Managed Annihilation

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NATURE | HISTORY | SOCIETY

Managed Annihilation

An Unnatural History of the Newfoundland Cod Collapse

DEAN BAVINGTON

FOREWORD BY GRAEME WYNN

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For my parents – Grace Ann Willis and Bill Bavington

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FOREWORD

This Is More Difficult Than We Thought

by Graeme Wynn

Another study of the demise of the Newfoundland cod fishery? Surely this topic, like the codfish itself, has been done almost to death. Since 1992, when Canada's minister of fisheries acknowledged the dramatic collapse of northern cod stocks in the waters off Newfoundland and Labrador and imposed a strict moratorium (subsequently extended indefinitely, although subject to limited regional exemptions) on all fishing for cod, thousands of trees have been sacrificed and much ink has been spread to produce countless pages of discussion of this calamitous event, described by one commentator as "an ecological crime comparable to the Soviet Union's draining of the Aral Sea."[1]

Writ large this story offers a classic tale of human rapaciousness and the plundering of nature's bounty.[2] Waters that sixteenth-century sailors described as teeming with cod quickly became the focus of an international fishery that drew men and ships on annual voyages from the eastern shores of the Atlantic to the Grand Banks (and other fishing grounds) to provide food for much of Europe. With time, men from England, Ireland, and France began to overwinter on the island of Newfoundland, a colonial territory that British politicians thought of, metaphorically, as "a great ship moored near the banks in the fishing season for the convenience of English fishermen."[3] Gradually, women joined the fishermen, and settlement of the "new founde lande" advanced. Late in the eighteenth century, some 30,000 English-speakers engaged in the Newfoundland fishery. Approximately forty percent of these people voyaged to the fishing grounds each

year. The remainder, including almost 3,000 women, sojourned on the island, and when war and economic perturbations at the end of the century sent the fishery into decline and all but ended annual voyaging, they formed the nucleus of an expanding population resident in Newfoundland. By 1840, there were 80,000 people living on the island, most of them scattered in bays and coves beyond the commercial centre of St John's and heavily dependent on the fishery. Mainly working the onshore waters, they produced dried salt fish for European and Caribbean markets. Despite the reduced productivity of cod stocks attributable to cold ocean conditions into the 1840s, Newfoundland exports increased almost threefold through the first three-quarters of the nineteenth century, and sustained a growing population, albeit usually in very modest circumstances.

In truth, the broad long-term upward trend of aggregate catch statistics, which reflected the exploitation of new geographical areas (by extending the fishery to northern Newfoundland and on to Labrador), as well as increasing fishing effort, masked local and short-term fluctuations in the productivity of the fishery. Catch rates per person fell by two-thirds during the nineteenth century. We cannot be certain, but both historical and biological evidence suggests that some bay stocks may have been overfished in the eighteenth century, and there are firmer indications that years of intense (and increasing) exploitation led to local failures of the fishery by the third quarter of the nineteenth century. Early in the twentieth century, the total catch on the Banks, the inshore, and off distant Labrador began to decline. In the 1940s, inshore catches were lower than they had been for a century, and all of this despite the efforts of growing numbers of fishermen spending more time on the water. In the 1890s, there were approximately twice as many fishermen as there had been in the 1850s, half the colony's workforce fished, and almost 85 cents in every dollar of the island's export earnings came from the cod and seal fisheries.[4] In these circumstances, market perturbations hit Newfoundland hard. The world price of salt codfish fell sharply toward the end of the century and, after a brief resurgence, declined again after the First World War. Between 1921 and 1945, the number of fishermen in Newfoundland fell by half; early in the 1930s, a quarter of the population depended on government relief. The colony teetered on the edge of bankruptcy. In 1934, the government of the United Kingdom assumed responsibility for Newfoundland's finances and the colony's elected government was suspended in favour of a six-person Commission. The Commission moved immediately, despite difficult trading conditions, to assist the fishery by building and then subsidizing the construction of fishing vessels, and improving methods of

production and marketing. Fifteen years later, in 1949, the colony joined the Canadian Confederation.

Still, Newfoundland's salt fish trade struggled. Exports fell by more than half in the decade after 1947. Economic historian David Alexander, the most astute analyst of this period, concluded his account of these difficult years when 15,000 fishing jobs were lost with a chapter on the "demoralization" of the fishery.[5] But the fishery was changing, not dying. Modernization and industrialization were the watchwords of the day. People and communities were forced to confront wrenching alterations to their ways of life. Challenged to improve services to its scattered outport population, the provincial government encouraged some 30,000 residents of over 250 communities to resettle in designated growth centres, where their health and educational needs could be better served. At the same time, new technologies encouraged a shift away from the traditional dispersed onshore salt fish industry to a more capital intensive near-shore and offshore fishery utilizing larger vessels to deliver the catch to central fish plants, where it was frozen for dispatch to distant markets. The costs of participation in this new industrial fishery were not easily met by capital-poor Newfoundlanders, and, initially at least, markets for frozen fish were neither as large nor as lucrative as anticipated. Moreover, the new technologies robbed Newfoundland of its locational advantage on the edge of the fishing grounds. From the mid-1950s onward, large, diesel-engined trawlers from France, Iceland, Norway, Spain, Portugal, West Germany, the USA, and the USSR worked offshore waters alongside Canadians, processing and freezing their catch onboard and delivering it to market. By 1953, more than 500 trawlers were fishing the northwest Atlantic; a decade later, the number approached 1,000, and many of them were among the largest fishing vessels in the world.

Catch rates climbed as the nations of Europe and North America mounted what historian Paul Josephson has termed their "war" on the fish of the North Atlantic ocean.[6] Initially, fish stocks may have been larger and healthier than for decades, even centuries, as wartime reductions in fishing effort and long-term productivity cycles produced a population rebound and an increase in the biomass of haddock, plaice, and other species as well as cod. But the battle was more uneven than anyone envisaged. In 1954, the British sent the first stern-trawler to the Grand Banks. In a couple of months, the crew caught over 2,000 tonnes of fish. In the years that followed, sophisticated new vessels, "armed with the intelligence of oceanography and marine fisheries science," harvested fish with unprecedented precision and efficiency.[7] In the decade or so after 1958, the

quantity of cod taken from waters off Newfoundland and Labrador tripled. In 1968, the catch from the northwest Atlantic was 1.2 million tonnes, with approximately two-thirds of this from the northern cod stock alone. By one estimate, four to five billion cod (more than 14 million tonnes of fish) were taken from the Banks between 1960 and 1972. Indeed, Canadian fisheries biologists Jeffrey Hutchings and Ransom Myers later estimated that between 1960 and 1975, the northern cod catch equalled that taken between 1500 and 1750.[8] Onshore, however, catch rates per person fell sharply. By the mid-1970s, the populations of several species of fish (including cod) were down by 75 percent from historical levels of abundance.

