Adaptive Governance

The Dynamics of Atlantic Fisheries Management

D. G. Webster

The MIT Press
Cambridge, Massachusetts
London, England

This book was set in Sabon on 3B2 by Asco Typesetters, Hong Kong.
Printed on recycled paper and bound in the United States of America.

Library of Congress Cataloging-in-Publication Data

Webster, D. G., 1975–
Adaptive governance : the dynamics of Atlantic fisheries management / D. G. Webster.
p. cm. — (Global environmental accord)
Includes bibliographical references.
ISBN 978-0-262-23270-8 (hardcover : alk. paper) — ISBN 978-0-262-73192-8 (pbk. : alk. paper) 1. Fishery management. 2. Fishery policy.
3. Intergovernmental cooperation. I. Title.
SH328.W43 2008
338.3′727—dc22 2008017103

10 9 8 7 6 5 4 3 2 1

1

Adaptive Governance

Progress is an ambiguous phenomenon. It has driven humanity's prosperity, yet it also comes with unintended effects, such as resource depletion, ecosystem disruptions, and climate change. Coping with these problems is a struggle in itself, one that depends on the coordinated actions of many individuals. Furthermore, while there are those who voluntarily eschew the comforts of consumerism, there are considerable numbers of people who are vested in the current economic system. For these individuals—whether they are producers, consumers, and/or decision makers—dealing with the side effects of progress is costly. Because so few are willing to sacrifice their way of life, early warnings of potentially catastrophic events can go unheeded for decades as "progress" rolls on (Rosenau 1993, 258).

For instance, in fisheries, progress has meant bigger, faster boats, more efficient capture techniques, and a wider availability of fish for human consumption—as well as profits, jobs, and other economic benefits. At the same time, the rapid expansion of fishing effort in the past century has caused major concern regarding the long-term viability of living marine resources, whether or not they are commercially valuable. To their detriment, fishers and governments alike have been unable to curtail excess fishing effort in many areas in spite of strong scientific and economic evidence of overexploitation. Recent collapses of important fisheries like Pacific anchoveta and the North Atlantic groundfishes, which include cod, haddock, plaice, and halibut, have shown how acute such failures can be. On the other hand, as Hilborn, Orensanz, and Parma (2005) point out, some other important fisheries, like north Pacific halibut, have been well managed.

What is even more interesting is that almost every documented example of sustainable fisheries management has occurred, not by design

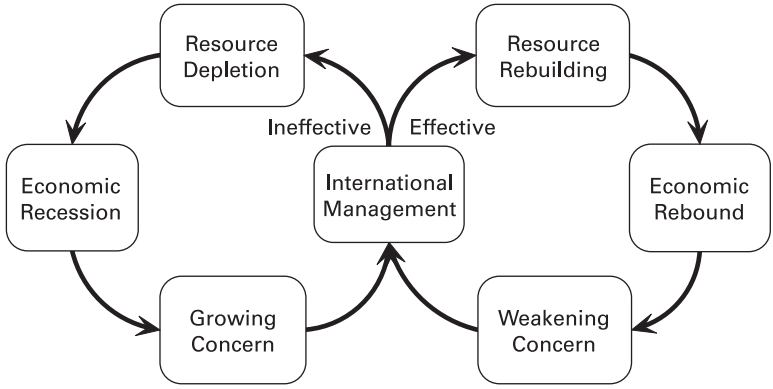

Figure 1.1
Pivotal cycle in common-pool resource management.

alone, but through an adaptive process. That is, the most effective measures are not born whole in the heads of managers, but are usually the result of trial and error. Certainly, design is involved, as the huge body of literature on fisheries management shows. However, observation suggests that fishers and managers learn by first trying and failing with measures that are less costly but also less effective before they become willing to accept the sacrifices required for successful regulation. The same can be said of the international institutions that govern shared and high-seas fisheries. The rules and norms of decision making may seem frustratingly static for long periods, but change does occur as fishing countries are forced to cope with the troubles that arise under open access.

Figure 1.1 shows how the ideal-type or pure form of adaptive fisheries governance might work in the international arena. On the left-hand side of the figure, the usual downward spiral associated with open access has been expanded to include political responses to the costs of resource depletion. This is the preliminary metastable state. Management is ineffective, but—at least at the international level—the system seems static. However, underneath this element, pressure is building from the "bottom up." As the resource gets smaller and smaller, fishers face growing competition, and policy makers are more and more dissatisfied with the status quo. If periodic release of this pressure occurs through partial management interventions, then the system might persist for a long time. It might even shift gradually into the effective management cycle pictured on the right-hand side of the figure. However, rapid change is

also possible, including the sudden collapse of the regime or the stock(s) in its jurisdiction.

