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DOI: 10.1111/j.1541-0064.2007.00171.x

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Competing use of marine space in a modernizing fishery: salmon farming meets lobster fishing on the Bay of Fundy

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Coastal fishing communities are frequently portrayed as bastions of tradition at odds with the modernizing forces of technological change and industrial capitalism. This article examines this debate in the context of intensive aquaculture introduced into regions formerly dependent on the wild fishery, specifically with respect to the explosive growth of salmon farming in New Brunswick. New farm sites are large, often located within or close to traditional lobster fishing areas, which has motivated considerable opposition from local fishermen. This article presents findings from research on interactions between salmon farming and lobster fishing around Deer Island and Grand Manan, New Brunswick. Fishermen and salmon farmers are concerned about possible long-term effects of farm operations on marine environmental quality and lobster health, and many are concerned about the concentration of ownership and lack of local control over the aquaculture industry. The potential for physical displacement from traditional fishing grounds is real, but the actual impacts have been tempered by a combination of factors, including unusually large lobster catches in recent years; technological advances that have encouraged a shift in lobster fishing effort further offshore, away from salmon farm sites; and social accommodations between salmon site managers and those who fish

L'exploitation compétitive de l'espace marin dans un secteur de la pêche en voie de modernisation: la salmoniculture se heurte à la pêche au homard dans la baie de Fundy

Les villes côtières vivant de la pêche sont souvent considérées comme les derniers bastions de la tradition, en opposition aux forces modernisatrices représentées par les changements technologiques et le capitalisme industriel. L'article étudie cette position dans le contexte de l'arrivée intensive de l'aquaculture dans des milieux qui dépendaient de la pêche de stocks sauvages, particulièrement en ce qui a trait à la croissance fulgurante de la salmoniculture au Nouveau-Brunswick. Les nouvelles fermes d'élevage sont de taille importante, souvent situées à l'intérieur ou à proximité des lieux de pêche traditionnels du homard, ce qui amène les pêcheurs locaux à manifester leur opposition. Cet article présente les conclusions d'une recherche portant sur les interactions entre la salmoniculture et la pêche au homard dans les eaux environnantes de Deer Island et Grand Manan au Nouveau-Brunswick. Les pêcheurs et les éleveurs de saumon sont préoccupés par les impacts potentiels à long terme des exploitations salmonicoles sur la qualité du milieu marin et sur la santé des homards. Plusieurs s'inquiètent de la concentration de la propriété et de l'absence de contrôle local sur l'industrie aquicole. Si les risques

near salmon farms. More generally, tensions between the two sectors are tempered by overlapping economic interests between fishers and farmers in their respective industries, and by aspects of local 'tradition' that are consistent with the socio-economic and cultural transformation wrought by this new industry.

de devoir quitter les lieux de pêche traditionnels sont réels, les impacts concrets sont toutefois tempérés par une combinaison de facteurs tels que les captures inhabituellement élevées de homard au cours des dernières années, les développements technologiques qui ont permis à la pêche au homard de se déplacer au large des côtes et de s'éloigner des zones d'élevage du saumon et des accommodements sociaux entre les gestionnaires des sites salmonicoles et ceux qui pêchent près des fermes d'élevage. D'une manière générale, les tensions qui existent entre ces deux secteurs sont atténuées par des intérêts économiques communs entre les pêcheurs et les éleveurs qui œuvrent dans leurs industries respectives, et par des facteurs liés à la «tradition» locale qui correspondent aux transformations socioéconomiques et culturelles apportées par l'arrivée de cette industrie.

Introduction

Most coastal fishing communities are geographically isolated and have long-established dependence on the sea for livelihood. These conditions foster a strong sense of self-reliance, community identity, and visceral attachment to fishing as more than just an occupation, but as a 'way of life' (Smith 1977; Acheson 1981; Wilbur and Harvey 1992). Not surprisingly, the forces of modernization—industrial capitalism, technical specialization, penetration of global markets, etc.—are often met with skepticism, if not outright opposition, by residents of coastal communities.¹

The widespread development of industrial aquaculture has brought substantial socio-economic and environmental changes to many coastal communities (Weeks 1992; Bailey *et al.* 1996). Yet, remarkably little research has sought to understand in what ways the introduction of this quintessentially modern industry might impact existing fishing practices and wider, coastal community interests. Aquaculture can generate economic opportunities that complement existing resource uses and values (Bernal *et al.* 1999; Perez-Sanchez and Muir 2003; Buck

et al. 2004). Adverse impacts have also been documented, including marine pollution, social conflict and displacement of existing resource users (Stephenson 1990; Weeks 1992; Primavera 1993; Millar and Aiken 1995; Anutha and Johnson 1996; DeWalt *et al.* 1996; Aarset 1998; Naylor *et al.* 1998; Walters 2003).

In particular, social science research has revealed complex patterns of marine space utilization by traditional fishermen (Acheson 1981; McCay and Acheson 1987a). Nearshore fisheries are often characterized by fidelity to specific areas wherein fishing access is restricted to certain individuals or groups (Christy 1982; Davis 1984; Acheson 1988; Dahl 1988; Cordell 1989; Bailey and Zerner 1992; Recchia 1997; Wagner and Davis 2004). The use of fishing grounds year-after-year and even over generations can lead to the development of in-depth knowledge of local fishing conditions and, in some cases, a high degree of economic dependence on these areas (Johannes 1981). In this regard, the de facto privatization of ocean space that occurs with the introduction of large-scale marine aquaculture may be highly disruptive of customary fishing practices.

Salmon aquaculture is among the fastest growing and now largest industries in New Brunswick (Mandale *et al.* 2000). From their initial appearance in the late 1970s, farm sites have multiplied in number and expanded in size, and are now

1 In these regards, coastal communities can be viewed as members of the wider 'resource periphery' (Hayter *et al.* 2003).

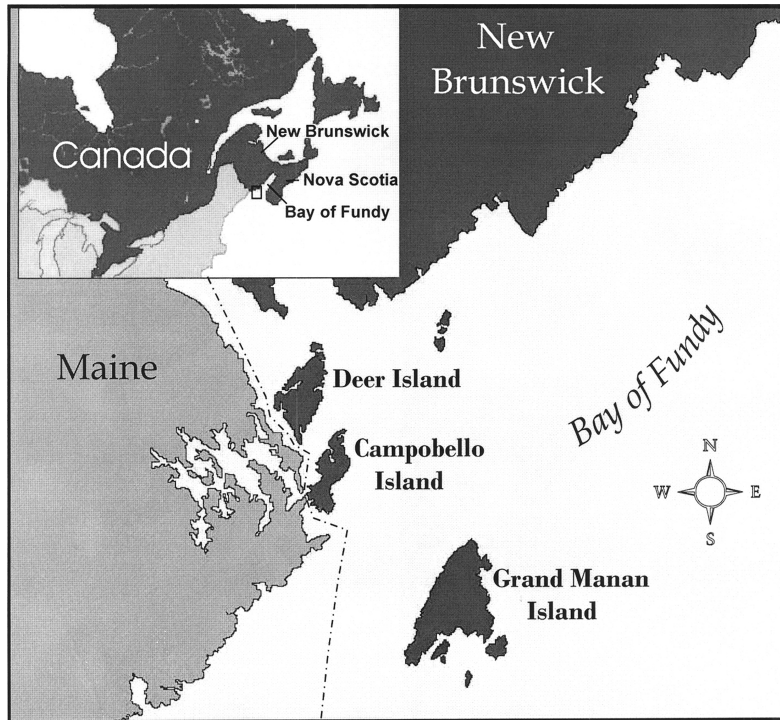


Figure 1
Map of Grand Manan and Deer Island, Bay of Fundy, New Brunswick.

commonplace along the southwest coast of New Brunswick in the Bay of Fundy. Salmon aquaculture has generated considerable employment and economic prosperity in New Brunswick coastal communities that might otherwise be in decline. Nonetheless, the industry's rapid expansion has generated controversy in many of these same communities (Stephenson 1990; Millar and Aiken 1995; Dwire 1996; Phyne 1996; Marshall 2001). In particular, new salmon farm sites often compete for space with traditional fishing of lobster, herring and scallop. Furthermore, chemical treatments for salmon diseases are thought by some to pose a risk to the health and quality of harvested benthic invertebrates, such as lobster (Milewski *et al.* 1997; Haya *et al.* 2001; Waddy *et al.* 2002).

