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Embeddedness and Influence: A Contrast of Assessment Failure in New England and Newfoundland

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Global Environmental Assessment Project
Environment and Natural Resources Program
Belfer Center for Science and International Affairs

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The Global Environmental Assessment Project is a collaborative team study of global environmental assessment as a link between science and policy. The Team is based at Harvard University. The project has two principal objectives. The first is to develop a more realistic and synoptic model of the actual relationships among science, assessment, and management in social responses to global change, and to use that model to understand, critique, and improve current practice of assessment as a bridge between science and policy making. The second is to elucidate a strategy of adaptive assessment and policy for global environmental problems, along with the methods and institutions to implement such a strategy in the real world.

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Publication abstracts of the GEA Project can be found on the GEA web site at http://environment.harvard.edu/gea. Further information on the Global Environmental Assessment Project can be obtained from the Project Associate Director, Nancy Dickson, Belfer Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University, 79 John F.

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FOREWORD

This paper was written as part of the Global Environmental Assessment Project, a collaborative, interdisciplinary effort to explore how assessment activities can better link scientific understanding with effective action on issues arising in the context of global environmental change. The Project seeks to understand the special problems, challenges and opportunities that arise in efforts to develop common scientific assessments that are relevant and credible across multiple national circumstances and political cultures. It takes a long-term perspective focused on the interactions of science, assessment and management over periods of a decade or more, rather than concentrating on specific studies or negotiating sessions. Global environmental change is viewed broadly to include not only climate and other atmospheric issues, but also transboundary movements of organisms and chemical toxins. (To learn more about the GEA Project visit the web site at http://environment.harvard.edu/gea/.)

The Project seeks to achieve progress towards three goals: deepening the critical understanding of the relationships among research, assessment and management in the global environmental arena; enhancing the communication among scholars and practitioners of global environmental assessments; and illuminating the contemporary choices facing the designers of global environmental assessments. It pursues these goals through a three-pronged strategy of competitively awarded fellowships that bring advanced doctoral and post-doctoral students to Harvard; an interdisciplinary training and research program involving faculty and fellows; and annual meetings bringing together scholars and practitioners of assessment.

The core of the Project is its Research Fellows. Fellows spend the year working with one another and project faculty as a Research Group exploring histories, processes and effects of global environmental assessment. These papers look across a range of particular assessments to examine variation and changes in what has been assessed, explore assessment as a part of a broader pattern of communication, and focus on the dynamics of assessment. The contributions these papers provide has been fundamental to the development of the GEA venture. I look forward to seeing revised versions published in appropriate journals and books.

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ABSTRACT

This paper examines fisheries assessment failures in New England and Newfoundland. While scientific assessments proved ineffective determinants of sustainable policies in both cases, a comparative analysis reveals important differences. In New England, ominous assessments were ignored by decisionmakers while in Newfoundland more optimistic assessments led decisionmakers astray. This contrast in outcomes illustrates the countervailing perils associated with the degree to which scientific assessment processes are embedded within the organizations that use assessments to inform their decisions. Embedded assessments are often influential within their host organization, but are apt to raise suspicions outside of them. Disembedded assessments garner less suspicion, but run the risk of being marginalized when their conclusions conflict with the objectives of decisionmaking organizations. Given the prevailing conditions within their respective issue domains, this analysis suggests that scientific assessments were insufficiently embedded in New England's regulatory structure while exceedingly embedded in Newfoundland's.

ACRONYMS

ADFP	Atlantic Demersal Fisheries Plan (US)
CAFSAC	Canadian Atlantic Fishery Scientific Advisory Committee (Canada)
CFPA	Coastal Fisheries Protection Act (Canada)
CLF	Conservation Law Foundation (US)
DFO	Department of Fisheries and Oceans (Canada)
EEZ	Exclusive Economic Zone
ICNAF	International Commission for Northwest Atlantic Fisheries
MFCMA	Magnuson Fisheries Conservation and Management Act (US)
NEFMC	New England Fisheries Management Council (US)
NIFA	Newfoundland Inshore Fisheries Association (Canada)
NMFS	National Marine Fisheries Service (US)
NOAA	National Oceanic and Atmospheric Administration (US)
SSC	Science & Statistical Committee (US)
TAC	Total Allowable Catch
TMG	Technical Monitoring Group (US)

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OVERVIEW

When the United States and Canada extended their exclusive economic zones (EEZs) to 200 miles in 1976 and 1977, respectively, considerable optimism existed concerning the ability of both countries to rebuild the famed groundfisheries on their North Atlantic coastal shelves. Twenty-five years later, the majority of these stocks have collapsed and much of the fishing industry is mired in crisis.

Unfortunately, the sad experience of the U.S. and Canada is not unique to the North Atlantic region. Nor is it much different from the general experience of coastal states worldwide in the wake of an oceans enclosure movement. Coastal states were granted ample authority under the 1982 Law of the Sea Convention (LOSC) to manage the resources under their respective jurisdictions in a sustainable manner.[1] This authority was underpinned by confidence in the ability of scientific assessments to estimate existing populations of fish stocks and to recommend maximum sustainable yields (MSY) or annual quotas that could be caught without jeopardizing the health of stocks. As we head into the 21st century, there is little evidence to suggest that overfishing has significantly diminished under an oceans enclosure regime. Clearly, the transmission of scientifically sound advice into long-term sustainable policies has proved more difficult than anticipated. As stock collapses persist, the fishing industry, fishery managers, and fishery scientists continue to blame one another for the unfolding tragedies.

With this general puzzle in the background, the experience of New England and Newfoundland illuminates a second order puzzle with respect to the public's general perception of the reasons stock assessments were insufficient guides to sustainable policies. The puzzle is nicely illustrated in the form of two recently published accounts of the fisheries collapses in each country. David Dobbs' *The Great Gulf* (2000) depicts the New England experience as one in which the inability of scientists and fishermen to effectively communicate led to the marginalization of science by politics. The implication is that the resulting assessments were impotent. Alternatively, Michael Harris' *Lament for an Ocean* (1998) depicts the Canadian experience as one in which science was constrained by politics to the point of corruption. The implication is that the resulting assessments were impaired. Marginalized science and impotent assessments on one hand, constrained science and impaired assessments on the other. What are we to make of these different messages regarding the influence of fisheries stock assessments?

