

# The Political Ecology of Crisis and Institutional Change:

## The Case of the Northern Cod<sup>1</sup>

by

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### Introduction: Systems Crisis

The question we pose, although cannot yet answer with certainty, is whether the current set of crises in fisheries--- from the salmon of the West Coast of North America to the groundfish of the East Coast of North America--will open the door to institutional-cultural, social, political- change. There are theoretical and logical grounds for thinking that crisis and institutional change might be linked (Holling 1986; Kuhn 1962, 1970) although the nature and outcomes of linkages are not so straightforward (Lee 1993).

Fisheries management is a thoroughly modernist venture, imbued as are so many other of the applied "natural resource" areas with a very pragmatic, utilitarian, science-dependent, and mostly optimistic perspective on the ability of people to "manage" wild things and processes. Management decisions--such as quotas, the timing or length of a fishing season, and the kinds of fishing gear allowed--are influenced by many things but are in theory dependent on information and understandings from a probabilistic but deterministic science known as "stock assessment." However, the alarming occurrence of fish stock declines and collapses throughout the world is accompanied by critical appraisals of the specific tools and the more general philosophies of fisheries management. One example is encoded by the phrase "adaptive management" (Holling 1978, Walters 1986, Walters et al. 1993, Lee 1993). Adaptive management<sup>2</sup> explicitly acknowledges uncertainty in natural systems and an imperfect science. It calls for management interventions that involve experimentation and flexibility so that scientific uncertainty can be reduced and the management system can be adjusted or adapted to what is learned.

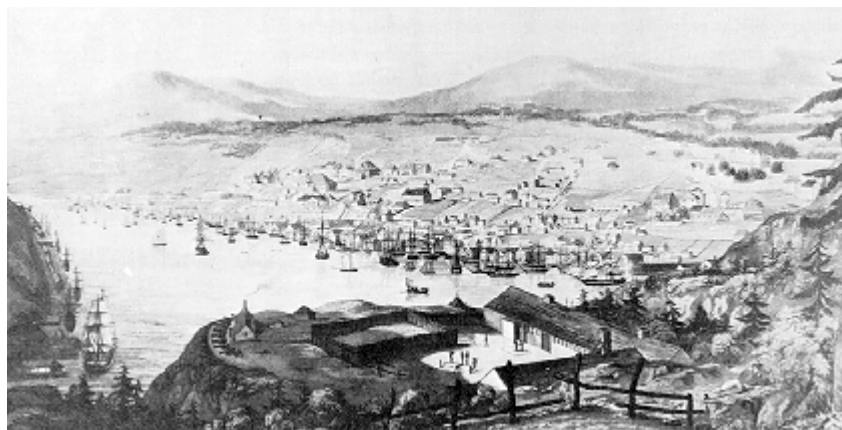
Glimmers of change also come from discussions of the need for "ecosystem management" rather than species-based management, as well as related attempts to

explicitly deal with chaotic or stochastic phenomena in marine ecosystems and fisheries (Wilson et al. 1990). A third source of potential change is found in the notion of "co-management" (McCay 1988; Pinkerton 1989, Jentoft 1989). This means "power-sharing in the exercise of resource management between a government agency and a community or organization of stakeholders" (Pinkerton 1992: 331). Related is the notion of "participatory research," whereby scientists and fishermen and other community members collaborate in various dimensions of fisheries research and where the knowledge of fishers is accorded value alongside the knowledge of scientists. Each of these perspectives already has a "foot in the door" in fisheries management policy and agencies, but separately and together they represent major structural, ideological, and social changes.

With the foregoing in mind, we turn to what has become the classic case of the failure of conventional science-based fisheries management: the collapse of the northern cod of Newfoundland and Labrador. The current crisis in the fishery of Newfoundland, a province of the east coast of Canada, has destabilized prevailing political and epistemological power relations and thereby created an opportunity for renegotiation of those relationships. The relations most at stake have been those centered on scientists and science-based management.

## **The Northern Cod Crisis**

In St. John's, Newfoundland, on Thursday, July 2, 1992, John Crosbie, Canada's Minister of Fisheries and Oceans, announced a two-year moratorium on fishing for *Gadus morhua*, also known as the northern cod. Northern cod are found from the northern edge of the Grand Bank along the northeast coast of Newfoundland and up to the coast of Labrador.<sup>3</sup> Cod were the main reason that Europeans took heed of this part of the New World in the 15th century and stayed to decimate the native Americans and the great Auk and to create a lifeway dependent on commercial fishing for export, mostly again for this northern cod.



