

**Framing policy research for adaptive management:
the case of Atlantic Canada's seal hunt**

Murray A. Rudd*, Stephanie M. Coombes, Rachell F. Ellerbeck, Amber L. Frickleton, Simon J. Gallagher, Gerald R. Glode, Leigh A. Kelloway, Kim J. Olson and Rebecca R. Willcott

Environmental Studies Program
Sir Wilfred Grenfell College, Memorial University of Newfoundland
Corner Brook, Canada

*Corresponding Author: Dr. Murray A. Rudd, Email: mrudd@swgc.mun.ca

15 Apr 2008

© 2008 by the authors



Abstract

The need for adaptive management of coasts and oceans is widely recognized. The capital-based institutional framework proposed here can be applied at different levels of analysis – operational, implementation, political – in such a way that stimulates thoughtful design and monitoring of adaptive management initiatives. We illustrate the approach by examining the current derby-style Northwest Atlantic harp seal (*Pagophilus groenlandica*) hunt in Canada. We suggest that a policy experiment with transferable seal use rights between hunting proponents and opponents could provide valuable information necessary for conflict resolution, reduce the transaction costs of managing the seal hunt, and increase net benefits to society.

Keywords: Adaptive management; capital assets; institutional analysis and development; seal hunt; Atlantic Canada; transferable quota.

Word count (body of report): 5946

Total word count: 7555

Introduction

Coastal and marine ecosystems around the world are under stress from increasing human activity (Turner *et al.* 1995, Goudie 2005). The stress is manifested in a number of ways including the loss of biodiversity (Wood *et al.* 2000, Worm *et al.* 2006), coastal degradation (Lotze *et al.* 2006), and the collapse of fisheries (Myers and Worm 2003, Hutchings and Reynolds 2004). In some cases, biophysical degradation can have important direct social consequences (Adger *et al.* 2005). In other cases, such as the Northwest Atlantic harp seal (*Pagophilus groenlandica*) hunt in Canada, human activities can lead to stress and conflict even when biological resources are relatively healthy.

Coastal ecosystems provide myriad stakeholders with diverse ecosystem services under varied governance regimes. For many renewable marine resources, property rights are poorly specified and resources are treated as open access goods to be serially exploited (Berkes *et al.* 2006). In some jurisdictions, laws and regulations – often implemented in an ad hoc manner – have become so complex that it can make it difficult to reconcile inconsistent policies and regulations (Healey and Hennessey 1998). In other systems, there is substantial divergence between formal rules and informal social norms, the de facto ‘rules in use’ (Acheson 1988). Stakeholders and citizens may also have vastly differing perceptions of what constitutes ‘degradation’ or threats to marine resources. We need to address these challenges in a systematic way, using sound logic models of social-ecological systems, so that a full range of policy options can be identified and considered, direct and indirect outcomes of selected interventions can be effectively monitored, and management strategies can evolve to meet new challenges. This is the essence of adaptive, or experimental, coastal management (Walters 1997, Rudd 2004).

The focus of this article is on the development and demonstration of an integrated, institutional policy analysis framework for: (1) describing and understanding the ecological and socio-economic state-of-the-world in terms of capital assets; (2) designing and comparing investment options and institutional interventions for sustainable coastal management; (3) understanding and resolving values-based conflicts; and (4) implementing results-based management and monitoring. The Institutional Analysis and

Development (IAD) framework (Ostrom 1990, 2005) can be used as the base for such analyses. When the state-of-the-world is contextualized in terms of capital assets, the IAD framework provides a very useful platform for framing policy research on sustainability issues (Rudd 2004).

We use the example of the seal hunt to illustrate the potential utility of this institutional approach to a highly contentious coastal management challenge in Atlantic Canada and briefly explore the possibilities for an innovative policy experiment, moving from the current derby-style hunt to an individual transferable quota (ITQ) system with inter-sectoral transfer rights between hunt proponents and opponents. This could provide valuable information on the economic and cultural significance of sealing to hunters and rural coastal communities, and on the benefits of more humane harvesting practices to animal rights activists and the general public.