In the New England's groundfisheries, it does not appear that scientific assessments have had a significant impact on fisheries policy until very recently. Fisheries scientists in the U.S. have expressed concern about the health of New England's groundfish stocks since the advent of extended EEZs and have never wavered in their call for caution. New England's fisheries policies have nevertheless proceeded haphazardly, resistant to constraint and ineffective in curbing fishing intensity until environmental interest groups successfully sued the U.S. government in 1991. Regulations have tightened considerably since then but stock conditions remain precarious and policies more responsive to scientific assessments seem to manifest only under the continued specter of legal sanction.

In Newfoundland the story is somewhat different. From the late 1970s through the late 1980s fisheries scientists were adamant in their claims that groundfish stocks were being rebuilt. Regulators depicted fisheries polices as harmoniously in tune with sound scientific advice. It was inshore fishers, rather than fisheries scientists, that first expressed concern over the condition of fish stocks. The common observation of recalcitrant fishers rebuffing what they perceive to be the scientific underestimation of fish stocks was turned on its head as the vast majority of fishers rejected scientific assessments as *overestimates* of the actual number of fish. In contrast to the 1991 lawsuit in the U.S., Newfoundland inshore fishers were unsuccessful in a 1988 lawsuit that charged the Canadian government with inaction. By 1990, fisheries scientists in Canada recognized the dire condition of groundfish stocks but federal

regulators failed to enact emergency measures until it was too late. Newfoundland's groundfish stocks collapsed in the early 1990s and are now widely viewed as commercially extinct.

Both New England and Newfoundland groundfish collapses constitute policy failures in which scientific advice did not translate into sustainable fisheries policies. Each case represents a different form of failure, however. Unlike the New England case, scientific assessments were indeed influential in establishing fisheries policy in Newfoundland. Though influential, they were flawed in that they corroborated a policy course that led to disaster. Assessments in Newfoundland fisheries proved ineffective in ascertaining actual environmental conditions. Assessments in New England fisheries appear to have more accurately captured these conditions but, as noted, seemed far less influential in establishing fisheries policies.

To explain this contrast in failure, this paper examines the institutional dimensions of fisheries stock assessments in these two cases. I argue that variation in the form and degree of assessment influence results from the manner and degree to which assessment processes are embedded within the organizations that use assessments to inform their policies. Embedded assessments are often influential within their host organizations because the rules that govern their production will likely be devised in a manner that infuses them with credibility. Embedded assessments may be less influential in the broader issue domain, however, where policy contestation can diminish perceived credibility and legitimacy on account of embeddedness. Disembedded assessments may benefit from less suspicion in a contentious issue domain, but they also run the risk of being marginalized when assessment advice is at odds with the objectives of a decisionmaking organization.

Embeddedness can thus be viewed as a double-edged sword in that either its presence or absence can derail the ability of scientific assessments to effectively guide sustainable policies. Embedded assessments are more influential to some actors and less influential to others. The degree to which issue development is enhanced by embedding an assessment within a decisionmaking organization depends upon conditions in the broader issue domain. In issue domains characterized by high levels of policy contestation, embedding assessments within institutions or organizations that are perceived as representative of a broad range of interests should enhance assessment influence. When institutions or organizations are perceived as biased, disembedded assessments may be more appropriate.

VARYING DEGREES OF EMBEDDEDNESS

Embeddedness, as considered in this paper, is the degree to which scientific assessment processes are embedded within the institution or organization that uses the assessment to inform or validate policy decisions.

Under the 1976 Magnuson Fisheries Conservation and Management Act (MFCMA), the United States established a fisheries management regime in consisting of seven regional fisheries councils[2] that were given the responsibility for devising fishery management plans for their respective regions. Council membership includes both state and federal officials along with a number of industry representatives. Environmental interest groups are often represented as well, usually as non-voting members. The balance of voting power within the New England Fisheries Management Council (NEFMC), as in most regions, lies with industry interests. Of the eleven at-large voting members appointed to the initial NEFMC in 1976, seven had strong ties to the fishing industry (Carey 1999). Stock assessments and associated fishery science, though nominally incorporated into scientific and statistical committees, is conducted outside of the fishery management councils in regional branches of the National Marine Fishery Service (NMFS).

In addition to its regional decentralization, the U.S. fishery management structure is one in which the "fishery manager" is perhaps the weakest link. The role of the federal bureaucratic manager is noticeably minor in the U.S. regional management councils. Unlike Canada, one does not observe a team of senior bureaucrats in NEFMC that devise strategic objectives for New England and translate them into federally guided policies.

Figure 1 provides a rough depiction of the fisheries regulation in New England. The box in the lower left corner represents NEFMC. Scientific advice, represented by the yellow arrow, comes from NMFS, which is independent of NEFMC. NMFS is a branch of the National Oceanic & Atmospheric Administration (NOAA), which, in turn, is a subordinate agency under the Commerce Department. A Science and Statistical Committee, or SSC, exists within NEFMC but formal connections to NMFS are absent. The red arrows represent informal channels of industry influence. In New England, NEFMC exerts influence on its Congressional representatives who, in turn, communicate directly with council members and often pressure the Secretary of Commerce and NOAA Administrator to accede to industry preferences.