Late in 1970, Canadian politicians and their officials followed dozens of other states in extending their country's offshore territorial claim from three to twelve nautical miles. Although this gave Canada the right to stop foreign vessels fishing within this zone, agreements and concessions allowed most nations engaged in the Newfoundland fishery to reduce their activity over several years. When the third United Nations Law of the Sea Conference convened in 1973, Canada sought exclusive control of waters (and fisheries) to the edge of the continental shelf, but international opinion favoured a clear boundary. By 1977, Canada had declared and had recognized its right to manage fisheries within an exclusive economic zone (EEZ) that extended 200 miles offshore. This left the southern and eastern tips (the nose and tail) of the Grand Banks and the Flemish Cap (further east) in international waters and open to fishing vessels from other countries, but conferred upon Canada a form of "ownership" over the fish in the exclusive economic zone. Despite the wise and cautious words of the federal minister of fisheries and oceans, Romeo LeBlanc, who "saw no faster road to disaster than forgetting ... that biology cannot keep up with ... technology – that the wealth of the oceans cannot yet match the greed of man," most local, political, corporate, and bureaucratic minds were filled with optimism.[9] Stocks would be rebuilt, the fishery would be rationalized, new fishing and processing capacity would be constructed. In 1980, the Department of Fisheries and Oceans (DFO) released a report: *Northern Cod: A Fisheries Success Story*.[10] A dozen years later, "the formerly vital Grand Banks, and adjacent continental shelf – once a marvel of the world and a centre of human food production – [had been reduced] to a virtual desert."[11]

Many reasons have been offered to explain this collapse. Historical anthropologist Gerald Sider sees the "historical logic of industrial capitalism" as the destroyer of the fishery, and suggests, bizarrely, that a combination of merchant capital and geography (as location) turned rural

Newfoundlanders into the Mexicans of Canada.[12] David Alexander argued that things might have been different after 1949 had the Canadian government not been "either unbelievably myopic or terribly timid about venturing out into the world," in failing to help Newfoundland achieve an international trading presence "at a time when foreign nations were busily building vessels to come to fish in Canadian waters."[13] Some have blamed the foreign fishermen. They, of course, would not have been a "problem" had Canada held out for control of the entire continental shelf in the 1970s, and had not the Law of the Sea Convention insisted that other countries have access to "underutilized" species within Canada's EEZ.[14] One line of thought suggests that there has been "an age-old negative social attitude toward the fishery and its support services, including science."[15] Other accounts have indicted those common villains of environmental declensionist narratives, greed, incompetence, negligence, and rapacity. Climate change appears as the deus ex machina in some versions of this story, because the North Atlantic Oscillation brought some of the coldest years on record to the waters of Newfoundland and Labrador in the late 1980s and early 1990s, and capelin, the most important food of the cod, all but disappeared from northern waters. Political opportunism, bureaucratic incompetence, and industry pressure tactics have also been apportioned a large share of responsibility.[16]

Although snow crab and shrimp populations in Newfoundland waters have provided a lucrative fishery in the years since the moratorium, and hitherto underutilized species (such as Greenland halibut, winter flounder, and sea cucumbers) have also been taken by some of the 25,000 people still engaged in the fishing industry of Newfoundland and Labrador, doubts about the future – the ecological and social future – of the fishery remain. World seafood prices are high, and money is being made, but both crab and shrimp fisheries face problems, and there is little research into the effects of the rapid increase in exploitation on these stocks. Moreover, the globalization of the fishing industry, which has led to the processing in China of crustaceans taken from Newfoundland waters, has meant that disproportionately few jobs and benefits have been generated for shore workers in Newfoundland and Labrador by the post-moratorium fishery. Cod stocks have not rebuilt as quickly or as widely as hoped since 1992, and when limited catch quotas have been allowed due to political pressures and industry demands, they have almost invariably slowed the recovery process. As outport communities face decline, and the young people of Newfoundland and Labrador drift away from the fishery and out of the province, there are insistent concerns about the future.

Managed Annihilation shares these concerns, but broadens them. Interested in the decades before and after 1992, in the historic fishery as well as the fishery without cod, and convinced that the fate of Newfoundland's fisheries signals a wider crisis of late-modern resource management, Dean Bavington takes the Newfoundland case as reason to think again about the relations between human and non-human nature in western societies. As its title indicates, *Managed Annihilation* contends that northern cod were administered unto virtual extinction. Further, the book argues that when this untoward (albeit unintended) outcome became clear, in 1992, neither politicians nor fisheries scientists questioned the fundamental tenets of the managerialist impulse that had brought them to this point. Instead, they simply ushered in a new phase of managerial ecology, emphasizing risk and uncertainty in place of "the confident forecasting and control-oriented approach associated with [earlier] single-species scientific management" (p. 83).

According to Bavington's thought-provoking account, for the last two decades, fisheries managers and the governments they represent have been abandoning their former roles as researchers and regulators seeking to ensure stability in the fishery in favour of encouraging fishermen to manage themselves. To this end, they have considered two substantially different approaches.[17] Turning away, in one direction, from what have come to be regarded as the industrial, capitalist, state-led, and abstractly scientific shortcomings of earlier forms of management, they have acknowledged the value of Local Ecological Knowledge (without denying the worth of formal scientific understanding), recognized the importance of the fishing economy to the (generally small and scattered) places in which fishing families live, and envisaged the possibilities of effective community stewardship. Communitarian at its base, this approach seeks to empower local people and to reduce the socioeconomic inequities that are said to have resulted from the former management regime. Much discussed, it has not been widely implemented.

More effective, as an action strategy, at least, has been a second approach that (in Bavington's words [p. 9]) seeks to achieve "'mutual coercion mutually agreed upon' through the self-organizing disciplinary power of the market's invisible hand." In pursuing this option, fisheries scientists and managers have discarded their conviction "that the conditions for manageability exist in the nature of cod and fishing people as natural laws passively awaiting discovery" (p. 114) and have re-envisaged managerialism "as a condition that must be actively engineered into the very nature of cod and fishing people" (p. 114). To put Bavington's point bluntly, fisheries

managers turned from attempting to manage wild fish to domesticating fish and managing fishermen. As a corollary, fishermen are encouraged to "act more like corporate ranchers and farmers than hunters" (p. 89). Rather than pursuing wild fish in the depths of the untamed ocean, they are now expected to become careful harvesters of marine biomass (or fish conceptualized as living property even before they are caught [p. 11]) from a sea that is ever more like the land – enclosed, owned, and fenced about with laws and limits. Conveniently, these strategies proved entirely congruent with prevailing neoliberal economic doctrines emphasizing the challenges of complexity, conflict, and uncertainty in economic systems: "As centralized, state-led command and control, bureaucratic rule-following, and proceduralism ... [fell from] favour, flexibility, coping, experimentation, and learning ... [rose] to take their place" (p. 107).