The Atlantic Canadian harp seal hunt

Six species of seal are found off of Canada's Atlantic Coast: the harp, hooded, grey, bearded, ringed, and harbour seals. The harp seal, with an estimated population of 5.82 million (DFO 2005a), is the most abundant in Atlantic Canada. Besides the Atlantic Canadian herd, smaller populations exist off Russia and Greenland.

The seal hunt is closely associated with most, if not all, the cultures that have occupied Newfoundland and Labrador for the last 9,000 years. The Palaeo-Indians, the Palaeo-Eskimos, the Thule and the Labrador Inuit were all marine-oriented societies (Candow 1989) and many of their ancestors today still participate in the seal hunt. Historically, seal blood and meat was used as food, seal oil was burned to provide light and heat, and seal skin was used for clothing and shelter (Candow 1989). European settlers started taking seals commercially in the eighteenth century although it is believed they harvested seals for subsistence since their arrival (Candow 1989, Rose 2007). The living conditions of early sealers were filled with hardship and tragedy; the struggles that accompanied the seal hunt ('the organized exploitation of both seals and men') have been thoroughly documented in the abundance of Atlantic Canadian literature on the subject (e.g., Wright 1952, Brown and Harwood 1972). Atlantic

Canada's seal hunt, the largest in the world (McLaren *et al.* 2001), is now concentrated in two areas off Newfoundland and Labrador's northwest coast ("the Front") and in the Gulf of St. Lawrence ("the Gulf"). Most harp seals are hunted at the 'beater' stage, which follows moulting of their white coat, 10 to 14 days after birth.

The pelt is the most economically valuable product derived from the seal hunt; seal oil, meat, flippers, and male genitals also have some market value. After peaking around Cdn \$100 per pelt in 2006, the price for top quality pelts fell to \$33 by 2008. Seal pelts have traditionally been exported from Canada with minimal value-added processing via a handful of exporters based in Newfoundland, PEI and the Magdalen Islands (DFO 2006a). While international seal fur trade statistics are unreliable, limited evidence suggests that most pelts are shipped to Norway where they undergo further processing before being sold in Russia, China, Korea and other markets.

Policy Framework

Capital Assets

Capital assets are stock variables that have the capacity to provide a flow of goods and/or services to society, now and in the future, and which can be combined with other goods or services and transformed into valuable outputs (Castle 1998). A second general characteristic of capital is that it requires investment, reflecting savings or consumption foregone in one time period, to increase well-being in the future. Six kinds of capital assets (natural, financial, manufactured, human, social and cultural) are now widely recognized.

Natural capital refers to the part of the environment (air, water, soil, and ecosystem) that provides people with (1) ecological functions that support living systems, (2) products that can be consumed (source services), (3) waste assimilation (sink services), and (4) nonmarket amenities (Ekins *et al.* 2003). In the case of the harp seal, the overall population (the natural capital asset) was approximately 5.82

million animals in 2005 (DFO 2005a). The seal hunt is a somewhat unusual case because the population is at highest recorded levels rather than at depressed levels typical of many Atlantic Canadian fisheries.

The ecological and human amenity services that harp seals provide are far less clear than the source service the population provides to hunters. There has been speculation that the growing Atlantic Canadian harp seal population is responsible for the lack of resurgence in groundfish stocks such as the Atlantic cod (Hammill and Stenson 2003), which remain largely closed to fishing since the 1992 cod moratorium (Rose 2007). Whether changes in the number of seals killed each year during the seal hunt would have any direct or indirect impact on Atlantic cod recovery is an open question (Hammill and Stenson 2003). From a human amenities perspective, the seal population might provide people with value for non-consumptive reasons. Some tourists visit PEI in the spring specifically to view seals during the birthing season. Other people, in Canada and abroad, may derive a benefit from simply knowing that seals are not being hunted; benefits arising from these 'existence values' may be economically important (Rudd 2007).

Financial capital refers to the money, property and other financial assets of households, firms, governments and non-governmental organizations (NGOs). Financial wealth can be invested to enhance other capital assets or used to pay for commodities from outside the system. Many seal hunters are also fishers; because fishing in Atlantic Canada is an economically marginal activity, fishers and fishing associations have relatively limited access to financial capital. The Government of Canada and the NGOs that protest the hunt, the other major actors in the policy arena, are well-financed and have access to significant amounts of financial capital.