This article reports findings from an ethnographic study of the interactions between recently introduced salmon farms and traditional lobster fishing around Grand Manan and Deer

Islands in the Bay of Fundy, New Brunswick (Figure 1). The research is guided by the following general questions: What perceptions and concerns do lobster fishermen and salmon farms have regarding their respective industries? How has the development of salmon farms affected lobster fishing practices and, in particular, the use of marine space?

Modernization, Community and Common Property Fisheries

The social science literature on coastal fisheries and fishing communities is diverse, but broadly indicative of two general perspectives or paradigms: one neo-liberal and economic in focus and the other social or community-centred (Charles 1992; Jentoft and Davis 1993; Apostle *et al.* 1998; McCay and Jentoft 1998; Wilson and Jentoft 1999; Wiber 2000; McCay

2002; Mansfield 2004a; St. Martin 2006).² Most economists approach issues of fisheries management and coastal community development from a neo-liberal economic perspective that makes individual agency, economic efficiency and privatization of fishing rights central to understanding and resolving the challenges facing coastal fishing communities (Wiber 2000; Mansfield 2004b). This perspective views fishermen as rational, self-interested actors whose primary motivation is individual utility maximization within a competitive market context. Marine resources such as fish are difficult to manage because secure property rights over them cannot be readily established and, lacking such rights, resource users have little incentive to limit their harvest, especially given that other fishermen are competing to catch the same fish. This dilemma makes over-exploitation of marine resources inevitable, that is, a 'tragedy of the commons' (Gordon 1954; Hardin 1968) or, more properly, of open access resources.

By contrast, anthropologists or sociologists are more likely to emphasize social-structural or cultural aspects of the human condition and how this bears upon the identity, social relations and practices of fishermen and wider members of the community; what I will refer to hereafter as the 'community-centred' perspective (McCay and Acheson 1987b; McCay and Jentoft 1998; Newell and Ommer 1999; Wiber 2000; Grafton 2005; St. Martin 2006). This paradigm views the actions of fishermen as not solely economic in nature, but guided also by norms and values that reflect their 'embeddedness' in particular cultural and historical contexts and within networks of wider social relations in the community (McCay and Jentoft 1998; Wilson and Jentoft 1999; cf, Polanyi 1944; Granovetter and Swedberg 1992). The relevance of this paradigm to marine natural resource management is best illustrated by research in the now thriving field of common property resource (CPR) studies, which has demonstrated both theoretically and through numer-

ous empirical case studies, the potential for resource management practices to emerge and be sustained at the local, community level (McCay and Acheson 1987a; Acheson 1988; Berkes 1989; Cordell 1989; Pinkerton 1989; Feeny *et al.* 1990; Ostrom 1990; Singleton and Taylor 1992; Ostrom *et al.* 2001; St. Martin 2001; Walters 2004).

In many respects, the neo-liberal economic paradigm has become ascendant in mainstream Canadian fisheries policy over the last 30 years, as the federal government has sought to restrict entry to the fishery and, at the same time, encouraged capital investment, technological modernization and other strategies (training, etc.) intended to 'professionalize' those fishers who remain (Davis 1991; Apostle *et al.* 1998, 2002b). Yet, recently aspects of the community-centred paradigm have also become acknowledged and (selectively) employed by the federal government in various settings, including in scientist-fisher collaborations in fishery knowledge generation; multi-stakeholder consultation processes in policy making; fishery co-management experiments; and Aboriginal self-government initiatives (Apostle *et al.* 1998; Newell and Ommer 1999; Neis and Felt 2000).

The promotion of intensive aquaculture, including salmon farming, sits comfortably within a neo-liberal fisheries strategy as it is based on the private enclosure and micro-managed control of specific areas of the marine commons, and generates significant and concentrated returns from large capital and technological investments (Marshall 2001). It could be argued that aquaculture is the ultimate realization of the neo-liberal ideal as applied to coastal fisheries management in that it could, in principle, eventually eliminate altogether the need for the (inefficient, ungovernable and inevitably tragic) wild-caught fishery.³

There has been considerable social upheaval and local opposition to the development of industrial aquaculture in sites around the world

2 Of course, this is a gross simplification of what constitutes a varied and complex literature. Nonetheless, it becomes quickly apparent when delving into this literature that much of the debate among social scientists is framed within some variant of these broadly opposing/binary categories or 'paradigms'. Charles (1992) describes a third, 'conservation' paradigm, but this view is chiefly held by natural/biological scientists, not social scientists.

3 There are of course many practical problems with such an idealized scenario, among them the externalities caused by one fish farm that impact other farms (pollution, disease, etc.). As well, most salmon fish food comes from wild caught fish lower down the food chain (herring, anchovies, etc.). The growth of salmon farming in some parts of the world is thus creating new wild caught fishery management challenges in other parts of the world.



where it has been introduced, including Canada (Bailey 1988; Stephenson 1990; Millar and Aiken 1995; Dwire 1996; Phyne 1996; Stonich and Bailey 2000; Walters 2003). Viewed from the community-centred perspective, local opposition to aquaculture comes as no surprise given its potential to compete directly for space with traditional fishing. But there may be more to the opposition than just competition for space. Compared to traditional fisheries, aquaculture operations typically involve more bureaucratic and hierarchical systems of labor organization and are more likely to be owned by outsiders to the community. In this respect, the introduction of aquaculture may, for better or worse, significantly alter existing social and economic relations in the wider community. For example, regarding the development of salmon farms on Grand Manan Island, Marshall (2001, 350) paints a grim picture, suggesting that, 'The introduction of new productive relations that are directed from outside the community, and the alienation of the very marine spaces that have sustained the community over generations, together threaten to, at the very least, *completely transform all social relations*' (italics mine). She further adds that,

Increasing privatization of the marine commons is fundamentally a disenfranchisement of all traditional fishers, effectively precluding sustainable livelihoods within the wild fishery. The loss of local control threatens to transform the communities into "competitive, atomized, and dependent entities" (Marshall 2001, 350).

This statement gets to the heart of the community-centred paradigm; namely, that processes of neo-liberal privatization and economic development bring with them fundamental changes not only to pre-existing patterns of marine resource access and control, but also to core social relations within the community (St. Martin 2006). But, as some authors have noted and the findings from this study show, the gap between the neo-liberal economic and community-centred paradigm is not as wide as is often portrayed (McCay and Jentoft 1998; Mansfield 2004a, b). Thus both perspectives acknowledge that secure property rights—vested either in the individual or in the community—are usually critical for effective marine resource management. Both also appear to recognize the resourceful, self-reliant and

competitive nature that characterizes most fishermen (Smith 1977; Acheson 1981; Jentoft and Davis 1993; McCay 1999; St. Martin 2001; Mansfield 2004b; but see also Davis 1991). In short, coastal communities are often culturally rich in tradition and socially complex, but this does not necessarily make them unduly vulnerable or inevitably opposed to the processes of neo-liberal economic rationalization.

Lobster Fishing in Southwest New Brunswick

The southwest corner of New Brunswick along the Bay of Fundy has long depended on marine resources, including significant fisheries for herring, groundfish (cod, pollock, haddock), anadromous fish (salmon, gaspereau, alewife), invertebrates (lobster, scallop, crab, clams, urchin) and seaweeds (dulse, rockweed) (Lotze and Milewski 2002). Lobster is the most widely and intensively fished species in the region. Since its development as a significant industry in the mid- to late 1800s, lobster fishing has been one of the economic mainstays of dozens of coastal mainland and island communities. Fishermen in the region are traditionally occupational pluralists: shifting fishing effort to and from lobster to groundfish and other species, depending on the season and the relative abundance and market value of different species. Lobster fishing is attractive because it often fetches good market prices, although this was not always the case (Ingersoll 1970). Also, the relatively simple technology required for lobster fishing has meant that fishermen could fall back on lobster in hard times.