In practice, the line between these seemingly discrete courses of action has blurred. As Bavington notes, "participatory management under neoliberal influence has stressed the importance of using local ecological knowledge and achieving 'buy-in' from resource users to achieve consensus, avoid conflict, and permit ongoing economic growth" (p. 107). More to the point, however, is Bavington's view that neither of these strategies, the communitarian or the neoliberal approach, is truly a significant step forward, because neither questions the ultimate "need for, or the usefulness of, management" (p. 10). And this is the crux of the matter. *Managed Annihilation* argues that both the colossal failure of natural resources management that became evident in 1992 and subsequent efforts to manage the fishery hold wider lessons for people too much given to framing the world as a set of problems that they have the capacity to fix. *Managed Annihilation* pleads for renunciation of "the holy grail of manageability," the belief that all problems (including environmental ones) can be solved merely by exerting more effort, and obtaining greater efficiency, within the status quo order of advanced industrial societies. In the end, this book urges a new view of human-environment relations, one that would replace Western society's long-standing drive to manage nature with a commitment to living within the limits of the ecosystems of which we are part.

This is a bold, some would even say audacious, agenda, not least because it challenges the foundations of environmental stewardship as it has been conceived and practised by a growing proportion of first world societies in the last 150 years. When George Perkins Marsh published *Man and Nature* in 1864, he aimed to challenge prevailing ideas that "the earth made man" by demonstrating that "man in fact made the earth" or, as the subtitle of his book had it, that physical geography was modified by human

action.[18] His fundamental point was that people and their technologies changed nature, in innumerable, often unavoidable ways. There was nothing intrinsically bad about this. Marsh believed, with others of his era, that "mankind's mission was to subdue and domesticate nature."[19] But the consequences could be serious. Marsh was well aware of "the dangers of imprudence and the necessity of caution in all operations which, on a large scale, interfere with the spontaneous arrangements of the organic or the inorganic world." Indeed, his book was written out of a deep concern that humankind had "too long forgotten that the earth was given to ... [them] for usufruct alone, not for consumption, still less for profligate waste."[20] Recognizing their responsibility for the world they passed to their descendants, responsible societies would, Marsh insisted, mitigate or repair the damage they did, not cease to modify their habitat, because – and on this he was unequivocal – "wherever man fails to master nature, he can but be her slave."[21]

Human impacts on nature, understandings of science and society, attitudes toward the environment, confidence in the future, and individual and collective expectations, as well the very language we use to discuss these things, have changed markedly since Marsh's day. But we live with the legacy of his work, which is often said to have "ushered in a revolution in how people conceived their relations with the earth," and which Lewis Mumford saw fit to identify as "the fountain-head of the conservation movement."[22] It is not too much to say that Marsh's plea for stewardship of the earth – starkly but effectively summarized by his biographer and closest student David Lowenthal as: "We are stuck with a managed world; it is up to us to manage it better" – was instrumental in fostering a long, and not ignoble, series of efforts to ensure prudent use of the world's natural endowments or, as more recent generations would have it, effective resource management.[23]

Marsh's identification of the destructive implications of the nineteenth century's voracious onslaught on American forests and his arguments for "the necessity of adopting a different course" were instrumental in the establishment of the Division of Forestry within the US Department of Agriculture in 1883, the passage of the Forest Reserve Act of 1891, and the organization of various American Forestry Congresses held at the turn of the century. They also influenced the creation of the Commission of Conservation in Canada in 1909 and the important developments of the early twentieth century in the United States, described in a 1910 book by Gifford Pinchot, one of the leading figures in the movement, as "the fight for

conservation."[24] In this formulation, rooted in forestry but setting the template for North American resource management for decades to come, conservation was a utilitarian doctrine that sought to reconcile competing interests to secure "the greatest good for the greatest number in the long run."[25] Its proponents, imbued with the reformist zeal of the Progressive era, believed that expert scientific and technical knowledge of nature, coupled with the administrative capacities of the state, could benefit everyone by ensuring the fair, wise, and efficient use of resources.

Through the early twentieth century, the basic tenets of progressive conservation were extended in the United States, the United Kingdom and Canada, and several European countries by a growing cadre of bureaucrats and experts committed to eliminating the wasteful exploitation of resources by promoting the wise and rational use of nature's bounty. Similar developments occurred in colonial possessions dispersed across Africa, Asia, and South America, where (in the British case at least) state-directed "constructive imperialism" evolved, as Joseph Hodge has shown, into "development" conceived as a means to improve "the social and economic welfare of colonial peoples through sound ecological and population management."[26]

In the years immediately following the Second World War, belief in the capacity of technology, of science and management, to order and improve the world became widely entrenched. In the mid-1950s, when a major symposium inspired by Marsh's work convened to assess "Man's Role in Changing the Face of the Earth," the seventy invited participants were generally positive about the changes they considered.[27] Although one of the organizers, Lewis Mumford, worried that there had been too much discussion of the ways in which people could exercise control over nature and not enough on the need for restraint, the prevailing attitude, of the symposium and the era, was encapsulated in some ironic doggerel written at the symposium by University of Michigan economist Kenneth Boulding. A work in two parts, it begins with sixteen lines styled as "A Conservationist's Lament": *"The world is finite, resources are scarce, / Things are bad and will be worse. /... Man is far too enterprising. / Fire will rage with Man to fan it, / Soon we'll have a plundered planet."* Then it continues with fourteen more lines offering "The Technologists Reply," which begins: *"Man's potential is quite terrific, / You can't go back to the Neolithic. / The cream is there for us to skim it, / Knowledge is power, and the sky's the limit."*[28]

In the third quarter of the twentieth century, the heyday of what James Scott has called the age of "high modernism" and the critical period in

the despoliation of northern cod stocks, the technologists' knowledge was power indeed, and most acknowledged its capacity to negate the conservationists' lament and resolve Boulding's dilemma by turning nature into something ordered, rational, and machine-like.[29] The 1950s were momentous years in American ecology, during which, it is now broadly agreed, the discipline fragmented. Some see this fragmentation as a consequence of a move away from holistic to reductionist approaches, others see it as the result of a shift from taxonomic to functionalist emphases.[30] In any event, during these years of relative intellectual turmoil in the field, the mathematization of ecology, new studies of island biogeography, the combination of population ecology and economic reductionism, and a focus on ecological objects (fish, trees) rather than upon the complex relations among the numerous components of ecosystems, brought the concept of Maximum Sustainable Yield (MSY) to the fore in resource management. By determining the size of and calculating growth or reproduction rates in forests or fish stocks, managers believed they could identify the extent of the "harvestable surplus." With this in mind (and with due consideration of economic and social as well as ecological factors), they could establish an Allowable Annual Cut or Total Allowable Catch, removal of which would ensure a perpetual yield of equal or increasing volume. Cogent, efficient, and seeming to meet the promise of providing the greatest good for the greatest number in the long run, the MSY doctrine created the conviction (some would say illusion) that natural resources are inexhaustible.