There is considerable confusion regarding the net impact of the seal hunt on financial wealth in Atlantic Canada (Southey 1997, McLaren *et al.* 2001). Hunt proponents often imply that the "value" of the hunt is equal to the gross revenue; for instance, the total landed value of Cdn \$17.5 million in 2005 (DFO 2006a). From an economic efficiency perspective, this is incorrect. It is clear from other government guidelines (TBS 1998) and analyses (e.g., DFO 2006b) that producer surplus (essentially profitability) is recognized as the appropriate measure to use for assessing changes in net financial wealth arising from policy changes. Given typically modest profit margins in the Atlantic Canadian fisheries

(DFO 2006b), in the range of 5% to 20%, aggregate producer surplus from the seal hunt may only range from \$0.8 to \$3.5 million annually. In 2008 seal pelt prices fell by about 50% from 2007 and the number of vessels at the Front for season opening fell by about 60% compared to 2007, implying that profit margins had entirely disappeared for many sealers and they could not even recover their variable costs of going hunting.

The issue of transaction costs (e.g., gathering information, scientific research, negotiation, Coast Guard support operations, monitoring and enforcement, government promotion of the seal hunt) is also important for assessing the overall impact of the seal hunt on societal financial capital. Gallon (2001) argued that the Government of Canada subsidized the hunt for \$6.67 million annually. While there is debate over the definition of subsidy, Munro and Sumaila (2002) found that Canadian government subsidization was extensive in Atlantic Canada, equalling about 33% of total landed value for the fisheries (although largely in the form of income support programs that are not directly relevant to the seal hunt). If the transaction costs of governing the seal hunt exceed several million dollars per year, which does not seem unreasonable given the inordinate amount of time and effort that Fisheries and Oceans Canada (DFO) devotes to an economically minor hunt, it could well mean that the seal hunt depletes, rather than enhances, the stock of financial capital in Canada each year. Ultimately, transaction costs are paid for by tax-paying citizens and firms across Canada.

Manufactured capital refers to human-produced goods (e.g., facilities, infrastructure, equipment, and technology) that can be used to produce further benefits for people over time. Seal hunting is technologically simple but the largest concentrations of seals occur some distance from major fishing ports. In 2005, a total of 1,800 vessels participated in the hunt (DFO 2006a). Smaller vessels (the < 35-ft fleet) and larger vessels (the 35- to 65-ft fleet) share the annual seal allocation. Seals are killed using high-powered rifles, shotguns using slugs, clubs, and hakapiks (a club with a hook). The Coast Guard dispatches icebreakers to the hunt to help vessels navigate heavy ice and DFO observer aircraft report seal herd locations and monitor the hunt. The NGOs often hire helicopters to access the hunting grounds and

some organizations (e.g., the Sea Shepherd Society) also bring vessels to Atlantic Canada to observe and protest the hunt.

Human capital refers to the health, knowledge, skills, training, competencies, and other attributes embodied in individuals that facilitate the effective production of personal, social and economic well-being (Helliwell 2001). While not usually considered in the human capital literature, it is useful to think of motivation - an attribute of individuals - as a component of human capital given the importance of 'champions' in successful implementation of adaptive management (Walters 2007). Seal hunters, many of whom have taken part in the annual hunt for decades, may have relatively low levels of formal education but high levels of human capital accumulated through on-the-job experience.

Social capital refers to social networks in society that facilitate mutually advantageous collective action by increasing information flow, reducing uncertainty about the world and the behaviour of others, and increasing people's propensity to cooperate (Woolcock 1998, Rudd 2000). It can function within communities (helping people cope in the absence of government services), across communities (information exchange and capacity building), and between communities and governments (access to decision-makers). Fishers have always relied on social capital to access fishing information and cope in dangerous conditions. The seal hunting industry has well-developed vertical networks to senior bureaucrats and politicians (the current DFO Minister is from Newfoundland).

Cultural capital is the set of beliefs or behaviours which are produced and transmitted socially, that help shape the aptitude or inclination of a group or society to behave in a certain way, and are commonly referred to as heritage or tradition (Cochrane 2006). Atlantic Canada has a rich marine-oriented culture and the seal hunt, as an iconic activity, is a contributor to cultural identity. When the Atlantic cod moratorium took effect many Atlantic Canadians, who typically felt a deep connection to the sea, experienced a sense of loss of purpose. Since that time there has been great sensitivity surrounding fisheries policy and a shared sense of resentment is still felt in many communities (Sturm 2006).