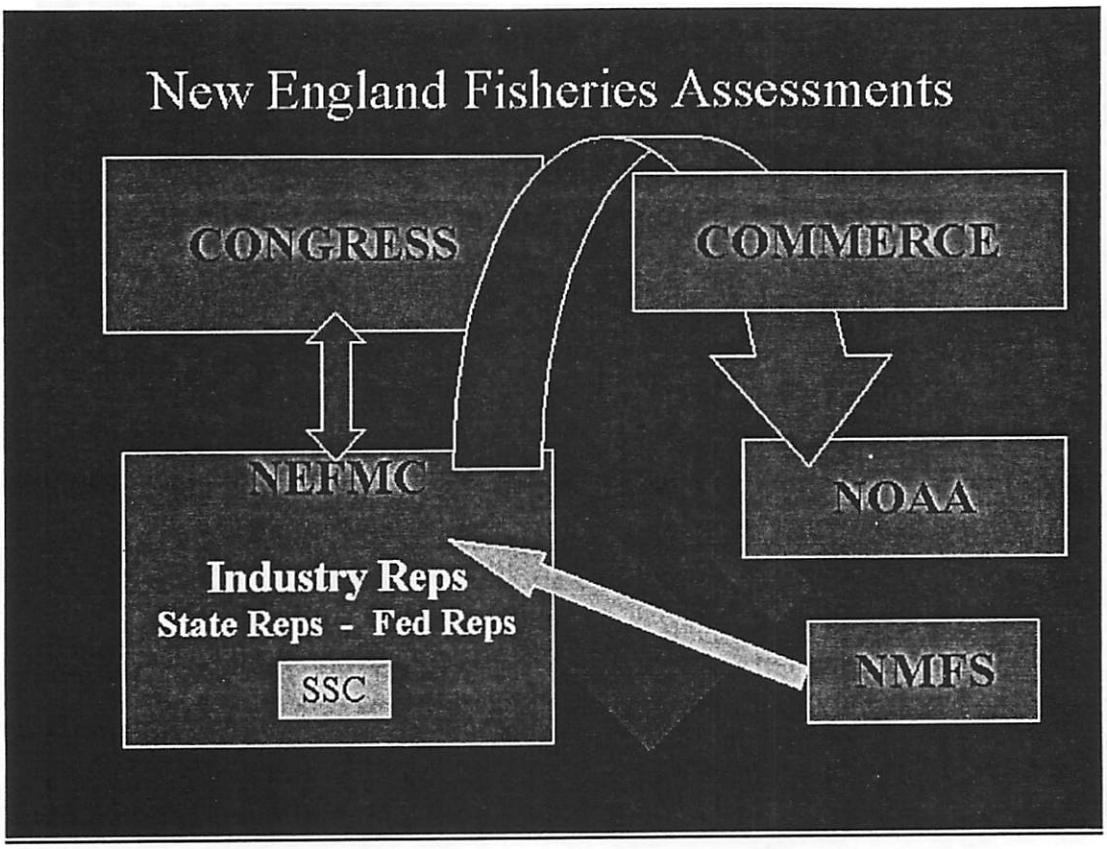

Figure 1: New England

The New England fishing industry largely manages itself through a majority of the voting seats on NEFMC. With a disparate array of heterogeneous interests (different gear types, competing states and communities, processing vs. harvesting interests, etc.) there is little common ground for long-term planning other than the perceived fairness of an open access fishery that does not impose undue constraints on any particular interest. The process by which management plans come to fruition is long, tedious and subject to numerous vetoes along the way (Hennessey and Healey, 2001). Scientific input to

this process is less formalized than in Canada and might be considered analogous to the input of a sideline referee that flags the regional councils when their activities lead them beyond the boundaries of sustainability. Under MFMCA, the Secretary of Commerce retains the authority to bypass the regional management councils and intervene directly in fishery management at the behest of NMFS. In absence of such extreme measures, however, NMFS advice to NEFMC has for the most part been conducted ad hoc.[3] As such, one can characterize the institutional relationship between stock assessment processes and fisheries management in New England as relatively disembedded.

Under the Coastal Fisheries Protection Act (CFPA), Canada established the Canadian Atlantic Fishery Scientific Advisory Committee (CAFSAC) in 1977. CAFSAC formalized the relationship between fisheries scientists and fisheries managers through an annual assessment process. By 1979, a Department of Fisheries and Oceans (DFO) had been created from former branches of the Department of the Fisheries and the Environment. A newly established DFO organizationally circumscribed the CAFSAC stock assessment process. Figure 2 provides a rough characterization of fisheries regulation in Newfoundland.

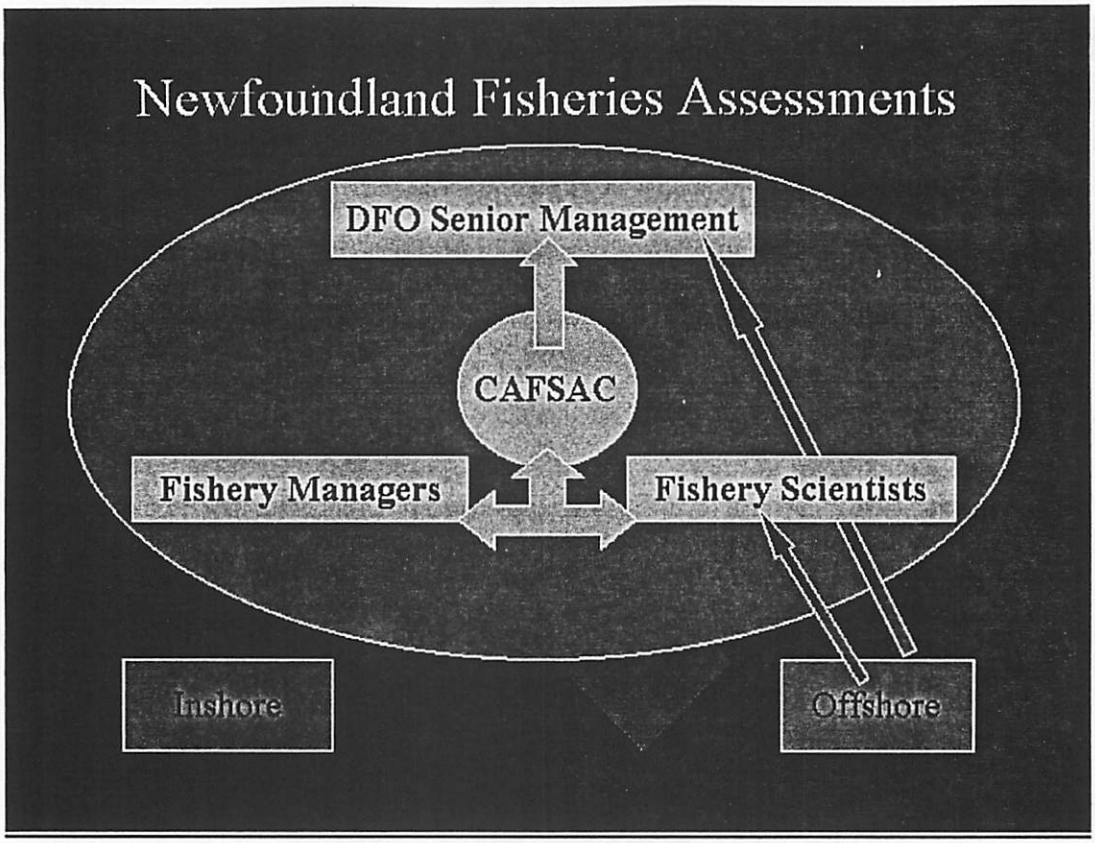

Figure 2: Newfoundland

In Canada, both fishery management and scientific assessment are centralized under the DFO. Fishery managers within the DFO are perhaps the strongest link as they play a central role in devising both grand strategies and annual plans targeting specific objectives.[4] CAFSAC consists of a number of subcommittees that have responsibility for certain types of stocks (groundfish, pelagics, salmon, etc.) and includes representation from DFO's Fisheries Branch and Science Branch on each subcommittee. In DFO's Fishery Branch, fishery managers formulate strategic policy and specific objectives for a given stock. Once the managers set the objectives, the Science Branch applies them in the form of biological

reference points to estimate stock status and quota advice. Ostensibly working together, managers and scientists in each committee formulate a set of recommendations that is forwarded on to the DFO Minister in the form of an annual CAFSAC advisory document (Finlayson 1994). After revisions, CAFSAC advisory documents are made available to the general public. In Figure 2 yellow arrows represent the flow of scientific advice.