In the mid-1970s, a small group of ecologists associated with the University of British Columbia began to question the MSY dogma. Among them, C.S. (Buzz) Holling interrogated the simplifications inherent in the use of ecosystem theory for resource management, and Peter Larkin argued that ideas about the harvestable surplus rested on ideal types that ignored ecological realities and conceived of ecosystems as assemblages of commodities.[31] Holling even went so far as to ask his colleagues whether "our traditional view of natural systems ... might well be less a reality than a perceptual convenience." The complexity, indeterminacy, and openness of natural systems identified by these scholars and others are now widely accepted, and Holling's notion of resilience – "a measure of the persistence of systems and their ability to absorb change and disturbance and still maintain the same relationship between populations or state variables" – offers an important challenge to older ideas of stability and equilibrium in natural systems.[32] The world is a lot more complicated, and more difficult to manage, than proponents of MSY have taken it to be. Many

scientists had known this for years, of course. They appreciated, with Aldo Leopold, that "the biotic mechanism is so complex that its workings may never be fully understood" and, with Frank Egler, one of the leaders of the field in the 1950s, that "the ecosystem is not more complex than we think, it is more complex than we *can* think."[33] But resource managers could not find refuge in imponderable complexity. They were charged to think, and decide, as catch (and cut) rates had to be set each year. Managing nature depended on predictions, which depended upon models, which depended on assumptions, which depended on data (which were often partial). In the end, the whole business depended on a series of constructs and necessary simplifications. And 1992 proved that the predictions of those who managed the Newfoundland fisheries were awry.

But what if, Bavington asks, the pressures placed on ecosystem scientists to "set out simple and clear rules for proper ecosystem management" were removed (p. 117)? What if the very idea of "management" – an idea "rooted in the political and economic context of capitalist resource extraction"– were abandoned?[34] What if moral values replaced management techniques as the basis of the relationship between human and non-human nature? Bavington's answers to these questions, his musings about a new way forward, will not be entirely unfamiliar to those who have paid attention to recent debates about scientific practice among social scientists. Challenging the reductionism of modern science and "raising the spectre of irreducible uncertainty, context dependence, and relationality in scientific knowledge," he proposes a new "post-normal relational understanding of nature" as the route toward "a moral approach" to defining the "relationships that should exist between people and cod and their mutually supporting contexts" (p. 127). In Bavington's view, we need to acknowledge both the limits of our knowledge and our inability to extend it indefinitely. Above all, we need to replace the hubristic conviction that it is possible to manage and control nature with a more humble attitude that places justice, compassion, and learning above science, rationality, and profit in shaping our interactions with the earth.

Not all will agree with these views, especially if they overlook the complex intricacy of Bavington's argument. Indeed, there is a need for careful balance here. There is no doubt that political and public confidence in fisheries science was damaged by the events of 1992 or that efforts to deflect responsibility for the debacle onto others exposed some fisheries scientists to public ridicule immediately thereafter. The government slashed funding for fisheries research on Canada's east coast and, in 2005, an all-party Standing Committee of the federal parliament released a report titled,

bluntly: *Northern Cod: A Failure of Canadian Fisheries Management*.[35] Yet, there are dangers in following this track to the conclusions that all fisheries science has been discredited by this particular failure to deliver on a managerial promise, that scientific representations of nature are but one set of opinions among many, and that the common sense observations of fishermen are better than the quantitative constructs of fisheries science. Pause, in the wake of the 2009 Copenhagen Climate Conference, to consider the parallel implications that might be drawn from the efforts of some climatologists to attribute inaccurate predictions about the imminent disappearance of Himalayan glaciers to the work of social scientists, from the efforts to discredit the work of the Intergovernmental Panel on Climate Change with claims of collusion to suppress information and interference with the peer-review process on the basis of illegally obtained emails and documents, and from the argument that atmospheric science is of no value because its evidence of long-term global climate warming is contradicted by short-term fluctuations in the weather.

Neither scientists nor citizens will be well served by unbridled skepticism about scientific efforts to understand the processes that affect and change complex atmospheric, oceanic, or other systems. Shaped by internal tensions between positive and negative feedback loops as well as by emergent properties, complex organic systems are far more difficult to comprehend and to model than mechanical systems (such as the orbits of the planets).[36] There is, observes one commentator on these matters, a law of gravity but "no law for a cloud."[37] There may never be a cloud law. But this is no reason to reject the efforts of atmospheric physicists seeking better understanding of these phenomena. Even as climate scientists debate projected rates of climate change and dispute the details of future scenarios, there is ample scientific (rather than sensory) evidence that carbon dioxide has a warming effect on the atmosphere and that emissions of this gas are increasing. By the same token, and even as the particular failings of fisheries management that led to the 1992 moratorium are acknowledged, there seems no reason to abandon the quest for better scientific knowledge of fish and the waters in which they live. Such evidence, such knowledge will surely be integral to the process of making wise and informed decisions about what we do, about how we live in the world.

Yet, Bavington is right to question the authority widely granted to scientific/managerial estimates of the future state of complex organic systems. Given the uncertainties inherent in these systems, observes the mathematician and author of *Apollo's Arrow: the Science of Prediction and the Future of Everything* with reference to climate modelling, "trying to

make detailed mathematical predictions is just a distraction, another symptom of the hubris that got us into this fix in the first place."[38] Indeed, hubris may be reinforced by the very act of prediction, because it is easy to conclude that "if scientists can model the future ... they can control it as well." The effective management of nature has proven far more difficult than Marsh, and generations who followed him, thought. In this context, as we grapple with a growing sense that much is not right with the world, Bavington's efforts to shine a new and critical light on the managerial impulse that has underpinned decades of resource extraction around the globe offers an arresting call to find different ways of thinking about the state of our planet and our individual and collective roles in shaping its future. Let the discussion begin.