In fact, the simplicity of figure 1.1 is quite deceptive. There are many different microlevel interactions and context-specific elements that control the strength and flow of this macrolevel system (Schelling 1978; Putnam 1988). Actors may be affected or respond at different rates, creating different levels of aggregate concern. Options often depend on available technologies and institutional precedents, so the potential for change is limited at any given point in time. Complex dynamics and stochastic elements can also distort the causal links that are depicted so clearly in the figure, creating a pattern of "one step forward, two steps back, then maybe a couple of steps sideways." In fact, the only certainty is that the system will always be in flux, and that for every action there will be a reaction—sometimes equal, sometimes amplified by feedbacks, and sometimes nullified by exogenous forces.

All of this makes it quite difficult to understand adaptive governance. The *vulnerability response* framework developed in this book is a meso-level perspective that falls between the thin approaches of economic and game theory-based work and a thick approach, which relies heavily on detailed case descriptions (Young 2002). It will guide the development of predictions regarding the evolution of countries' policy positions that can then be tested using cases from the International Commission for the Conservation of Atlantic Tunas (ICCAT, pronounced ī-kat), which manages highly migratory fish species in the Atlantic. This analysis is an important first step toward understanding adaptive governance in international fisheries. Collective decisions on management are not predicted, but are reported in the cases so that emergent patterns of collective outcomes can be identified in the final chapter.

After a brief background on the politics and economics of highly migratory species (HMS) in section 1.1, the rest of this chapter outlines some important innovations in the international management of these valuable and beleaguered fish. As described in sections 1.2 and 1.3, the most important of these innovations was developed by ICCAT. Several of the stocks that are managed by the Commission have been severely depleted, but ICCAT has also developed new management tools that include specific allocation of access rights and international monitoring and enforcement mechanisms. Furthermore, there has been some intriguing variation in the application of these measures that needs to be explained. Finally, section 1.4 elaborates on the need for a combined

perspective in order to explore both the static and dynamic aspects of adaptive management in the HMS context.

1.1 The HMS Context

Highly migratory species are some of the Earth's most important renewable resources and present some of the most complicated practical issues for sustainable use. As top end predators, they play a key role in the marine ecosystem, ensuring that populations of smaller fish do not exceed the carrying capacity of the oceans (Berkes et al. 2006). In addition, the commercial value of these species is quite large and is distributed across many fleets. More than 150 countries and "fishing entities" harbor fleets targeting HMS stocks, supplying the world with almost half a million tons of fish per year (FAO 2007b).[1] Furthermore, half of all HMS harvests are traded internationally at an export value of over US $5 billion, surpassed among fish products only by shrimp and groundfish (FAO 2006).

These aggregate statistics conceal some variations among the species. Adult tunas, especially bluefin and bigeye, are prized by sushi and sashimi connoisseurs and can bring very high prices for quality fish. Juvenile and small tunas are packaged and sold in large quantities at low prices. Swordfish, which is also commercially targeted, is consumed mainly in high-end restaurants in the United States and Europe. There are some less prolific highly migratory species that command low prices, including several stocks of billfish. Some, like white marlin, are only caught incidentally; these stocks are *by-catch*, rather than targeted species, in commercial fishing operations (Majkowski 2005; FAO 2007c).

As might be expected, growing demand for highly migratory species has precipitated considerable expansion of the fishing industry targeting these stocks. This in turn has resulted in the depletion of many of these fisheries. Of the twenty-four major market tunas, thirteen are estimated to be overexploited, six are fully exploited, and only four are moderately exploited (De Leiva Moreno and Majkowski 2005). Of the six stocks of swordfish in the major oceans, at least two are thought to be moderately overexploited and the rest are at full exploitation. Several by-catch stocks, including white marlin and Atlantic blue marlin, are also heavily depleted (IATTC 2006; ICCAT 2007a; IOTC 2005).