Lobsters are fished from relatively small, agile boats that enable the precise setting of traps on the ocean bottom, on rocky substrate in relatively shallow waters, preferably close to port. Fishermen typically employ two trapping strategies. In shallow waters where setting is precise and retrieval relatively easy, traps are set in sequence (a 'line') individually or in pairs with each buoyed to the surface. In deeper waters, because of the difficulty in retrieving traps, fishermen typically deploy 'trawls', sets of three to twenty-five traps that are spaced apart but joined together by rope, with buoys floating at each end of the trap line.

Lobster fishing is regulated by season, trap limits per licence and minimum size of landed lobster. The total number of licenses is capped, limiting new entry to only those who can acquire pre-existing licenses. Lobster licences are allocated based on government-designated, Licence Fishing Areas (LFAs), which restrict in absolute spatial terms the areas within which individual fishermen are permitted to set traps. Fishermen typically fish within much more limited areas, however, based on such considerations as knowledge about the location of good fishing grounds, relative proximity to home port, and use of different areas by other fishermen (lobster and otherwise). In many cases, lobster fishermen also adhere to certain fishing areas based on a degree of tradition. In short, they often fish within informal territorial boundaries that have been defined by generations of previous fishermen as a way to minimize conflict between fishermen from different ports or familial cohorts (Davis 1984; Acheson 1988; Recchia 1997; Gendron *et al.* 2000; St. Martin 2001; Wagner and Davis 2004). Within these varied formal and informal constraints, there typically exist considerable variation and opportunism in the setting of traps: individual fishers often experiment with untried areas, move their traps within and between seasons, and compete on a first-come-first serve basis for setting on the best grounds. These practices are shaped by informal rules. For example, the setting of a trap line over-top of a pre-existing line is viewed as a serious transgression that typically entitles the initial setter to cut the line of the latter setter.

Compared to the dramatic fluctuations and changes in other fisheries, the lobster fishery has remained relatively stable over time. For example, in contrast to the corporatization that characterizes most other modern fisheries, lobstering remains almost exclusively a small-boat, owner-operated fishery in which licence holders are required to fish their own licences, thus preventing concentration of licence ownership.⁴ The basic harvesting gear used in lobster fishing

has changed remarkably little as well: the passive, bottom traps set by lobster fishermen have evolved in design and material construction, but show considerable resemblance to the traditional, spruce-bow traps used a century ago (Ingersoll, 1970; personal observation).

Lobster landings have also remained relatively stable compared to most other harvested marine species. Between 1900 and 1990, annual lobster landings in southwest New Brunswick varied by a factor of only two- to three-fold (Williamson 1992).⁵ But this trend has changed recently. Lobster landings have steadily grown since the mid-1990s, achieving unprecedented levels in the last few years (Lawton *et al.* 2001). Because markets for lobster have expanded, prices paid to fishermen have remained high. Good catches and a strong market, combined with declining stocks of other commonly fished species (notably ground fish and weir-herring), have led many fishermen to focus greater effort and investment into lobster fishing. The value of lobster landings to the region now greatly surpasses that of any other wild fishery and for most fishermen today, lobstering is highly lucrative and the predominant, if not exclusive, source of income.

Salmon Farming in Southwest New Brunswick

Salmon farms in the Bay of Fundy are essentially ocean-based, grow-out operations. Farmers purchase young fish ('smolts') from regional salmon hatcheries, and grow these into market-sized, adult fish (typically 4–5 kg), which usually takes 18–24 months. At sea, fish are reared in net cages that are suspended by floating collars and anchored to the seabed by mooring lines (Chang 2003).

Salmon farming is a relatively recent arrival to southwest New Brunswick. The first farm in the region was developed in 1979 on an experimental basis. Few areas along the eastern Canada

4 Notable exceptions to this are lobster licenses which have been bought-up from existing fishermen and allocated by government to native bands in the region since the 1999 Marshall decision. These Aboriginal licenses are owned and operated collectively by individual native bands, and so more closely resemble a corporate structure. For example, Abo-

iginal licenses can be operated entirely by 'hired' labor, whereas non-Aboriginal lobster licences must include the license owner in the boat operation.

5 By contrast, the annual landings of most other significant fish and invertebrate species in the region have varied by 10- to 100-fold during this same period (Lotze and Milewski 2002).

Table 1

Growth of salmon aquaculture in the Bay of Fundy, 1980–2004

	1980	1985	1990	1995	2000	2003/4
Total no. farm sites	2	18	51	66	87	97
Deer Island sites	1	4	11	17	21	21
Grand Manan sites	1	1	3	8	18	24
Total salmon production (metric tons)	–	500	7,200	14,400	25,000	33,000
Average site production (metric tons)	–	28	141	218	287	340

Source: Chang 1998, 2003; Chang *et al.* 2005.

coastline offer suitable site conditions for salmon farming, which include proximity to wharf access, protection from severe weather events, and water temperatures that remain above critical, minimum thresholds all-year round (Chang *et al.* 2005). The initial success of the first farms confirmed the likely suitability of the lower Fundy Coast for salmon growing. This finding, combined with supportive government policies and a (then) high market price for farmed salmon, led to rapid investment, mostly from multinational companies, and multiplication of sites throughout the region (Table 1). Within two decades, salmon farming grew into a dominant marine resource industry, creating considerable employment both on farms and in various spin-off industries.⁶ In 2000, eighty-seven farms in the region produced 25,000 tonnes of salmon, worth an estimated \$190 million, a figure roughly equal to the value of all wild caught fish landings in New Brunswick. This constituted 95 percent of farmed salmon production on Canada's east coast (Chang 2003). Some of these farms are locally owned, but most of the capital investment and ownership

of salmon farms in the region is from multinational corporations (Marshall 2001). Evidence suggests the current trend is towards greater concentration of ownership in the hands of these companies.

Salmon farmers hold long-term leases issued by the Provincial government that provide them with secure access to specified (mapped) areas of marine seascape and the waters and sea bottom below this. To secure a lease, prospective farmers must identify suitable sites that are no closer than 1 km from pre-existing farms, nor can they impinge too directly on pre-existing herring weir sites that are common in the area. This latter point is crucial because it has led many herring weir fishermen to convert long-held weir leases or 'privileges' into salmon farm leases, either for their own farms or, more likely, to lease to an aquaculture company (Marshall 2001). Such leases can be lucrative for fishermen, but are often time-limited in that companies commonly negotiate a time period (e.g., ten years) in the lease agreement after which fishermen are required to either sell or cede full control of the lease to them.

At the time of this study, there were ninety-five farm leases dotted along coastlines throughout the southwest New Brunswick region, almost all of them active. In recent years, production has increased considerably overall and especially by unit. While the total number of farm sites grew by roughly five times between 1985 and 2000, total farm salmon production grew by almost fifty times (i.e., production per farm grew by ten-fold; Table 1). This increased production reflects a combination of improved management and the steady, incremental enlargement of farm sizes over time. Salmon farms in the region today average 15 ha in size and hold 200,000 fish, with the largest sites approaching 30 ha and 600,000 fish (Chang 2003).

That growth of the salmon farming industry in the region reached or exceeded sustainable levels became increasingly apparent in the mid- to late 1990s when outbreaks of disease, most notably the highly virulent infectious salmon anaemia (ISA), began to afflict farms and result in significant production losses.⁷ Also, concerns over

6 Salmon farms employ staff directly to build, monitor and maintain sites, feed fish and provide boat transport to-and-from sites. Others are employed off-site in management, administration and accounting positions. Various direct spin-offs have also been created in the region to serve the salmon industry, including companies that build and supply salmon farm infrastructure components and supplies; hatcheries that rear salmon eggs to smolts; companies that make, wholesale and/or retail farm inputs such as fish feed and medications; and post-harvest fish processing operations.

7 ISA spreads rapidly within farms and is believed to jump readily between farms through tidal movement or by vectors such as boat hulls. Risks are especially high where farm

environmental impacts of ever-expanding numbers and size of salmon farms gained greater attention among environmental scientists, activists and the media (Milewski *et al.* 1997; Mittelstaedt 2002). Further, there was a coalescing of local opposition from fishermen who were concerned about displacement from traditional fishing grounds and possible impacts of salmon farms on wild fish and lobster populations.

