade Hotel - the Fremantle venue chosen, comfortably accommodated 400 people, but what if too many (or too few) people wished to attend? This uncertainty haunted us for sometime. Directly related to this was the question of financing the conference, something Peter Millington was able to finesse with the Fisheries Research & Development Corporation of Australia.

It was only as the conference proceeded did we appreciate the serendipity of the decision on the conference's location and venue. Fremantle retains almost all of its confederation charm. The Hotel was minutes away from a friendly and active commercial centre with an abundance of footpath cafés and the design of the hotel was such that 'tween sessions discussions and contacts - social and intellectual - were almost unavoidable, even by the most reclusive or jet-lagged conferee. These periods were assisted by abundant provisions of tea, coffee and high fat-content biscuits. An active evening social programme followed the day's sessions, made possible by the generosity of Australian fishing companies and Australian and New Zealand industry groups. This time too was seized upon for yet further discussions and interactions.

¹ See Morgan, G.R. 1997. Individual Quota Management in Fisheries: Methodologies for Catch Quotas and Initial Allocations. FAO. Tech. Fish. Pap. No. 371. 41pp

² Christy, F. 1973. Fishermen's Quotas: A Tentative Suggestion for Domestic Management. Law of the Sea Institute, University of Rhode Island. Occ. Pap. No. 19.

³ FAO/Japan 1993. Expert Consultation on the Development of Community-Based Coastal Fishery Management Systems for Asia and the Pacific. FAO Fish. Rep. No. 474. Suppl. Vol. 1 & 2. FAO, Rome. pp. 689.

An early decision of the Programme Committee was that the conference was not to be about instructing people what they should think or do in relation to rights-based fisheries management and that the sessions should avoid being, in any way, didactical. It was also agreed that no declarations or other polemic banners would formally result from the conference's deliberations. Sessions were not to be taped to encourage a not necessarily "for-the-record" nature of discussions. Our objective was to provide a forum for the exchange of views and experiences, whatever they be, and to this goal the programme committee returned time and again when organizational problems had to be resolved or programme policy issues clarified.

FAO, for its part, had one further objective in terms of the conference. Our mandate, unlike that of a national fisheries department, includes promoting better fisheries management on an international basis and we hoped that the conference would attract people who, though interested in this approach to management, might have had little background in what was involved. For this reason we believed that it was necessary to precede the Core Conference with a mini-course so that participants new to this type of management approach could be introduced to the concepts and practices involved and thus participate and better benefit from the discussions during the Core and Workshop sessions. A desirable mini-course structure quickly became self-evident - a session on theory followed by one on applications. In the event, the majority of those attending the Core Sessions elected to attend the mini-course as well - a wise decision as the lectures provided both complemented and supplemented the presentations that followed. I was delighted that we were able to have Tony Scott, Professor Emeritus at the University of British Columbia, anchor this part of the conference proceedings.

An appropriate structure for the Core sessions was also quickly apparent: we wished to address the concerns of government, those of the fishing industry and also those of the "community at large" - whether their stake in the fishery be direct or indirect. But there were many other concerns beyond the challenge of achieving a good programme structure. It became increasingly obvious that there was much disquiet among those working in the field that the conference would turn out to be an 'ITQ-fest' (Individual Transferable Quotas) or would promote, either intentionally or inadvertently, a particular rights-based approach to fisheries management. This was a difficult unease to counter. To those concerned, it was noted that the conference was to be about Property Rights in Fisheries in their widest sense and that all views would be, and were, solicited for presentation during the sessions. However, on the other hand, given the tremendous advances in ITQ management systems it was apparent that it would be unavoidable that a major emphasis would be given to this particular management approach.

Further it seemed unconstructive to insist on a strict allocation of time to all views on a subject-by-subject basis as this would do an injustice to learning about the developments in rights-based fisheries management as they had been occurring. And, none of these concerns were helped by the difficulty we encountered in trying to 'shoe-horn' into the limited conference time frame the tremendous breath of the topic that was involved. In the event, I believe that the 'warts' of ITQ management were appropriately noted and the more so in a well-argued, elegant and constructive manner - see, for example, the papers of Bonnie McCay, Rolf Willmann and David Symes. Perhaps next time the imbalance in the numbers of presentations on the different subjects may be better solved.

Concerns about possible undue attention to ITQs were, I believe, better understood as a consequence of one of the conclusions I drew from the conference. This was the increasingly common use by many of the locution 'ITQ' as a generic term for any form of rights-based management. On several occasions at the conference I watched discussions splutter along until this confusion in terminology was recognized and resolved. Likewise, similar problems arose with the multitude of interpretations of the term 'property' and here I found the progress in dealing with the potential confusion of legal and non-legal use of this term particularly scholarly, enlightening and welcome. This too was another major contribution of the conference.

Another of our requirements for the conference was that it should provide an opportunity for those working in the field of rights-based fisheries management to give their own presentations, whether they be personal experiences in applying the methods, developing new techniques or conclusions regarding the applicability and benefits of this management approach. The Programme Committee also considered it essential that there be the opportunity for people to express value-based, or cultural, views in a way that clearly distinguished between ideological-based concerns and those of the administrative difficulties and practicalities of implementing rights-based approaches to fisheries management. This was done through the two-day workshop sessions, and I refer the reader to the foreword in Volume II, Workshop Presentations, for comments about this part of the programme.

It is sometimes the practice in forewords such as this to signal to the reader particularly interesting papers in the texts that follow. This is a challenge I wisely forgo. In fact, I think that it is a measure of the overall quality of the papers that I have found that the proceedings can be opened at any point and the reader will be interested and learn from the discourse on the pages in front of them. In total, there are 110 contributions, 11 from the Mini-course, 36 from the Core session and 63 from the Workshop sessions. While I have added an index to aid the reader in a hurry for particular reference material, I do stress that the time taken to read the various presentations in full will be well rewarded.

In looking back at the conference a year later, two things remain foremost in my mind. The first was the atmosphere of the event - the stimulation and common interest of so many people with like interests but different perceptions and experiences - it truly was a remarkable nine days of fomentation, which many of those present remarked upon. My second recollection, which remains ever so strongly, was that of the professionalism and excellence that Fisheries Western Australia had brought to the preparation and execution of the conference. Peter Rogers has thanked those responsible in his preface and it is only the fear of omitting some of the many that deters me from noting an even longer list of personal appreciations. But, to Carli Gettingby, FWA Conference Co-ordinator, and Rebecca Metzner, also of Fisheries Western Australia, for their dedication and efforts, no such excuse would be admissible. To the authors, my thanks and congratulations for their so-many excellent contributions. Nor can I overlook the enormous effort of my secretary, Marie-Thérèse Magnan, in single-handedly undertaking the text processing for the Proceedings, and my colleague, Mike Mann, in tracking down so many missing hyphens and incomplete references.

Fremantle '99, as I hope the conference will be remembered, has been a major part of my life for the last two years. I look forward to seeing its developments provide a significant influence on fisheries now and in the future.

Ross Shotton

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FishRights99 Programme Committee
Editor, Conference Proceedings

Shotton, R. (ed.)

Use of property rights in fisheries management. Proceedings of the FishRights99 Conference. Fremantle, Western Australia, 11-19 November 1999. Mini-course lectures and core conference presentations.

FAO Fisheries Technical Paper. No. 404/1. Rome, FAO. 2000. 342p.