Preface

The aim of this book is to understand the history of, and possible alternatives to, managerial responses to environmental issues by examining one of the largest natural resource management failures of the twentieth century: the collapse of the northern cod fisheries off Newfoundland and Labrador, Canada. I wanted to understand this history partly to make sense of a childhood loss. I fondly remember fishing for cod with my father and grandfather off the St. Anthony point on the Great Northern Peninsula of Newfoundland. Before I reached my twentieth birthday, the cod fishery had collapsed, and a strict moratorium on fishing was imposed in 1992. The northern cod had been reduced to 1 percent of their historical abundance, and cod fishing as a way of life had come to an end.

After the cod collapse, fishing for cod off the point in St. Anthony became a crime for which one could be arrested. This book tries to understand the role that scientific management played in the destruction of the northern cod and the criminalization of fishing as a way of life. What I have found illustrates the destructiveness of management as it has been applied not only to the Newfoundland cod fisheries but also to fish, fishermen, and fisheries around the world. Understanding the damaging effects of fisheries management is all the more urgent today, as scientific management is often viewed as the solution to the global fisheries crisis.

To gain distance from management, I begin by developing and applying a critical theory of management to explore the history and consequences

of scientific ideas and interventions in the cod fisheries. I argue that fisheries management is deeply implicated not only in the collapse of the cod fisheries and the failure of cod stocks to recover but also in creating novel ecological and social problems that cannot be solved by new and improved managerial techniques.

In the rest of the book, I describe the ascendance of management within Newfoundland and Labrador cod fisheries, beginning with the introduction of the fisheries management idea and its development up to the time of the 1992 moratorium on cod fishing. I then present developments after 1992, emphasizing the tendency of politicians, bureaucrats, and academic researchers to offer new managerial strategies for the cod fishery rather than to call into question the managerial relationships themselves and to propose fundamental alternatives. I illustrate how, under post-1992 reforms, cod have become managed as elements in complex ecosystems as opposed to single-species populations; how traditional fishermen[1] who want to continue fishing are required to become self-managing professional fish harvesters; and how industrialists and government bureaucrats promote the idea that the wild cod fishery should be replaced by industrial fish farming.

The book concludes with a reflection on the development of management in the face of natural resource collapse. I offer suggestions for future political action in world fisheries that move beyond managerialism. I also focus on debates within the philosophy of ecological science that challenge the efficacy of management and on normative-political arguments that question its legitimacy. Future fisheries research would benefit immensely by listening to fisherman on how fishing should be done and to what end it should be pursued.

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Abbreviations

ACOA	Atlantic Canada Opportunities Agency
AFPR	Atlantic Fisheries Policy Review
CGP	Atlantic Cod Genomics and Broodstock Development Project
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFA	Department of Fisheries and Aquaculture
DFO	Department of Fisheries and Oceans
EBFM	ecosystem-based fisheries management
EEZ	exclusive economic zone
EI	Employment Insurance
FAO	Food and Agriculture Organization
FFAW	Fish, Food, and Allied Workers
FPI	Fisheries Products International
FRAC	Fisheries Recovery Action Committee
FRCC	Fisheries Resource Conservation Council
GLOBEC	Global Ocean Ecosystem Dynamics Project
GMOs	genetically modified organisms
ICNAF	International Commission for the Northwest Atlantic Fisheries

IQs	individual quotas
ITQs	individual transferable quotas
LEK	local ecological knowledge
MEY	maximum economic yield
MPA	marine protected area
MSY	maximum sustainable yield
NAFO	North Atlantic Fisheries Organization
NRC	Natural Resources Canada
NRM	natural resource management
PFHCBNL	Professional Fish Harvesters Certification Board Newfoundland and Labrador
PNS	post-normal science
SOHO	self-organizing, holarchic, open
TAC	total allowable catch

Managed Annihilation

1

A Sea Swarming with Fish

The sea is covered with fish which are caught not merely with nets but with baskets.

– Raimondo de Soncino, London, 18 December 1497[1]

On the surface, the story of the northern cod fishery appears to be a classic case of uncontrolled human exploitation, ignorance, and mismanagement pushing an unfathomably abundant species toward scarcity and extinction. Like the now-extinct flocks of passenger pigeons, at one point so numerous that they reportedly blocked out the noonday sun, or the seemingly infinite numbers of plains buffalo that once obstructed the paths of people for hours at a time, northern cod *(Gadus morhua)* and their abundance and decline have become legendary.[2]

The first European explorers to Newfoundland, at the end of the fifteenth century, reported schools of cod so thick that they slowed the movement of ships and could be scooped from the sea with baskets.[3] Codfish from Newfoundland fed the coffers, slaves, and subjects of the British Empire. Cod abundance in the waters off Newfoundland and Labrador supported the largest ground fishery in the world, leading to an international "cod rush" that attracted over twenty fishing nations in the second half of the twentieth century. From 1500 to 1992, approximately 100 million tons of cod were killed.[4] On 2 July 1992, the cod fishery that had been pursued for over 500 years came to a sudden end when Canada's fisheries minister – a Newfoundlander named John Crosbie, who had recently returned from the Rio Earth Summit in Brazil – made the staggering announcement that the northern cod fishery had to be immediately shut down.

Crosbie placed a moratorium on all cod fishing off the northeast coast of Newfoundland and Labrador, thereby ushering in the largest single-day layoff in Canadian history.[5] Over 30,000 people were put out of work,

and the cod were declared a *commercially* extinct species.[6] By 2003, after more than a decade of rotating fishing moratoria, cod were recommended for placement on Canada's endangered species list, raising the spectre of *biological* extinction.[7] Cod breeders – the so-called spawning stock biomass – were estimated to be at a level less than 1 percent of what they had been historically.[8]

So what happened? Did the cod simply suffer the same fate as the plains buffalo, the passenger pigeon, and the close to 200 species per day that we are told now go extinct? On closer inspection, similarities between the collapse of cod and other species break down. Unlike the demise of passenger pigeons, the plains buffalo, and contemporary species, the northern cod was *scientifically managed* out of existence. Rather than being a case of ignorance, neglect, or unwise management, prior to the moratorium, the northern cod fishery was presided over by one of the world's most comprehensive renewable resource management systems.[9] Almost overnight the northern cod fishery went from being an example of managerial best practice to being a textbook case of fisheries management failure.[10] The story of the northern cod fishery is an astonishing example of management creating the very thing that it was designed to prevent.[11]

Despite this failure, fisheries management has not suffered the fate of fish and fishermen. Most retrospective investigations into the cod collapse have highlighted numerous cases of mismanagement, producing a vast array of proposals for new and improved managerial interventions. Academic, bureaucratic, and economic discussions on what to do about the cod collapse, over a decade after it occurred, have largely become arguments over competing managerial designs, with disagreements over *what* should be managed, *who* should do the managing, and *how* fisheries management should be reinvented.