It is generally believed that the overexploitation of targeted stocks is due to the common pool nature of high seas fishing, which is open to

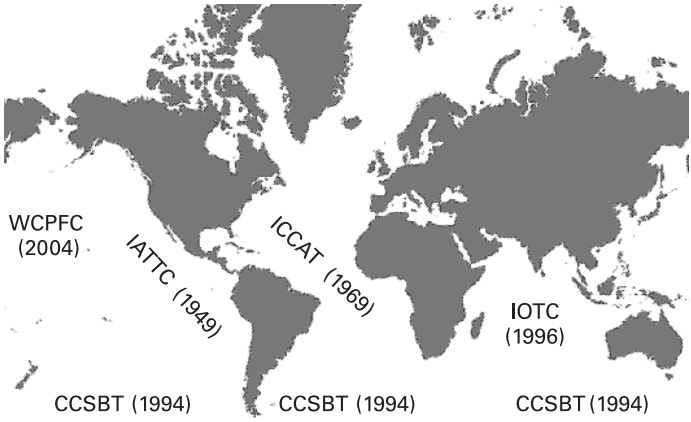

Figure 1.2
Map of regional fisheries organizations with jurisdiction over HMS. IATTC, Inter-American Tropical Tuna Commission, began activities in 1949; ICCAT, International Commission for the Conservation of Atlantic Tunas, began activities in 1969; CCSBT, Commission for the Conservation of Southern Bluefin Tuna, began activities in 1994; IOTC, Indian Ocean Tuna Commission, took over activities from the Indo-Pacific Tuna Development and Management Program (IPTP, 1982) in 1996; WCPFC, Western and Central Pacific Fisheries Commission, began activities in 2004.

fleets from around the world. The scale of these fisheries precludes collective action by individuals and no single country has jurisdiction over highly migratory species, so international cooperation is required if these stocks are to be maintained at either biologically or economically optimal levels. Recognizing this, fishing countries have signed agreements establishing several multilateral commissions, or regional fisheries management organizations (RFMOs), which meet annually to negotiate international management measures (see figure 1.2 for a map of tuna-related RFMOs).[2] The ultimate goals of these commissions vary somewhat, but the target of most is to maintain highly migratory stocks at some benchmark level of harvest, usually maximum sustainable yield (MSY; Sydnes 2001).

As the numbers on overexploitation show, these commissions have not been completely successful at meeting their goals. There has been little public outcry regarding these failures, largely because tunas and tunalike species are not charismatic, at least not on the level of dolphins, turtles, and whales. Movements by noncommercial interest groups have had

minimal impacts on international management because they just don't have the capacity to influence the policy process on a large enough scale (DeSombre 1999; Webster 2006). Alternatively, the range of HMS fisheries undermines the power of coastal states, which has proved pivotal to the sometimes successful management of straddling and transboundary stocks (Hannesson 1997; Peterson 1995; Stokke, Anderson, and Mirovitskaya 1999).

Because of these impediments, much of the literature on these organizations is quite pessimistic regarding the RFMOs' ability to manage highly migratory species.[3] For many years it did indeed seem that these international bodies were powerless to prevent the overexploitation of many of the world's most important HMS stocks. However, in the mid-1990s, the International Commission for the Conservation of Atlantic Tunas began adopting strong management measures that both conformed to scientific advice and that were monitored and enforced at the international level. Although these measures were not uniformly applied, nor were they successful in all instances, they have been partially linked to the rebuilding of some stocks (ICCAT 1995–2007b: 2005, 58, 125). Thus, an explanation is required for the overarching issue—the negotiation of management innovations in spite of multiple barriers to cooperation—as well as for the underlying irregularities in the timing, application, and effectiveness of those measures.

1.2 Depletion and Rebuilding of Atlantic Highly Migratory Species

Among the five HMS regional fisheries bodies, the stocks managed by the International Commission for the Conservation of Atlantic Tunas are the most depleted. Historically some of the most heavily fished stocks on the planet, Atlantic tunas and tuna-like species were still plentiful when the commission first met in 1969. This continued throughout the 1970s, and members of ICCAT's Standing Committee on Research and Statistics (SCRS) made few management recommendations.[4] However, in the 1980s, larger fleets, more advanced fishing technologies, and high demand for fish products led to steep reductions in the abundance of several stocks. Tracing these changes in their research, the SCRS began suggesting that the commission should either freeze or reduce fishing pressure on about half the stocks in their jurisdiction. In spite of these warnings, six of the twelve major Atlantic HMS stocks were assessed as

overfished by the mid-1990s (ICCAT 1971–1994: 1994, 204; 1995–2007b: 1995, 170; 1996, 46, 53; 1997, 34; 1998, 29).