Throughout the 1980s, offshore fishing companies contributed detailed catch-per-unit-effort data that is used in these assessments whereas the inshore sector did not, though landings data was collected from both sectors.[5] Unlike the U.S. regional management councils, the Canadian fishing industry was not given a formal voice in the process until very recently.[6] Informally, significant consultation occurred throughout the 1980s between the senior bureaucrats of the DFO and the senior executives of the offshore companies. In Figure 2, red arrows represent the informal industry input to fisheries regulation.

Importantly, the CAFSAC process was organizationally shielded from much of the public scrutiny that characterizes the U.S. management process. In comparison to the New England stock assessment process, one can characterize the institutional relationship between stock assessment processes and fisheries management in Newfoundland as relatively embedded.

VARYING DEGREES OF CONTESTATION IN THE ISSUE DOMAIN

High levels of contestation surround the fisheries stock assessments in both of the above cases. Conceiving of scientific information as pure or unadulterated prior to transmission into the policy domain misconstrues the pre-existing relationships between the set of relevant actors in a given issue domain. For fisheries policy, the institutional relationships between fisheries scientists, fishery managers and the fishing industry exist a priori to assessment processes. Moreover, the industry should not be considered a unitary actor but rather a subset of competing actors with their own relevant histories and institutional relationships. Public interest groups should also be considered an additional type of actor in this issue domain.

EEZ extension was the equivalent of an endowment for many coastal states, including the U.S. and Canada. At their most basic level, fisheries stock assessments are a means of informing the self-interest each of these states have in sustaining this source of wealth. States ask themselves, "how many fish are there under our jurisdiction and how many of them can we catch in a given year without damaging their ability to reproduce themselves?" When one allows for the possibility of different time horizons among different actors in the issue domain, say between the industry and the public, assessments also become a means of policy justification. In many cases stock assessments are needed by policymakers to justify constraints on fishing to the industry and to justify the absence of more significant constraints to the public interest groups.

With respect to the industry itself, there is a temptation to consider it as a homogenous actor with a uniform interest. But "the industry" is actually a misnomer that conceals the degree of heterogeneity within this subset of actors in most coastal states and the conflicting interests among them. In New England there are significant tensions between offshore and inshore fishers along with tensions between different gear types and communities. A fleet of relatively large trawling vessels, or draggers characterizes the New England offshore sector. In comparison with the Canadian offshore sector, however, the New England can be considered atomistic in that there is little horizontal concentration and virtually no vertical integration (Doeringer and Terkla 1995). Inshore fishers consist of various gear and regional groupings. Industry wide, most vessels are owner operated, even the relatively larger draggers. Large-scale factory trawlers are absent.

Though the offshore sector is generally perceived as having more political influence than the inshore sector, overt political conflict between the inshore and offshore sectors is relatively tame in New England. Both interests are represented in NEFMC and the two groups often adopt a common political stance in opposition to environmental interest groups and government regulators.

In the immediate wake of the MFCMA, substantive measures were introduced to rebuild New England groundfisheries. These included a set of regional TACs for a variety of groundfish species that were based on scientific recommendations from the International Commission for Northwest Atlantic Fisheries (ICNAF), the international organization responsible for facilitating cooperation and regulating high seas fisheries in the Northwest Atlantic prior to EEZ extension.[7] Mindful of the destructive legacy of the international fleet factory trawlers, NEFMC deferred to the conservation objectives of NMFS in setting TACs for 1977, the year it came into existence. NEFMC's deference was short lived.

A combination of federal subsidies and industry optimism that followed the banishment of foreign vessels led to a rapid expansion in fishing capacity within the initial years of EEZ extension. Not surprisingly, the expanding New England fleet began to exceed some of its regional TACs midway through NEFMC's first year in 1977.[8] Pressure to increase the TACs was partially successful, but NMFS ended up closing the entire groundfishery for the last week of the first season. In 1978, NEFMC tried breaking up the annual TAC into quarterly TACs with little success. With continued overfishing threatening to close the groundfishery for the entire fourth quarter, industry pressured Congress and the Secretary of Commerce to allow it to effectively borrow against its 1979 quota by beginning the 1979 season in October of 1978 (Carey, 1999).

Throughout the 1979 fishing year, TACs were routinely revised upward in response to fishing industry pressure. Inshore fishers complained that TACs privileged the larger offshore vessels that had easier access to the fish, effectively catching the entire quota before the inshore sector had a chance to operate. The offshore sector, in turn, resisted early efforts to differentiate offshore from inshore vessels and split the TAC accordingly as they found such proposals too constraining. Rather than deal with the asymmetric costs inherent in any attempt to tighten regulatory restrictions, NEMFC invariably challenged the government's scientific basis for imposing restrictions in the first place. Internal conflict was quickly redirected toward NMFS and its justification for TACs. By 1982, under a Reagan Administration sympathetic to industry interests, the quota management system was discarded in favor of an indirect management system that included minimum fish sizes, mesh requirements and rolling area closures (Hennessey and Healey, 2000). The next ten years of regulatory policy in New England proved largely impotent in restraining overfishing.

The fissures within the New England fishing industry stand in contrast to the fault line of contestation between the offshore and inshore sectors of Newfoundland. Here, intra-industry rivalries can be traced to longstanding class conflicts.[9] Unlike the New England industry, the Atlantic Canadian industry is comparatively bifurcated with a comparable owner-operated inshore sector as well as a vertically integrated, offshore sector consisting of large processor-owned vessels. In the initial years following EEZ extension the offshore sector confronted severe financial problems as overcapitalized operations and fluctuating prices pushed some of the largest fishing companies toward bankruptcy. Accordingly, Canada's Prime Minister Pierre Trudeau commissioned a Task Force in 1982 to recommend a plan of action for the future of Atlantic Canada's fisheries.