Marine fisheries fall under federal government jurisdiction in Canada and are regulated by Fisheries and Oceans Canada. However, federal-provincial cooperation agreements signed in the 1980s and 1990s established provincial governments as the principal authorities for siting and regulation of marine aquaculture sites. In response to the aforementioned concerns about the industry, New Brunswick revised its existing aquaculture policy and in 2000 passed the 'Bay of Fundy Marine Aquaculture Site Policy' (New Brunswick 2000). This policy is intended to rationalize and better regulate the development of salmon farming in the region by, for example, halting continued expansion in areas deemed as over-crowded, while facilitating continued expansion in less developed areas, including the southern coast of Grand Manan Island. Within months after the passage of the policy, the provincial government gave the green light for development of three new sites there.

The problem is that the waters off southern Grand Manan are widely recognized by fishermen and fisheries scientists as among the richest fishing grounds in the region, especially for lobster. Eighty-five licenced lobster fishermen are based out of the three ports on southern Grand Manan. In response to the government's decision, members of the large and well-organized Grand Manan Fishermen's Association organized a blockade of two wharves in May of 2001 to prevent the deployment of the new farm sites in Grand Manan waters. This blockade against salmon farms was not the first protest by Grand Manan fishermen, but it was by far the best-organized and most aggressive protest that had ever manifested on

fish stocking densities are high and where there is little distance between neighboring farms. In cases of ISA outbreak, drastic measures are typically enforced including site quarantines and the destruction of the entire stock of held fish on infected farms.

the island or in the wider region. In short, the fishermen's concerns were that the new farm sites would displace them from particularly valued fishing grounds and possibly result in serious environmental health impacts on wild lobster populations, the mainstay of many of their livelihoods. In particular, fishermen were concerned that chemical therapeutants added to farm fish feed to treat disease might be consumed by lobster that, as bottom feeders, scavenge for food below fish farm cages. Anecdotal observations from scuba divers and unpublished scientific surveys had confirmed the presence of abundant lobsters below many salmon cages (Robert Bayer and Peter Lawton, personal communication).

Negotiations between the provincial government and fishermen led to a dismantling of the blockade, and an agreement by government to study the risk of fishing displacement and damage to lobster health from existing and proposed salmon farms in the area. A multi-stakeholder working group composed of representatives from the provincial and federal governments and lobster and salmon farming industries was formed to coordinate the relevant investigations. Within this context, I was contracted in 2002 by the working group to formally research the concerns of the key stakeholders and specifically examine the nature of competition and possible displacement on the water. Parallel studies of lobster health issues are currently underway.

Deer Island and Grand Manan

Deer Island is 5 km from the mainland from where it receives an hourly ferry service (Figure 1). The first salmon farm in the region was established on Deer Island in 1979, with the growth of the industry steady thereafter until the late 1990s, at which time suitable sites were largely exhausted (Table 1). Swift currents and relatively narrow shallows surround the island and limit its development potential for farming as well as its value for lobster fishing. At the time of this study in 2003, there were twenty-one active salmon farms and fifty-three lobster license holders on Deer Island.

In contrast, Grand Manan is larger and more remote, receiving ferry service to the mainland only two to five times a day depending on the

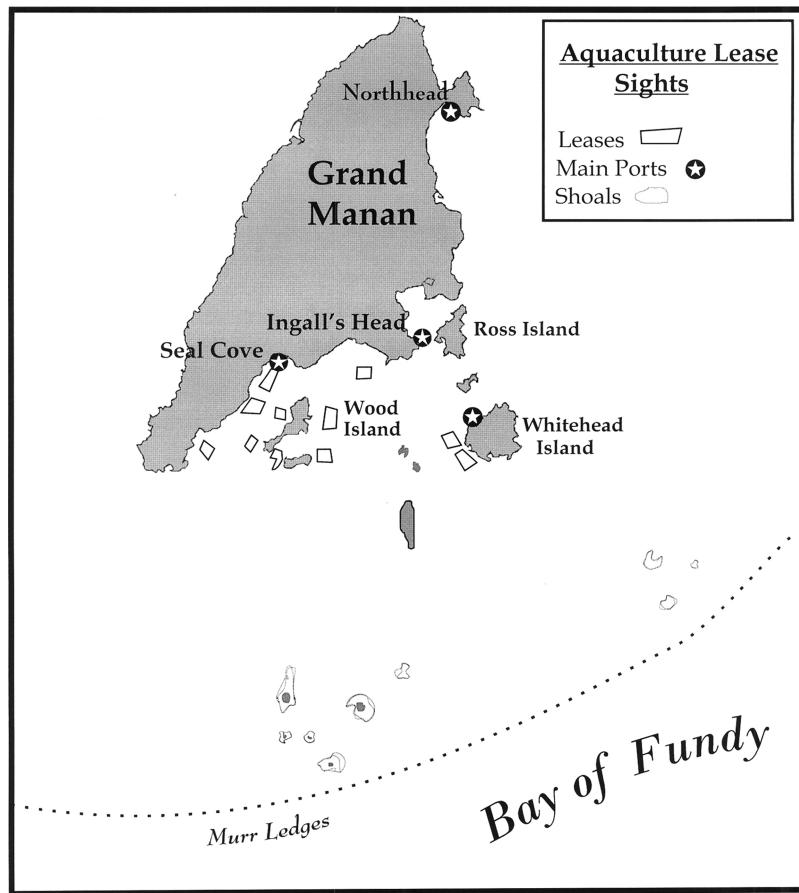


Figure 2

Map showing salmon farm leases on southern Grand Manan.

season. The island has extensive shallow shoals, especially south of the island, which offer some of the region's richest fishing grounds, as well as its best salmon sites (Campbell 1992; Marshall 2004). Salmon farming on Grand Manan developed more recently (during the 1990s) but at a much faster rate than on Deer Island (Table 1). In 2003 there were twenty-two active farms on the island, eleven in the southern waters serviced by the ports of Seal Cove, Ingall's Head and Whitehead Island (Figure 2). Among the approximately 120 lobster license holders on Grand Manan, 85 fish in waters south of the island. Research efforts were focused there.

Interviews with Fishermen and Salmon Farmers

I interviewed forty-seven lobster fishermen and twenty salmon farmers during the fall/winter of 2002–2003 (Table 2). To obtain a fairly comprehensive but also representative sample, license holders were randomly selected so that about one-third of lobster license holders from each of Deer Island and southern Grand Manan were interviewed. Fishermen were asked about their general fishing practices and landings, and how these had changed in recent years; about concerns and interactions they had with the aquaculture industry; and about fishing practices around farm

Table 2

Number and characteristics of lobster fishermen and salmon farmers interviewed

	Grand Manan	Deer Island	Total
<i>Lobster Fishermen</i>			
No. interviewed	29	18	47
Age (mean and range)	53 (30–80)	57 (35–81)	54 (mean)
Years fishing (mean and range)	31 (3–55)	36 (13–60)	33 (mean)
Lobster licence owner	24	16	40
Captain/deck hand	4	1	5
Lobster buyer	2	1	3
Aquaculture business	7	4	11
<i>Salmon Farmers</i>			
No. interviewed	12	8	20
Age (mean and range)	45 (25–80)	54 (38–65)	49 (mean)
Years farming (mean and range)	6 (2–18)	16 (9–25)	10 (mean)
Site manager	7	5	12
Site owner	3	3	6
Site leaseholder	8	4	12
Site diver	2	1	3
Lobster fishing	6	5	11

Note: There is an overlap between categories of employment.

sites. Fishermen were also asked to indicate on maps the locations where they fished and, where relevant, draw patterns of trap setting around salmon sites. I also spent one day aboard a lobster boat in the opening week of the fall season to observe, first-hand, the setting of traps around salmon farms in southern Grand Manan.

The average age of fishermen interviewed was 54 years, with 33 years of fishing experience (Table 2). All but seven of those interviewed were current licence owners. In five cases, persons interviewed did not own the licence in question, but served as boat captains or deck hands on behalf of the licence holder (e.g., First Nations fishermen or 'silent partners' on a double licence). Three of those interviewed were also in the business of lobster buying and pounding.⁸ It is also noteworthy that eleven of the forty-seven lobster fishermen interviewed were involved in the salmon farming business, typically as co-owners of a farm site lease.

