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Editor

Fisheries, Quota Management and Quota Transfer

Rationalization through Bio-economics

Centre for Maritime



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Cover illustration: 'Wild' Sockeye salmon, frozen-at-sea and ready for sale at a market in Vancouver, British Columbia, Canada (photo: G. Winder 2015). The sign speaks to the rationalization of salmon through the bio-economic project of a wild capture industrial fishery.

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List of Abbreviations

ADF&G	Alaska Department of Fish and Game (USA)
AERE	Association of Environmental and Resource Economists
ANT	actor-network theory
CFP	Common Fisheries Policy (European Union)
CPU	catch per unit effort
DAP	dedicated access privilege
DCF	data collection framework
DTS	demersal trawl segment
EEZ	exclusive economic zone (200 nautical miles)
FTE	full-time equivalent
GDP	gross domestic product
GQ	group quotas (Germany)
HMAP	History of Marine Animal Populations
ICES	International Council for the Exploration of the Sea
ICNAF	International Commission for the Northwest Atlantic Fisheries
IPHC	International Pacific Halibut Commission (Canada and USA)
IQ	individual quota
ITQ	individual transferable quota
IUU	illegal, unreported and unregulated fishing
IVQ	individual vessel quota system
LAP	limited access privilege
LAPP	limited access privilege programmes (Alaska)
MAFF	Ministry of Agriculture, Fisheries and Food (UK)
MPA	marine protected area
MSC	Marine Stewardship Council
MSP	marine spatial planning
MSY	maximum sustained yield
NFA	Norwegian Fishers' Association
NGO	non-governmental organization
nm	nautical miles

NOAA	National Oceanic and Atmospheric Administration (USA)
NPFMC	North Pacific Fishery Management Council (Alaska)
OECD	Organisation for Economic Co-operation and Development
PO	producer organization
QEM	quota exchange market (Iceland)
QMS	quota management system (official name for New Zealand's fish stock assessment programme)
RC	regulatory council (Norway)
SQS	structural quota system (Norway)
TACC	total allowable commercial catch
TOKM	Te Ohu Kaimoana (a Māori fisheries trust, New Zealand)
TQ	total quotas (Germany)
TURF	territorial use rights for fishing
UQ	unit quota (Norway)
VQ	vessel quota

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Part I
Bow Waves and Boat Wakes

Chapter 1

Introduction: Fisheries, Quota Management, Quota Transfer and Bio-economic Rationalization

Gordon M. Winder

Abstract Individual transferable quotas (ITQs) were heralded in the 1980s as a market-based solution to the problem of overfishing and were adopted around the world. These neoliberal market mechanisms combined with the fisheries science of stock assessments in diverse contexts to produce a new baseline in fisheries management, albeit one set out in a diverse array of related but not identical bio-economic projects. Appropriately, quota management, quota transfer and bio-economic rationalizations have received attention from social scientists, with some finding that ITQs have produced desirable and effective results while others note the (un)intended, negative social consequences of this private rights regime. Stock assessment has been critiqued for not paying enough attention to ecosystems and for providing insufficient insight into how many fish there are. Further, ITQs are associated with a growing focus on de-centered, self-organizing responses to what are perceived as crises in natural systems. The movement away from centralized state control, towards diffuse, client-centered managerial interventions and assessments has consequences for how fishing communities and property rights are understood, how fisheries investment functions, how enforcement and conservation are carried out, how fisheries are assessed, and what the characteristics of ecosystems are thought to be. Thus economic and policy attention is being shifted to aspects of fisheries besides allocation of access privileges as property among fishing companies, and particularly to new concerns emerging from the achievements, limitations and failures of ITQ regimes. How have fishing places and fishing people been reconfigured by the unique hybrid of science, capital and managerialism that has been ushered in alongside ITQs? This chapter sets out the scope of the field of inquiry.

Keywords Area-based management • Bio-economic project • Catch share • Fish stock assessment • Individual transferable quota

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1.1 In the Wake of Bio-economic Rationalization

Fisheries, Quota Management and Quota Transfer considers the impact of fish stock assessment and catch share arrangements in context through case studies and in terms of ecosystem, economy and society. It examines the rationalizing work of bio-economic projects, especially the institutionalization of individual transferable quota (ITQ) in the fisheries: what impact have they had on fisheries and fishers?

