

# **FISHERIES DEPENDENT COMMUNITIES: PROPOSITIONS ABOUT ECOLOGICAL AND SOCIAL CHANGE**

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## **Introduction**

Canada's 1992 moratorium on fishing for Northern Cod marked the collapse of a resource that had shaped Newfoundland society for five hundred years. This collapse immediately affected some 40 000 workers, and undermined the traditional livelihoods of hundreds of coastal communities. Newfoundland's cod crisis in fact comprised only one facet of widespread, fisheries-influenced ecological transformations taking place in the Northwest Atlantic. Cod fisheries off New England, Greenland, Nova Scotia and the Gulf of St. Lawrence also collapsed during the early 1990s. Northeastern Atlantic fisheries, including those of Iceland, Norway and the Faroe Islands, also experienced crises in groundfish resources during the late 1980s or early 1990s. Populations of other species—some targeted by commercial fisheries, and others taken unintentionally as bycatch—often declined steeply as well.

These widespread crises signal a worrisome instability in the resources and marine ecosystems upon which fishing communities depend. Fishers adapted, where possible, by shifting their efforts towards new targets such as shrimp, lobster and

crab. These alternative fisheries required different equipment, licenses and processing/marketing facilities, however. Some fishers could not make the transition. Since catching and processing capacity for most fisheries resources exceed ecological production, governments have been encouraging fisher folk to learn new skills and seek other kinds of work. Adaptation can be difficult, and tends to pose continuing challenges (Harris 1998; Palmer and Sinclair 1997).

In 1996, my colleagues and I began a four-year comparative study on adaptive strategies and outcomes among fishing communities of the North Atlantic Arc (NAArc). We developed statistical databases and qualitative case studies for sites in Norway, Iceland, Greenland, Newfoundland and Maine. Preliminary findings from the NAArc project have been described in a number of articles (Haedrich and Hamilton forthcoming; Hamilton 1998; Hamilton and Duncan 2000; Hamilton, Duncan and Flanders 1998a, 1998b; Hamilton and Haedrich 1999; Hamilton, Lyster and Otterstad forthcoming; Hamilton and Otterstad 1998a, 1998b; Hamilton, Rasmussen, Flanders and Seyfrit 1996). Our analyses to date have been primarily exploratory and descriptive. The results, together with research by others, suggest a number of theoretical propositions that could have broad relevance to the study of ecological and social change. These propositions are outlined below under four broad headings: changing marine ecosystems, natural resource dependent communities, migration and demographic change, and individual and community adaptations.

### **Changing Marine Ecosystems**

Fisheries, especially modern ones, produce systematic changes in exploited marine ecosystems. These changes in turn have consequences for the people whose lives depend on fishing. Certain kinds of ecological changes appear widespread:

- 1) Reduction in biomass of target species, and of other species taken as bycatch (Gomes et al. 1995) or affected by benthic habitat disruption (Watling and Norse 1998).
- 2) Downward shifts in the size distributions of caught fish, due both to the progressive elimination of older age classes, and evolutionary reductions in size-at-age (Haedrich and Barnes 1997).
- 3) Reduction of large predator species, leaving room for expansion by smaller and lower-trophic-level species (Deimling and Liss 1994).

One consequence of these trends can be to shift the mean trophic level closer to primary production, a process called “fishing down food webs” (Pauly et al. 1998; also see Caddy et al. 1998).

These changes tend to undercut demersal fisheries based on large predators such as cod and haddock. To adapt, fishers target alternative species, which may have increased in either relative or absolute abundance. Switching to alternative species drives further changes:

- 4) Some alternative species are comparatively scarce (e.g., lumpfish), or slow-growing (e.g., Greenland halibut), and hence less able to withstand sustained fishing pressure.
- 5) Other shorter-lived species, including shrimp, herring and capelin, are periodically quite abundant but volatile, subject to great swings in population. And they are food to demersal species.
- 6) Reductions in biomass, size distributions and bycatch species next occur in the alternative fishery.

Alternative fisheries can replace the value lost by declining groundfish resources, but in doing so they often benefit different groups, with different capitalization, licenses and location—one link between ecosystem and social system change. Moreover, the alternative fisheries sometimes require new, distant markets, and thereby increase vulnerability to changes in foreign economies.