ABSTRACT

Part I of the proceedings consists of two major sections, the Mini-course lectures and the presentations presented during the Core Conference (*Mini-course*). The lectures presented during the two-day Mini-course were grouped in two sections. The first dealt with the concepts, theory and practice relating to the use of Property Rights in Fisheries Management. Subjects covered in the first part of the Mini-course included the historical development of the introduction of property in fishery management, property rights as a means of economic organization, selection of a property rights management system, resistance to changes in property rights or, whether to use Individual Transferable Quotas (ITQs), current property rights systems in fisheries management and group and community-based fishing rights. Topics covered in the second part of the Mini-course included Management Infrastructure for Rights Based Fishing, Legal Planning for Management of Fisheries Using Property Rights, The Administration of Fisheries Managed by Property Rights, Administration of Enforcement Mechanisms for Rights-Based Fisheries Management Systems and Fisher Participation in Rights-based Fisheries Management: The New Zealand Experience.

The second major section of Part I of the proceedings consists of the papers presented during the three-day *Core Conference*. These papers covered the perspectives of (a) governments in introducing and administering such methods of management and the political, conservation, social and economic consequences, (b) industry; and (c) the wider community and other involved stakeholders. The topics covered in the Core Conference were introduced by two major perspectives, Moving through the Narrows: from Open Access to ITQs and Self-government and Common Property Rights: An Alternative to ITQs.

Papers presented during the first day of the Core Sessions covered government perspectives and issues, institutional arrangements, administrative challenges and the politics of the Rights-based fisheries management process. Papers presented during the second day of the Core Sessions described the perspective of industry, strategic responses of industry and industry initiatives in advancing rights-based fisheries management. Papers presented on the final day of the Core Conference dealt with the issues of community perspectives, recreational fishing, community property rights, customary fisheries management, community-based fisheries management and the exclusivity of rights. The session was closed with papers that provided a prognosis on the future development of property rights in fisheries management.

Thus, the conference papers addressed the theory and application of property rights in fisheries management with an emphasis on national applications and experience. The presentations included those made from the perspective of the fishing industry, government policy makers and administrators and the legal implications as a consequence of national systems of law. Eleven papers were presented during the Mini-course and 36 during the Core Session.

Keywords: Fisheries Management, Property Rights, ITQs, Individual Transferable Quotas, Fisheries Policy, Fishery Access Rights

Distribution:

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INTRODUCING PROPERTY IN FISHERY MANAGEMENT

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1. INTRODUCTION

This lead-off presentation briefly sketches the historical emergence of property rights from ancient open-access to modern licensed regulatory regimes. It then outlines what property rights mean from an economic point of view, with special emphasis on their characteristics: especially duration, exclusivity, and transferability. Permits and licences are seen as property rights that are weak and have little of these characteristics. The evolution of individual transferable quotas (ITQs) is shown as the development of the old system of licences, with more of the valuable characteristics added. This provides the basis for other lectures in the series and in a final section I show how the property-like ITQs can be the building-blocks for voluntary fisherman self-regulation and cooperation.

Many of the points referred to here are taken up in other presentations. There is indeed a great deal of healthy overlap. If what is presented here seems unclear or wrong, perhaps the other approaches will correct, or confirm, these impressions.

To keep the discussion as simple as possible, I focus on an offshore fishery concerned with a single, valuable species of fish. I assume at first that the fishery is neglected by the administrators and later becomes subject to various regulations. I acknowledge that many of the most important fisheries are found along the beach or close inshore, so that complications to my approach would arise. I also acknowledge that in many of the most important fisheries, more than one species are caught together, and I find some space to discuss the role of ITQs in this most difficult of managerial problems. Then, I return to a simplified one-species offshore version and introduce ITQs, combining many of the features of the old system of regulation in support of a total allowable catch (TAC) for the season with features of a system of property rights in land.

Other assumptions will be obvious. I say almost nothing about the managerial complications of divided international powers over fisheries, that may be shared because of stock migration or by the position of an international boundary. ITQs would be useful there too, but there is not enough space to discuss multi-national fisheries.

I have two apologies. First, I write about fishermen when it would be more appropriate today to use the word fishers. Second, I have tried to avoid writing like a cheerleader for property rights in the fishery. As the lead-presentation, I have tried to build on how fishermen and

governments have behaved and what they have revealed that they want. Fishermen have given little thought to the losses of the *rest of the economy* arising in the wasteful and costly ways that competing fishermen have been induced to adopt. Here too I have steered away from these problems of general economic efficiency within and beyond each fishery. I have not dealt with the use of fishing effort in separate fisheries at different seasons, or with the lives of fishing people who divide their time between fishing and other occupations. The system of transferable property rights can be very important to them, but I leave these opportunities to other lecturers.

2. A LITTLE HISTORY OF OFFSHORE AND OCEAN FISHERIES

2.1 The open fishery

In the old days, when offshore fish stocks were large and fishing fleets were small, there was no call for either private ownership or government regulation. As well, private ownership of fisheries was effectively banned by the English king and his barons in the Magna Carta, in the 13th century. This action was followed by hundreds of years of free fishing in English waters.

In the waters of other countries, somewhat similar arrangements prevailed. As a result, within most European countries, both inshore waters and the adjoining high seas were regarded as "common property" of all those who wanted to fish. Between countries, however, foreign fishermen were sometimes excluded. Exclusion policies required policing and regulation. They reflected an economic protectionism. Their regulations were not to preserve the fishstocks, but to preserve the local markets for the local fishermen.

Indeed, the kind of fishstock specific, biological regulation known today was absent in nearly every ocean-type fishery until the 19th century. Until then, as far as I know, the main fisheries in all the seven seas were free, open-access and unregulated.

As the growing cities provided increasing markets for both fresh and salted fish, more and larger vessels put to sea for longer periods. Offshore and distant-water ocean fisheries expanded steadily over many centuries. But for long the fishstocks were so large and robust that the expanded fishing hardly affected the catches. That is why the occasional "fish war" was not for possession of dwindling fish stocks - they were not dwindling. The fish wars were fought to capture, for one country's vessels, both monopoly positions over the richest markets and possession of places for vessels to winter or to dry fish.

However, by the mid-19th century, ocean fishing activity had expanded to a dangerous level and each year's fishing left the stock a little smaller than the year before. Although fishing costs per ton began to rise, the world's markets were willing to pay these higher costs and expansion continued. The world's offshore fishermen began to realize that they were directly competing with each other for the catch. As they competed, their hours at sea, and the dangers of winter fishing, all rose. Gradually they began to "race" each other, installing more powerful gear, larger vessels, and planned to spend more days at sea for a given catch. These competitive responses to the scarcity of each fish stock raised their costs further. Some fishermen began to fill their holds with fish they would have rejected a generation earlier: fish that were under-sized or belonging to other less valuable species. That was the position of most of the offshore and ocean fisheries on both sides of the Atlantic toward the beginning of this century. Some inshore fisheries were closed to foreigners. There was only a 3-mile limit, and beyond it the open-access of the high seas. There was little or no government regulation of fisheries for biological reasons. Table 1 illustrates this evolution of property rights in fisheries.

Fishermen argued that the declining catches were someone's fault. They pressurised government to ban the foreigners and the part-time fishers. When that did not help, they wanted government to ban some ways of fishing: some types of vessel; kinds of gear, some seasons, or some sizes of fish. Governments obligingly banned some of these things, resulting in shorter seasons, larger net-meshes, and so on. At first governments had no real theory about how these bans were supposed to help - but that did not matter much because at that time governments had no way of enforcing their bans anyway. At the same time, some governments invested in hatcheries for demersal species, especially plaice. They had no real theory about how a few million eggs would restore the main sea fisheries. So these random regulations and random hatchery operations made little difference.

2.2 The coming of regulation

In the last decades of the century governments' advice began to come not only from perturbed fishermen, but also from scientists. Starting with fresh-water fisheries, then with inshore fish, and salmon, knowledge spread about spawning, migratory behaviour, age structures and so on until there was some confidence that regulations, applied to some species of fish, might actually conserve the stocks and increase the catches.