The contributing authors understand that diverse measures come together as linked bio-economic projects, that is, as widely deployed but locally constituted projects that combine biological and economic logics to rationalize production and, in this case, fish, ecosystems, labor, community and capital. Politicians and managers use these projects and the models that justify them to rationalize fisheries in favor of modern technology and for capital, fleet and species efficiency. We see fisheries management under these bio-economic projects set against indigenous, animal and landscape knowledge of fisher, fish and sea, and against older moral economies of the fishery evident in such institutions as traditional or customary fisheries, co-operatives, or boat shares, a perspective that is in keeping with much of the social sciences literature on fisheries management.

The metaphor of a boat's wake is used in this volume to evoke the effects on ecosystem, society and economy from diverse but related rationalizing projects (Mansfield 2004a). When a boat drives across the sea it displaces water, ideally in the form of V-shaped waterfronts, inside which the water surface is turbulent. The wake enjoys a group velocity but the ideal pattern dissipates as friction and dispersion reduce the wake. The wake can be amplified through constructive interference to form shock waves. As regulators drive the "boat" of rationalization through the "sea" of ecosystem and social arrangements of fishing, they cause displacements but the precise effects depend upon the context and perspective. Small boats can be swamped and coastal erosion can be induced by the wakes of large vessels travelling at speed through sensitive passages. Dolphins may enjoy their ride on a boat wake but the noise of the boat may disturb some creatures in the ecosystem. Who is steering the boat, with what skills, chart and direction matter to the wake form and its effects, as do the maneuverability and seaworthiness of the vessel and the wind and tide conditions. Some fisheries are more difficult to steer or manage than others. When the boat tows a trawl its wake effects are compounded by the rationalizing process its net produces: prized fish can be harvested, unwanted catch discarded, some livelihoods secured, others rationalized, while habitat is uprooted and transformed.

As a bio-economic project, ITQ necessarily combines fisheries stock assessments with catch share arrangements and expert systems to form a management regime. While ITQ architects certainly mean to lay the foundations for a long-term management regime with long-term benefits conferred on owners of fisheries access privileges, they simultaneously also mean to set in place ITQ as a short-lived project that will promote some actors at the expense of others, and around which other policies, institutions and regulations will be set to work. This is doubly important. ITQ

now has a 40-year history, for example in the Netherlands, but it is no longer the same bundle of regulations with the same effects as it was when it was first established there (Pinkerton 2015: 110). Equally, the fishery is no longer the same as it was 40 years ago: it has been rationalized by ITQ projects and has adapted and transformed. By emphasizing emerging, becoming, learning and transforming through knowledge, the book conceives technology as a field of power and choice, nevertheless dominated by managers and politicians through specific projects, none of which is ever complete let alone the same as related projects pursued elsewhere.

The authors are aware of the complex lexicon that has emerged around ITQ as a result of the diverse variants of the general management regime that have been trialed as well as the intellectual contestation of the term, its putative ideal form and the ways of knowing its effects. For example, debates over what constitutes the ideal model for allocation have helped to produce a long list of acronyms that classify the terms under which fisheries access privileges are allocated by governments: individual quota (IQ), vessel quota (VQ), territorial use rights for fishing (TURFs), limited access privileges (LAPs), dedicated access privileges (DAPs) and Individual Transferable Quota (ITQ). It is conventional in resource economics to distinguish between primarily quota-based and primarily area-based programs: such distinctions are important but potentially detract attention from both the rationalizing impulse behind the diverse management systems and their effects when combined with stock assessment in particular contexts.

Rather than become embroiled in these classificatory distinctions and debates we concentrate on case studies of specific bio-economic rationalization projects in fisheries. The book investigates the origins and diverse experiences of these types of project, including resistance to them, attempts to develop resilience around them, and experiences of the impacts that come from them. It does so in specific contexts. A final chapter discusses the extent to which the separate findings together indicate whether ITQs meet five general objectives: preventing overfishing, fair allocation, promoting responsible self-management, creating well-functioning markets, openness to new entrants and adaptation. This list of objectives is understood, from the start, as a limited sub-set of possible expectations and the last chapter is envisaged as an effort to draw tentative conclusions from among the case studies and perspectives brought together in this volume.

The authors of *Fisheries, Quota Management and Quota Transfer* are inspired by diverse theoretical perspectives including resource economics. However, in framing our understanding of ITQ and stock assessment we view technology as a calculus of how to make the world, or parts of it, governable, and rationality as a system for making, in this case, fish, fisheries and ecosystems into intelligible and translatable subjects. Chapters examine how resource economists developed ITQ, how governments set it in place, and how fishing enterprises responded.