Table 1.1 lists the current status and utilization of those stocks as estimated by the SCRS in their most recent assessments. All of these scientific evaluations are based on the concept of maximum sustainable yield. This is the idea that a particular stock, or group of fish that is both biologically and geographically capable of reproduction can be fished at some constant average rate that maximizes current catches without reducing the potential for future harvests. The level of MSY depends on several factors, but two of the most important are the size of the stock, or its biomass, and its overall growth rate. There are two major components that can be evaluated by using this method. One is the level of fishing effort (F_{MSY}), which is associated with *overfishing*, or the process of taking out more than the MSY level of harvest. The other is the size of the stock (B_{MSY}), which can be *underfished* if it is too large to allow significant population growth or *overfished* if it is too small to support harvests at or above MSY (Clark 1990).

As a management benchmark, MSY has many drawbacks. For instance, it is based on the premise that the sole purpose of management is commercial exploitation. Also, by focusing on a single stock it simplifies a highly complex system and thereby ignores potential ecosystem effects of fishing. A pertinent example is the territorial expansion of the large and very predatory Humbolt squid (*Dosidicus gigas*) in recent years (Zeidberg and Robison 2007). If this top predator is biologically successful, the tunas that remain may have a harder time finding food, reducing their overall growth rate. This would reduce the sustainable yield for these stocks but the change would not be captured in most MSY-based assessments for several years.[5] Finally, the use of this benchmark emphasizes direct effort or catch limits rather than more holistic approaches such as place-based management (Crowder et al. 2006).

In spite of these disadvantages, MSY dominates the dialogue in regional fisheries management organizations. The simplicity of the approach has a certain appeal for scientists, particularly in an area where first-hand data on abundance are difficult to collect. Decision makers have also embraced MSY, largely because of its focus on maximizing resource use over time. Management at MSY is the stated goal of ICCAT and several similar RFMOs. Other organizations use the term "optimal sustainable yield" in their agreements, but MSY remains the de facto

Table 1.1
Biomass Status and Utilization for Major Atlantic HMS Stocks

Atlantic stocks	Status relative to B_{MSY}	Utilization relative to F_{MSY}
Bigeye tuna	Rebuilt	Stable, previously overfishing
Eastern skipjack tuna	Not estimated, probably full/underfished	Not estimated, probably full
Western skipjack tuna	Not estimated, probably full/underfished	Not estimated, probably full
Yellowfin tuna	Full/slightly overfished	Full, increase in effort unsustainable
Eastern bluefin tuna[a]	Severely overfished	Overfishing still occurring
Western bluefin tuna[b]	Severely overfished	Overfishing still occurring
Northern albacore	Rebuilding, moderately overfished	Overfishing still occurring
Southern albacore	Underfished	Underfishing, increase effort sustainably
Northern swordfish	Rebuilt	Underfishing, previously overfishing
Southern swordfish	Underfished	Probably underfishing, can increase effort
Blue marlin	Severely overfished	Probably overfishing still occurring
White marlin	Severely overfished	Overfishing still occurring

B_{MSY} = biomass that supports maximum sustainable yield; Underfished = biomass > B_{MSY}; Full exploitation = biomass ≈ B_{MSY}; Moderately overfished = biomass ≥ 50% B_{MSY}; Severely overfished = biomass ≤ 50% B_{MSY}.
F_{MSY} = level of fishing mortality (F) that will keep harvests at maximum sustainable yield; Underfishing = fishing mortality < F_{MSY}; Stable = fishing morality is at F_{MSY}; Overfishing = fishing mortality > F_{MSY}.
[a] Spawning stock biomass; summary statistics relative to biomass 1970–74; includes Mediterranian.
[b] (SSB), recruitment MSY.
Source: Most recent estimate of B/B_{MSY} and F/F_{MSY} as recorded in ICCAT (2007a).

measure of stock abundance. Furthermore, it is the basis for the only available estimates of the size of fish stocks and the level of fishing effort for Atlantic highly migratory species, so it will be used throughout this text. In fact, one could say that MSY is in itself an institution, which may or may not evolve over time.