Today, regulations based on biological theories can be found everywhere. Two main types are applied to offshore fishing. One is gear control, usually prevention of the use of nets with small mesh, of certain kinds of trawls, and of large powerful types and sizes of vessel. The other is the closed fishing season which is a common technique.

At first the chief purpose of regulation was to help the reproduction of large fish. To do this, the fishery

tended to be run so as to allow the escape of spawning and under-sized fish. When this proved inadequate, steps were taken to regulate and reduce the total amount of fishing effort with which a stock came in contact. First seasons became shorter, then the total size and fishing power of the fleet was controlled and reduced. To do this, the number of fishermen was limited and the fishing licence, at first merely a part of the administrative and enforcement system, became a sort of proof of a personal fishing right, akin to a deed.

No other sector or occupation has been so subject to control and regulation. Fishermen agreed to them because, while they argued about the means, they agreed with the purpose. They knew that individual fishermen could not be expected to restrain themselves. This is what is called an open-access situation, one where the individual fisherman, acting alone, has no incentive to do what would benefit the group as a whole.

But the regulatory regimes, as other presentations will show, had serious disadvantages. Fishermen, government administrators, biologists and academics, began to look for a better way. It was agreed that compulsion was necessary. No individual will, by himself, voluntarily fish less or use less destructive gears, for he would be pretty sure that he would not get a full share of whatever benefit resulted. As this year's Nobel Prize winner, Amartya Sen, insisted years ago, people in the fishermen's position want what he called *assurance*. They will make sacrifices for future gain, agreeing to a smaller catch, or fishing under frustrating regulations, if they are assured that everyone else must do the same. All the same, no other sector of the economy was so tangled up in changing, *ad hoc* regulations. When it was found in the 1960s that regulatory techniques could not stop more vessel owners from applying more and more fishing capacity, two new types of control were suggested.

One was a royalty. It was well-known, from people's response to prices, excise taxes and customs tariffs, that the less the suppliers got paid, the less they produced. The idea was that, applied to the fishery, the higher a royalty on landed fish, the less the fleet would catch and land. But this idea was resisted. Fishermen preferred coping with the kinds of regulations with which they were familiar than figuring out how much fishing to do every day, to keep on the profitable side of a price plus tax. The idea made administrators uneasy: they had been trained to think about changing openings during the season, when their information about stocks changed. It was hard to picture these persons changing prices or taxes, taking cross-pricing of other species into account. Consequently the royalty alternative has never taken hold.

The other new idea was restricting access. There had always been a few observers who recommended that since regulation had become necessary, because of the over-fishing made possible by open access, the obvious policy was to close access to the fishery. There were a number of ways of doing this.

Table 1
Historical evolution of property rights in fisheries

	1000 AD	1215 Magna Carta	1600 Grotius	1750 Naval powers	1900 Exhaustibility	1960s	1990s
Inland Pond River	Stock right Catch right	Stock right Catch right				Regulated	
Tidal River	Catch	Free		Free	Regulated	Regulated & licensed	
Inshore	Catch	Free		Free	Some regulated	Regulated & licensed	ITQ
Offshore	Catch	Free	“None”	Free	No regulation	Regulated & licensed	ITQ
National sovereignty		Declared	“None”	3-mile limit		12 to 50 non limit	200 (EEZ) non limit
				Treaty Waters		Fishery Treaties	Fishery treaties
				“Open seas”			Law of the Sea

The one chosen in many fisheries was limited licensing. To start, the number of licence-holders who could fish a particular stock was fixed. Then ways were tried to reduce this number. But, as you know, this simple idea was defeated when it was found to give the remaining licence-holders an incentive to “stuff” their vessels with more and more equipment, capacity, and size. The administrators’ regulatory problem was still there.

There were a number of ways to fix this. Most of them involved putting a limit both on the number of licences and on the permitted inputs (effort) available to each licensee. In Iceland in the 1970s, for example, there was a limit on the number of hours during which each licence holder (each vessel) could fish. In other places there was a limit on the size of the licensed vessel, or its horsepower, or perhaps the number of traps or nets that it could carry (for an inshore fishery). In 1984 in Australia’s northern prawn fishery (also “inshore”), a composite gear or input unit evolved. These were all improvements on simple limited licensing, and versions of them are still being refined. But in offshore fishing they still involved each licensee racing for the catch, and searching for ways around the limits. Each vessel wanted to beat the other vessels and beat the regulators too.

A second approach was to pursue a territorial approach. In one variant the control of the fishery is assigned to one person, or group, be it a corporation, cooperative or community. Control by a group can go beyond co-management by local fishers and government, to something like ownership. The approach is geographical or spatial - it treats the fishery and its environment as

though they were a lake or a piece of land. It has been especially advocated for fisheries that are inshore, in shallow water, and most actual examples, which are traditional fisheries, are inshore and lagoon situations.

A third approach is my subject here. It involves extending regulation bycatch and open season to regulation by setting of a catch quota. Instead of limiting the amount of capital or effort for a fixed number of vessels, it simply limited the catch per vessel. It emerged by trial and error in Iceland, and as a privatizing expedient in New Zealand. For many fisheries, it removed all or nearly all the wasteful and costly incentives at one stroke. For these fisheries, there was no longer any reason to spend money on ever more elaborate vessels or equipment.

Between 1979 and 1999, catch regulation for selected species and stocks was updated by adoption of quotas. By far the most serious initial policy problem was the transition: who should get quotas, how large should they be and at what price? The usual answer, as is apparent from other presentations, has been “grandfathering”. This is a procedure in which each licensee’s future quota, as a percentage of the TAC, is based on his average catch in past years as a percentage of the total catch at that time (while this sounds simple, in the pioneering systems it had to be modified to take account of recent local events, such as when various complementary fisheries were open, preventing a fisherman’s participation in both). Further, its actual introduction revealed many hardship and special cases, and occupied the time of many administrators for many, many, months.

Another expected problem was that of enforcement. In the past, the closing of a body of water had been easy to monitor, for any transgressor was clearly visible to all. But under quotas, there would be no closures. Instead each fisherman's actual cumulative catch had to be compared with his own and his rented quotas. Some complicated systems of inspecting and auditing licensees' catches in relation to their quotas had to be devised, both at sea and at the dock. Experience has permitted some of these complex systems to be simplified.

Much more can be said about the development of regulation by quotas. The chief advantages were that the incentives to race and to over-investment and capital stuffing were greatly reduced. This saved the fishermen money and made the job of the fish managers easier. It further brought about the possibility of deferring catch when market prices were low or when other fisheries were not, and enabled the catch to be taken when prices were high and when fishermen and their vessels were free.

My chief point is that improving regulation was still the purpose. In each country the originators had their own local reasons for going over to catch quotas. They did not think they were introducing a revolution. They expected that, as with previous types of regulation, there would still be administrators, inspectors and watchers, and biologists calculating official TACs. As far as I can see, the public servants and the biologists never regarded the licences of the time as a kind of property, and so did not consider that they were inserting more of the characteristics of property into fishery management.

3. INTRODUCING PROPERTY

3.1 What property in the ocean means

While it is sometimes said that some fishery "belongs to" or is "reserved to" particular users, we know that this does not reflect any individual property right. The truth is that, compared to, say, farming, under most systems of law individual ownership in the fishery is rare. A good common-sense explanation of this was given by Hugo Grotius, a great international lawyer and a philosopher. His 17th century explanation relied on his observation of the two conditions for holding property in a thing. First, he said someone had to have the power to appropriate the thing and hold it in possession against others. Second, he said the thing had to be scarce and exhaustible, so that it was worth-while going to the trouble of holding it as property.

Taken together, his two conditions help to explain why fresh-water fisheries, in rivers, lakes are often private property. First, fresh-water fish populations have long been exhaustible. Second, it is possible to fence out poachers and trespassers. The two conditions also lead to a prediction that many tidal inshore and beach fisheries will be private: the shellfish and so on are scarce and exhaustible, and it is sometimes feasible to exclude outsiders.