Now around 40 years old, ITQ has never been subjected to the kind of comprehensive sustainability assessments advocated by Elinor Ostrom (2005), let alone the “full-cost accounting of the impacts of ITQs” at the national level that Evelyn Pinkerton (2015: 113) insists upon. Neither approach is pursued in full here. Instead, individual chapters relate bio-economic projects to separate theoretical literature, an

approach that facilitates multi-disciplinary dialog. Some authors challenge efficiency expectations from resource economics while others draw connections to the practices of accumulation by dispossession, to recent literature in the social sciences on territorial development of the oceans and fisheries, or to literature on consumer sovereignty and the certification of seafood. Another chapter considers the fairness of rationalization under two individual quota schemes. These perspectives, debates and controversies are outlined below and returned to in the conclusion.

This chapter first defines ITQ and then situates stock assessments and ITQ within not only the marine biology and common property resource literatures respectively, but also the wider and diverse literatures of fisheries management. Several conceptual frameworks have emerged around these fisheries management practices – area-based management of fisheries, assessments of company behavior and industry performance, critical research on varieties of neoliberalism at work in the fisheries, and hopes for a Blue Revolution and co-management – each of which has implications for how we should now assess quota management and quota transfer. These are considered in turn before the subsequent book chapters are introduced.

1.2 Individual Transferable Quota

In the late 1970s, resource economists heralded ITQs as a market-based solution to the problem of overfishing. Subsequently, they have been adopted around the world, although one can hardly claim that they are a global phenomenon or that they are not surrounded by debate, conflict and contestation. These fishing permits parcel out the total allowable catch, apportioning individual responsibility for risk and uncertainty to owners. In combination with the fish stock assessments compiled by marine scientists using the concept of maximum sustained yield (MSY), ITQs secure stakeholder buy-in and responsibility, streamline fisheries management, stabilize fish populations and prices, and generate cost efficiencies for society generally. As market mechanisms, ITQs are simultaneously fisheries access privileges, (varying) quantities and qualities of fish, and commodities in their own right, since they are tradable. However, their precise status depends upon the regulations in force in the jurisdiction where the property entitlement is recognized. ITQs operate in conjunction with a fish stock assessment system that sets a cap on fish harvests. In this context, ITQs should end ‘the race for fish’: that is the trend for fishers to invest in more boats or fishing capacity in order to catch more fish, a situation understood as ‘overcapitalization’ or ‘uneconomic fishing’. However, it is sometimes claimed that ITQs help to end overfishing, though this is, properly, the expected outcome of effective fish stock assessment and its associated total allowable commercial catch (TACC), without which, ITQ cannot function.

ITQs bring with them an *apparent* de-politicization of fisheries management by legitimating practices through fisheries science and resource economics, but the management systems that result are, nonetheless, highly political and politicized. ITQs give power to particular groups, harden hierarchical structures, and legitimize

particular forms of expertise. They set a discursive framework for fisheries management in which politicians and policy makers, marine scientists and powerful fishers entrench their control over the fisheries, through the allocation of access rights to owners of capital and through an agenda of fisheries rationalization. Those with capital work to consolidate control over fish access rights, and the architects of the regime deem their efforts appropriate: they rationalize the industry. ITQs necessarily destabilize older discursive frameworks of fisheries industries – maintaining diverse regional economies, maintaining specialized fisheries communities or fishing places, or protecting indigenous or traditional fisheries. It becomes increasingly difficult for fishers without capital to access the fisheries. Consequently, the fisheries in fact become highly politicized: in particular, the bio-economic reorganization prioritized by ITQ, threatens to destroy land-based fishing communities and common property institutions. Not only have we seen the professionalization of fishers and the construction of the ‘self-managing’ stakeholder, but, in some communities, commentators find that the potential for adaptive management and experimental learning in fisheries is now at a limit.

Although many observers have noted the unintended, negative social consequences of this private rights regime the marriage of neo-liberal market mechanisms with fisheries science that underlies ITQs has not only endured, but has become naturalized as the new baseline in fisheries management. That ITQs have become “good to think with” in scientific circles is seen in the growing focus on de-centered, self-organizing responses to what are perceived as crises in natural systems. The movement away from centralized state control, towards diffuse, client-centered managerial interventions and assessments has consequences for how fishing communities and property rights are understood, how fisheries investment functions, how enforcement and conservation are carried out, how fisheries are assessed, and what the characteristics of ecosystems are thought to be.