Because fisheries operate in complex environments where many things change at once, conflicting explanations almost always can be proposed for a target species' decline.

- 7) “Natural” explanations, such as environmental factors or predation by marine mammals, have political appeal because neither management nor the fishery is blamed.
- 8) Environmental variation and species interactions probably do play roles, although not necessarily dominant ones, in many fisheries crises.
- 9) Fisheries' direct ecological effects, 2.1–2.6 above, can have indirect consequences by increasing the vulnerability of fish populations to environmental change.

The last point is important. For example, removing most of the large, older individuals (especially, the high-fertility older females) could undercut cod populations' natural adaptation to their variable northern Atlantic environments (Marteinsdottir and Thorarinsson 1998). Similarly, removal of food species could make entire ecosystems less resilient. Ecological change might involve either wild swings or regime shifts to a new stable state, in either case unfavorable to humans.

## Natural Resource Dependent Communities

Independent of most fisheries research, sociologists have examined the problems of boom-bust cycles, lagging human and social capital, dependency, and underdevelopment in natural resource dependent communities or NRDCs (e.g. Bunker 1989; Freudenburg 1992; Freudenburg and Gramling 1994, 1995; Humphrey 1995; Johnson and Stallman 1994; Rural Sociological Society Task Force on Persistent Rural Poverty 1993). Here are some basic propositions, derived from NRDC studies of forestry, mining, and energy-community studies (following Freudenburg and Gramling 1994; Humphrey 1995):

- 1) Many NRDCs have experienced persistent, long-term poverty. Resource extraction industries did not link to other industries to produce more diversified economic growth, nor did most of their workers invest in human capital sufficient to support adaptation to other industries or locations.
- 2) There has been a long-term downward trend in employment, due to shifts from labor-intensive to capital-intensive extraction and processing, global competition among resource providers, and “dematerialization of manufactured goods in advanced industrial countries” (Humphrey 1995:94).
- 3) Resource-extraction industries’ backward and forward linkages (e.g., manufacturing resource-extraction equipment; processing raw materials into finished products) often take place outside the NRDCs themselves. This limits the local benefits derived from their natural-resource industries.
- 4) Even in NRDCs, workers increasingly need advanced training and technological skills that are unavailable in their remote locations. The skills mismatch and “institutional mismatch” further hinder local development and lead to regional centralization.

These propositions appear to fit many fishing communities, suggesting that their problems have structural causes not tied to fishing per se. On the other hand, the ecological changes outlined in the previous section are distinctly marine. One challenge in our research has been to distinguish social changes linked to marine ecological factors, from the background of other trends resulting from structural and macro-social forces—as seen in the non-fishing NRDCs. Details in the timing of demographic changes (Hamilton and Haedrich 1999), as well as multivariate cross-sectional analyses (Hamilton and Otterstad 1998b), yield indirect evidence. More direct subjective evidence should come from the first-person accounts of fisher folk.

## Migration and Demographic Change

Many fisheries-dependent places in the Atlantic Arc have lost population in recent years (Hamilton and Duncan 2000; Hamilton and Haedrich 1999; Hamilton and Otterstad 1998b). Partly this reflects modernization trends common to other rural regions and NRDCs. The timing of population loss, however, often follows adverse fishery events. Rural-to-urban population flows are the classic subject of migration research, and contemporary Arc fishing communities conform to many of the classical patterns. Research suggests some detailed propositions about fishing-community demographic change:

- 1) Unreliability of resource jobs encourages outmigration, especially among females, young families, and people with higher education or skills (human capital). The pull of urban centers is greater when those centers prosper.
- 2) Outmigration leaves rural populations not only smaller, but older and less skilled, affecting prospects for economic diversification. Outmigration of young women and professionals becomes a new “push” factor, giving other people reasons to move away.
- 3) Declining rural areas create political pressure for central governments to subsidize troubled economic activities; expand the public sector as an inducement to stay; subsidize diversification efforts, often unsuccessfully; and relax conservation-inspired limitations on fishing.
- 4) Change creates winners as well as losers. Some places, usually the regional centers, benefit more than others from government decisions, or adapt better to the new realities. They grow, while others decline.
- 5) The government/service sector is essential in providing jobs for professionals and women, without which communities are unlikely to thrive. Universities form one key element, sometimes becoming a “growth engine” that drives economic development even in comparatively remote areas.
- 6) Growing ports tend to be those harboring the more capital-intensive fishing fleets.
- 7) Individuals, businesses and communities with higher education and skill levels, access to investment capital, and political influence or sophistication have adaptive advantages.