These two conditions are usually not satisfied in offshore or ocean fisheries. In Grotius' time, there were lots of fish for everyone, and anyway, it was not feasible for most countries to exclude outsiders and foreigners. Grotius made much of this. He asserted that because neither condition was satisfied, there could be no private property, and no national sovereignty, on the high seas. His assertion, appealing to reason and natural law, became enshrined in international law as the "freedom of the seas."

Grotius's two conditions also correctly predicted that until this century in most systems of law the swimming, uncaptured fish could not be subject to ownership. A stock of fish offshore is not analogous to a herd of domestic animals, exhaustible but subject to fencing. It is analogous to a population of wildlife or of birds, that shifts from place to place. Till recently such a population was thought to be proof against depletion by hunting. Anyway, a person who claimed to own wildlife was unable to enforce his claim against others. Therefore the English common law, like other systems, says that wild animals and wild fish (even fish reared in a hatchery) cannot be subject to property law until they have been caught and brought into the possession of the landowner, hunter or fisherman. This reasoning lies behind the common-law origin of the current "law of capture". Possibly a person may own a fishery as a place, but that person may not own any of the wild fish in it until they have been brought into private possession, alive or dead.

As a matter of fact, the medieval monarchs did try to enforce their personal ownership of some wild creatures: sturgeons especially, but also whales. But at that time either one or the other of Grotius's two conditions was not satisfied, so it was predictable that the monarchs would not be able to enforce their ownership claims for long. Today, as we shall see, Grotius's two conditions may now be satisfied. There are some private rights to land fish, and these can sometimes be interpreted as ownership of the fish even before they are captured. Fishing rights in Iceland and New Zealand are good examples.

3.2 What powers has the holder of a property right?

In brief, these powers were three-fold and can be found provided for in any system of law regarding property in land or water: (a) power to use the thing (or manage it); (b) power to dispose of it (to sell it or grant it); and (c) power to take its yield (e.g. as a crop, rent or royalty).

Consider the fisherman in his role as the owner of a fishing vessel. He has all three powers over it: he can run it, sell it and take the profit from doing these things. But now consider the same fisherman in his role as occupier of the fishery itself. This role does not give him powers to manage it or dispose of it. All he has is the third power, the law of capture: the power to take and keep the fish he catches. The absence of the first two powers deprives him of any incentive to look after the fishery.

To illustrate, if he were the kind of fisherman who tried to manage and exploit the fishery with care and prudence, he would not be rewarded. Although his care might have made the fishery more valuable, he would never have the powers needed to capture this extra value. His efforts would have a near-zero yield to him. That is why, lacking the necessary ownership powers, almost everyone in an offshore fishery finds it not worth while to look after it.

4. THE CHARACTERISTICS OF PROPERTY RIGHTS

4.1 Measurement of rights

Actually, in any system of property law, there is a range of the names of the rights that an individual may hold over a piece of land or a body of water. In common-law countries, for example, he may hold an *easement* or a *lease* over a piece of land, or he may hold all powers over it, as a *freehold* owner. The holder of a lease typically has more powers over the land than the holder of an easement, and the holder of a freehold has more powers than either of them. In other countries, there will be a similar range of kinds of property right.

It is commonly said that a freehold right is "complete", while the other two rights are incomplete or deficient. "Completeness" is a poor way to order them or classify them, but it has the grain of the quantitative idea. If instead we think of all property rights as being made up of *characteristics*, then we can say that the differences between the rights is in the amounts of each characteristic that comprise them. Understanding these characteristics is helpful in itself. It gives an insight into what makes a particular property right suitable for the functions it performs.

Before turning to the fishery, consider a simple example. A person drives into a private parking lot and is given a ticket, or a check. The ticket is evidence of a licence. Like an easement and a lease, a licence is a type of right over land. It is a rather primitive kind of right, with little of the usual standard characteristics. Consequently, it gives the holder, the driver, few powers. He cannot grant the parking right to anyone else, nor choose how his part of the lot is to be used. A licence to park can be considered a feeble property right having almost none of the characteristics of the right that is held by the owner of the lot.

A fishing licence is much like a parking licence. It gives the fisherman a right of access to the resource and to do something there. To understand this here, it is essential to realize that an administrative fishing licence or permit as a kind of property right, one that had few of the characteristics of a right and that therefore offered few of the powers of right ownership.

4.2 A short survey of characteristics

What are the characteristics of a property right? To survey them, consider the right that a farmer has over his land. Any holder of this right to land gets the benefit of four different and potent characteristics. These character-

istics are not abstract, they are tangible and conceptually measurable. (Note that the three powers that ownership gives to the holder of a property right are not the same as the five or six characteristics, or dimensions, of a property right. The powers can be likened to the outputs of a property right; while its characteristics are more like its inputs).

The first characteristic is *exclusivity*, the freedom from interference by a holder of his enjoyment of his right. The more legal interference, the less exclusive the right. Every kind of property right has *some* exclusivity, but none is completely exclusive. Consider a right to fish. The question to ask is, to what extent must the rightholder take into account the actions and decisions of his neighbours? If his right is like that of a fishfarmer over a pond, it may be highly exclusive. If however it is like that of an Atlantic cod fisherman beyond the 200 mile line, it has little exclusivity.

After exclusivity, the second characteristic is *duration* the length of time the holder's powers may be enjoyed. A right can be exclusive, yet have a very short duration, like a three-month's rental of a house. Many open-access ocean fishery rights lack other characteristics, but they effectively have a long duration; even permanence. Other fishery rights, such as licences and permits have a short duration. What counts here is the effective total duration after automatic renewals have been taken into account.

The third characteristic is *security* (or *quality of title*). Most holders obtained their rights by grant from an earlier right-owner. Since owners may not grant what they do not own, the question arises about how good the prior owner's title was. Much of so-called property law is devoted to resolving or preventing disputes about who has the better property title to a piece of land. But a grant is not the only way of getting a good and secure title. Under some systems of law, especially in a new territory, being the first user or appropriator entitles one to become the owner. Sometimes one can get title by just squatting on a piece of private, but unused, land. And one can get a right to use land, or to do something on it, by recourse to *contracting* with the owner, or even by paying him to disregard his rights to stop you from creating pollution or some other *nuisance*. All these procedures may once have been traditional or customary, but have since been improved by registration arrangements, checked by the courts, and subjected to legislation. But since all persons' land titles have some possible flaws, every right-holder faces some risk that their ownership may be challenged by someone else. Low security in a title works like uncertainty in fishing: potential buyers tend to deduct a "risk premium" from what they are willing to pay to get it.

The final characteristic discussed here is *transferability*. In the past there was little need for ocean and offshore fishing rights to be transferable. They were not exclusive - anyone who wanted one could get it for almost nothing from the government. Why bother buying from a holder? But when offshore rights became more exclusive,

transferability was wanted (it may also be called assignability, marketability or exchangeability). All degrees of transferability are possible. On land, most freehold rights are highly transferable and most leases are transferable with the permission of the landlord. But there are exceptions - some landlords will not allow their tenants to sublet a house. In the fishery, when licences were just part of the system of biological regulation, licences were usually personal, and not transferable. It rarely mattered, for in those days anyone could get his own licence.

4.3 Why each characteristic of a right is desirable to the right-holder

When people acquire property, they may be able to choose the kind of property right they will hold: a leasehold, or a freehold for example. Up to a point, they can choose the right with the characteristics they want. Generally speaking, the more of all characteristics a right has, the more it is valued and the more it costs.

Duration is valued because it allows the right holder to get the pay-off in later years from the investments he has made in the earlier years. Indeed, if a right's duration is short, and is not necessarily renewable, the holder will avoid any long-run improvements or investments. In a fishery, it encourages the right-holder to make costly changes in the size and age structure of the fishstock that may result in larger and more more profitable catches even if there must be an extended waiting period.