Societal Vision and Goals

Quality of life can be defined, in large part, by the state-of-the-world as defined in terms of the six capital assets (Rudd 2004). Ethics, beliefs, personal experience and cultural attenuation shape preferences, as well as personal and societal definitions of quality of life, risk, and sustainability. What poses a threat or opportunity to a society depends on the mental filter through which its citizens view the world; there is a tremendous amount of variation in how people define quality of life and their subsequent willingness to give up one type of asset to gain more of another.

There are few Canadian examples of issues that polarize people as much as the seal hunt. On the one hand, an extremely high level of support for the hunt, especially within Newfoundland and Labrador, has translated into vigorous defence of the hunt by both the Federal and Provincial governments. Those advocating the hunt focus on the dire situation in the rural communities where the majority of sealers reside, as well as the historic traditions of sealing in Atlantic Canada. On the other hand, those who oppose the hunt do so primarily on the basis of the hunt's inhumane harvesting practices. A national survey (n=1000), sponsored by DFO and conducted by polling firm Ipsos-Reid, found that 60% of Canadians either strongly (22%) or somewhat (38%) supported a seal hunt that was sustainable, humane, and did not target nursing seals (DFO 2005b). The anti-hunt International Fund for Animal Welfare (IFAW) countered with a survey (n=1000), conducted by rival national polling firm Environics, that showed 73% of Canadians would favour a ban on hunting seals less than three months of age (Fink and Sinclair 2005).

It was the media campaigns of the 1970's, unrelentingly pushed by Greenpeace and IFAW, that led to a global consciousness of the hunt and a 1983 European ban of white-coat seal products (Bjorndal *et al.* 1993). However, the hunt itself did not end and many anti-sealing groups continued to use traditional media, the internet and celebrity endorsement (e.g., Paul and Heather McCartney's 2006 Canadian visit on behalf of the Humane Society of the United States) to raise publicity (and funds) to oppose the ongoing hunt. Proponents (the Government of Canada on behalf of sealing interests) and opponents have likely spent millions of dollars in getting their views disseminated to the general public. Unlike environmental debates that pit materially-motivated industry groups against purposive, values-based interest group

coalitions (i.e., Jenkins-Smith and Sabatier 1994), the two polarized sides in the seal hunt debate appear to have deeply held policy core beliefs.

Institutions

Institutions are comprised of both formal rules and informal social norms about what behaviours are required, permitted or prohibited in a society (Crawford and Ostrom 1995). Institutions specify financial or social rewards for compliance with (or sanctions for infractions of) acceptable behaviour. As a result, they have a strong influence on human incentives, cooperation, and on the critical transaction costs (i.e., gathering information, negotiating agreements, monitoring, and enforcement) of coastal management. Seven different types of institutions can be differentiated (Ostrom 2005).

Boundary rules specify who is allowed to participate in prescribed activities and position rules specify the role each participant plays (i.e., they are ‘placeholder’ rules). There are three types of licenses (position rules) in the seal hunt: commercial, assistant and personal (DFO 2006a). Commercial licenses are nominally priced and are only distributed to those sealers who were in possession of one the year prior or to people who have held an assistant sealing licence for the two previous years while working under a professional seal hunter (boundary rules). In 2005, DFO issued 14,050 commercial sealing licenses in total, of which about half were used. Personal use license holders must have a valid licence for big game or a hunter’s capability certificate.

Authority rules specify what actions and activities are permitted, required or forbidden. For the seal hunt, authority rules are framed in term of when (seasons), where (zones), and how (gear restrictions and rules regarding humane killing) licensed seal hunters are permitted to harvest harp seals. Aboriginal people and residents are able to hunt seal north of 53N latitude the whole year for subsistence purposes (DFO 2006a). Technically, the season for personal use and commercial harvest is November 15 to May 15 annually; functionally the commercial season is dictated by seal reproductive biology and ice conditions. Most hunting starts in the Gulf in the third week of March, while farther north on the Front it starts in the second week of April. Openings can be changed by DFO to reflect changing ice quality, seal