The resulting "Kirby Report" characterized the fishery as being in dire need of "economic rationalization." The best means of accomplishing this rationalization, according to the report, was to consolidate the offshore segment of the industry and to encourage marginal inshore fishermen to exit the industry. Following the Kirby report's recommendations, the Canadian Government proceeded to

consolidate the offshore sector into two vertically integrated companies – Fisheries Products International in Newfoundland and National Seafoods in Nova Scotia. The government established equity positions in both of these companies and both were awarded Enterprise Allocations (EAs). EAs were fixed quotas that the companies had annual rights to so that they could fish more efficiently without concern that fish left today would be taken by another company tomorrow.[10]

The Kirby Report was not well received by the inshore sector of Newfoundland who saw it as an attempt to justify squeezing them out of the industry (Blades 1995). While neither the offshore nor the inshore sector had a formal role in fisheries regulation, offshore company executives maintained a regular dialogue with DFO managers while the inshore fishers did not. The inshore sector was also concerned that the EAs awarded to the offshore companies could adversely impact the inshore access to fish. In Newfoundland, these concerns were initially mollified by a bargain struck whereby the inshore allocation would be fixed at its recent level, which was roughly 50% of the total TAC of the northern cod stock (Harris 1998). If the total TAC dropped, cuts were to be made from the EAs and not the inshore TAC. If the total TAC increased, surpluses would go to the offshore companies. In practice, stock assessments thus set the parameters for subsequent distributive politics. Distributive outcomes were inextricably tied to the assessments as the DFO "guaranteed" the inshore fishermen a fixed amount of the northern cod TAC with the balance going to the offshore sector. The higher the TAC, the better the distributive outcome for the offshore sector regardless of the actual condition of the stock. Whether or not this led to an intentional bias in the data provided by the offshore companies is not known; what is known is that the inshore sector sharply criticized the validity of the assessments on account of the relationship between the offshore companies and the DFO. This resulted in a highly polarized issue domain.

As a general rule, fisheries issue domains are highly contested environments with conflicting interests manifesting within the fishing industry as well as between the fishing industry and public interest groups. In New England, a broadly representative set of interests exercised direct influence on policymaking within NEFMC. Fisheries assessments were conducted outside of NEFMC by an organization (NMFS) that lacked clear authority and received equivocal support from its parent agencies.[11] In Newfoundland, policymaking was, until 1993, conducted exclusively within a federal agency (DFO) in the absence of formal industry participation. Despite the lack of formal participation offshore companies were perceived by inshore fishers as having considerable indirect influence through informal dialogue and data input to the fisheries assessment process. Fisheries assessments were conducted through DFO's internal CAFSAC process and DFO managers were institutionally unfettered in making use of their own scientific advice.

EMBEDDEDNESS AND CREDIBILITY

What can be inferred about the relationship between embeddedness and credibility from these two cases? Treating credibility as an attribute that varies among actors in the issue domain is instructive in understanding how institutions in general, and embeddedness in particular, infuse credibility into the assessment process.

The proposition advanced here is that embedded assessment processes enhance the perceived credibility of assessments for those actors who operate within the embedded organization. Conversely, embedded assessment processes can weaken the credibility for those actors in the issue domain who operate outside of the organization and who a priori challenge the organization's credibility. More succinctly, actors in an issue domain will attribute to an assessment those qualities they attribute to the organization producing it. The more embedded the assessment processes are, the higher the correlation between attributes made about the assessment and the organization producing it independent of the content of assessment. This

linkage is not unwarranted, as embedded assessment processes are more vulnerable to the political constraints of the parent organization. These constraints need not be direct attempts to distort the accuracy of an assessment. They can include more subtle pressures to impose precision, downplay uncertainty and direct assessments towards questions that will advance an organization's objectives (and away from questions that will undermine those objectives).

If the objective of a given assessment is to provide justification for a policy decision or position, there exists a strong incentive to harmonize assessment conclusions with policy choices or recommendations. This could simply involve choosing or recommending the most appropriate policy given the assessment conclusions. But when an organization has a priori preferences for a given policy option an incentive arises to frame an assessment or its conclusions in a way that minimizes the dissonance with the organization's preferred policy option. With embedded assessment processes, this incentive manifests as a moral hazard in that the decisionmaking organization has considerable discretion in shaping its assessments and framing its conclusions.

In the Canadian case the DFO viewed the credibility of its fisheries science and its CAFSAC assessments as above reproach, at least until political fallout of CAFSAC's 1989 "reassessment", when it admitted that previous assessments had overestimated the northern cod stock by 100%. Until that time, DFO scientists were viewed as some of the best in the world (Finlayson 1994), and the connection between the CAFSAC assessment advice and subsequent policy was direct and fluid. Within the issue domain of Newfoundland fisheries policy, however, CAFSAC assessments were not viewed with the same level of deference. By the mid 1980s CAFSAC assessments began to diverge from the observations of inshore fishers who were witnessing shrinking catches and smaller fish. These observations were strikingly similar to those witnessed in the 1970s when foreign fleets drove the stocks to a near collapse.

Inshore concerns were initially downplayed by the DFO, as its CAFSAC assessments continued to suggest healthy stocks. Dissatisfied with DFO's response to its concerns, inshore fishermen in Newfoundland established the Newfoundland Inshore Fisheries Assocation (NIFA) in 1986 to better represent their interests. NIFA promptly commissioned three biologists from Memorial University in St. John's, Newfoundland to conduct an independent review of DFO's stock assessments. Using data provided by DFO, the three biologists produced what became known as the Keats Report. The report was highly critical of DFO's data sources, statistical procedures and subsequent conclusions. Though it based its conclusions on DFO data, NIFA considered the Keats Report as a more credible assessment because it was produced outside of the DFO.

DFO responded to the attack on its credibility by trying to discredit the attacker. DFO claimed that the Keats team had inadequate expertise and less time and resources to devote to their analysis than DFO. It also depicted the Keats report as lacking credibility because it was commissioned by NIFA – it was labeled as propaganda from the inshore lobby. Of interest, the content of the Keats report seemed to be much less the target of DFO's criticism than the actors responsible for pushing it into the issue domain.