Appropriately, ITQs have received a great deal of attention from social scientists, and so this book considers developments in fisheries policy in the wake of ITQs, that is with hindsight. There is now considerable scope for hindsight – four decades of policy work and experimentation – and also considerable diversity in experiences. This book is the product of a conference held in Munich in 2013 that brought together scholars from anthropology, economics, geography, marine environmental history, sociology, and the history of science, to discuss experiences from fisheries in eight industrialized countries. It adds to the recent study of IQ in the European Union by Schriever and Høyrup (2012) by considering cases from outside as well as inside the EU, including ITQ pioneers, New Zealand and Iceland. Similarly, it adds to the collection of essays published in *Marine Policy* (Pinkerton and Davis 2015) on ITQ and neoliberalism in North America’s small-scale fisheries. The combination allows for an unprecedented international perspective on ITQ.

In many jurisdictions economic and policy attention is being shifted to numerous aspects of fisheries besides allocation of harvest property rights among fishing companies, and particularly to new concerns emerging from the achievements, limitations and failures of ITQ and fisheries management. Other pressing issues are emerging in fisheries management, and consequently in many jurisdictions interest

is now less in examining how ITQs are performing, and more in how fishing places and fishing people have been reconfigured by the unique hybrid of science, capital and managerialism that has been ushered in alongside ITQs (for example see Høst 2015). There is an urgent need to consider a range of concerns that have emerged around the edges of the introduction of privatized fisheries property rights and quota systems: how are these changing the face of fisheries and fisheries management?

The contexts for thinking about ITQ are very different now than they were 40 years ago. The authors contributing to this book have each placed their enquiries into ITQ into what they see as these changing contexts, and, of course, these vary from jurisdiction to jurisdiction. Nevertheless, at core, they also each contend with the claims made for fish stock assessment in the marine biology literature and for ITQ in the common property resource literature. Following outlines of the literatures associated with each of these topics, this chapter briefly considers five other emerging sets of issues in fisheries management: the new priority being given to area-based management and territoriality; company behavior and industry performance; varieties of neoliberalism in fisheries; damaged ecosystems; and the potential of aquaculture.

1.3 Stock Assessments

The neoliberal policies that introduced ITQ property rights (see for example Shallard 1996) built upon the foundation of fish stock assessment laid down by a sub-discipline of biological science. Marine biologists who engaged in efforts to take stock of the biomass of fish formed one wing of the bio-economic project or alliance. The development and diffusion of stock assessment generally preceded ITQ. Jennifer Hubbard traces the origins of 'efficiency conservation' to eighteenth century Prussian forest management, the origins of fisheries statistical areas to the 1930s, the adoption of the Beverton-Holt stock equations to the late 1950s, and John Gullard's virtual population analysis to the 1960s (Hubbard 2013). In 1955 managing fisheries productivity for a maximum sustained yield (MSY) was declared to be the economic ideal of Cold War era scientists and policymakers and, thanks to US efforts, codified as such in an international treaty (Finley 2011; Hubbard 2013: 92). Significantly, administration support for the MSY concept also developed in Washington and became a cornerstone of US policy related to the Law of the Sea conventions (Hollick 1981).

By the 1970s, fish biomass accounting systems operated in support of governance of some, but by no means all, wild marine fisheries. They legitimated harvesting levels using modern equipment, simultaneously declaring them ecologically sustainable harvesting rates and economically efficient and rational resource use. For example, Canada was practicing and developing MSY as part of its post 1972 fisheries planning for Atlantic Canada (Barrett and Davis 1984). These practices predate the institutionalization of ITQ in Atlantic Canada and made ITQs possible in Canada.

In some instances, and spectacularly in the management of the harvest of cod in Canadian waters, stock assessment and quota management have proved inadequate for the task of sustainable management of fisheries (Ehrlich and Daily 1993; Finlayson 1994; Ludwig et al. 1994; Hutchings and Myers 1995; Harris 1998; Newell and Ommer 1999; Bavington 2010). Environmental historians (Finley 2011; Hubbard 2013; Schwach 2013) have been tracing the origins of fisheries science and policy, and they highlight Cold War geo-political priorities and misunderstandings produced around quantitative era biological modeling as central aspects of the subsequent problems of fisheries collapse.