Turning back to the table, one can see that seven of the twelve major stocks that are managed by ICCAT have been classified as overfished at some time in the past two decades. Of these, four are severely overexploited, including both eastern and western bluefin tunas as well as blue marlin and white marlin. Overfishing is still occurring for these stocks, so they are likely to continue to decline unless some factor changes in the near future. One other stock, northern albacore, is moderately overexploited. This is actually an improvement since it was thought to be severely overexploited as recently as 1997. Because overfishing has not stopped, the Atlantic stock of northern albacore is not likely to return to MSY levels of productivity and may even decline again.

On a more positive note, two of the stocks listed in the table have been rebuilt to MSY levels. Bigeye tuna and northern swordfish, both of which were found to be moderately overexploited in the late 1990s, are now estimated to be close to full exploitation. Moreover, fishing mortality—once well above the level that supports MSY—is now thought to be at sustainable levels. This reversal of fortunes is both exciting and intriguing, but it should be viewed with caution. Because of the complex nature of ocean ecosystems, it is virtually impossible to directly link ICCAT management to the rebuilding of particular stocks.[6] Even with lower fishing effort, stocks may not rebound because of poor environmental conditions, such as unfavorable temperatures or lack of prey species. Alternatively, a really good combination of events, such as perfect spawning conditions and abundant food supplies, could result in stock increases irrespective of changes in fishing pressure. These possibilities confound our ability to determine the causal role of ICCAT management in the observed changes in the size of bigeye and swordfish stocks.

Nonetheless, it is still possible to describe the management of these stocks as a qualified success, not because of the rebuilding per se, but because of the steps that the commission took to ensure that fishing effort was reduced to the levels recommended by its scientific committee. For many years, scientific advice was ignored or downplayed by members of the commission, and the measures that they adopted failed to match up

with SCRS recommendations. This all changed prior to the rebuilding of these stocks. The commission set total allowable catch (TAC) levels in accordance with scientific advice and distributed the TAC among member and nonmember fishing countries, making enforcement easier. This also facilitated the adoption of the international enforcement mechanisms mentioned earlier. Because of these new measures, they were able to reduce legal fishing in the Atlantic and curtail illegal fishing as well. While it would be better if we could be certain of the impact of these measures on the stocks, their adoption was still quite an achievement in international cooperation.

1.3 Management Innovations at ICCAT

In fact, the measures adopted for bigeye and northern swordfish were part of a larger trend toward increased management for most of the Atlantic HMS stocks. As shown in figure 1.3, only a few regulations were adopted by the commission throughout the 1970s and 1980s. These included size limits on yellowfin, bigeye, and bluefin tunas and catch limits on western bluefin tuna. In contrast, from 1990 to 2003, ICCAT introduced catch limits for stocks of yellowfin, bluefin, albacore, and bigeye tunas, as well as swordfish and blue and white marlins. Time-

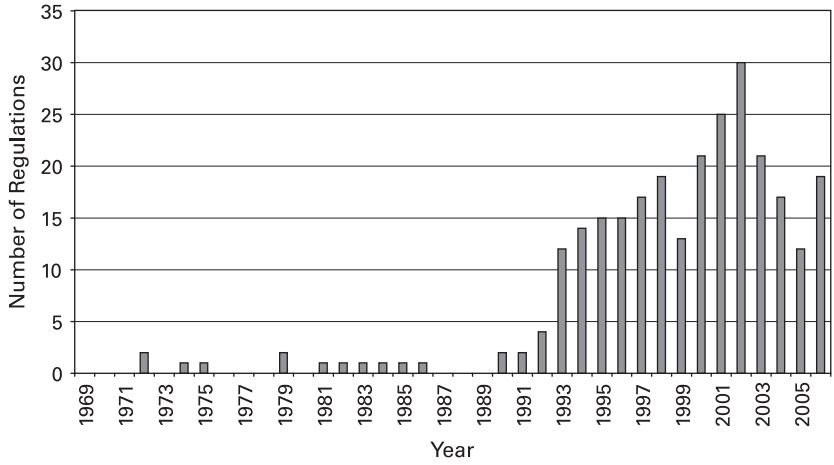

Figure 1.3
Number of ICCAT management measures adopted per year. Source: ICCAT 2007a.

area closures and capacity limits were also adopted for several of these stocks.[7] During this same period, it pioneered the use of international monitoring and enforcement mechanisms, such as statistical documents that enable tracking individual fish through various points of trade, and the multilateral implementation of sanctions on countries whose fleets were found to be fishing in contravention of ICCAT rules (ICCAT 2007a).