The last point leads into ideas about human and social capital.

## Individual and Community Adaptations

Human and social capital are critical resources affecting adaptation to change (Coleman 1990; Portes 1998; Apostle et al. 1998). Development scholars, critiquing the neo-liberal paradigm, draw on social capital theories to bring both communities and the state back into the picture. They recognize that national and global policies in both the public and private sectors play out in communities in which particular social and political institutions, civic culture, and traditions are embedded (Hoselitz 1957; Putnam 1993; McCay and Jentoft 1996; Granovetter 1985; Piore and Sabel 1984; Ostrom 1990; Sabel 1994; Evans 1995, 1996; Tandler 1997; Apostle et al. 1998; Duncan 1999). These ideas suggest some propositions about the adaptive paths open to individuals, enterprises, and communities:

- 1) Those with greater human capital have a larger field of possibilities and greater ability to create alternative economic enterprises. Social capital can enhance the acquisition of human capital (Coleman 1990; Woolcock 1998).
- 2) Norms of trust and inclusive social institutions (social capital) improve prospects for economic development (Putnam 1993; Flora and Flora 1993; Portes and Sensenbrenner 1993; Evans 1996).
- 3) Communities with long-standing habits of cooperation and participation will be better prepared to develop effective resource management, in part because they are more likely to have sufficient legitimacy and sanctioning authority to control individual behavior and avert free riding or selfish depletion of common-property resources (Coleman 1990; Buenavista et al. 1994; Portes 1998; Acheson 1984; Locke 1996; McCay and Acheson 1996).
- 4) People in communities where outside forces—such as creditors or distant government bureaucracies—have controlled access to resources and “the rules of the game” will be less trusting of one another and of outsiders (Colombis 1983; Peluso 1992; Duncan 1999). They may lack the institutional resources and habits of decision making necessary to carry out alternative strategies (Hirschman 1958; Tandler and Freedheim 1994).
- 5) The widely-accepted dichotomy between “traditional” and “modern” fishery sectors breaks down as growing differences in education, capital, technology, and fishing capacity emerge within the formerly traditional small-boat sector (Sinclair 1985; Matthews 1993). Increasingly sophisticated fishing technology creates more business-oriented fishermen.
- 6) Cohort replacement, by younger generations with more education and higher expectations, forms a primary mechanism of social change.

Propositions 1–6 address the social and political conditions that affect the success of adaptation to environmental change. Understanding such conditions should contribute to policy discussions. A related issue, not formalized above, involves *how* individuals adapt. Sometimes apparently “rational” individual decisions turn out differently than policy makers expect, and even work at cross-purposes (Harris 1998).

## **Conclusion**

The propositions outlined in this paper derive from theoretical arguments, studies of particular northern Atlantic fishing regions, or studies conducted in other, non-fishing social environments. It remains an unanswered question how useful these propositions will prove to be as generalizations. For example, do these propositions apply widely to coastal regions of Europe and North America, as well as the extreme northern Atlantic? What about other fishing places, such as those of South America or Africa? Do some propositions have value as predictions about human response to a different kind of environmental shift, global climate change? All of the propositions describe relationships among observable phenomena, and should therefore be amenable to confirmation, refinement or rejection through research.

These propositions are meant to characterize some key relationships among fisheries’ natural and human components. While examining the components, however, it is important also to step back and think about how they fit together. Many social scientists have sought to understand fishing societies entirely through the lens of one academic discipline, such as anthropology, sociology or economics. The underlying ecosystem, which makes a fishery possible, can get taken for granted—until it visibly declines, often as the unexpected (but foreseeable) result of human activities. Fisher folk themselves often do not think in ecosystem terms either. On the other hand, biologically-oriented analyses can lose sight of the social realities that drive overfishing, constrain the options and effectiveness of fisheries management—and produce all the fishery’s data..

In addition to testing and extending individual propositions, therefore, future research faces a greater, integrative task: advancing our understanding of the complex interactions between biophysical and socioeconomic systems that underlie modern fisheries.

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