Stock assessment practices did not in fact recognize the marine environments and ecosystems in which target species lived. This was partly because the statistical areas used for assessing fish stock populations were established to provide modeling consistency and homogeneity, and paid scant heed to ecosystems (Hubbard 2013). Further, in this context, fish stocks “remained ill defined: for biologists, these were self-sustaining natural populations of a species; but for managers, they were ‘fish which happen to be within a defined management unit’” (Hubbard 2013: 94). Already in the 1960s, some of the implications of this confusing ‘virtual’ world of fisheries were recognized in the waters off Newfoundland by fisheries scientist Colin Story but were ignored (Hutchings and Myers 1995; Hubbard 2013: 95). Heroic assumptions used in the modeling of fish stocks, underreporting of catch, inadequate policing of catch, the lack of independence of the scientific institutions responsible for the assessments, political interference in the setting of harvest rates, and poor recognition of and inadequate response to problems of uncertainty, are now well documented in studies of the practices of some stock assessment systems (Bavington 2010).

To these issues we must also add poor knowledge of the ecological impacts of fishing methods (Turner et al. 1999; Law 2000; Dayton et al. 2002), and increasing concern from fish toxicology studies. Since the North Sea Herring and Peruvian anchoveta collapses of 1968–69 and 1972, respectively, marine biologists began to take “fisheries geography into consideration” (Hubbard 2013: 96 citing Seijo and Caddy 2008 and an earlier study by Gales and Caddy 1975). They have been investigating new methodologies, the concepts of fish assemblages and backcasting (Newell and Ommer 1999), the incorporation of fishers’ and indigenous peoples’ knowledge (Holm et al. 2000), and research into fish life cycles and ageing. Fisheries science is developing, but perhaps fastest in the area of cultured fish.

Environmental historians are answering Arthur McEvoy’s (1990) call for a marine environmental history (Chiarappa and McKenzie 2013: 3–4). Embracing inter-disciplinarity and partly inspired by anthropologist Stefan Helmreich’s book *Alien Ocean* (2009) and developments in the history of science, they are investigating the social construction of the oceans in the marine sciences (Smith 1994, Taylor 1999, 2013; Rozwadowski 2002, 2010; Roberts 2007; Finley 2011; Hubbard 2013; Schwach 2013). As we have already seen this means an analysis of ‘spatial history’ or, more precisely, the calculative practices of marine biology, and their reconfiguration during the Cold War (Finley 2011). In addition, environmental historians are researching the histories of fish farming, the role of fishermen in debates about

economic history and many other aspects of the ways that fisheries and the oceans intersect with social, economic and political history (Dobbs 2000; McKenzie 2010; McClenachan 2013; Payne 2013). So while the emergence of the calculative practices of modern marine biology are a main focus of inquiry, the positions of fishing communities in the history of fisheries are also clearly in sight.

In a parallel project, the History of Marine Animal Populations (HMAP), has, since 1999, been researching an historical reference point to the Census of Marine Life. Chief among the accomplishments of this group is the finding that a ‘shifting baseline syndrome’ has been at work in marine biology as “the current status of an ecosystem, species or fish stock, is assumed to be normal by contemporary observers unaware of its previous states” (Holm et al. 2013: 123). The work challenges the use of short-term data in steady-state modeling of marine ecosystems (Pauly 1995, 1996). The group points to an historical turn within marine biology (Holm et al. 2001; Jackson et al. 2001, 2011; Pinnegar and Engelhardt 2008; Holm et al. 2010). Marine historians, archaeologists and marine scientists have also been in dialogue for some time (Holm et al. 2013).

1.4 ITQ, Common Property Resources and Beyond

The case for government intervention to close open access in (apparently) unregulated fisheries by privatizing rights to fish is usually traced to the tragedy of the commons scenario (Hardin 1968). The case for using privatization to end the race for fish and overfishing was made by Scott Gordon (1954), A.D. Scott (1955) and Christy and Scott (1965). These foundational works played roles in economic thinking related to fisheries management during the years of Cold War and Keynesian policies, but were later invoked to legitimize ITQ. A.D. Scott (1986a, b, 1989, 1993) published a series of papers making the case for individual ownership in the fishery to prevent overfishing. In this volume, Jennifer Hubbard explores the ideas and roles of Canada’s Keynesian economists in promoting bio-economic models and modernization (see also Mansfield 2004a).