abundance, and overall landings. Spatial rules in the seal hunt are defined in terms of fishing zones. The underlying principle is that the spatial allocation of fishing effort should reflect biological production (70% of the pups are born near the Front and 30% are born in the Gulf region). Finer-scale zones were introduced in 2006 to help reduce the competitive nature of the hunt and ensure a humane hunt (DFO 2006a). Most recently (2008), a 'three-step' rule was implemented as part of licensing conditions to ensure humane harvest practices (i.e., not skinning seal pups before they are dead). Under the new rules, sealers are required to stun the animals (by clubbing or shooting them), test for unconsciousness (an eye blink reflex test) and bleed them before the skinning process.

Information rules specify reporting requirements, which vary according to vessel class. Sealers in the 35- to 65-ft fleet are required to report their daily harvest to DFO by radio and to record their catches daily in a logbook (DFO 2006a). DFO collates the data by species, zone and vessel class for release in weekly reports. Community reports, landing checks, and plant statistics are collected by DFO for the <35-ft fleet and for land-based sealers. Monitoring sealers' compliance with authority rules is particularly difficult due to challenging at-sea working conditions and intense hunting activity.

Aggregation rules specify how people can make decisions. In political or regulatory situations, for example, there may be formal rules regarding committee representation and voting. In the seal hunt, there are no formal operational-level aggregation rules specifying how practical matters are organized by hunters on the water.

Scope rules focus on what states of the world (i.e., outputs and outcomes) are permitted, required or forbidden. Typically in commercial hunts and fisheries these rules tend to specify seasonal or annual Total Allowable Catch (TAC), daily bag limits, size restrictions, and bycatch limits. The main scope rule used in the seal hunt is an annual TAC (DFO 2006a), currently (2008) set at 270,000 animals. DFO adopted an objective-based fisheries management (OBFM) approach to seal hunt management in the 2006-2010 management plan. The OBFM approach facilitates a market-driven hunt allowing for a maximization of sealer's economic benefits while ensuring conservation by maintaining the population level above 70% of the maximum observed population of 5.82 million (DFO 2006a). The OBFM

approach is viewed as a less risky management strategy than the previous replacement yield approach (Hammill and Stenson 2007). The TAC is implemented using a sharing arrangement amongst the < 35-ft and 35- to 65-ft fleets working in the Gulf and at the Front. Historically, there have not been any grading standards regarding seal pelt quality. Given the large variation in seal pelt quality (and value) – a function of seal age, method of killing the seal, and post-skinning handling and care – there is currently a move to implement a quality grading system (an outcome rule).

In some industries, payoff rules are used to specify incentives or sanctions for certain behaviours or outcomes. The Government of Canada used to provide a direct subsidy to seal hunters for utilizing seal meat (carcasses are usually left at the hunting grounds due to the labour intensive nature of preparing seals and the low market value of the strongly-flavoured meat). The subsidy was discontinued in 2001.

Results-Based Management

Private and public sector organizations are increasingly using “results-based management” frameworks to consider the ultimate impacts of their activities and outputs (e.g., Wholey 1999; Kaplan and Norton 2000). A key concept is that there is a causal chain linking resource use, activities, outputs, and outcomes with higher-level societal impacts (i.e., changes in capital assets) that people value.

Activities are operations or work processes intended to produce specific outputs. Carrying out activities requires resources from within the system as well as purchased commodities (goods and services) originating from other systems. Outputs are the direct products or services stemming from the activities and delivered to a target group or market. Activities and outputs have direct and indirect outcomes that impact, along with external factors, the accumulation and depletion of the various capital assets.

The Canadian Auditor General's 1997 criticism of DFO (for a lack of clear fisheries management objectives and performance measures, amongst other factors) led to DFO responding with the OBFM framework (see Shelton 2007). The intention was to set clear and measurable objectives based on biological and socio-economic factors, and use risk management principles to implement a precautionary

approach to fisheries management. Most OBFM exercises have so far been defined objectives in narrow biological terms. Even in the seal hunt, the only fishery with a practical OBFM plan in place (Rivard 2006), the economic objectives are narrow in scope. Some progress has been made towards developing more robust socio-economic objectives for Large Ocean Management Areas (e.g., Rutherford *et al.* 2005) but progress in implementing results-based management for Canadian coastal resources has been slow.