Exclusivity is valued because it protects the right-holder from interference with the fishstock and with fish catching. In a fishery, we have seen that the low exclusivity of the average fisherman's licence forces him to compete, every time out, with other vessels for his usual share of the catch.

Quality of title is valued because it saves the right-holder from the costs of protecting and enforcing his rights to be fishing. In most public fisheries, the fisherman's right is secure; but he may be surprised by new arrangements and regulations that in effect arbitrarily reduce the characteristics of his right.

Transferability is valued because it allows the holder to make the best use of his time and capital, by selling his right if he so wishes.

Some analysts add other useful or essential characteristics, such as flexibility, enforceability and divisibility to this list of four, but they are not needed in this discussion.

When a person's property right is said to be "complete" or perfect it means that the right can be shown to have all these four characteristics, each one to the fullest possible extent. Now apply all this to the right of a fisherman over the fishery. Of the four characteristics of a property right, we find that his public right of fishing has: no exclusivity; long, but meaningless, duration; great security, for what it is worth; no transferability.

Thus, to put all these ideas together, to be like a farmer's ownership rights to manage, dispose and profit from his land, the fisherman's public right of fishing must be changed. His right must have more of two characteristics: exclusivity and transferability.

4.4 "Standard" types of real property rights

There are many types of standard property interest in land are recognised today. A freehold or fee-simple right for example is rich in all four characteristics. A leasehold can be much the same, but with a shorter duration. A licence can be like a lease, but with little or no exclusivity or transferability. The unfamiliar *profit-à-prendre* allows the holder to take something from another's land or water, while the similar easement allows its holder to do something on another's land or water. Both these can be transferable and exclusive. All are very old, traditional, common-law types of ownership interest in land. Over the centuries they have been adapted for new purposes by their holders and these have been assimilated into the rights by repeated exposure in the courts. Owners have gone to the courts to resolve disputes about who owns a right to property, and what ownership entitles them to do with it. The court's decisions have gradually changed the characteristics of the various rights. For example, the holder of a lease originally had security against encroachment by his landlord, but not much security when others tried to dispossess him. Today, thanks to refinement in the common-law courts, the title of a leaseholder is good against all the world.

Other types of property right in land are quite modern and have been deliberately created by acts of the legislature. An interesting example is the strata-title condominium, an ownership right with carefully-limited exclusivity and transferability. It was created by Australian and Canadian legislatures to replace clumsier ways by which occupants could "own" their space in an apartment building. A third type of property right in land, has been created by the legislature as part of its land-disposal and resource-management policies. Examples are the mineral patent (freehold), Crown grant, lease and claim. Governmental legislatures have also created a number of other resource-using grants, permits, leases, licences, reserves, titles and so on. All these have many of the characteristics of property rights, such as exclusivity transferability and duration even when not advertised as "property".

The government's offshore and ocean fishing licence was different again. It arose out of administrative laws, not land-disposal laws. Thus it can perhaps be likened more correctly to a dog licence or a building licence. One reason was that governments had not "owned" the offshore fishery resource in the same sense that they owned the inshore shallows and the public lands. They could not by licensing an offshore fisherman, give him *all* the three powers of ownership for they had not all the powers themselves.

5. VIEWING THE ITQ AS A PROPERTY RIGHT

5.1 Background

Earlier (Section 2.2), I pointed out that ITQs were introduced to improve the existing licensing systems. There was little idea of creating a property right, or of giving the old “right” additional characteristics. In Section 4, I regard the licence as a potential right and will compare its characteristics with those of the ITQ.

5.2 Behaviour in a fishery without exclusivity

Under closures and equipment regulation, the fishermen’s licence had little or no exclusivity. There were no boundaries across the fishstock and so no connection between a vessel’s impact on the fishery today and its own part of the total catch a few seasons later. Both the good things and the bad things the vessel did while fishing were so dissipated over the entire fishery that it had no incentive to worry about them. This changed a little when limited licensing started, and again when each vessel’s licence gave it powers over a limited part of the stock. But these modifications hardly changed the licence-holder’s perfectly reasonable belief that his actions had no perceptible effect on his future catch. The stock was not his. Therefore he had little personal incentive to obey the regulations or to help to improve them. For the most part, the system forced him to adapt. First, he must adapt to the regulations by competing relentlessly within the open seasons, using the permitted equipment; and second, he must adapt the regulations to the competitive struggle by avoiding them when he could and negotiating to get them changed in his favour when he couldn’t.

5.3 How ITQs gave the fisherman more of the powers of ownership

The added *exclusivity* characteristic of the quota licence changed his behaviour. From having to act as though he were a tolerated poacher, it gave him some powers to act as though he were an owner. There are three general powers of ownership: to manage the asset, to transfer or sell it, and to take the income from it. The ITQ certainly gave the fisherman the third power. Instead of merely allowing him to go out and compete with others until the TAC was reached, it entitled him to a definite fixed percentage of the TAC - that is to the yield itself. The fishermen, as a group, had been given the third power of ownership. By it they collectively acquired something like a *profit à prendre* in common, a standard property right in land. Each fisherman had a fixed share of this yield, and so he possessed the third power of ownership.

The *duration* and *security* characteristics of the ITQ also gave the holder the second power of ownership: management. As for short-run management of the harvest, it gave him the power of deciding when and where to land his fish, and for what market. No longer were regulatory closures needed that governed when all fishermen must land and sell their catch. As for long-run management of the size and composition of the future fishstock, it happens that there is no other way to ensure it than by varying the size and composition of earlier

catches. And, under ITQs, these earlier catches belong to the quota holders. Thus there is a direct, though fractional, link between what a quota-holder takes from the stock today, and what will be available for him to take in future years. Therefore, subject to regulation, each quota-holder has a modest *ownership* power over management. Of course, these powers of management are divided among the holders in proportion to the quota shares, so it is difficult for them actively to manage. Nevertheless under quotas it is a greater power, and opportunity, than under regulation.

What about the first power of ownership: of transferring and bequeathing it? At first, in Iceland and New Zealand, the quota licence was not transferrable. It was not clear what its originators had in mind. However, with a few years’ experience fishermen applied pressure to make their quota licences *permanent*, and *transferable*. It was easy to see why. Permanence gives the quota holder opportunity to act more like a farmer. He can develop markets for fish landed at particular times and of a particular quality. He can acquire vessels and equipment adapted to fishing for smaller amounts over a longer period of time, without cut-throat racing on the grounds. Transferability allows any right-holder to allocate his time and attention to the fishery in accordance with the other uses of his time and capital. If he has other opportunities, he can sell or rent his right permanently or for a period of time. If he is doing well, and has economies of scale, it allows him to acquire more rights when he and his crew and vessel have the time and opportunity. These arguments generally persuaded the governments. The quota became movable from holder to holder, between long-term holders and from long-term holder to short-term renter, not by being turned in to government and reallocated, but by private grant, sale or bequest.

Thus, although the quota concept itself does not call for a marketable certificate, in practice the quota licences have all acquired long duration and transferability.

5.4 Competitive behaviour under property ownership

To proceed, we may compare the behaviour of the fisherman under licensing and under ITQs. We noted earlier that the licensing system forced him to adapt by competing relentlessly within the open seasons using the permitted equipment. The ITQ-property-rights concept changed this. He no longer had to incur costs to keep and increase his share of the TAC. These costs were abolished, and his profits increased by that amount.

Of course, competitive behaviour did not vanish. Somewhat as economists define competition among farmers (behind their fences) as keeping down costs, raising quality and finding good markets, so the fishermen (their quotas established), compete in landing catches economically, raising quality and finding good markets. Those who want to expand buy more quota from those who would rather transfer to other fisheries or to other sectors of the economy.