**Fishing season, St. John's harbour, Newfoundland, 1831**

Why did he do this? And what were the consequences? Answers to both require an understanding of the "political ecology" of Newfoundland and its fisheries.

## The Northern Cod Fishery and Adaptations to Periodic Decline

The northern cod fishery was the focal point of the distinctive culture of outport Newfoundland. The outports are small, once-isolated communities of people mostly of English and Irish descent scattered around the coast adjacent to the fishing grounds. The dominant pattern of small-scale, seasonal domestic commodity production in fishing is rooted in and supported by a robust folk culture of egalitarian social relations and ideology mediating problems such as mercantile exploitation, ethnicity, and competing gear-types, but also capable of generating organized resistance and opposition (Martin 1987, Faris 1972, Sider 1986, Cadigan 1990) . Although variable and dynamic, in broad outlines "outport culture" persisted for more than 300 years, surviving substantial changes in fishing technologies, the larger political and economic contexts, and natural fluctuations in the cod stocks (Sinclair 1985, 1987; McCay 1976, 1978, 1979).



Historical records suggest that for at least one hundred years northern cod have experienced cycles of abundance (Harris 1993). Every 30 years or so there was a period of severe decline or "failure." Even more often there were localized "failures." But the fish always came back and people adapted in a variety of idiosyncratic, cultural, social, and political ways ranging from diversified gear types and occupational strategies to the costly and problematic relationships between fishers, local merchants, and governments (McCay 1978).<sup>4</sup>

The situation changed in the 1960s with the arrival of foreign trawlers built to cope with the ice and storms of winter.<sup>5</sup> Although there was an important offshore "banks" fishery from the beginning of European exploitation of the region, the scale and fishing power of the post-1950 offshore fishery were far greater than ever (see Warner 1983). Northern cod catches peaked in 1968 (Figure 1), at over 800,000 metric tons, or about 4 times what the "normal" or average catch had been over the past 3 centuries.<sup>6 7</sup> This increase in catches was clearly on the part of the offshore, foreign fisheries, and at the expense of the inshore Newfoundland fishers (Figure 2). The 1968 catch is called in retrospect "the killer spike" (Hutchings pers. comm. 10/95). One effect it seems to have had is to ratchet up expectations about the catches that could be sustained by the northern cod stocks, such that early-mid 1980s projections were for at least 400,000 mt, versus the historical average of 200,000 mt. Another is that it more directly made a very large dent in the northern cod population and may thereby have reduced its resiliency in the face of both fishing mortality and exceptionally challenging environmental conditions.