Operational-Level Framework

The components outlined so far can be synthesized into a logic model for policy design, analysis, and monitoring (Figure 1).

<<<Figure 1 about here>>

One way to describe capital assets in detail and develop functional sustainability indicators is to engage in an ‘unpacking’ exercise (O’Boyle and Keizer 2003), breaking down high level concepts into terms of increasing specificity until properties of capital assets can be simply defined, measured and monitored. A useful unpacking hierarchy for policy purposes views capital assets as elements of the overall system, having attributes that can, in turn, be described by characteristics. Characteristics themselves can be described by indicators that provide a single meaningful message (information) used to infer the status of a characteristic of the system.

Institutions shape both incentives and behaviours. A single change in a key rule could conceivably lead to substantially different behaviour on the part of resource users (Ostrom 2005). Production activities have direct and indirect outcomes that, when combined with influences from outside the system, have impacts and lead to changes in the stock of various capital assets. Macroeconomic factors (e.g., economic recession and decreasing demand for luxury consumer goods) and demographic change (e.g., out-migration of younger workers from rural fishing communities to oil industry jobs in Alberta) are important exogenous driving forces impacting the seal hunt.

Threats or opportunities are defined and evaluated according to the mental model through which actors filter the impacts. When people perceive 'threats' to important capital assets, which are framed based on their own values and beliefs, they can respond in a number of ways: by curtailing consumption of constraining resource flows; by obtaining better information about the state-of-the-world and how resource flows can be transformed into outputs more efficiently and effectively; by obtaining better information about the preferences and behaviour of others to increase the benefits derived from a given quantity of output; and/or by undertaking investments that build capital assets, increase resource flows, and alleviate resource bottlenecks.

Linkages

At the day-to-day operational level, formal rules and social norms may be taken as fixed but the 'rules of the game' can obviously evolve in response to changing ecological conditions, technology, and societal values. The rules governing operational situations are crafted in higher-level collective action (Ostrom 1990) or implementation (Rudd 2004) situations (Figure 2). Actors in implementation situations (often civil servants) use resources, undertake activities, are subject to rules, and produce outputs just as operational level actors do, except that their outputs are the formal rules and investment decisions that shape lower-level operational situations.

<<< Figure 2 about here >>>

The rules governing implementation-level actors are created at an even higher constitutional (Ostrom 1990) or political (Rudd 2004) level. Political-level situations involve actors and coalitions who engage in, or influence, the process of rule-making. Their outputs are (1) policy directions, (2) rules that govern the behaviour of implementation-level actors, and (3) coarse-scale investments at the implementation-level. Human, social and financial capital are key assets for political actors.

Outputs from one level cascade down to the next lower level, directly influencing capital asset accumulation or depletion at lower levels. The process is not unidirectional, however, and there are feedback mechanisms between levels. External driving forces also have impacts at higher levels. At the implementation level, resource managers at DFO account for harp seal harvests in Greenland when setting Canadian TACs (DFO 2006a). At the political level, DFO has a goal of international leadership in oceans management, so strong pressure from the European Union to stop the seal hunt likely has significant influence on high-level Government of Canada policy decisions.

Coupled systems can also be linked horizontally across space (and time). Resources originating in one system may eventually be used as inputs in other systems when commodities are sold as intermediate goods. Activities within one system can also cause positive or negative externalities that provide benefits to, or impose costs on, people in other systems. It is evident that some consumers place a great deal of importance on 'credence attributes' (Caswell and Mojduszka 1996) such as environmental sustainability, animal welfare, and fair returns for primary producers. These broad preferences relating to production processes, rather than commodity characteristics, for have been manifested in recent years with the proliferation of 'green' products and 'fair trade' labels (Rudd in press). Inhumane harvesting practices that reduce consumers' well-being can, in principle, be accounted for if fur buyers can obtain credible information about harvest processes and they make consumption choices accordingly.