Also as noted, under licensing, fishermen had maintained their past sharing of the TAC by circumventing the regulations. I will not claim that avoiding the inspectors does not also occur under ITQs. But, the point is, much of the incentive to do so had vanished. They do not need to cheat and poach to maintain their share. Some continued to do so, but most of them found it easier to acquire more quota or to give more of their time to other fisheries or jobs. (Recent data on the new Alaska ITQ systems confirm that illegal behaviour had been greatly reduced).

Finally, I noted above that under licensing, fishermen had battled against the regulations. Regarding the fishery as the government's, they had only a limited interest in improving it. For example, when a fishery was exploited by vessels of different types, subject to different regulations, many of the regular meetings had been devoted to squabbling about how the catch was to be divided between the openings for the vessels of different gear types, or from different communities. The point is that the conferences were *not* devoted to the exchange of information on how to increase the stock or its value. Indeed many fishermen had an incentive to conceal the special information they had required, rather than contribute it to the improvement of stock management.

5.5 Digression on the *tontine* and transferability

Transferability also allows retirement. The curious things that happens when there is no transferability can be illustrated with a *tontine*. It was a club-like arrangement invented about the same time as Grotius was explaining the freedom of the seas. Each person in a group, all about the same age, would put some money in a fund. They shared the fund's income equally, much as in a mutual fund today. As each shareholder died, the fund's income was re-divided, among the reduced number of survivors. With the years each survivor's income became larger and larger. Finally only one person was left. He or she received the entire income. When he died the capital of the fund would go to his children. Other members' children got nothing. One family prospered because shares in the mutual fund were not transferable.

What was a desirable feature in a *tontine* was a flaw in the design of the earliest versions of limited licensing and ITQs. In these early versions, the number of active licences was to be reduced by attrition: by the death or retirement of the licence holders. But, what the designers had not provided for was that as time passed and some fishermen dropped out, those who remained would be ageing. In 15 years 65-year-old holders would be 80. The longer they stayed on, the greater the reward for staying still longer. It was like the old *tontine*. No one would have an incentive to retire. Eventually one old surviving licensee would be found doggedly trying to take the entire catch with one vessel. The answer to this bizarre situation was of course to allow holders to transfer their licences by sale or bequest. Then the government would have to think of some other way of reducing the number of licences, perhaps by a buy-back scheme for vessels or li-

cences, perhaps by re-auctioning some licences, or by using a lottery. All such devices have been used.

5.6 Conclusion

To conclude, the main points have been two-fold. First, the increase in the *characteristics* of the licences held by fishermen have increased the effective and legal *powers* of the fishermen (to get income from harvesting the yield of the stock; to participate in the management of the stock, and to deal in the ownership of the rights). Second, these expanded powers have turned the regime of regulations and licences into one of property rights.

6. TESTING THE ITQ IN MULTIPLE-SPECIES FISHERIES

6.1 The bycatch situation

The potential of the property approach can also be seen when we remove the simplification that the offshore fleet confronts only one stock of fish. Imagine that there are several species that feed together. For illustration assume just two species and that the second has a low value. There are usually markets for both species. Typically, vessels like trawlers and seiners, having unselective gear, catch both species. The second species is commonly referred to as a bycatch. A bycatch is not necessarily a new problem.

6.2 The "capacity" problem and the social problem of bycatch species

Vessel owners or skippers have a "capacity" problem to solve even in the absence of any policy, regulation or property right. For simplicity, imagine that on a trip each vessel of given capacity, travels to the grounds, brings in equal quantities of both species in its catch, fills its hold, returns to port and sells the two species at market prices. Because trip costs are the same regardless of the mix of species in the catch, economists define the two products as being in "joint supply".

The vessel's limited capacity is partly occupied by the species that sells for a lower price. The more valuable the popular species, the greater the gain from dumping the low-value species. That is, the vessel's returns are reduced by the act of filling half the net and half the hold with the low-value species. Carrying this species is like a "tax" on carrying to port, the high-value species.

This fisheries joint-supply problem has familiar equivalents in all natural-resource industries. For example, both miners and loggers must take some low-grade material in the process of removing high-grade product. Sometimes the second product is regarded as a low-value commodity, sometimes as a high-cost waste or pollutant.

The skipper can try either of two different strategies. The first is avoidance. He can try selective fishing. He attempts to learn where the desired species are concentrated, and heads for where the high valued species abound (unless it is too remote). The typical skipper finds selective fishing difficult; that is, the catch of the "better" fish per trip is too low (or the cost per fish of the higher

value is too high). He rejects a selective-fishing strategy and settles for a run-of-the-mill mixture.

The second strategy is dumping: the skipper brings the low-value species on board, but dumps them the side over to make room for the preferred species. He may sort through every netful, or he may just select whole netfuls by keeping some and dumping the others. Compared with carrying less popular species home, this strategy has obvious benefits, the jointness of supply is broken.

To what extent will fishermen as a group follow the dumping strategy? Some will be deterred because there are some extra costs associated with it. For example, a vessel that always had to dump half its catch to get rid of low-value species would incur the costs of twice as many sets of the net on each trip. Furthermore, the more some fishermen "high-grade" by dumping, the higher will be the market price of the remaining bycatch carried to market, and the more some fisherman will decide to carry more of the bycatch back to the port. These two influences will reduce, but not stop, a fisherman from dumping. His general rule, will be: continue dumping a low-value species unless the cost of doing so exceeds the gain from selling the high-value rather than the low-value species.

6.3 Bycatches: comparison of two regimes with a bycatch species

6.3.1 Introduction

Dumping is adopted in a free fishery, because the low-value species occupy capacity on the vessel - not because of any regulation or quota. Since the vessel owner does not own the wasted fishstock, he does not think that dumping is a source of extra cost; for him it is a way of avoiding costs. Society bears the cost of wastage and perhaps of extinction of over-fished and dumped bycatch species. Dumping has led to demands for government regulatory policies to reduce it. I imagine and compare alternative regimes: anti-dumping regulations *versus* ITQs.

6.3.2 Bycatch handling behaviour where the high-value species is regulated by closures

One policy in use is a *prohibition* of dumping and to fine those caught. However, the skipper may choose to disregard the prohibition, taking the chance that he will be caught only occasionally, adding the expected fine to the cost of dumping until it is greater than the gain from dumping. The government may increase the expected fine by placing observers on each vessel. The heavy cost of observers is billed to the vessel owner; consequently small vessels are not usually required to carry observers.

An alternative regulatory policy, that reduces the expenses of prohibition and observation, is to close a multiple-species fishing ground altogether. The low expense of this policy however is deceptive. It might be called procrustean, in that the main catch is reduced to a size dictated by the survival of another species. For example, where the species are caught in a 50 - 50 ratio, the private cost of saving each threatened-species fish is the

foregone net profit on the main-species; if the ratio is 65-35, the cost is the foregone net profit on the two main-species; and so on.

6.3.3 How these problems look under an ITQ regime

Some critics imply that when ITQs are introduced, dumping begins. They seem unaware that there will always be some dumping of low-value species as long as vessels have capacity limitations. The critics' argument is that ITQs give the skipper more reward for dumping the low-value species than he gets under anti-dumping regulations. This is hard to understand, and is probably wrong. Indeed, under ITQs the skipper is in less of a hurry than under regulation, and so can tolerate more extra load of the low-catch species, than if there were no ITQs.

Setting up an ITQ system for the low-value species will make no difference to the skipper's behaviour. He will continue to dump the low-value species as long as the costs of dumping are less than the extra gain from freeing up his capacity for the high-value species.