## COD HARVESTS, ICNAF SUB-AREAS 2J3KL SELECTED YEARS 1956-75

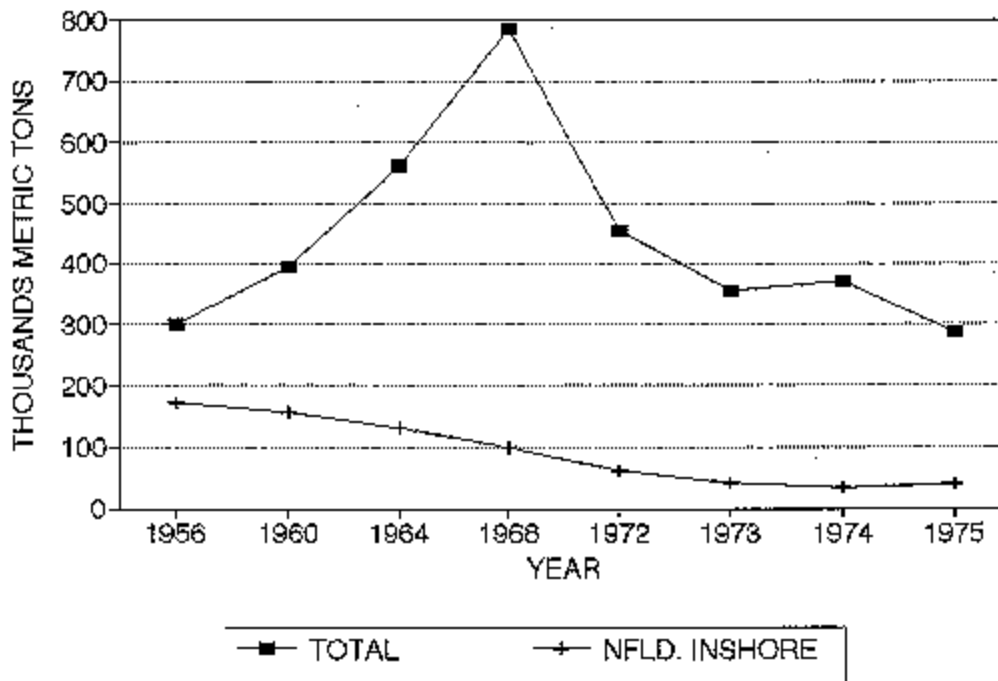


Figure 1

In 1977 in the context of United Nations Law of the Sea negotiations Canada declared a 200-mile exclusive fisheries zone. Foreign fishing was phased out, the offshore fishery became a Canadian fishery, and the federal government developed a science-based system of fisheries management (Parsons 1993). A period of cautious and incautious optimism ensued, fueled by signs of a rebound in the fish stocks and fairly consistent scientific stock assessments that led to projections of even higher catches in the future. This lasted until the late 1980s, and saw important changes in outport society and culture, including an increase in the numbers of people and firms in the fishing and fish processing industry and firms<sup>8</sup> and the revival of many small coastal places. It also saw the rise within the inshore fishery (as opposed to the corporatedominated offshore fishery) of a class of "petty commodity producers" (Sinclair 19xx) involved in the ownership and use of larger, more diversified, farther ranging, and more heavily capitalized fishing technology than before. These changes were accompanied by the urbanization and suburbanization of most of the populace of Newfoundland, heavily reliant on service industries and government and optimistic about the (as yet to be realized) prospects of offshore oil and gas.

A quick summary of a long and complicated narrative (see Finlayson 1994; Steele et al. 1992) is that during the 1980s some inshore fishers as well as academic biologists and others began to worry about the stock assessments because of localized inshore fishery

failures and apparent decreases in the sizes and numbers of fish caught in inshore fishing gears. The projections of the government management agency, the Department of Fisheries & Oceans (DFO), seemed out of line with their observations and experiences, and it was discovered that there had been serious and systematic errors in stock assessments of northern cod. We will return to these problems below.

Although quotas were lowered in response to more realistic stock assessments, the magnitude of the problem was not appreciated until the late winter survey of 1992, which was followed by a shut-down of the offshore, large-dragger fishery dominated by two large corporations. By July 1992 it was reported that the northern cod populations had declined to the point that they were on the verge of commercial extinction. The estimated biomass was about one third the average since 1962 (Coady 1993: 74). This was the basis for the moratorium on the entire northern cod fishery. Some 35,000 fishers and fish-plant workers were affected by this closure, not to mention the other businesses, families, and community organizations dependent on the work of fishermen and plant workers. The government provided assistance for what was planned as a two-year closure to allow the stock to rebuild. Contrary to assumptions and expectations, the 1994 assessment indicated that the northern cod population had continued to decline, and to the point that it was possible to use the language of biological, not just commercial, extinction. As of 1995, the talk is of keeping the fishery closed for another 10 or 15 years. Fishery-dependent workers and their families have been promised assistance for a much shorter time, up to May of 1999. This is a crisis.

The current crisis may be just another one of those cyclic periods when "fish is scarce, b'ye." Yet the scale, scope, and duration of the collapse of northern cod and the apparent truncation of the population to just two year classes suggests the possibility that it is not. Hence the heroic and costly measures imposed by the Canadian government, in hopes of giving the stock a better chance to recover. The question of whether heroes can learn from their mistakes is one to which we return at the end. Our focus now is the question of what caused the northern cod crisis.

## **Causes of the Crisis**

### *Environmental Change And/Or Overfishing*

Many theories have been offered to explain the unsettling news of the collapse of the northern cod stocks by 1992 and their subsequent failure to rebound. Again to summarize a much longer narrative, the theories included "the fish are hiding," "unusually cold water did them in," and "the seals ate them [or their food]."<sup>9</sup> There are other interpretations, including the possibility that critical features of cod behavior are affected by low population size.<sup>10</sup>

Recent reviews of the data appear to confirm what seemed obvious to most observers, including Newfoundland's inshore fishers and fish-plant workers: the overfishing theory (Hutchings and Myers 1994; Myers et al. in press). So many fish had been killed by

fishing that the population was reduced in size, in age-structure, and in ability to reproduce itself. Why?