In response to their work, Daniel Bromley (1991, 1992, 2006, 2008, 2011) outlined what he calls the ‘conceptual confusion’ in the fisheries resource economics literature. He argues that the justifications for ITQs show no clear understanding of resource rent. He concludes that privatization is not an answer to overfishing. In contrast, Alex Clapp (1998, 1999) argues that when an economic logic of efficiency is pursued then overexploitation of wild populations, their destruction and their subsequent replacement by farming systems is inevitable (see also Millar and Winder 1999). The implication of his ‘resource cycle’ concept is that ITQs can only delay the inevitable. Resource economics is a broad field in which the merits of privatization of common property resources have long been debated. The central contribution of the sub-discipline to fisheries management has been to frame “sustainability” in terms of an economic calculus of efficient use of resources (sustainable yield management with economic efficiency) combined with plans to make some fishers

responsible for the fisheries through direct ownership. Ultimately, fishing is treated as a second class of economic activity to aquaculture.

While the origins of ITQ lie in resource economics, the introduction of ITQ in the late 1980s and 1990s stems from a new conjuncture of policies that were neoliberal. ITQ became an instrument of fisheries management policy only when neoliberal economic policies took charge in some industrialized economies in the 1980s. Privatization of state assets, such as fisheries, gelled neatly with neoliberal agendas. As the cornerstones of Keynesian fisheries policies – planning for regional growth, belief in modernization and mass production for mass markets, and US Cold War policy for the high seas – eroded and tumbled, so interest in reregulating and restructuring fisheries increased. The transition to neoliberal policy frameworks for fisheries was not a smooth and synchronized development even among the industrialized countries most frequently associated with ITQ. Iceland and New Zealand were among the first to embrace the change. There are different situations in each of the Scandinavian countries. Canada has been dealing with the aftermath of its ambitious fisheries initiatives on the Atlantic coast, while on the Pacific coast the government contends with complex ecosystem interactions and legitimacy issues raised by First Nations claims and practices. In contrast, the USA (Mansfield 2004a, b, 2007b) and the EU have been much slower to embark on privatization and restructuring along ITQ lines.

In a fine collection of essays (Schriewer and Høystrup 2012) European social scientists recently reviewed the Common Fisheries Policy (CFP), the European fisheries, and the situations in a wide range of fishing communities based in European countries and active in Mediterranean, North Sea and Atlantic waters. Following years of discussion, the European Commission's new policy was launched in 2011. It diagnosed overfishing and excess fleet capacity as significant problems, and so committed the EU to reduce the number of vessels, and to promote stakeholder companies committed to an efficient and sustainable utilization of the fisheries through introduction of transferable fishing concessions (basically, ITQ). Schriewer and Høystrup (2012: 24) interpret the policy as an effort to alienate existing rights from small fishers and existing fishing harbors and communities, and to “concentrate fishing rights in the hands of a few large mass-producing vessels and plants”. They argue that this focus, along with what they regard as an unenforceable and impractical split of rights between two vessel classes (under and over 12 meters) discriminates against “low-impact, eco-friendly, small-scale fisheries” (Schriewer and Høystrup 2012: 24). The volume signals that fears of new rounds of enclosure now grip Europe's fishing communities.

Fears of enclosure are, however, by no means a new theme in the fisheries literature. Anthropologists and sociologists responded to the tragedy of the commons scenario with a torrent of critical papers. They saw that this scenario legitimized the extinction of existing fisheries rights and management practices under first regional industrial policy and then neoliberal agendas (McCay and Acheson 1987; Feeney et al. 1990; Bromley 1992, 2011; Berkes 1989; Berkes et al. 1991; Brox 1990; McCay 1995; McCay et al. 1995; McCay and Jentoft 1998; Cullet 2001). They demonstrated that both open access resources and the common pool, resource

management practices that Hardin's scenario assumed were in fact rare or did not exist at all. They pinpointed the alienation of fisheries rights and protests from the disenfranchised, and researched alternative means of governing common property resources. They also identified the problems of overexploitation actually brought about by the state led modernization schemes that came with privatization of fisheries resources (for example Brox 1990).