6.3.4 When the second species has a high value

If the second species is valuable, the skipper's dumping rule will give a different result. In a fishery with no regulation, or with anti-dumping regulation, he will no longer regard the second species as a nuisance. Instead he will bring them on board and carry all his catches to port. It is here that the critics of ITQs are correct. If the skipper has a quota for the first species but not for the second, he will wish to land both species but will be prevented from doing so by enforcement system for the quota system. Then it can correctly be said that the ITQ system will force him to dump valuable fish, which he would not have done under the alternative regime.

The most obvious remedy is to introduce a quota system for the second species, which the skipper can acquire. This solution has been tried, and can work. I have described elsewhere an open market in short-run quotas for various species, which a skipper may acquire after he has landed the bycatches. It runs into difficulty if there is a social or external reason for not catching the second species, even if its market value is high. For example, it may be that the second variety in the fishery does not belong to another species, but may be under-age or under-sized fish of the first species. Or, it may be that the second species is under a moratorium. Then a quota to take such fish cannot be bought or rented because it does not exist. It seems that a realistic solution would be to create new quota licences even for closed and protected species. If the species is valuable, they will be eagerly sought, at a price, by skippers who want them as an alternative to their dumping them as bycatch.

The greatest difficulty will be found where there are many species, all caught together. Then the ITQ property-right approach runs into large individual control costs. Most systems of regulation are difficult to apply when there are dozens, perhaps hundreds, of kinds of fish caught together. The ITQ system is no exception.

6.4 A suggested set of rules

In studies some years ago I sketched how the bycatch problem could be solved if every species can be placed under divisible and transferable quotas, each species subject to its own TAC.

- i. Vessels using unselective gear may not enter areas with two vulnerable species without acquiring quota for each species.
- ii. Quota must be assigned to every fish of all species caught on board. Sufficiency of quota for the main species can be checked at the dock. Checking quotas against landings for the bycatch-species quota however will have high enforcement costs, perhaps requiring randomised monitoring by on-board observers.
- iii. Vessels whose quota for step (ii) is deficient must buy more, probably by cell phone or radio purchase or rental on the organized quota market. Obtaining quota for marginal species may involve paying a higher price than the fish are worth. Some sellers will no doubt demand repayment in the form of delivery of the bycatch species to a particular dealer or in the form of later returns of similar quota, or perhaps in the form of quota for the main species, perhaps for a future year. If the terms are strict, the skipper may be tempted to dump and face the possible penalty.
- iv. Although their total bycatch must be covered by quota, vessels may economise on their capacity to hold, transport and market it by discarding the quoted bycatch. Possibly, dumping should be allowed if the second species has a low market value. Little is gained by lugging it to the market. This would be no more an anti-social waste than a farmer's decision to discard the cullings from his fruit trees. Vessels' short-run decisions to take this costly action will probably in the long run induce their investment in technology and in capacity to move themselves and the whole fleet toward an equilibrium solution: catching and landing bycatch in the same proportions as the TACs.

7. FISHERMEN, PROPERTY AND SELF-MANAGEMENT

7.1 Remaining issues

Two main property-right topics remain to be covered. One is the prospect of fishermen in offshore fisheries having to provide for themselves many of the services now performed by government. I argue that they could do this satisfactorily, probably better than government does. The other is the role of ITQs and property in getting to the setting up and operating of a self-management cooperative.

7.2 Limitations of ITQs

The discussion in previous parts has shown that the introduction of ITQs automatically solves only one set of fishery problems: those arising in a fishery with open access plus a regulatory regime utilising area closures. ITQs help rid over-crowding, racing for quota share,

short seasons and low-quality product. But even when they work perfectly, they still leave each fishery in the hunting and gathering stage of economic production. The problem is that this highly individualistic mode of production does not encourage its participants to better pool information, protect stocks, achieve economies of scale in production and try other forms of cooperation.

7.3 Example: a property-basis for self-regulation

7.3.1 The incentives for self-regulation

Someone once said that because the regulations and the TAC are in effect local, undivided, "social goods", one cannot expect that any non-government, without powers of compulsion, could provide them efficiently. But today "co-management" and "self-governance" are in the air. Since the late 1970s, commissions and think-tanks have been conducting reviews of the possibilities for "de-regulating" bits and pieces of the entire economy. Many began to question the size of government's role, even in the fishery. In New Zealand especially, in the late 1980s politicians, knowing little about the subject, automatically included fishery regulation services among the branches to be downsized. One principle advanced was that everything should pay for itself; another that government should not provide free what industries privately needed. States were increasingly leaving farmers to look after themselves; why should fishermen also not look after their own needs?

I take as an example the services of regulation or management. I assume that the owners of the vessels harvesting a particular offshore fishery have successfully joined forming a self-governing organization. The question is whether this organization, which I will call a cooperative, can successfully take over the regulation of the fishery.

Does an ITQ fishery need regulation? The ITQ does solve the distributional question. There is no longer an automatic need to adjust closures to maintain equity and fairness among the fisheries and their gears. To that extent the distributive role is simplified to that for any kind of property: making sure that ownership is enforced, which is to say registered, secure, divisible and transferable, by policing and in the courts. This is no small problem. Even for quota holders, temptations abound to abuse the fish resource. True, under an ITQ regime fishermen have a stronger incentive to make the system work. But the quota institution leaves them torn between enhancing their joint fishery and breaking through their individual quota constraints. Each individual, knowing that his own impact on the joint fishstock is small, will be tempted to free ride on the quota scheme, by exceeding his quota, taking under-sized fish and dumping bycatch species. Overall enforcement and monitoring are still needed.

Can the cooperative provide the ITQ fishery with its TAC? The TAC and the biological regulations are the fruit of an overall stock management plan. How can this be worked out? There is nothing in the theory of an ITQ fishery to produce a management plan (although Ragnar Arnason has shown that the marketability of ITQs can

provide the value-maximising basis for picking the best of several management plans). Must the cooperative abdicate from providing its own TACs?

These are larger questions of organization information and transactions costs than I can cover here. To suggest how to look at them, I take perhaps the most difficult function: the setting of the TAC. Would a cooperative be competent to take on the responsibility of setting annually the TAC and other management details? Under a regulatory regime, government experts ("scientists") make and report observations, helped by fishermen's reports. The scientists interpret these data and apply what they have learned to recommend the season's TAC. For a cooperative to do as well, it needs good information about the size, growth and composition of the fishstocks. Having this information, it needs a long-run management goal, and a plan, for setting each year's TAC.

7.3.2 Information

Fishermen are already the source of much, if not most, information used by the government. Their vessels can seek and provide more kinds of data, of better quality, than they have usually been asked for. They have time for this, for under ITQs they need not be frantically busy during the short period when the season is open. As for scientific interpretations of the fishermen's observations and data, they can be provided by private consultants as well as by government.

As for the TAC decision, fishermen in cooperatives that must live with the results, can make their own decisions based on what they have seen, what the data tell them and their consultants, and what their consultants advise. The cooperative can get the same advice as government, from the same sources, public or private. (If, especially, future government belt-tightening policies require that fishermen pay for the services that government has provided free in the past, they will want to get it from the best sources).

7.3.3 Criteria

Giving the cooperative responsibility to make the TAC decision therefore is less a question of fishermen being informed and advised than it is of their using the "right" criteria in weighing the alternatives. Consider a TAC committee in a government agency compared with a cooperative's TAC committee of active fisherman. Can we predict how their attitudes and decisions will differ?

In the hands of either party, the TAC policy decision boils down to dividing this year's expected fishstock between the catch this year and, indirectly, the catch in future years. It's something like the household's how-much-to-save decision, or the farmer's how-much-to-spend on this year's harvest versus and how much to invest in the land and estate for future harvests. The annual fishstock decision involves an analogous choice between present TAC and stock building for the future.