⁸ Landed lobsters are either sold directly to market or they are purchased and held live for extended periods in large outdoor holding pens or indoor tanks, called lobster 'pounds', later to be sold to market.

For salmon farmers, an attempt was made to interview at least one individual associated with each farm site, preferably the site manager, although this was not always possible (Table 2). In the interviews, the farmers were asked about involvement in the industry and characteristics of their salmon site; concerns and interactions they had with lobster fishing; patterns of fishing practices around farm sites; and disease and drug treatments. The average age of farmers interviewed was 49 years, with 10 years of farming experience. Twelve of the twenty farmers interviewed were actual site managers, whereas the other eight were either site owners or leaseholders. In several cases, individuals were both owners *and* leaseholders or managers *and* owners/leaseholders. In two cases, site managers also worked as divers on their and others' sites. It is notable that eleven of the twenty farmers interviewed, mostly site leaseholders, were also fishing lobster or had other interests in the industry (e.g., as a lobster buyer).

To quantify the spatial extent of fishing displacement on southern Grand Manan, in particular, farm sites were mapped in relation to fishing patterns (based on interview information) using geographic information systems software. Farm lease areas were obtained from lease agreements. The area occupied by the physical cage structure itself was derived from the site dimensions, which were calculated by multiplying the diameter by the number of cages and adding the spaces between each cage (the latter figure was estimated from direct observation of sites or, alternatively, it was assumed to be half the diameter of the cage). These data were then used to calculate the approximate areas of the seascape that are, for most practical purposes, no longer available for fishermen to set lobster traps. However, it should be kept in mind, that each trap has an effective fishing area on the bottom that varies in relation to bottom type, currents, and propensity of different lobster to move towards the bait. For example, although some fishermen only set 20 m from a cage, they actually draw some lobsters from within the 20 m.

Fishermen's perceptions of salmon aquaculture

Most lobster fishermen acknowledge that salmon farming contributes to the local economy,

Table 3

General opinion of salmon aquaculture as cited by lobster fishermen

	Grand Manan (n = 29)	Deer Island (n = 18)	Total (n = 47)
Positive	16	8	24
Ambivalent	4	5	9
Negative	9	5	14

Table 4

General opinion of salmon aquaculture comparing responses of fishermen with economic interests in salmon farming to those without

	Economic interests in aquaculture (n = 20)	No economic interests in aquaculture (n = 27)
Positive	15	9
Ambivalent	3	6
Negative	2	12

especially by creating employment for young people. About half of the fishermen expressed generally favourable opinions of the salmon industry (Table 3). Not surprisingly, those fishermen with economic interests in aquaculture (defined here as being personally or having an immediate family member employed in salmon farming) have more favourable opinions (Table 4). Those with favourable opinions of aquaculture tended to be younger (52.1 years, $n = 24$) than those with ambivalent or negative opinions (57.0 years, $n = 23$). This difference is especially marked when the comparison is made excluding fishermen who have direct economic interests in the industry, in which case those with favourable opinions are, on average, 12 years younger than those with negative or ambivalent opinions (45.0 years, $n = 9$, vs. 57.3 years, $n = 18$).

Fishermen expressed many specific concerns about salmon farming. Most frequently cited was the possibility that salmon wastes, diseases or disease therapeutants might impact the marine environment, lobster health and lobster meat quality (Table 5). Some expressed fears that their waters would become degraded like areas along the mainland where salmon farms are most heavily concentrated. A few fishermen claimed to have caught lobsters with sores on their shells and bitter tasting tamale, and they suggested that farm pollution or disease could be the cause.

Table 5

Specific concerns about salmon farming as expressed by lobster fishermen

	Grand Manan (n = 29)	Deer Island (n = 18)	Total (n = 47)
Pollution from farm sites	23	10	33
Displacement of lobster fishing	17	12	29
Corporate control of industry	10	8	18
Damage/loss of fishing gear	8	4	12
Lease/siting process (politics of)	9	3	12
Impacts on weir fishing	-	8	8
Impacts on scallop fishing	4	3	7
Ongoing site expansions	4	3	7
Government bail-outs of industry	4	3	7
Continued expansion of industry	5	-	5
Crowding on wharves	4	1	5
Disruption of local culture	-	5	5
Navigational obstructions	-	4	4
Garbage from sites	2	2	4
Insufficient regulation	-	3	3
Escaped salmon: impact on wild fish	2	-	2
Lobster fishing by site workers	1	-	1

Displacement of lobster fishing was frequently cited as a concern and will be discussed in detail below. A smaller number of fishermen, all on Deer Island, believe that salmon farms had reduced herring weir fishery landings, and similar numbers indicated that scallop fishing had been displaced. Five fishermen cited further expansion of the industry as a concern, and seven expressed frustration over the fact that many of the sites have expanded in size since first established, encroaching on a greater area of the lobster bottom. This claim was borne out by interviews with farmers: almost every salmon farm older than two years has enlarged beyond its original size, and for those sites that are younger, farmers anticipate future expansion. Loss of fishing gear was also commonly cited by fishermen as a concern. This results from gear entangling in cage mooring lines, especially during rough weather when traps are apt to shift, or from trap lines being cut by feed or processing boats that lack protected 'cages' over their propellers.

Many fishermen expressed concerns about aquaculture, which are more political in nature. Specifically, more than one-third of the fishermen expressed concern over the growing corporate control of the industry. For example, several fishermen had formerly owned and drawn

significant income from the renting of their weir privilege to aquaculture companies for salmon farm sites, but had recently been forced (by prior contract agreement) to cede these leases to those same companies. About one-third of the fishermen also expressed concern about the farm lease allocation and the siting process, which they saw as favouring those with money and connections (Table 5). A common sentiment expressed is that too many important decisions are made outside the region and too much profit is drained away from the islands; some fear that these trends may eventually undermine the relatively healthy relationship that currently exists between salmon farm workers, who are mostly locals, and fishermen. It was also commonly noted that while the original intent of aquaculture policy was to target fishermen and provide alternative livelihoods for them, few are actually direct participants in the industry and many have been gradually squeezed out.

Other, less frequently expressed concerns included the increased crowding on wharves and on the water as a result of the growing aquaculture presence in the area; garbage created by salmon farms; the potential for escaped salmon to contaminate wild fish populations; and illegal setting of lobster traps by farm site workers (Table 5).

Fishing practices and use of marine space around salmon farms

Historical patterns of lobster trap setting around Grand Manan and Deer Island are characterized by fidelity to grounds located close to home ports, with some spatial overlap between fishing from neighbouring ports, but greater mixing the further one moves offshore (Recchia 1997). For example, fishermen from the port of Seal Cove, Grand Manan, use the inshore waters of Seal Cove without exception, but a few also set traps in adjacent inshore waters in Long Pond Bay on sites that are otherwise dominated by fishermen from Ingall's Head. There was little evidence of active territorial defence between neighboring fishermen, either within or between ports. Individual fishermen tended to pursue a mixed strategy of trap setting over time, returning to certain good sites repeatedly in some cases, but also shifting gear around to 'test the waters' in different areas.

All inshore and near shore waters are set

with 'singles' and 'doubles' (i.e., either one or two traps per buoyed line). Such traps can be set with relative precision in relation to known bottom contours and are less likely to entangle with neighbouring traps and nearby salmon cage moorings. The productive inshore waters, the favoured location of salmon farms, can thus be set with high densities of traps from many different fishermen. A typical pattern of trapping is to set singles and doubles inshore in the opening few weeks of the fall season, at which time the largest landings of the season are made. More than half of the fishermen (29 of 47) indicated that displacement of lobster fishing by salmon farms is a concern in inshore waters (Table 5).

After the opening few weeks, many fishermen begin to shift effort offshore to capture lobster as they migrate into deeper water in response to cooling temperatures. About half of these fishermen will shift some or all of their effort into the use of 'trawls': groups of five to twenty-five traps strung together along the bottom and buoyed at either end of the string. The lack of setting precision and difficulty of hauling traps makes the use of trawls in deeper water more appropriate. But the risk and cost of gear entanglement in cases of overlapping trawls can be significant, so there exists an informal understanding among fishermen that they be used only in deeper, offshore waters, and that they be set on a first-come, first-serve basis, regardless of which port of call fishermen claim. Trawl setting does not occur in areas currently occupied by salmon farms. By Christmas, most fishermen have stopped fishing inshore entirely, with only some maintaining trawls offshore through the winter months. In spring the pattern is reversed, with fishermen shifting effort back to singles and doubles in the inshore waters where lobsters return to spawn and molt.