### *Tragedies of the Commons*

The simple answer to why overfishing took place is that there were too many people after too few fish, without adequate signals of trouble and incentives to stop. This situation is often called a "tragedy of the commons," referring to the notion of the commons as an open access, essentially unregulated or anarchic regime. The idea that fishery problems in Newfoundland (and Canada more generally) might be "tragedies of the commons" began to appear in official writings and speeches in the 1960s, 1970s, and especially 1980s (Matthews 1993), following the formulation of the economic theory of common property by Canadian economists H. Scott Gordon (1954) and Anthony Scott (1955) and its specific application to the situation in eastern Canada (e.g., Copes 1982) .

As we shall see, the theory is easy to support when looking at the international fishery but much more questionable when looking at the domestic fishery given the existence of both formal and informal controls on effort in the inshore fisheries and structural distortions between inshore and offshore sectors (Matthews 1993; McCay 1979). Nonetheless, there was a spate of rapid growth in the numbers of fishers and the numbers, sizes, and fishing power of the vessels they used after the 200-mile limit was imposed in 1977. The number of processing plants also grew rapidly during the 1980s as did the capacity of the large, vertically-integrated corporations to both process and catch fish, the latter using increasingly effective ice-going trawlers. Post-moratorium policy has focused on these facts, arguing for the need to reduce participation in Newfoundland's inshore fishery by half or even two-thirds, and to reduce processing capacity. The blame implied in this policy-and rhetorically intensified by "tragedy of the commons" talk-is misplaced, however, because the offshore fisheries, domestic and foreign, had far more significance for the northern cod stocks." [11](#)

### *Territorialization and an International Tragedy of the Commons*

Territorialization refers to the process whereby the claims of states commodify nature into separate entities (Greenberg, this panel). In Newfoundland and its waters one would find territorialization as early as the 16th century, and then over the centuries, particularly in the contested claims of the English and the French, and at times the Americans, to fishing and fishprocessing rights in Newfoundland and its waters. A new kind of "managerial territorialization" is evident in the most commonly reproduced chart of Atlantic Canada's fishing grounds (figure 2), which shows the 200-mile limit of extended coastal state jurisdiction as well as management units defined by an international commission known as NAFO (Northwest Atlantic Fisheries Organization), formerly ICNAF (International Commission of the Northwest Atlantic Fisheries), both under FAO of the UN.