To a considerable extent, the cooperative committee's TAC decisions will reflect the members' private attitudes and preferences. It is difficult to see why these

should differ significantly from those of a government committee's. Both are driven by a concern for the future. Under simple regulation, the fishermen's behaviour did not reveal much concern about the future of the fishstock. It had not belonged to them, and they lacked the security that would give them faith that they would share in it in the future. But their decision-making behaviour when they hold ITQs, reveals much the same attitudes as those of the government fishery administrators. Indeed property-owning fishermen may be more interested in the future of the fishstock than administrators. For administrators, the penalties in making wrong predictions (and the rewards for being right) are not great. For the property-owning fishermen, the penalties, in the form of a time-stream of smaller catches, and, or, a lower market value of their quotas, would be much tangible and personally felt.

There are two well-known objections to allowing fishermen to make the decisions about the TAC and the gear regulations to go with it. One is that, compared to government regulators, fishermen will be short-sighted. The other is that they will be too little concerned with the survival of low-value bycatch species. I think they are probably mistaken.

The short-sightedness theory comes down to saying that fishermen will give less weight to future harvests (i.e. discount future harvests more heavily) than would be in their own interests or in those of the economy or society as whole. It could be true if property-less fishermen continued to be a race apart, risk-loving people who lived for the moment. But it will not be true if fishermen are property-owning harvesters, as concerned with biology, technology and markets as are farmers. Even with ITQs, we observe that fishermen have long looked after their own vessels, nets and equipment, homes and their port facilities as well as anyone else. And we observe today that in the increasing number of ITQ fisheries, especially those run by cooperatives organizations, that conservation and growth, not liquidation, are their objectives.

As for the theory that a cooperative will neglect other species, there may be something to it. Left to itself, a well-informed fisheries cooperative will be more concerned to protect the habitat and the prey of the species they harvest and to get rid of its predators and competitors than its members acting alone. That is probably an advantage. When in addition society wants to protect species that the cooperative's members regard as a nuisance, society will have to intervene actively. In my opinion, the cooperative organization may be helpful in this role: certainly it would not make things worse.

7.3.4 Summing up

From a fisherman's point of view, the only reasons for retaining a government to make his regulations and set his TAC is that the government may continue to do it for nothing. Probably, where under ITQs things are going well, money-conscious governments will opt out. So fishermen should ask themselves whether the mix of

services they need must all be provided by the government.

Here the complicated question of who should be responsible for regulation has been simplified by focusing attention of only one feature of modern ITQ-regime management: the setting of the TAC. When this particular question is examined for the case of a deep-sea fishery, it appears that fishermen could cooperate to do it themselves. They can hire observers, exploratory vessels, consultants and advisors, perhaps from government (as in New Zealand today) perhaps from private-sector sources (possibly active members of their own fishery). Their new concern for the future value of their property will help to unite them when they set about interpreting the recommendations they receive.

The same is true when we go on to consider other fisheries' services: enforcement in particular, but also those, such as:

- i. running an exchange for short- and long-run transactions in quotas
- ii. organizing or sponsoring joint-fishing operations and
- iii. running docks or a port, and storage or repair facilities.

Still other functions become possible once fishermen unite and hold their own quotas. As a unit they might deal with pollution, stock enhancement, habitat protection and make binding "treaties" with other individuals or groups fishing the same migratory stocks. Some of these functions are best performed by, or with, government. Anyway, offshore fishermen do not need them all and they can decide among themselves which to leave to government, which to skip, and which provide themselves (and whether by their own work or by contractors). One has only to visit the Japanese inshore fishery to learn how many activities can be undertaken by one fishery cooperative. Of course, not every group undertakes the same list of functions.

7.4 Getting there and back to the role of property

How a group of independent fishermen get to self-government depends on where they start, the attitude of the government and the attitude of the industries to whom they sell their catches. In high-seas fishing, cooperation like that sketched above is still a utopian ideal. Internationally there are probably more examples of *de facto* corporate sole ownerships than of fisherman self-management (on offshore grounds). Why are there so few cooperatives? The purpose of the following sections is to review the explanations and sort them out.

The chief difficulty about an offshore cooperative is how to get there. Fishermen may realize that they might gain a better TAC policy, lower administration costs, lower fishing costs and higher prices through a cooperative. Yet they may oppose cooperation, or, avoid becoming members themselves. There are a number of reasons. Here I list three of the most important:

i. *Free riding on the sacrifices made by cooperative members*

Some clever fisherman, following their experiences as taxpayers, may favour the formation of a cooperative, yet refuse to join themselves. For example, they may want to enjoy the gains from higher yields in later periods without having suffered the pains of deliberately smaller catches in earlier periods. They want to "free ride" on the sacrifices of others. There is little harm in this, unless the majority of the fishermen try to free-ride. If so, none has the A. Sen "assurance" that I mentioned in Section 2.2 and the cooperative will fail. This problem is related to that of the "prisoners' dilemma" in game theory.

The remedy for free riding is simple: everyone must become a member and remain a member. This is the remedy used by governments in a system of regulation: everyone must conform to the rules. It is also used by citizens in political jurisdictions: every person can enjoy the public goods provided by the state, but everyone must contribute, especially by paying taxes. No one may free ride nor opt out.

ii. *Domination by a majority*

Some self-dependent fishermen, in a minority, may object to the TAC and rules made by a majority. This is inevitable in any organization, from cooperatives to business corporations, trade unions and private clubs. Outright tyranny and dishonesty are prevented by government-made voting and reporting rules, and are just as necessary in a fisheries' cooperative. If these rules are inadequate, the fisherman can try politicking within the cooperative, or, finally, sell his membership and moving to another fishery or occupation.

iii. *Losing by joining up*

There is a more profound problem: like the first item above it is also loosely related to that of the prisoners' dilemma in game theory. To put it in its simplest terms, the setting up of a fishermen's cooperative is like deciding whether to adopt a new joint policy. Each person can see that working together will raise the average incomes of the group, by getting finely-tuned regulations, cutting regulation costs, landing more fish, catching a better quality product, getting higher seasonal prices, and having lower fishing costs. But for each member, an expected increase in the *average* income will not be enough. What is to prevent his own expected increase being less than the average? Indeed, what is to assure him that he will, individually, actually get *any* increase? Under the cooperative there will be no government to protect him from losing. Therefore he will behave as game theory and organization theories predict: he will not support the policy. In this example, it means he will refuse to support the formation of a cooperative.

What would change the individual's mind and win his support? What would relieve him (and each other potential cooperative member) from the reasonable fear that his own harvest and price would fall short of the general improvement? Put this way, the answer is obvious: to win his consent, there is a need to offer *a guarantee of a fixed share of the future total TAC*. As it happens, almost by coincidence, the system of ITQs does automatically provide the fixed percentage sharing needed to make the fisherman secure within the cooperative. In the original assignment of ITQs, probably using a grandfathering procedure, the government has already, incidentally, imposed agreed historical percentage shares on the harvest from the fishery. In a nutshell: the fishermen harvesting an isolated offshore stock, having escaped from competitive harvesting to regulation, and then from regulation to ITQs, are now likely to be enthusiastic about moving on to further developments to improve the stock and cut costs. This inevitably requires joint action.

Having ITQs, the fishermen have already achieved the two indispensable features for fisherman cooperation and self regulation. First, they already have compulsory, complete and closed "membership." No one else is involved. Second, they already have in existence, as individual property rights, a sharing of the catch that is secure and reliable as the equity of shareholders in a business corporation or the rights of tax-paying local property owners in municipal government.

It is not essential that offshore fisherman form a cooperative for mutual regulation and the setting of the TAC. But it is predictable that many of them will want to try. On the whole, they are bound to fail, arguing amount the distribution of the harvest. But they need not fail if they already have the fixed property-like sharing of ITQs, with the extra incentives derived from transferability of being able to cash in on the prospects of ever more valuable catches.