The management innovations of the 1990s reflect important changes in the regulation of Atlantic highly migratory species, and some less obvious alterations in the rules and norms by which the commission operates. Many of the measures that were adopted in this period would have been completely unacceptable to most ICCAT members in the 1970s. At that time, catch limits were not tenable because of disagreements between historical fishing countries like Japan, Spain, France, and the United States and developing countries like Brazil, Morocco, the Ivory Coast, and Senegal. The heart of this conflict was a disagreement over the distribution of access rights. Developing countries refused to accept limits that would inhibit the expansion of their fleets, while their counterparts insisted that historically dominant fleets should not have to reduce their own harvests to make room for new entrants when the stocks were already in trouble.

Tension between these interests still exists at ICCAT and in many other regional fisheries organizations, but sufficient rapprochement has taken place to permit agreement on both total allowable catch limits and national quota distributions. Moreover, the implicit acceptance of developing countries' rights that began in the 1980s was codified by the commission in 2001 with the adoption of the ICCAT Criteria for the Allocation of Fishing Possibilities. Officially recognizing the rights of developing coastal states, the criteria also give credence to the claims of historical fishing countries without establishing any set weighting system for the various elements on the list (ICCAT 2007a, oth. 01-25).[8] As of yet, neither norm has completely won out, and quotas continue to be determined by negotiation.

Although some vestiges of norm entrepreneurship, or the manipulation of norms for national gains, are evident in the divided state of affairs at ICCAT, the vague nature of the allocation criteria stems from much deeper international institutions.[9] Of particular importance is the norm of sovereignty, not just in legal or operational terms as per Litfin (1998a), but also in regard to acquisition. There is an accepted though

unpublicized right of national governments to do whatever they can (diplomatically) to maximize their citizens' access to shared resources.[10] It was for the protection of this institution that safeguards such as the objection procedure—which allows members to opt out of particular management measures—were written into the original ICCAT convention. Similarly, the norm of decision by consensus, rather than de jure majority voting, has predominated over most of the commission's history. Until recently, reliance on domestic monitoring and enforcement mechanisms also ensured that countries could implement ICCAT recommendations based on their own national standards.

These sovereignty-protecting institutions undermine the impact of recent innovations. Decision by consensus gives individual countries inordinate power to block agreement on regulations that are detrimental to their domestic interests, including any trade measures used to ensure compliance by contracting parties.[11] Because of this system, ICCAT has mainly been successful at excluding nonmembers rather than directly enforcing cooperation internally. Considering that membership at ICCAT is still open to any country with an interest in fishing in the Atlantic, those wishing to avoid sanctions often apply for commission membership (ICCAT 1966, art. XIV, par. 1).[12] Other weaknesses in ICCAT institutions, like the objection procedure, are also persistent, but signs of change are evident, such as recent calls for majority voting on some proposals and criticisms of countries that have chosen to object to important management measures.

While such pressures build, the current decision-making procedures at ICCAT forestall the application of punitive measures to contracting parties. However, the adoption of stronger, multilateral monitoring and enforcement mechanisms has improved compliance somewhat. Also, contracting parties have agreed to serious cuts in their own harvests of some HMS stocks, which can be monitored via the newly developed trade-based systems. This makes noncompliance more risky than in the past, even if the worst punishment is international censure.

All in all, the recent actions taken by ICCAT suggest that as a collective body, fishing countries are giving up more now to obtain cooperative management than they were willing to give up in the past. Moreover, this willingness to pay is not limited to side payments, which are an accepted international institution, but also include measures that curtail access to international markets.[13] As DeSombre (2006) points out, this shift from physical to economic enforcement is a major step

toward overcoming the daunting scale of monitoring and enforcing international agreements. While much has remained the same at the commission, these innovations are important changes that need to be more fully understood.

1.4 A Combined Perspective: Vulnerability Response

Several potential sources of change in international fisheries management have been identified in the literature. Broader trends in international politics are one causal factor, particularly the empowerment of developing countries in multilateral fora (Barrett 2001; Powell and DiMaggio 1991; Wendt 1999).[14] Alternatively, Haas and Haas (1995) have posited the importance of epistemic communities in such transitions, and it is possible that stronger management could have resulted from the consolidation and dissemination of knowledge regarding the state of HMS stocks in the Atlantic. Similarly, grassroots movements and international nongovernmental organizations have worked to protect some ICCAT species, although they have been less successful in this area than in others (Webster 2006).[15] Finally, game-theoretic economic models such as those summarized by Munro, Van Houtte, and Willmann (2004) suggest that exogenous shifts in economic incentives have altered management. This too has been observed, yet alone, none of these perspectives systematically explains adaptive governance at ICCAT.