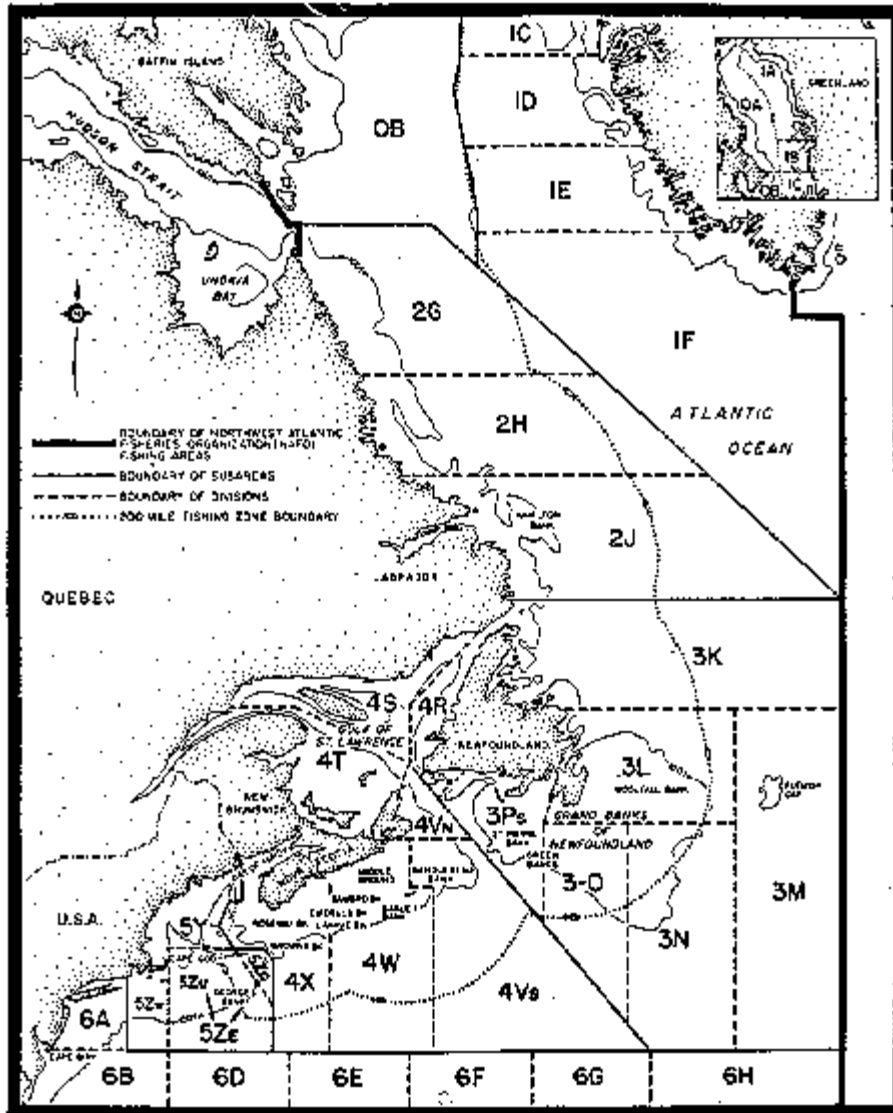


Figure 2. Subareas & divisions of the NAFO Convention Area & limits of Canadian fishing zones (east coast). Includes modifications of Subdivision 5Ze to take into account the Canadian side of 5Ze (5Zc) & USA side of 5Ze (5Zu).

Although it is difficult to say in any simple, straight forward way that it **caused** the decline in northern cod, the specifics of the territorialization of Newfoundland's fisheries - in particular the failures of international management - played a significant role in **shaping the events** that led to John Crosbie's announcement of a moratorium.<sup>12</sup>

As noted earlier, the "killer spike" of 1968, shown in Figure 2, may have had a lasting effect on the northern cod populations. But even after the Law of the Sea enclosure movement that created 200-mile territories of exclusive jurisdiction for coastal states there were problems. Northern cod were vulnerable to foreign fishing outside the 200-mile limit, on the "nose and tail" of the Grand Banks. This was not a totally unregulated

"freedom of the seas" situation. ICNAF, and then NAFO, developed quotas for the participants. However, both ICNAF and NAFO were ineffective because of classic problems of international environmental policy: quotas tended to be set at the "least common denominator" level because nations unhappy with them could defect; and enforcement could only be done by the flag-states of the fishing vessels (Peterson 1993; Parsons 1993; Haas et al. 1993). The fundamental conditions of "international anarchy" (Young 1989), including the retention of sovereignty for enforcement of regulations by nation-states,<sup>13</sup> contributed to the ineffectiveness of international fisheries management (Peterson 1993). Canada's latest move in the "turbot war" of 1995,<sup>14</sup> using gun-boat diplomacy to enforce international quotas, may be viewed as part of the longer term process of carving up this international commons into zones of extended jurisdiction and turning the matter over to nation states, although Canada stopped short of this and was effective in gaining international support for a stronger "straddling stocks" convention at the UN in 1995.

Canada's heroic action in the "turbot war" of 1995 may also be a de facto, if unintended, way of diverting public attention from other causes of the fisheries crisis - a crisis which had "spread" to other species and to other Northwest Atlantic fishing grounds by the mid-1990s.

### *Globalization*

How does globalization relate to John Crosbie's announcement on "Black Thursday" 1992? Globalization is not new to the Newfoundland fisheries; although the relevant "globe" has expanded and shifted over time, they have been oriented to global markets ever since Europeans established them in the 1500s. Recent historical research suggests that this fact was accompanied by "overfishing" by the 1600s and on; i.e., fishing effort was less attuned to local needs and signs of the health of the resource than to signals from markets and the manipulations of merchants to serve those markets.