These general patterns notwithstanding, fishing practices have been changing in important ways in recent years (Table 6). More than half of the fishermen (25 of 43) have shifted greater effort offshore during the last 10 years, and fifteen of these began using trawls during this time. To illustrate this trend, Figure 3 shows changes to the areas fished by one such fisherman, pre- and post-1997. This shift has been motivated by several factors, including improved technology, which enable fishermen to set and retrieve traps more efficiently long distances from

**Table 6**

Recent changes (last 10 years) to trap setting in southern Grand Manan and Deer Island

	Grand Manan (<i>n</i> = 28)	Deer Island (<i>n</i> = 15)	Total (<i>n</i> = 43)
Moved more gear offshore	16	9	25
Shifted more to trawls	13	2	15
Little change	8	4	12
Shifted location inshore	1	6	7
Moved more gear inshore	3	1	4
Bigger boat	3	1	4

port (e.g., faster boats, trap haulers, GPS). Also, steadily increasing lobster catches during the last decade have resulted, first, in greater overall fishing effort and crowding inshore—a fact exacerbated by the installation of salmon farms—plus an explosion in landings offshore (Table 7). While almost every fisherman still sets traps inshore during the first week or two of the fall season, ambitious fishermen are increasingly motivated to set further offshore in areas less heavily fished in anticipation of large catches.

There is unanimous sentiment among fishermen that every salmon site is believed to have displaced at least *some* former lobster fishing ground (Table 8). Some sites are viewed as being more critical than others; for example, a few sites on the west side of Deer Island are deemed as unimportant areas for lobster. In contrast, particular concern was expressed about recent sites in southern Grand Manan, which are perceived as located on particularly prime lobster fishing ground or critical nursery and molting habitat. However, in spite of the widely recognized perception that displacement is occurring, only eleven of forty-four fishermen expressed serious concern about it (Table 8). Many fishermen have come to believe that farm sites actually attract or enhance local lobster abundance (Table 9). They recognize further that lobsters attracted to sites will eventually be caught as they move away from the site. In fact, recent studies of tagged lobsters caught around salmon cages in southern Grand Manan reveal that these animals move frequently and considerable distances from cage sites (Peter Lawton, personal communication).

As noted, fishermen increasingly trap offshore and so are less directly affected by the siting of farms. When fishing does occur inshore, some

fishermen indicated that they will set traps 20 m or closer to salmon cages (Table 10). Trap setting around salmon cages varies from site to site depending on the layout of anchors and underwater mooring and the location of the cages relative to bottom topography. A typical pattern involves a series of traps at common water depth running in a line between the lease boundary and edge of the salmon cages (Figure 4). Others will circle an entire cage structure, setting traps all around it at a similar distance from the cage structure edge.

Fishermen believe that fishing is good near salmon cages because farms attract lobsters to them (Table 11). Others set within lease boundaries, but not as close. Nine of those interviewed simply avoid salmon sites altogether and set only well outside lease boundaries. When asked why they do not set closer to cages, fishermen commonly expressed concern about their fishing gear becoming entangled in salmon cage mooring lines and having their traps lost. Several also indicated that waters adjacent to cages were already too crowded with traps to make it worthwhile.

None of the fishermen indicated that they were prevented from setting close to sites by farmers, although fewer than half actually sought permission to do so (Table 12). The majority of fishermen simply assumed that they could set as close to cages as they wanted; that it was their risk to take and that farmers would presumably not try to stop them. For some, this reflected their belief that they still had a right to fish wherever they wanted because they were there first. But it also reflected common knowledge and experience since salmon farmers, with rare exception, have not indicated any opposition to such trap setting. Concerns about trap loss are reduced by the fact that farmers will often retrieve traps that get caught in cage mooring lines: eight different fishermen cited farmers having done just that (Table 12).

As of 2003 there were 141 salmon cages across eleven different farm sites in southern Grand Manan (Figure 2). The combined lease area for all sites was 224 ha (Table 13). This represents the *effective* area unavailable for trap setting for one-third of the fishermen unwilling to set traps within farm lease areas. But the actual area precluded from fishing is less because almost two-thirds of fishermen set within lease boundaries.

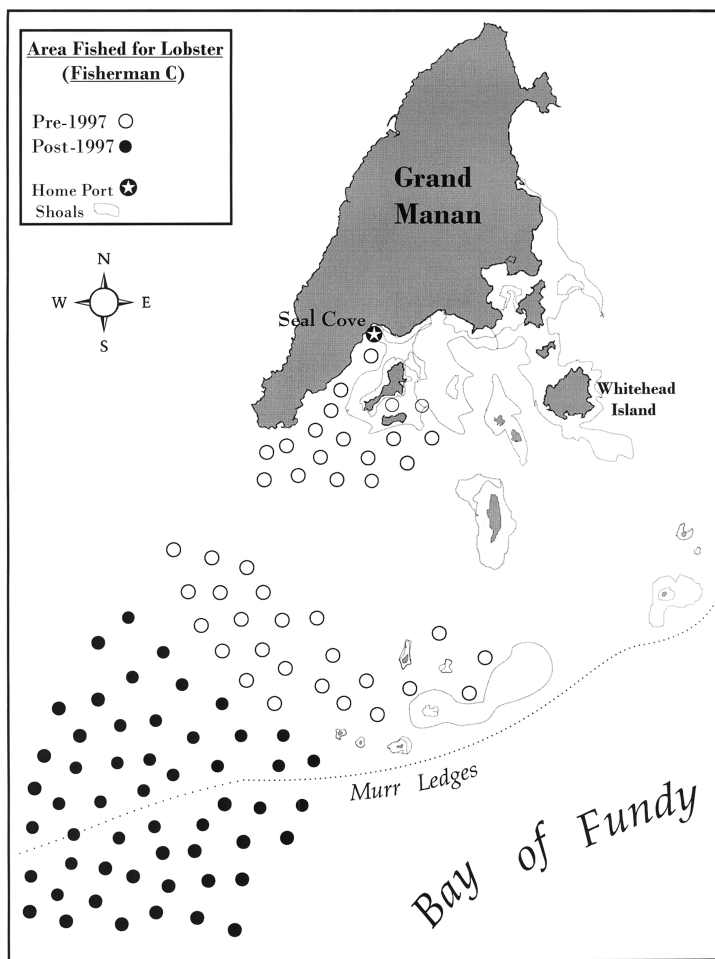


Figure 3

Map illustrating the recent shift offshore in lobster trap setting as characterized by a fisherman from Seal Cove.

Areas occupied directly by the cage grids add up to 47 ha and are completely unavailable to set traps. Considering the varied willingness of fishermen to set around cages, the effective area unavailable for trap setting has been estimated using a range of 'buffers' that incorporate an added distance from cages that most fishermen are unwilling to set. Since interviews suggest that few will set closer than 50' to cages, but many will set within 100', estimates assumed buffers of 20 m (60') and 35 m (100') around cage sites, producing effective areas unavailable for trap setting of 69.9 ha and 89.7 ha, respectively.

Impacts of lobster fishing on salmon farming

Salmon farmers are troubled by the political opposition expressed by some fishermen to salmon sites, but otherwise have few concerns about lobster fishing. Even though they have the legal right to prevent fishing within lease boundaries, not one farmer categorically objected to the setting of traps within their farm lease or close to cages, although several were concerned that setting too close increased the risk of traps tangling in cage mooring lines and trap lines being cut by feed boats. During routine maintenance site managers

Table 7

Recent changes (last 5–10 years) in lobster catches by individual fishermen on southern Grand Manan and Deer Island

	Grand Manan (n = 26)	Deer Island (n = 14)	Total (n = 40)
Better	6	9	15
50% increase	7	–	7
100% increase	7	–	7
300% increase	2	–	2
500% increase	1	2	3
Never been better	3	3	6

Table 8

Perceived displacement of lobster fishing by salmon farming

	Grand Manan (n = 27)	Deer Island (n = 17)	Total (n = 44)
No, it does not displace	–	–	0
Yes, and is significant	6	5	11
Yes, but not significant	21	12	33

Table 9

Why displacement is viewed by many fishermen as not significant

	Grand Manan (n = 21)	Deer Island (n = 13)	Total (n = 34)
Farms attract lobsters & enhance local abundance	13	2	15
Cages not located in area currently fished (offshore)	5	4	9
Cages located over poor lobster bottom	–	9	9
Will eventually catch lobster as they leave site	4	1	5
Area displaced is minimal	3	–	3

attempt to retrieve and return traps to the wharf when these get caught in mooring lines. Such actions are seen as consistent with a 'good neighbour' policy that is motivated, at least in some cases, by recognition that fishermen have prior rights to fish in these areas. Most farmers believe that fishing is good, even enhanced, near cages because of the supplemental feed or possibly a reserve effect.