DFO commissioned a rebuttal assessment which sought to diffuse some the credibility attacks on its CAFSAC assessments by bringing in fisheries scientists from outside DFO.[12] It remains debatable whether the equivocal conclusions contained in the rebuttal assessment (the Alversen Report) were substantively different from those in the Keats Report (Finlayson 1994). Nevertheless, DFO senior managers chose to portray the Alverson report as an outright vindication.[13] At a critical time, DFO seemed more concerned with preserving its credibility than it did with seriously entertaining the possibility that its own assessments were inaccurate. It did not consider the possibility that its CAFSAC advice could be biased due to internal pressures for minimizing uncertainty and/or misleading or falsified information from the offshore sector.[14]

In interviews conducted by Finlayson (1994), DFO scientists admitted that DFO's senior managers pressured the Science Branch to make their TAC recommendations as precise as possible. Investments being made in the offshore sector in the early 1980s necessitated a degree of certainty in access to high quantities of northern cod that was probably unwarranted. To the extent that the DFO scientists constructed stock assessments in terms of broader ranges of possibilities with associated levels of uncertainty, DFO managers chronically chose the most optimistic interpretations and publicly understated the uncertainty involved.

In subsequent publications, DFO and the offshore sector have sometimes been depicted as having a conspiratorial relationship (Blades 1995, Harris 1998). An alternative explanation may be that the embedded assessment processes within DFO resulted in DFO policymakers attributing *excessive* credibility to their internal CAFSAC assessments and *insufficient* credibility to contradicting assessments and information that was emerging from other actors in the issue domain. This myopic perspective was in part a defensive reaction to the attacks on DFO credibility that were in part due to the embedded assessment processes. Embeddedness in this instance may have contributed to the polarization of credibility perspectives in this particular issue domain. If DFO had taken a less defensive posture during this time it may have facilitated a quicker and more substantive adjustment in the TAC. Doing so, however, would have been costly to its reputation for in admitting inaccuracy DFO's credibility would have been weakened.

This is not an issue for NEFMC, as it does not assume ownership for the scientific assessments that it uses to inform its policies. Disembedded assessments have challenges and advantages that mirror those of embedded assessments. The simple logic that suggests that a decisionmaking organization will be reluctant to challenge the credibility of an assessment produced internally is turned around. Assessment processes that are outside of decisionmaking organizations are more vulnerable to discrediting on the part of those organizations simply because there is less cost in doing so if the organizations objectives can be protected or advanced by discrediting the assessment. Conversely, disembedded assessment processes are less vulnerable to discrediting from other actors in the issue domain who would suspect embeddeded assessments to be politically constrained.

NEFMC criticism of NMFS scientific assessments began soon after it came into existence. The initial criticism was fueled by NMFS recommendation that the haddock fishery be closed in 1977 for the first year of the new regime. ICNAF data suggested that haddock populations were on the brink of collapse in the mid 1970s and NMFS believed that the stocks should be rebuilt for a short period before allowing the industry to harvest them. However, in making the recommendation NMFS did not disclose the fact that a very large year class of haddock was produced in 1975, a large class that fishermen were beginning to see in 1977 (Hennessey and Healey 2000). NMFS acknowledged this in 1978 and though closing the haddock fishery in 1977 and possibly 1978 to allow the 1975 year-class to mature could have been invaluable to rebuilding the stock they were sharply criticized for withholding this information. The incident reinforced the suspicions of many fishermen about NMFS credibility, and more generally about what they perceived to be an environmentally biased federal government.[15]

For most of the Reagan Administration, the influence of NMFS scientific advice in New England groundfisheries was tempered by these suspicions, to which NEFMC remained sympathetic. In 1985, when NEFMC submitted a new management plan (the Atlantic Demersal Fisheries Plan, or ADFP) for approval by the Commerce Secretary, it was rejected at the behest of NMFS on the grounds that it did not prevent overfishing. NEFMC resubmitted the plan again in 1986 virtually unchanged. Despite recommendations from the U.S. Coast Guard to reject the plan on enforceability grounds, NMFS partially approved it with accompanying admonitions that a newly created technical monitoring group (TMG) would address ADFP's recognized deficiencies. Hennessey and Healey (2000) attribute NMFS acquiescence to an aggressive lobbying effort in which a congressional delegation from New England

wrote the regional director of NMFS urging him to approve the plan on the grounds of socioeconomic necessity.

Despite a 1987 amendment to the ADFP tightening restrictions on mesh sizes and closed areas, NMFS stock assessments revealed a deteriorating situation and in 1988 the newly created TMG concluding that the stocks and catch-per-unit-effort of the principal groundfish species were at historic lows. In 1989 new MFCMA guidelines directed regional councils to explicity define overfishing within its fishery management plans and later that year NEFMC did so. Its specification of 20% of the maximum spawning potential of groundfish stocks was accompanied by an acknowledgement that the New England fishing industry was overfishing these targets. A subsequent amendment (Amendment 4) to ADFP failed to include provisions that would address continued overfishing but was nevertheless approved by NMFS in 1990. In 1991, the Conservation Law Foundation successfully sued the Secretary of Commerce and NMFS on the grounds that they failed to fulfill their legislative obligations under MFCMA. A consent decree was signed between the parties in August of 1991 aimed at forcing NEFMC to adopt more stringent regulatory measures that would satisfy specific effort control targets.

The development of Amendment 5 in 1992 was met with continued resistance from the industry. Antagonism between NMFS and the fishing industry resurfaced when a strong year class of groundfish from 1987 was observed in 1990 and 1991. Improved catches reinforced the industry's suspicions of the credibility of NMFS' ominous assessments. Despite industry criticism, most other actors in issue domain had by now accepted the validity of NMFS assessments. Amendment 5 was adopted by NEFMC in late 1993 targeting a 50% reduction in fishing mortality over the subsequent five year period. In August of 1994 NMFS scientists released a Special Advisory Report contending that groundfish stocks on the Georges Banks had collapsed and that Amendment 5 was insufficient to allow for recovery. Subsequent amendments throughout the 1990s have further tightened restrictions and closed more areas to fishing.

Though NMFS assessments were not subjected to the same institutional influences that DFO assessments were, NMFS assessments were nevertheless criticised by NEFMC because NEFMC could not otherwise influence them. In fact, NMFS relative candor in reporting uncertainty seems to have been turned against it in another ironic contrast to the DFO assessments. Since TACs were imposing costs on the industry NEFMC felt justified in marginalizing NMFS warnings regarding overfishing because of the significant uncertainty in NMFS' stock assessment process. Alternatively, the autonomy of the assessment process from NEFMC and its industry pressure led to greater credibility in the broader issue domain as public interests groups became increasingly involved. NEFMC's explicit marginalization of science became increasingly difficult to sustain in the late 1980s because of mounting federal and legal pressure coupled with recognition of overfishing in the region. In 1987 NEFMC established a technical monitoring group that subsequently confirmed the NMFS prognosis of groundfish stock conditions in 1988, forcing NEFMC to acknowledge as much in 1989. Since CLF's lawsuit in 1991, NMFS assessments appear less contested by NEFMC, though the industry continues to contest them outside of NEFMC. The influence of NMFS assessments have arguably increased over time, though not nearly quick enough to prevent substantial depletion of New England's groundfisheries. This gradual change has occurred indirectly as NMFS assessments gained credibility in the broader issue domain where pressure was generated forcing NEFMC to act.