Although these proposals for the reinvention of cod fisheries management often suggest contradictory explanations for the underlying causes of the fishery collapse and offer divergent proposals for intervention, they all agree that new and improved management is the solution. The proposals differ only on the specifics of their managerial designs. None questions the usefulness or appropriateness of the *idea* of management itself. Only a select few protest against management dictating responses to the cod collapse. The inherent worth of management is taken as a given, and the implications of framing the cod collapse as a management failure are left largely unexplored.

Could it be, however, that the very idea of managing fish is somehow flawed? In the rush to propose managerial solutions to the cod collapse,

could an important opportunity to thoroughly explore management itself, and the relationships that it brings to nature, have been overlooked? Is it possible that cod fisheries management is part of a broader managerial ecology that raises management to an ideal, thereby confining responses to the cod fishery collapse and other mounting environmental crises? Despite broad agreement and volumes of academic and governmental studies on the failure of cod and other fisheries management, the underlying idea of management itself and, more broadly, the inherent *value* of managerial ecology have largely escaped critical engagement. My purpose in this book is to historicize management by focusing on two critical issues: the interrogation of the idea of management as it has been, and is currently being, applied to cod fishermen and cod fisheries in Newfoundland and Labrador, and an exploration of the possibilities for thinking before and beyond managerial ecology more broadly.

Managerial Ecology and Our Relationship with Nature

> *Management is a tertiary skill – a method, not a value. And yet we apply it to every domain as if it were the ideal of our civilization.*
>
> – *John Ralston Saul,* The Doubter's Companion [12]

Carolyn Merchant describes managerial ecology as a modern utilitarian approach to nature with philosophical roots in the Age of Enlightenment and the revolutionary economic, political, and scientific order that began to emerge in Europe in the sixteenth and seventeenth centuries. As society became increasingly organized around the dictates of the market and a scientific view of nature gradually replaced organicism, "a value system oriented to nature as a teacher whose ways must be followed and respected" gave way to a system of human values focused on "efficiency and production in the sustained use of nature for human benefit." Managerial ecology became the dominant way of framing society-nature interactions as modern people sought to "maximize energy production, economic yields and environmental quality through ecosystem modeling, manipulation, and prediction of outcomes."[13] Management and modernity emerged historically together in western Europe.

By assuming that solutions ultimately lie within the hands of managers, that better organization is the key to improvement, and that problems can

be solved merely by increasing effort or efficiency, managerial ecology has come to significantly constrain human relations with the natural world, obscuring alternative ways of framing and responding to environmental issues.[14] Although theories, practices, philosophies, and meanings of management have changed significantly over time, faith in management's applicability has only strengthened.[15] Indeed, management of all kinds expanded rapidly in the twentieth century to become ubiquitous, dominating the ways in which social, economic, political, and environmental issues are framed and addressed.[16] As R. Paehlke and D. Torgerson state, "if there is a problem, better management is often assumed to be the solution. This assumption has deeply influenced the rise of advanced industrial societies and now guides much of the response to environmental problems."[17]

Max Oelschlaeger supports the observations of Paehlke and Torgerson, tracing managerial responses to the global ecological crisis back to the Age of Enlightenment. It is not surprising that the Western intelligentsia "would want to manage their way out of ecocrisis," Oelschlaeger explains, "because that is the Western *paradigm.* We have been trying to manage the planet for at least three hundred years."[18]

Management thinking now defines much environmental scholarship and practice. For example, charts and measurements, central to the enterprise of modern, scientific geography and planning, are vital to the exercise of managerial powers. This is the case not only for empires and states[19] but also for economic elites and corporations interested in conquering, instrumentalizing, and commodifying space. Such ambitions are clearly reflected in the contemporary digitization and remote sensing of space, whether the aim is to manage fish, forests, and fields, competitive commercial advantage, or modern warfare.[20] Despite proclamations by environmental scholars about worldwide crises, pathologies, and even the end of management itself, managerial interventions remain firmly mapped across the face of the Earth and stand unchallenged as the dominant legitimized response to a host of social, political, economic, and ecological problems.[21]

What Does Management Mean?

Despite the grip that management holds over the contemporary imagination, clear definitions of the term, and its implications, remain largely unexplored. At first blush, *management* appears to be a word without history or geography, a received tool, a ubiquitous technical necessity, a

rational given. Management has been described as a "plastic," archetypically pliable term because its use conjures up numerous connotations without a specific denotation.[22] However, the etymology of the word *management* foils this interpretation. The term, in fact, encompasses three principal meanings: management as control, management as caretaking, and management as coping.

Management as control originated in Italy during the sixteenth century. Descending from the Latin root word for "hand," *manus,* the Italian *maneggiare* suggests the exertion of dominion over nature through the breaking and training of wild horses.[23] Extended through to the present, the essence of management as control can be found in the faith that management can successfully manipulate nature, human beings, and, increasingly, the enterprise of management itself.[24]

Management as control implies a sovereign power, steering and directing the managed along a charted course. As Petter Holm observes, "management is a control strategy by which processes or people are handled indirectly through a system of representation."[25] These representations simplify the world, turning it into a malleable space. Through a wide variety of scientific and technical methods, people and other living species are rendered legible as resources, or "standing reserves" in Martin Heidegger's words,[26] subject to manipulation by managers. Once objectified and quantified, the world becomes an actionable space open to rational control and instrumentalized intervention from a distance.[27]

Management, however, means much more than manipulation, iron fists, and control. During the early part of the seventeenth century, the meaning of management was influenced and confused further when the French word *ménager,* meaning "to use carefully,"[28] was introduced into the English language. With its Latin root, *mansionem,* meaning "a dwelling or household," *ménager* shifted the meaning of management to a different location (the household [*oikos*] in place of the horse corral), a different set of activities (housekeeping as opposed to wild horse training), and a different set of attitudes (caretaking and wise stewardship instead of brutal command and control). The caretaking sense of management introduced a domestic and morally positive association of management with housekeeping, stewardship, and husbandry. With caretaking, the iron fist of management as control donned a velvet glove.