Globalization is not new but it is relevant. Here is one way: whereas the moratorium on northern cod fishing (and associated decline or closure of other groundfish fisheries) is a crisis for many fishers and their families and communities, it is not necessarily so for companies positioned to take advantage of the more recent phase of globalization in the fisheries, whereby fish caught in the Barents Sea above Scandinavia and Russia by Russian vessels may be sent to Canada for processing and then to Boston to be sold to consumers. The large fishery firms of eastern Canada have become brokers as well as processors of imported fish, and are much more profitable than before the moratorium. The "crisis" is also an opportunity, and their interests in sustainable harvests of northern cod are therefore different from those of the fishers and fishery-dependent communities of Newfoundland. This may contribute to an explanation of why the large firms and the captains of their offshore trawlers so insistently denied problems in the fish stocks until the very end. For example, in the context of an announcement that DFO would drastically reduce quotas for the 1990 offshore fishing year, a local newspaper carried a letter from one of the deepsea trawler skippers that began: "I've been fishing northern



cod for eight years and I tell you there are more fish there now than [sic] there were eight years ago....(Cox, William in the St. John's Evening Telegram, Feb. 24, 1990 p. A1; cited in Finlayson 1994: 108). However, one does not have to point to global forces to find an adequate explanation. A simpler alternative is that their technology allowed them to find and catch the fish during spawning aggregations, even in the winter amidst storms and ice, so that they perceived more abundance than the inshore fishers did.

## **Science and Its Centrality**

Another factor left out of the official analyses, and overlooked until very recently in discussion of Newfoundland's fishery problems, is the problem of the science of the commons and how science relates to policy (Steele et al. 1992, Neis 1992). Put another way, the problem may very well be the centrality of science in the process of deciding such critical questions as the total allowable catch (TAC) (Finlayson 1994). The TACs, and projected TACs, were central to the optimism that fueled boat-building, fish plant licensing, and decisions to go fishing or work in a fish plant instead of finishing school. As it turns out, they were far too high and thus promoted overfishing .

Shortly after claiming a 200 mile limit, Canada created the Department of Fisheries and Oceans (DFO) with the foremost goal being the rebuilding and rational scientific management of the northern cod. Generously supplied with material, human, and financial resources, DFO's program was a superb example of scientific fisheries management done the way that scientists had long advocated ( Parsons 1993) .

The goal of objectivity in science was emphasized in a later restructuring of DFO to completely separate science from management, creating the Science Branch. It is responsible for research leading to stock assessments, which are the basis of advice given to the Minister of Fisheries. Scientific advice was finalized at an annual meeting of CAFSAC (Canadian Atlantic Fisheries Scientific Advisory Committee).

By 1982 DFO was claiming that the rebuilding process was well under way and was predicting a 1987 northern cod quota of 400,000 mt and a long-term sustainable yield of 550,000 mt (Kirby Task Force 1982) - which was over twice as high as the long-term historical average catch .

## **Problems in the Science of Northern Cod Assessment**

Despite optimism expressed in the 1982 and subsequent TACs for northern cod, many inshore fishermen worried as their catches became spotty and the fish smaller. The day-to-day operational reality of the inshore fishing community increasingly diverged from that of DFO's science-based construction of reality: the inshore sector was landing progressively fewer-and smaller-fish while the offshore trawlers' catches were continuing to increase. Inshore fishermen began to claim that the stock was in danger-that the scientific description of a healthy, growing stock must be wrong-and that the northern cod quotas, particularly those for the corporate offshore fleet, should be immediately and significantly reduced. A remarkable metaphysical change had occurred

in their thinking. There had always been failures in the fishery in the past, but they were seen as natural and transient. When the European fishery escalated, people began to see that fishery failures could be caused by fishing itself, and they began to voice a new possibility:

*Now a few mistakes and a few bad decisions could cause a failure that was not natural but man-made. Now there could be a failure and the fish wouldn't come back. Now there was someone to blame. And this was utterly different than anything they had known before [interview with Bernard Brown conducted in St. John's on August 3, 1990; cited in Finlayson 1994: 108].*

This change in perception fueled the movement that led to the 1989 reassessment of the status of Northern cod. The inshore sector of the fishery had no meaningful input to the stock assessments and was on the extreme margins of the general policy formation process. Despite these apparent handicaps this sector was able to mobilize and sustain sufficient cultural and political resources to force a genuine and substantive internal reevaluation of scientific stock assessment. A coalition of inshore fishers, working with university scientists and lawyers, forced a reassessment of the data and methodologies behind those TACS. There were two governmentsponsored reports (Alverson 1987; Harris 1990), both of which identified serious problems in data and methodologies, and one of which (Harris 1990) prompted action. It followed on alarming reports that the 1989 DFO research vessel survey showed that previous estimates of northern cod abundance were very wrong.