An additional mechanism through which embeddedness affects credibility may be transparency, or the degree to which assessment procedures are understandable and visible to actors in the broader issue domain. Assessment processes that are disembedded from the organizations that use the information do not necessarily embody higher levels of transparency than embedded assessment processes. Such processes are more likely to be transparent, however, to the extent that assessment processes are conducted by organizations that are judged on the basis of their scientific proficiency rather than their policy competence. Without the complicating concern of justifying policy decisions, organizations whose

mandate is limited to scientific analysis and recommendation have greater latitude in preserving scientific integrity without necessarily having to account for the decisions made on the basis of their assessments. Transparency and candor with respect to uncertainty are easier under these conditions.

In the CAFSAC advisory process, and in DFO's Science Branch more generally, scientific dissention was something to be ironed out internally before presenting a uniform DFO position to the public. In the wake of the northern cod collapse, when some DFO scientists produced papers disputing the DFO's public position that environmental factors were the primary cause of the collapse, DFO tried to dissuade them from making their opinions public. When they published their work they were ostracized (Harris 1998). As noted previously, internal DFO questions regarding the certainty of the stock assessments prior to the collapse were muted. DFO apparently felt it necessary to substantiate both its management competence and its scientific proficiency by harmonizing its public scientific positions with its policy choices.

In the New England case, NMFS had an easier time in advancing scientifically critical analyses of existing NEFMC policies, as NMFS was not responsible for the policy choices of NEFMC. Though much of the methodology and modeling used by NMFS fisheries scientists is similar to that used by DFO scientists, dissenting opinions seem less problematic at NMFS. The long and often tedious review process offers ample opportunity to question assessment processes in New England fisheries policy development and ensure a relatively high degree of transparency (at the potential expense of efficiency). NMFS also seemed to be more forthcoming with respect to the inherent uncertainty in its stock assessments than was witnessed at DFO with CAFSAC – even allowing the uncertainty to be used against it as NEFMC ended up doing in justifying its reluctance to specify and implement more stringent regulations.

EMBEDDEDNESS, SALIENCE AND LEGITIMACY

Salience is treated as the perception of relevance in this volume and salience issues usually involve decisionmakers who have difficulty in applying the information contained in an assessment to the questions that they find pertinent to their decisions. In general one might posit that embeddedness would be likely to enhance salience for the parent organization of the assessment process at the potential expense of diminishing salience for other actors in the issue domain. The logic is similar to that of credibility and legitimacy as the greater latitude an organization has in shaping an assessment for its own purposes the greater the potential for shaping it in a manner that's less useful for others.

For fisheries stock assessments, salience is less of an issue in that assessments are used to set TACs, and TACs affect most everyone in the issue domain. Fisheries stock assessments are contested on grounds of credibility and legitimacy in large part *because* of their high degree of salience. Stock assessments are relevant to all the stakeholders.

That said one might be able to posit an interesting monitoring/feedback question concerning the relationship between embeddedness and salience for actors conducting assessments. Is information that is transmitted into an issue domain by actors outside of the formal assessment process more or less likely to be perceived as salient depending upon the degree to which the assessment processes are embedded in decisionmaking organizations? Posing a counterfactual to the above case comparison, had DFO's Science Branch been organizationally disembedded from DFO (having greater autonomy), would inshore observations be viewed as more salient than they were?

The question is difficult to answer, as credibility and salience issues were intertwined in this instance. DFO managers publicly discredited the Keats report on account of its political motivations while DFO scientists questioned the salience of observations made by the inshore fishermen. Had DFO's assessment processes been less embedded in the DFO bureaucracy they may have been more transparent with respect to dissenting opinions and thus less apt to discredit outside information as lacking credibility (and perhaps salience).

However, caution should be exercised in suggesting that embeddedness was a causal factor shaping monitoring feedback on account of the observation of NMFS scientists discounting information provided by fishers on similar grounds of tractability or consistency as lacking salience (Dobbs, 2000). How research organizations perceive the salience of information that is in discord with their assessments is a question that might be explored further along with broader questions of adaptation of research institutions to feedback from the issue domain.

Whereas credibility is invoked to denote the perception of technical accuracy, legitimacy is invoked in this volume to denote the perception of fairness. In assessment processes fairness stems from representation or participation in assessment processes and/or having one's concerns taken into consideration in those processes. In this comparative case analysis, the two attributes are interrelated as legitimacy concerns sometimes generate credibility concerns. Assessments are perceived as unfair or biased *and* inaccurate because of their bias or unfair dismissal of certain concerns.

Embeddedness affects legitimacy in much the same way that it affects credibility. The more embedded an assessment process is within a decisionmaking organization, the greater discretion that organization has in shaping the participation and scope of an assessment in a manner that satisfies its concerns and advances its goals. It would be odd to observe an organization contesting the legitimacy of one of its own assessments. Embeddedness may tarnish the legitimacy of an assessment for other actors in the issue domain for these very same reasons.

In the DFO case one can observe the inshore sector challenging the legitimacy of DFO assessments in that offshore data was used extensively in the assessment processes while inshore data was not. This bias was perceived as unfair and part of a general pattern on the part of DFO of responding to the concerns and observations of the offshore sector while neglecting the inshore sector. These legitimacy challenges were inextricably connected to credibility challenges as the primary claim made by the inshore sector was that DFO's assessments were inaccurate.

With respect to disembedded assessment processes, it would seem that legitimacy is neither helped nor hurt by the lack of embeddedness. The legitimacy of assessments produced outside of decisionmaking organizations are likely judged on their own merits (or those of the producing organization) independently from the decisionmaking organization. Thus, it would seem unlikely that actors in an issue domain would claim that an assessment was more or less legitimate *because* it was conducted outside of the organization that would use the information. Legitimacy challenges to disembedded assessments are more likely to target the organizations producing them. Legitimacy claims did not seem to be a contested attribute in the New England stock assessment process.