What is needed is an approach that captures the underlying dynamics of fisheries economics but remains malleable in the face of institutional, scientific, and political variations. Furthermore, in order to understand recent adaptations in the governance of international fisheries, one must account for the ways in which countries actually respond to biological depletion and resultant domestic economic losses. It is well known that the complex nature of these fisheries obscures causal pathways, which leads to polarization and politicization of scientific advice (Ludwig, Hilborn, and Walters 1993). At the same time, management tends to be costly, both economically and politically. With the benefits so uncertain, few decision makers are willing to expend political capital or stretch bureaucratic budgets unless there is considerable pressure to do so (Hersoug 1996, 19).[16]

From a theoretical perspective, such behaviors resemble satisficing strategies, which are identified in the organizations literature, rather than the rationality assumptions of economics.[17] That is, countries are

responding to costs as they manifest, rather than anticipating and avoiding those costs through optimal management. While this approach is less amenable to mathematical modeling, it is possible to develop midrange frameworks that direct predictions of satisficing behavior that are theoretically powerful and rigorous without abandoning important details that create temporal and cross-sectional variation in specific cases. This type of analysis also permits the incorporation of both political and economic decision parameters within the international context, much as advocated by Putnam (1988) in his discussion of two-level games.

In fact, switching to satisficing as the central decision mechanism adds several layers of complexity to the task of theorizing about adaptive governance in an international fisheries context. One must seek out patterns of change and interactions that occur at different levels of analysis, including the economics of the fishing industry, the politics of domestic agenda setting, and the relations of international negotiations. Each of these is further complicated by fluxes in biological and oceanographic systems. Nor can stochastic or exogenous elements be completely ignored. The vulnerability response framework presented in chapter 2 is designed to incorporate all of these elements in a coherent approach to an analysis of changes in countries' policy positions in the context of international fisheries management. This task is not as onerous as it sounds, largely because the framework draws on theoretical precepts from each of the perspectives discussed here, rather than attempting to repeat earlier work.

Once the framework is presented, it is tested in chapters 3 to 10, using case studies from ICCAT. Each case covers a specific stock that is managed by the commission and all represent important variations in bioeconomic parameters, such as price, geographic range, and biological productivity. Drawn from a single RFMO, institutional elements are fairly constant among the cases, at least in cross-section. While it would certainly be useful to expand the scope of the study to include stocks managed by other RFMOs, the intensive nature of analysis precluded such an endeavor at this time. However, as discussed in section 2.4, many of the most important metainstitutions in international fisheries management are shared among the RFMOs, so the results should be somewhat generalizable in that context.

The cases are divided into three parts to facilitate comparison among some of the most closely linked stocks. Each subset of cases is preceded by a short explanation of the links between the stocks covered and the

bioeconomics of the fisheries targeting those stocks. First, part I covers tropical tunas, which may be targeted separately as adults but are usually caught together in the juvenile phase of their life cycle. The three chapters in this part deal with bigeye, yellowfin, and skipjack tunas, in that order. Next, part II contains the two cases of northern and southern swordfish in chapters 6 and 7, along with the case of blue marlin and white marlin in chapter 8. It is interesting that swordfish are frequently a by-catch for fleets targeting bigeye tuna, whereas marlins are a by-catch for fleets targeting either swordfish or bigeye tuna. Finally, part III includes the two stocks of Atlantic bluefin tuna, which are some of the most expensive and beleaguered fish in the sea.

Note that both the framework and the cases focus on national policy positions rather than adaptive governance as a complete theory of international fisheries management. The aggregation process—the way in which different national policy positions come together to operationalize international management or alter rules and norms of group decision making—is quite difficult to capture when we abandon the strictures of rational choice. Therefore, collective decisions are not predicted, but they are reported in the cases in order to explore the patterns of management that emerge from different systems. Largely encompassed in chapter 11, this analysis is only a preliminary step toward understanding adaptive international governance, but it is an important one.