As for farmers' concerns about their own industry, many cited continued local expansion of aquaculture as a concern because of increased risk of disease spread and potential impacts on

Table 10

How close fishermen set traps to salmon cages

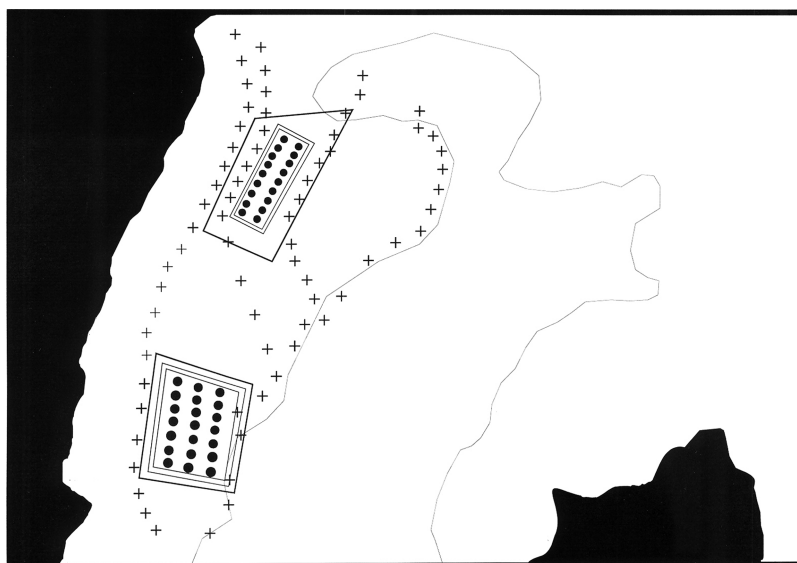
	Grand Manan (n = 27)	Deer Island (n = 15)	Total (n = 42)
Closer than 20 m	8	3	11
Between 20–40 m	5	2	7
Between 41–60 m	2	4	6
Outside the lease boundary	9	6	15
Not relevant: fish only offshore	3	–	3

local fisheries (Table 14). A common perception is that the islands are relatively disease-free compared to the mainland. But disease outbreaks do occur and so farmers feel compelled at times to apply therapeutic treatments. In particular, most sites experience sea lice infestations, which are treated with courses of the food additive drug SLICE (*emamectin benzoate*), typically once per year in the fall. Treatments of SLICE are effective and practical, but expensive. Some farmers are concerned that these chemicals and other pollutants (e.g., fish wastes) may have long-term impacts on the environment. Other concerns expressed by salmon farms are the increased corporate control of the industry and unfair lease allocation and siting processes (Table 14).

Discussion

This study reveals considerable variation in opinion among fishermen, but no clear differences between fishermen from Deer Island and Grand Manan. This result was not expected given that organized protests occurred on the latter, but not the former island. It suggests that lobster fishermen across the region share similar concerns and experiences in their interactions with the salmon farming industry. What differs is the far greater level of organizational sophistication and political representation that is expressed through the local Grand Manan Fishermen's Association (GMFA). The GMFA is a large, well-funded organization with strong leadership that is not reluctant to flex its political muscle. It has no counterpart on Deer Island.

These differences aside, the overall findings from this study reveal considerable goodwill and accommodation between salmon farmers and lobster fishermen. This was unexpected given the

**Figure 4**

Map illustrating lobster trap setting patterns in proximity to two salmon farm sites (showing lease boundaries and cage locations).

Table 11

Lobster fishing success near salmon cages as compared to areas away from cages

	Grand Manan (n = 26)	Deer Island (n = 12)	Total (n = 38)
Better	12	5	17
Lasts longer in fall season	7	–	7
No different	6	–	6
Variable	3	3	6
Worse	–	4	4
Don't know	5	–	5

Table 12

Understandings between lobster fishermen and salmon farmers about trap setting and retrieval of lost gear

	Grand Manan (n = 20)	Deer Island (n = 9)	Total (n = 29)
Assumed that setting close to site is permissible	12	7	19
Farmer consulted for permission to set close to site	8	2	10
Lost gear retrieved by farmer	8	–	8

number and size of salmon farms located at sites with long histories of lobster fishing, and given that the interests of fishermen and aquaculturists in eastern Canada are typically portrayed as competing and in conflict (Stephenson 1990; Millar and Aiken 1995; Dwire 1996; Phyne 1996; Marshall 2001). Having said this, other fisheries in the region, including herring weir and scallop, have been affected by aquaculture but were not studied here (Stephenson 1990; Marshall 2001).

To understand the perceived and actual impacts of salmon farming on the lobster fisheries

of Grand Manan and Deer Island, it is essential to appreciate the rapidly changing character of this 'traditional' fishery and the coastal communities dependent on it. The majority opinion among lobster fishermen is that salmon farming is a net benefit to the local economy, offering badly needed and year-round employment opportunities for young people when there are few other options available to them, due in part to the decline of the ground fishery (Wilbur and Harvey 1992). In fact, some lobster fishermen derive economic benefits from salmon aquaculture, either directly as partners in farm leases or

Table 13

Estimated physical area occupied by salmon farms in southern Grand Manan, including estimates with 'buffers' added

Site no.	No. of cages	Lease area (ha)	Cage grid area (ha)	Cage	Cage
				area + 20 m buffer (ha)	area + 35 m buffer (ha)
1	4	9.79	1.25	2.31	3.32
2	21	15.89	7.22	9.66	11.70
3	10	8.11	3.56	5.36	6.92
4	21	24.77	9.02	11.70	13.92
5	18	12.79	2.38	4.18	5.74
6	8	19.89	3.09	4.53	5.82
7	9	32.92	3.85	5.69	7.28
8	14	27.93	4.51	7.65	10.42
9	12	19.79	3.20	5.04	6.63
10	10	28.34	3.31	5.02	6.50
11	14	23.88	5.74	8.78	11.48
Total	141	224.10	47.13	69.92	89.73

indirectly through family members who work in the industry. Younger fishermen, in particular, are more likely to view aquaculture in a positive light, which is not surprising given that they grew up with it in their midst and have many close friends employed in it. Also, younger fishermen appear less tied to traditional fishing grounds; they are more likely to embrace new technologies and fish offshore where farms sites do not compete for space. This finding is consistent with Jentoft and Davis (1993) who found that younger fishermen in northeastern Nova Scotia were more likely than older fishermen to be individualistic and profit-motivated in their attitudes.

Among fishermen, the potential impact of aquaculture pollution on the local marine environment and lobster health is a greater concern than is displacement from fishing grounds. It is a widely held view among fishermen that the local herring weir fishery has suffered because of salmon farming and that other fisheries are in decline along the mainland in areas where the density of salmon farms is especially high. While there is not yet clear scientific evidence that lobster are impacted negatively in their natural environment by feed additives or other wastes from salmon farms, laboratory studies indicate that such effects are plausible (Haya *et al.* 2001; Waddy *et al.* 2002). Given the recent collapse of the ground fishery, fishermen are more heavily

Table 14

Specific concerns about salmon aquaculture industry as expressed by salmon farmers

Concerns	Grand Manan	Deer Island	Total
	(n = 12)	(n = 8)	(n = 20)
Continued expansion of industry	4	5	9
Corporate control of industry	4	3	7
Displacement of prime lobster fishing	2	3	5
Pollution from farm sites	3	1	4
Disease risk from site crowding	2	-	2
Impact on weir fishery	-	2	2
Impact on scallop fishery	1	1	2
Lease/siting process (politics of)	2	-	2
Government bail-outs of industry	1	1	2
Continued site expansions	-	1	1
Garbage from sites	-	1	1
Obstruction to navigation	-	1	1
Harvest boats that cut lobster trap lines	1	-	1
Impact on local culture	-	1	1

dependent on lobster fishing and so all the more anxious in light of these uncertainties.