CONCLUSION

What insights can be drawn from the above comparative case analysis regarding the relationship between the embeddedness of assessment processes and their resulting influence on policy development? To suggest that embeddedness increases the influence of assessments in general would be misleading.

Embeddedness increases the likelihood that the participatory and procedural rules that govern the production of an assessment will be consistent with those that infuse assessments with salience, credibility and legitimacy in the eyes of the organization in which the assessment processes are embedded. Embeddedness is thus an institutional characteristic from which one can infer concurrence between the institutional dimensions of assessment production and the preferences of the decisionmaking organization.

Does this imply greater influence? Not necessarily. First, it is quite possible that the decisionmaking organization is characterized by discordant internal preferences. If a decisionmaking organization is constituted by a multiplicity of conflicting preferences then the assessment processes within may be subject to counterveiling pressures that paralyze it. Embedding assessment processes within NEFMC through the establishment of the TMG did not immediately result in greater influence of scientific assessments. It did enhance the credibility of scientific input, however, which set the stage for other actors in the issue domain to bring pressure upon NEFMC to act.

In addition to the political context within the decisionmaking organization, the political context in the broader issue domain mediates the influence of embedded assessment processes. At the DFO, CAFSAC advice had significant influence on DFO's policy decisions but the embeddedness that enhanced its credibility internally weakened it outside of DFO. DFO made an explicit attempt to disembed the Alverson report by bringing in outside experts as a means of enhancing its expected influence (through greater credibility and legitimacy) in the broader issue domain. DFO is also an example where embeddedness actually impaired the decisionmakers ability to recognize dissonant information and reconcile it with its own assessment recommendations. CAFSAC assessments influenced decisionmakers, but their influence pushed the decisionmakers in a disastrous direction.

Under what conditions might we expect embedded and/or disembedded assessment processes to enhance the influence of assessments? When decisionmaking organizations are recognized as broadly representative of the full range of interests affected by policy decisions embedded assessment processes can be expected to enhance the influence of assessments. This does not mean that the decisionmaking organization include a broad range of interests in general, but a broad range of those interests impacted in a given issue domain. If assessments address specific issues in narrow issue domains, assessment processes embedded within the organization responsible for those issues should have considerable influence. When issue domains are highly contested, when decisionmaking organizations lack internal consensus and when decisionmaking organizations do not adequately encompass the full range of competing interests, disembedded assessments should be more influential than embedded assessments.

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ENDNOTES

[11] LOSC grants coastal states ample authority to conserve and manage resources within their EEZs. Article 297(3-a) provides that a coastal state shall not be obliged to accept any dispute settlement process with respect to living resources in their respective EEZ. It goes on to state that such conservation measures as allowable catch, harvest capacity and the allocation of surpluses to others fall within the discretionary powers exercised by the coastal state. In short, coastal states may establish any level of allowable catch for fisheries within their EEZ. If a coastal state determines that optimum yields for domestic fisheries exceed the capacity of their domestic industry to harvest that yield, the coastal state is encouraged to allocate surpluses of allowable catches to foreign fishermen. Again, though, these decisions are not subject to challenge when the coastal state decides that it is in their interest not to share the surplus. See Wang (1991).

[2] There are now eight regional councils.

[3] It should be noted that the role of scientific input likely varies among the eight different regional management councils in the U.S. (See Heinz study). One can also argue that the role of scientific input has varied over time in the New England case in that scientific assessments underpinned the quotas that were attempted in the initial years following EEZ extension before they were abandoned. Moreover, the establishment of the TMG can be interpreted as an increase in formalization of scientific input. However, I believe it fair to characterize the scientific input to fisheries management in New England as ad hoc in comparison to the formalized CAFSAC process in Newfoundland.

[4] Though federally centralized, Canadian fisheries policy is complicated by federal-provincial dynamics that are not taken up in detail in this paper. In particular, provincial governments have authority over licensing processing facilities that generate pressures on harvesting incentives. Responding to local political pressure from the inshore sector, provincial governments in Canada have also exploited federal unemployment insurance policies by facilitating seasonal expansion of the inshore sector whereby inshore fishermen qualify for federal unemployment insurance for the remainder of the year.

[5] The scale and sophistication of the information that the large offshore companies were willing to provide DFO afforded the agency a robust dataset that was both tractable and amenable to DFO's stock assessment models. Inshore observations were discounted because they could not be monitored with the same level of consistency (Finalyson, 1994).

[6] A number of reforms that have been implemented since the stock collapses in the early 1990s. A Fisheries Resource Conservation Council (FCCC) has replaced the CAFSAC process, greatly expanding the participation of industry and academia in the assessment process.

[7] Though nominally a regulatory body, ICNAF's mandate, authority and monitoring & enforcement capabilities were lamentably weak during its tenure.

[8] The Gulf of Maine fishery for cod was closed in June; for haddock and yellowtail flounder in July. Similar closures ensued on the Georges Banks in August, though incidental catches were still allowed.

[9] The owners of the vertically-integrated offshore companies were the descendants of the merchant class families that constituted the client-patron ties of the "truck-system" (see Apostle et. Al, 1998).

[10] The Canadian EAs were comparable to a private property right, or an IQ, for the offshore sector.

[11] Collins (1994) notes that NMFS incurred the largest percentage of budget reductions of any of the federal natural resource agencies during the Reagan years. Collins also contends that with little support from the Secretary of Commerce and NOAA, NMFS became a bureaucratically isolated organization during this period.

[12] In 1987 the DFO established a Task Group on Newfoundland Inshore Fisheries (TGNIF) to address inshore concerns. TGNIF was chaired by DFO's Dr. Lee Alverson but included a number of reputable fisheries scientists from the United States, the United Kingdom and Canada that had no direct institutional ties to DFO. The content of the TGNIF assessment acknowledged many of the points raised in the Keats Report, but the resulting "Alverson Report" remained equivocal with respect to the status of the stocks and the causes for the inshore declines

[13] DFO released a document entitled *The Science of Cod* in 1988 as a public reaction to the 1987 Alverson report. *The Science of Cod* puts an overly positive spin on the Alverson report that many have suggested was unwarranted by Alverson's content.

[14] Up until the time they docked their own fleets, the offshore companies maintained that they saw no indications of stock depletion.

[15] The point that scientific credibility is difficult to secure, but easy to lose is taken up in more depth in the chapter by Tony Patt in the forthcoming GEA volume on institutions.

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