This warm, paternal meaning of management, conjuring up illusions of happy households, well-tended gardens, and wise pastoral custodians, introduced a misunderstanding of its application throughout the seventeenth and eighteenth centuries.[29] Whereas management as control

referred to a hierarchical two-way relationship between the manager and the managed, management as caretaking placed the manager in the role of custodial middleman, entrusted to economically use objects previously mapped and staked by an owner or master creator in the heavens.[30]

Management as caretaking involves a hierarchical three-way relationship between owners, stewards, and wards.[31] Stewards look after and carefully use private property ultimately owned, and thereby presumably controlled, by someone else positioned above the steward. Management as caretaking does not indicate a relationship of altruistic care for another person or an autonomous subject that is accorded intrinsic value; rather, it implies looking after and tending to objects and possessions – forms of property with instrumental value. Management as caretaking, therefore, points not only up to control but down to a third meaning of management, one epitomized by the position of the ward or the managed.

The plight of wards, workers, targeted populations, and others who are managed is to cope with being controlled and carefully used. This third meaning of management, management as coping, therefore, implies the opposite of management as control and management as caretaking. Coping as a management strategy is a response to being controlled or carefully used. It refers to situations of unequal power where the one coping is reduced to "a subsystem, a creature that functions within an oppressive system."[32] Management as coping implies that one is "just getting by," passively adapting to a system or environment over which one has little say, ownership, or control. None of these meanings of management situates the actors as equal citizens in a *polis* allowing them to engage in democratic politics. At the top of the hierarchy, managerial actors are situated as masters, trainers, and directors; in the middle as husbands heading households; at the bottom as slaves, wards, usable property.

When control or caretaking breaks down, the position of the manager can suddenly become that of the ward. In the context of managerial failures, managers can merely cope with disorder, uncertainty, and conflict while trying desperately to survive long enough to restore an order that allows them to regain control and caretaking ability. When this type of desperate managerial coping appears in natural resource management, the overwhelming tendency is for the control and caretaking functions of management to shift their targets – from what is understood to be irreducibly complex and therefore unmanageable to something perceived as more manageable. In this instance, management as coping becomes an instrumental, institutionalized response to a crisis brought on by a temporary loss of control or caretaking ability.

As inequality and perceptions of threats posed by global systems failure, risk, uncertainty, ignorance, conflict, and complexity have increased, management as *control* and management as *caretaking* have declined in significance, leading to the expanded use of management as *coping* in natural resource management theory and practice.[33] This is perhaps most clearly evident in discussions about global climate change. The conversation has expanded in recent years from narrow talk of controlling or mitigating global warming to broader discussions that propose adaptive strategies to cope with the world-changing effects of climate change. This expansion of management amounts to an acceptance of the industrial way of life and ecosocial relations that have ultimately led to the climate crisis. Coping forms of management, therefore, conserve status quo hierarchical social and ecological relations.

From humble beginnings in horse handling and housekeeping, managerial thinking has expanded in scope to include economies, ecosystems, resources, environments, industries, transnational corporations, human labour, and the planet itself. Even emotions, values, beliefs, motivations, and life in general are now viewed as being in need of, and amenable to, managerial interventions. Internal human natures and external biophysical natures have become the objects on which management operates. In any or all of its three guises, management has been used to describe most every aspect of daily life, and, in so doing, it has entrenched the notion that everyone everywhere is a manager – and always has been.[34]

It is important to remember that in practice management remains rhetorically pliable. It can simultaneously mean control and coping with the lack of control; careful use and coping with misuse; controlling private access while promoting participatory stewardship; and coping when all the assumptions permitting a belief in control and caretaking have broken down. In this context, battles are waged over preferred *styles* and *types* of management as opposed to drawing attention to the effects of pervasive managerialism (see Figure 1.1).

As the critical management scholar Martin Parker observes, managerialism, of which managerial ecology is but one example, focuses on a narrow conceptualization of management as a generalized technology of control and caretaking applied "to everything – horses, humans and hospitals. This is management as the universal solution, not a personal assessment of a local problem."[35] Management applied as a universal solution to a world defined as a series of technical problems serves to silence assessments made by non-experts and those identified as problems in need of management. Managerial ecology – the particular version of managerialism that

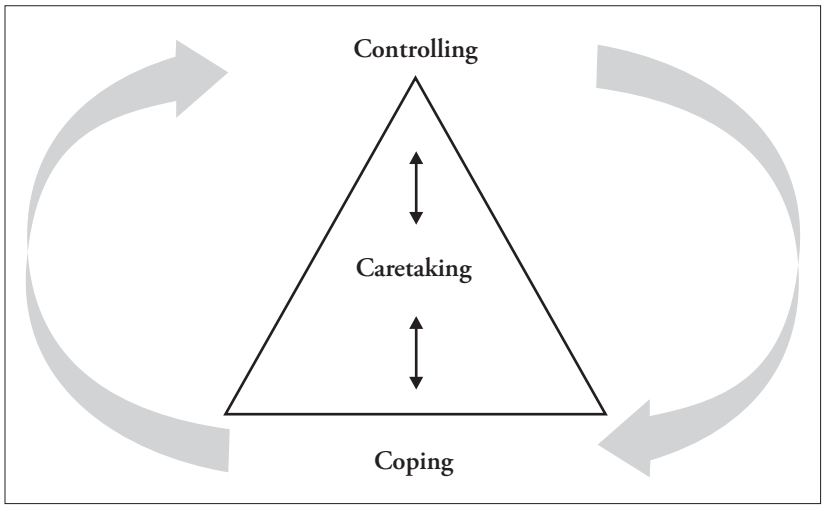

Figure 1.1 Major managerial meanings and their hierarchical relations

targets nature and was constructed during the Age of Enlightenment – is deeply implicated in the environmental crisis and limits our collective capacity to imagine alternative forms of organizing relationships with nature.

The expansion of management and its colonization of environmental discourse and practices of interacting with nature should not be taken as a sign of the end of history, leaving us with little more than cynicism or acquiescence. Rather, this state of affairs points to the need for a critical understanding of the enterprise of management itself. It is important to ask how management has mobilized human relationships with nature and how it has been deployed to address environmental issues at particular times and in specific places. Only when a clear description of the multiple meanings of management, their interconnections, and how they have been expressed in particular geographical practices over time is achieved can a space be provided in which to begin to understand managerial ecology and possible alternatives.

Managerial Ecology: The Case of the Northern Cod Fishery

In a comprehensive review and categorization of the cod fisheries management literature published since the fishing moratorium was declared in

1992, environmental historian Sean Cadigan groups the various management remedies for the fishery into two main schools of thought.[36] One school of thought supports a neoliberal management perspective that has significantly influenced government policy in the wake of the northern cod collapse. Another, less influential, school of thought comes from socialist and communitarian perspectives. Both schools advocate managerial approaches to address the fishery collapse.