Displacement from fishing grounds was cited by virtually every fisherman as a fact, yet it was less of a concern for most than might be expected (Table 8). Recent changes to the lobster fishery help to explain why this is the case. For one, lobster landings have increased since the early 1990s to unprecedented levels today. These increases have either followed or coincided in time with the development of the aquaculture industry, greatly reducing concerns about its possible impacts. At the same time, it is unlikely that salmon farms are a cause of increased local catches given that similar increases in landings have been occurring across the entire southwest Nova Scotia-Bay of Fundy-Gulf of Maine region (Lawton *et al.* 2001). It is thus reasonable to expect that fishermen's perception of salmon farming might turn sharply negative in the future should lobster landings return to pre-1990s levels.

Patterns of fishing are also changing. Lobster fishing is spread out across wide expanses of seascape, but traps are consciously set in relation to specific bottom features like ledges and rocky shoals. Considerable variation in trap setting occurs (cf. Kearney 1989), but fishermen typically lay claim to grounds closest to their

home port, and fish these areas year after year, sometimes over generations (Davis 1984; Acheson 1988; McMullan *et al.* 1993; Recchia 1997; Marshall 2004; Wagner and Davis 2004). Informal claims to superior fishing grounds are often strong and incursions into these areas by outsiders can be a source of great local consternation. But, patterns of trap setting around Grand Manan and Deer Island are in flux due to the explosion of lobster catches offshore and improvements in gear and boat technology that encourage fishing in deeper waters and further from port. Similar changes in the lobster fishery have been documented recently in Maine (Acheson and Brewer 2003), the Magdalen Islands (Gendron *et al.* 2000), and northeastern Nova Scotia (Wagner and Davis 2004). This greater mobility means increased fishing effort directed offshore where customary claims do not exist, and simultaneously, there is the gradual erosion of territorial claims in traditional inshore fishing grounds (Recchia 1997; Acheson and Brewer 2003; cf. Ruddle 1993). In short, the locating of salmon farms within traditional, inshore fishing grounds is generally of greater concern to those who have long fished and continue to fish mostly inshore, but it is less of a concern for the increasing numbers of fishermen who no longer do. Noteworthy in this respect are current plans to explore the development of aquaculture in more offshore waters (Chang *et al.* 2005). Advocates of aquaculture may believe that moving away from the inshore will liberate them from the kinds of conflicts with local fishermen encountered near shore, but the findings here suggest otherwise.

Yet, almost every fisherman still sets traps inshore during the first week or two of the fall season, and most obtain their largest seasonal catches during this brief period. Potential conflict over space with salmon farms is most likely here, but many fishermen have come to believe that lobster catches are often good close to salmon cages. More than half of the fishermen today will set traps well within lease boundaries. Among them, persons more knowledgeable about the layout of underwater moorings or willing to risk gear losses will set as close as 10 m from the cages. Salmon farmers permit the setting of traps within lease boundaries and close to cages. Citing the importance of maintaining a 'good neighbour' policy with fishermen, site managers

acknowledge that fishermen have an important interest at stake and strive to accommodate them. The fact that farmers willingly retrieve lobster traps that get caught in cage mooring lines is further evidence of this desire to maintain positive relations.

It is within this context of good neighbours that criticism of corporate control of aquaculture can best be understood. Fishermen are sceptical that non-local corporate interests will share this appreciation and respect for their way of life, even as many aspects of that way of life undergo radical transformation. With continued corporate concentration of the salmon aquaculture industry, many fishermen are concerned about whether the current good neighbour policies, born out of local familiarity and trust, will last. Yet, even though ownership of salmon farms is concentrated outside the community, farm site managers and workers are mostly locals and, as such, share relations with and friends among fishermen. These people intuitively appreciate the significance of the fishery to their respective islands' culture and economy (Ingersoll 1970; Wilbur and Harvey 1992). In this respect, their participation in the industry and constructive attitude towards existing fishing practices helps to 're-embed' industrial aquaculture while better adapting these new industries to the local ecological context (cf. McCay and Jentoft 1998; McCay 1999; Mansfield 2004a). At the same time, ongoing discussions and often heated debates over the appropriate place of aquaculture in these communities is part of a dynamic process of negotiation and trust-building among different stakeholder interests in an attempt to come to mutually agreed upon terms and understandings (Wilson and Jentoft 1999; cf. Habermas 1984; Grafton 2005). In this light, we can acknowledge the strengths as well as the vulnerabilities of local fishermen in the face of externally imposed change and thereby also acknowledge those elements of the local community that wish to embrace change.

Portrayals of fishermen in coastal communities are often one-sided. Just as there has been a tendency among advocates of the neo-liberal perspective to idealize the individual and overlook the influence of local culture and ecology, so too has there been a tendency among advocates of the community-centred perspective to romanticize community and overlook the neo-liberal



aspects of so-called traditional fishing societies (Apostle *et al.* 1998; McCay and Jentoft 1998; McCay 2002; St. Martin 2006; cf. Vayda and Walters 1999; Agrawal and Gibson 1999). This kind of blinkered perspective is, in fact, evident in a previous interpretation of this same fishery-aquaculture conflict (see Marshall 2001). In that study, salmon aquaculture on Grand Manan was viewed as severely disruptive and entirely negative in its impacts on local fishing practices and social/community relations, an interpretation that is not consistent with the findings presented here. The passage of time may account for some of the differences found: fishermen have had a few more years to adapt to the novelty of aquaculture. But what is also missing from Marshall (2001) is the recognition that the coastal communities under study are not as out-of-step with (and thus as vulnerable to) the forces of neoliberal modernization as one might initially think.

Fishermen on Grand Manan and Deer Island are resourceful, competitive and self-reliant and, as such, are for the most part eager participants in the market economy (but see Davis 1991; Jentoft and Davis 1993). They have for over a century participated in the global economy via the sale of their harvests onto international markets. Foreign capital penetration and corporate control are also not new: much of the land on Grand Manan and Deer island is foreign-owned and large sardine and groundfish plants have been present on the islands and in the region for a century (Ingersoll 1970; Wilbur and Harvey 1992). Even the notion of privatizing marine space has a long-established precedent in the form of the herring weir privilege, one of the oldest and still most widely practiced fisheries in the region (Stephenson 1990; Doucet and Wilber 2000). So similar in practice are weir privileges to modern salmon farm leases that the latter have in a great many cases literally been grafted onto the former. More generally, fishermen in the region have long contended with competing space use on the water, if not between lobster fishermen than between lobster fishermen and scallop draggers, crab fishermen, groundfish fishers, and so on. In this regard too, the competition and sorting out of access to desired fishing spots on the water is hardly unprecedented.

These last observations are not to suggest that the explosive development of industrial salmon

aquaculture in southwest New Brunswick is not of enormous social, economic and environmental significance to the region. It clearly is. Nevertheless, these dramatic changes need to be situated in their historical and geographic contexts, and thereby shed some light on why supposedly tradition-bound fishermen are so quick to adapt to them.

Acknowledgments

I am grateful to members of the Grand Manan Aquaculture/Lobster Fishery Interactions Working Group, especially Karen Coombs and Peter Lawton, and fishermen and salmon farmers who agreed to be interviewed. Thanks to Christiana Olfert and Lara West for assistance and Ron Cronk for advice. I much appreciate the hospitality extended to me by the Charters family and by Celia and Gene at Woodward's Cove. Rabindra Singh and Art MacIntyre performed the GIS analytical work presented here. I thank Jean-paul Vanderlinden and Omer Chouinard for their advice and support. I am also grateful for the suggestions offered by the editor of TCG, Roger Hayter, and four anonymous reviewers. Funding for this research came from Canada Network Centres for Excellence AquaNet (grant SE-14) and the Province of New Brunswick.

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