The internal DFO reassessment of 1989<sup>15</sup> showed that their earlier claims had overestimated the stock's abundance by as much as 100 per cent and underestimated the fishing mortality by roughly 50 per cent. Why the huge difference between the 1989 and earlier stock assessments? We briefly review some of the problems that surfaced in the post mortem of the northern cod crisis, referring the reader to other sources for fuller treatment (Finlayson 1994; Neis 1992; Steele et al . 1992; Lear and Parsons 1993) .

First, northern cod was treated as a unit stock, when it was known to be comprised of distinct populations with different migratory patterns, contributing in discrete ways to inshore and coastal fisheries. <sup>16</sup> Failure to incorporate this variability into the models may have contributed to overestimation of biomass (deYoung and Rose 1993; Lear, pers. comm. in Finlayson 1994).

Second, certain key variables, such as recruitment (survivorship of a year-class)<sup>17</sup> and natural mortality,<sup>18</sup> were treated as constants in the models used. This in combination with problems in the periods used to derive averages used to generate the constants resulted in overestimates as well (Myers and Hutchings 1994; Finlayson 1994).

Third, it is now appreciated that the data from the fishing industry that were used in stock assessments, in combination with research vessel survey data, were seriously distorted by the practice of discarding undersized fish which seemed to increase as

stocks decreased (Myers et al. in press). This resulted in underestimates of mortality from fishing.<sup>19</sup>

Another factor contributing to the northern cod stock assessment error was a bias toward the use of offshore versus inshore landings as an index of abundance to "tune" the stock assessment model (which was primarily based on survey data rather than landings).<sup>20</sup> Inshore fisheries landings were not systematically used in those assessments in part because of difficulties obtaining consistent measures of "catch-per-unit-effort" and otherwise dealing with messy and often "anecdotal data. Therefore evidence of decline in the abundance and size of inshoremigrating fish was apparently missed (Steele et al. 1992; Neis 1992), contributing to DFO's inclination to dismiss the concerns of inshore fishers.

Another important question is why those scientists who knew or suspected the problems of stock assessment did not speak up or were not heard. There are several directions to take in addressing this question about the sociology and political economy of science. One is that scientists knew the truth but were not heard or not allowed to speak because those charged with making fisheries policy had reasons to favor more generous assessments.<sup>21</sup> Another concerns the defensive behavior of bureaucracies under siege.<sup>22</sup> A third concerns relationships between scientists and policy-makers. The organization of the fisheries agency may have contributed to the problem, paradoxically, by isolating scientists from policy (cf. Susskind 1994, who makes a similar argument with respect to international environmental policy).<sup>23</sup> One result was that most scientists lost touch with the fishing industry, which may have further marginalized and delegitimized information from the inshore fishery. Moreover, when scientists had to present their assessments to officials in other branches and to the scientific advisory body (CAFSAC), they felt pressured to give the simpler answers or at least to be consistent, omitting questions they had about reliability, degrees of uncertainty, or the very models and data-sets they were using (see interview in Finlayson 1994: 79).

## Conclusions

We began this essay with a reference to a theory of systems crisis and the necessary conditions for fundamental change in fisheries management regimes. We turned to the case of northern cod, both as a textbook example of science-based management and as an empirical test of the systems crisis theory. The stock has collapsed to the point where biological extinction is not out of the question. The fishery dependent upon this stock has been closed indefinitely at enormous social and economic cost. Tens of thousands of men and women in hundreds of communities in Newfoundland and Labrador are facing the loss of both their livelihoods and their way of life. The federal government has already spent billions of dollars on a suite of crisis response programs and, with no end to the crisis in sight, will likely need to spend billions more in the years to come. We think that these should be necessary and sufficient conditions to precipitate a full-blown systems crisis.

The collapse of the northern cod should have destabilized prevailing political and epistemological power relations creating opportunity for renegotiation of those relationships. The most dogmatically resistant to this possibility would be those with the most to lose - the scientists. Their strong commitment to the shared cognitive reality of scientific culture is threatened as is the position of science as both essential and central to rational fisheries management. This is entirely consistent with the Kuhnian model of paradigm shifts. The inshore sector - with the most to gain - should be the most open to, in fact, insisting upon, a restructuring of the power relations. In short, if Holling's theory is correct, the total collapse of the cod stock should have been matched with a parallel collapse of the paradigm of science-based fisheries management and its supported institutional structures, processes, and relationships.