Within economics, Elinor Ostrom (1990, 2005, 2009) clarified many of the dubious claims and misunderstandings that followed from Garret Hardin's argumentation and significantly developed common property theory within resource economics (van Laerhoven and Ostrom 2007; van Laerhoven and Berge 2011). She paid particular attention to the institutions governing the commons (Ostrom 1990, 2005) and to the sustainability of social-ecological systems in efforts to manage resource use under common property (Ostrom 2009). Her work eventually bridged between anthropology, sociology, resource economics and sustainability studies. By the early 2000's it was widely recognized that co-management in fisheries was desirable, and attention moved to issues in the governance of common property (Grafton 1998; Grafton et al. 2000; Hughey et al. 2000; St. Martin 2001).

Once touted as a possible remedy for reliance on fisheries scientists and economists, that is the bio-economic experts, real co-management – that is a sharing of power, knowledge and resources – is rare. Fisheries management tends to remain dominated by the experts of stock assessment and resource economics. Many indigenous peoples, “traditional” fishers and small-scale fishers view co-management as an invitation to participate in someone else's resource management regime, but not as partners. One anthropologist has therefore asked whether indigenous knowledge can survive in the face of the universalizing practice of fisheries co-management (Wiber 2000). In New Zealand, efforts are underway to infuse the fisheries management regime with indigenous Māori knowledge, Māori fisheries officers, and Māori fishing enterprises (Harmsworth and Awatere 2013). But, even there, it has long been understood that indigenous knowledge and co-management are late add-ons to the neoliberal fisheries management regime, and that Māori must continue to struggle for a fisheries management that actually recognizes their knowledge, goals and aspirations (De Alessi 2012). Similar or worse situations confront indigenous peoples in the USA and Canada seeking roles in fisheries management, whether through co-management or other appeals (see the chapter by Steve Langdon, this volume). Small-scale fishers have also organized at local and global levels to resist bio-economic rationalizations.

In the light of these struggles and the ongoing hegemonic power of bio-economic rationalization projects, the anthropologist Evelyn Pinkerton (2015: 120) has recently redefined “the ITQ problem”:

The overarching problem is that ITQs constitute the privatization of a public good that profoundly alters the social contract between fishing communities and the state, a contract that has been in place for centuries in many European countries. The subsequent societal transformation is very costly to the state and its citizens in the long term and remains largely unexamined in the literature.

Table 1.1 Evelyn Pinkerton's list of problems with ITQs

1.	Inequity of initial allocation raises the cost of entry for future generations.
2.	Concentration of quota ownership or control creates market power.
3.	Crew share is greatly reduced.
4.	Leasing arrangements, where allowed, create inequity.
5.	Inequity of free transferability of quota out of communities, out of regions, even out of countries.
6.	Quotas are overcapitalized instead of boats.
7.	Safety is not always improved.
8.	Small boats are forced out.
9.	Monitoring costs rise under ITQs.
10.	ITQs are not compatible with the precautionary approach and not easily adjusted in response to problems.
11.	ITQs alone are not effective and need to be accompanied by input controls and adequate enforcement.

Source: Pinkerton (2015: 114–118)

She identifies increased unemployment, health and welfare costs and reduced citizen well-being as costs of the transformation, and explains the failure to assess these costs as the result of too narrow a framework. The “issue has been treated as a fisheries management problem or a gross domestic product issue involving only part of fish production, not a problem of how entire communities have been removed from their traditional livelihoods...” (Pinkerton, 2015: 114). After all, neoliberal-inspired governments have little interest in regional economics or regional development initiatives. In this context, Evelyn Pinkerton elaborates a list of problems with ITQs (Table 1.1) that add specific dimensions to the assessment of their total cost. She offers a very challenging critique of ITQs: it is a neoliberal policy pursued for ideological reasons and with no attention to social, environmental or regional economic costs.

Thus, the common property resources literature, which legitimizes ITQ, is subject to a wide-ranging critical response from social scientists. This makes the scientific terrain of fisheries management a highly contested, multi-disciplinary field of study, with claims and counter claims challenged at every turn, and with no agreed upon framework for inquiry. In this situation, considerable hope has been expressed in some quarters for a move towards area-based management in the oceans. However, area-based management has also proved controversial.

1.5 Area-Based Management

Generally, ITQs are part of a governance framework backed by economic and biological modeling, and the bio-economic models rely upon spaces and territories for fish stocks each with clearly defined stakeholders. Nevertheless, the territories themselves tend to be large and only tentatively linked to actual rights and