The neoliberal school of thought frames the cod collapse as a classic case of Garrett Hardin's influential "tragedy of the commons" thesis.[37] Hardin presents a tragic neo-Malthusian tale. A common pasture is destroyed when its users, modelled as a collection of individuals out to maximize their short-term gain, overexploit the unpriced, uncommodified grass of the commons by grazing as many cattle on it as they can. Tragedy ensues when the carrying capacity of the common pasture is exceeded as each individual attempts to maximize gain. The thesis assumes that individual self-maximizing behaviour is a natural, universal characteristic of human beings and suggests that privatization of the commons, by turning it into either state or individual property, is the only available avenue by which to avert tragedy. It also assumes that the pasture has a calculable carrying capacity that can be determined with enough accuracy to allow maximum exploitation.

Hardin's presentation of people as asocial, atomized, self-interested individuals and commons as tragedies waiting to happen has been criticized for naturalizing and reifying a narrow view of human and biophysical nature and for mistaking a tragedy of open access for a tragedy of common property resource systems.[38] The tragedy also seems to imply the empirically dubious claim that, if the commons is turned into property (public or private), overexploitation will automatically be averted.[39]

Neoliberals advocate a thorough privatization of fisheries, favouring managerial tools that achieve "mutual coercion mutually agreed upon" through the self-organizing disciplinary power of the market's invisible hand. They argue that, when Canada extended national jurisdiction over its 200-mile exclusive economic zone in 1977, it did not manage the new national property in the interests of cod.[40] Rather, the enclosed ocean space was managed as monopolized state property to implement social policy objectives, such as maximizing modern fisheries-related employment and negotiating favourable terms of trade for Canadian exports.[41]

Neoliberals argue that creating and defending exclusive property rights for fish would remove this legacy of ecologically harmful and expensive government control over fisheries management. They propose that, by

transferring management tasks to professionalized fishermen with an interest in conserving private property allocated as individual transferable quotas (ITQs), fishing behaviour can be steered by self-regulating free market mechanisms rather than central planners in Ottawa.[42]

On the other side of the cod fisheries management debate is the socialist-communitarian school of thought. It frames the cod collapse as a tragic case of state mismanagement driven by the interests of an industrial capitalist system that promoted inappropriate scientific and industrial models of cod, fishermen, and the fishery. Proponents of this perspective, however, argue for a reinvented fisheries management re-embedded in the interests of coastal communities through the encouragement of "new partnerships between fishers, fisheries scientists and fisheries managers."[43]

This approach to fisheries management, while rarely implemented as government policy, has encouraged a wide variety of policy research in three broad areas. First, there is a growing literature advocating the integration of local ecological knowledge into fisheries science and management.[44] Second, scholars are exploring the ways in which normative control, based on community stewardship ethics and nested governance rather than top-down, state-mandated rational control, can be maintained, encouraged, and recovered.[45] Third, some researchers argue for the allocation of fishery resources to place-based communities through the adjacency principle to address equity concerns.[46] The socialist-communitarian position focuses on debunking the tragedy of the commons thesis, illustrating historical and contemporary examples of the communal management of collective property – given the right norms and material conditions.[47]

Neither the neoliberal nor the socialist-communitarian schools of thought fundamentally question the need for, or the usefulness of, management. Both agree that management is the solution, and they simply argue over the correct managerial means. Management is often equated with all forms of organization and order. The neoliberal perspective places fisheries management within a history beginning with Canada's enclosure of the ocean commons in 1977. It frames management as a triumphant story of scientific and technological linear progression toward increasing human control, prediction, and ultimate stewardship of enclosed sections of commodified and domesticated nature. In neoliberal accounts, inefficient state-led fisheries management is to be replaced by finely tuned market mechanisms that steer the behaviour of an exclusive group of economically rational professional fish harvesters.

The socialist-communitarian school of thought criticizes the massive inequalities generated by state-guided scientific fisheries management and

the market managerialism of the neoliberals. However, in a bid to justify the value of fishing people in the wake of the cod collapse, socialist-communitarians have tended to naturalize management as a neutral tool that can be put to good use if control and caretaking are deployed by local fishing communities in partnership with social scientists and the state.[48]

Both neoliberal and socialist-communitarian schools of thought rely on narrow assumptions of human nature and the benefits of enclosing fish stocks as *property* to achieve control over, and careful use of, nature.[49] Both represent fishing people as economically rational actors who naturally seek to maximize short-term profits from their individual fishing activities in the absence of managerial constraints or incentives.[50] Although neoliberals propose competitive market mechanisms to achieve managerial constraint on individual economic actors, socialist-communitarians argue that a variety of cultural practices and institutional designs can achieve managerial constraint in ways that make it economically rational for individuals to co-operate. In both schools of thought, managerial constraints are to be achieved through enclosure of "the oceans within carefully delimited regimes of property, be those regimes of collective, state, or private control."[51] Fish are conceptualized as living property or swimming inventories that can be owned long before they are actually captured.

Existing fisheries management regimes in Newfoundland and Labrador have favoured the neoliberal approach that reflects the federal and provincial governments' current passion for market-based solutions. Parts of the socialist-communitarian argument for cultural practices and institutional designs that encourage co-operative management of collective and state-owned *property* have been applied as long as they have been made congruent with government downsizing and downloading initiatives.[52] However, both of these approaches have helped to enlarge managerial ecology without fundamentally questioning the enterprise of management itself, with its focus on the control and caretaking of nature conceived as various forms of available and alienable property.

Questioning Managerial Ecology in Cod Fisheries

To gain critical distance from the ideological debates in cod fisheries management, and to explore the possibilities for thinking before and beyond managerial ecology, it is important to answer three main questions. First, "when, how, and why did management come to be applied to cod

fishing, and what was the original form of the management regime in Newfoundland and Labrador?"

Second, "what have been the major managerial responses to the collapse of the cod fishery?" Detailed answers to this question illustrate the ongoing resilience of managerial ecology in the face of failure and document the specific ways in which cod fisheries management in Newfoundland and Labrador has been restructured in response to the demise of wild cod.

And third, "are there alternatives to managerial ecology in cod fisheries and beyond?" Answers to this question serve three main purposes. First, they provide an opportunity to reflect on the cod story and clarify exactly how managerial ecology has expressed itself in cod fisheries. Second, answers provide not only ground from which to explore patterns of society-nature relations that existed before the onset and development of managerial ecology in the cod fisheries but also a vantage point from which to understand why fishing people resist industrial fishing tools and the management that necessarily accompanies their introduction. And third, answers permit an exploration of the possibilities that currently exist to move beyond managerial ecology in cod and other fisheries worldwide.

I will explore the answers to these three important questions throughout the remainder of the book, which is divided into three main sections: the introduction and development of cod fisheries management; the managerial responses to the collapse of the cod fisheries; and alternatives to management and managerial ecology in cod and other fisheries around the world.