This has not, in fact, happened. What is collapsing along with the stock is the social structure of the fishery to the extent that it was dependent on the northern cod. To be sure, there have been some changes in management attributable to the stock crisis but they are evolutionary rather than revolutionary. In posing the "theory" of systems crisis, we have seriously underestimated the social and political authority of science. Modernist science is so firmly established and deeply rooted in society's consciousness as the well of certified knowledge and objective authority that it will take more and larger ecological crises than simply the collapse of a few fish stocks to seriously destabilize its authority.

But there are the ingredients for more adaptive, participatory, ecosystem-based fisheries policy.

It is clear that overestimates of the northern cod stocks contributed to overly generous quotas, which in turn contributed to overfishing. It is at least arguable that greater involvement of scientists in the policy-process, and greater openness of scientific debate, would improve the environment for truly critical reflection about what is happening to fish stocks and what should be done to protect them. We would go further to suggest the de-centering of science in that process, so that the information, knowledge, and concerns of fishermen and community members can play more direct roles.

Both an "opening ups of the process and a "decentering" of science have begun. In response to the bad news of 1989-which was a crisis of legitimacy for the agency- DFO developed innovative programs where scientists worked more closely with fishermen in their research and where fishermen voluntarily collected logbook data of use to scientists. However, momentum was lost with the 1992 closure of the northern cod fishery. In addition, there were signs that this had devolved to a one-way communication process, i.e., taking a few leading fishermen out on the research boats to show them how scientific data-gathering was done. Some institutional experimentation and perhaps learning are evident nonetheless. Early in the crisis, before the moratorium, two DFO scientists, George Rose and Ben Davis, had begun working more closely with inshore northern cod stocks and inshore fishers (Davis et al. 1994). A multidisciplinary team from Memorial University is engaged in a government-

funded analysis that includes collaboration between social scientists and fisheries biologists in interviewing fishers about their ecological knowledge and understanding (Neis, personal communication, 1995).

In addition, the value of a more participatory, inclusive decision-making process is reflected in a major organizational change. In 1993 the Minister of Fisheries & Oceans created the Fisheries Resources Conservation Council (FRCC), comprised of scientists, academics, leaders of industry groups, and other experts outside DFO. Final authority for resource assessments and recommending quotas and other conservation strategies to the Minister was removed from the Science Branch of DFO and vested in the FRCC. In existence only two years, it has nonetheless moved far more quickly and decisively, and with more legitimacy, than did DFO under the old system. <sup>24</sup>

Nonetheless, the critical stance about the methods and authority of science in fishery management has almost dissipated in Newfoundland. One reason is that the inshore fishers and community members have been "bought off" by the federal government's moratorium compensation program. In accepting payments of up to \$400 per week, the people directly affected by the failure of the state's management of the resource also implicitly accepted its continued central authority, including authority to impose, with the collaboration of the fisheries union, a down-sizing "rationalization" program, based on the "tragedy of the commons" analysis. <sup>25 26</sup> Rather than a revolution in the basic structure and process of management, fishery managers, politicians and others in power have exploited the chaos and fear of the crisis to impose a revolutionary restructuring policy on the fishing industry, one that had been advocated in various forms since 1982 but which had been successfully resisted by the industry until the northern cod moratorium .

The sell-out is not total. As always, the "victims" turn out to include some very resilient and forceful people who are working at the grass-roots to develop community economic initiatives and are linked within regional, national, and international networks concerned about the future of small-scale, community-based fisheries. The two major fishery cooperatives in Newfoundland have taken such initiatives, and the Fogo Island cooperative, led by Bernadette Dwyer, is developing a project to use the cooperative's data in combination with the logbooks and memories of fishers to provide data of use in appraising the inshore fisheries.

A summary/afterthought:

The tragedy-of-the-commons model has played a strong if implicit role in the diversion of effort away from understanding and improving the knowledge base for decision-making and toward the task of reducing the population's dependence on a patently uncertain and difficult resource. It has led to overly simplified accounts of both problem and solution. If overfishing was the major cause of the collapse of the northern cod, then overfishing must be prevented. So far so good; but what does an attempt to reduce the number of people licensed to fish have to do with overfishing? The collapse of the northern cod is indeed a tragedy, and it is indeed a tragedy of the "commons" broadly

construed. However, the northern cod fishery "commons was neither unregulated nor open-access, certainly not since 1978. But at this point the thinking represented in the economic model of the open-access fisheries intrudes, leading too quickly to the "downsizing" solution to what are complex problems caused in some potentially measurable part by government policies, corporate interests, international situations, and the errors and uncertainties of science.<sup>27</sup>

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