While labelling can work for consumers who buy a product, seal hunt opponents adversely impacted by hunt practices need other mechanisms and approaches to reflect their loss of well-being because they are unlikely to ever purchase seal products. Market boycotts of other Canadian products is a means by which NGOs have been trying to sanction Canada for continuing the seal hunt (e.g., Best 2004), though with limited success to date. The hunt clearly imposes substantial negative externalities on at least one segment of society; donations to NGOs opposing the hunt appear substantial, reflecting some people's willingness to pay for curtailing the seal hunt and/or making hunting methods more humane. The economic magnitude of this externality (i.e., consumer surplus) has not yet been quantified but could be substantial (Rudd 2007), potentially weakening the economic rationale for the seal hunt even further.

Can Conflict be Reduced?

Given the mix of unstable ice, poor weather, the use of high-power rifles at sea, and a history of confrontation between hunters and protesters, it is easy to envision incidents with potentially fatal results. In addition, effective boycotts of other Canadian export products could have serious consequences for Canadian businesses. Clearly there are opportunities for various types of human and economic crises associated with the seal hunt. Both sides in the seal hunt debate retain firmly entrenched positions and there are unlikely to be compromises between them under the current management system. Indeed, in April 2008 there seemed to be a hardening of positions as DFO seized the Sea Shepherd Society's vessel using a police tactical squad (a move that will drastically increase the transaction costs of the seal hunt if DFO proceeds with prosecution) and the DFO Minister publicly called the anti-hunt activists "a bunch of money-sucking manipulators" (Nguyen 2008).

Shutting down the hunt is not politically tenable. Are there, then, other management options that might be used to reduce the potential for conflict surrounding the seal hunt? If so, are there policy experiments that might let us ease into a management transition, gathering important information as we proceed? One innovation that we believe worth considering is the development of an Individual Transferable Quota (ITQ) system with transfer rights not only intra-sectorally between hunters but also inter-sectorally between hunt proponents and opponents.

The current derby-style seal hunt is often referred to as a 'regulated open access' management system (Wilen 1995). From an institutional and biological perspective, it is relatively simple albeit with ever-increasing ad hoc rules that increase management complexity (Healy and Hennessey 1998). Moving from regulated open access to an inter-sectoral ITQ system would involve two main steps: developing a quota system in which the TAC was divided into individual shares and allocated to hunters; and making the harvest rights freely transferable between hunters and non-hunters.

Yandle and Dewees (in press) note that the positive effects of typical intra-sectoral ITQ systems relate to a slowing of the harvest and elimination of industry overcapacity, while the negative effects can

include quota aggregation, industry consolidation, quota busting, high-grading, unemployment, and loss of small-scale harvesters. In the seal hunt, biology and weather dictate the timing of the hunt; under an intra-sectoral ITQ system most harvesting would still take place over a relatively constrained time frame. Having even a little flexibility in timing of the hunt could, however, slow the race to harvest seals and improve at-sea safety. Hunting tools and methods would remain the same but an ITQ system would allow sealers to selectively harvest preferred animals with high-quality pelts rather than taking whatever seals were first encountered. Overall, an intra-sectoral ITQ system may have some advantages over the current derby-style hunt but alone it might be difficult to justify ITQ given its implementation costs and the relatively modest improvements expected.

The practicalities of implementing intra-sectoral ITQ systems can be challenging (e.g., Batstone and Sharp 1999). The inter-sectoral transfer of quota between recreational and commercial fishing sectors is relatively rare (Pearse 2006), never mind transfer rights between harvesters and non-harvesters. Inter-sectoral transfer rights would be challenging to implement but they are theoretically feasible (e.g., Kim 2007). Pearse (2006, 13-14) notes, in a fisheries context, that "[d]efining each sector's share of the catch will alleviate the uncertainty and conflict where one sector could otherwise expand at the expense of the other. But to enable market processes to effectively provide for reallocations to rationalize fishing among sectors the shares must be divisible and transferable between sectors". The key objective of a move to an inter-sectoral ITQ system would be to use bargaining, rather than confrontation, to settle the issue of if and/or how many seals are killed each year in the hunt.

Restrictions on transferability lead to an economically inefficient outcome because the resource may not be used by the people that value it most (Kim 2007). In the case of the seal hunt, it is not at all clear which side in the controversy that might be. Transferable harvest rights would, however, provide crucial information about the value of dead versus live seals to various segments of society. Transferable rights should greatly reduce conflict over the hunt. Simply put, if NGOs opposing the hunt had the option to buy out seal harvest rights but did not 'put their money where their mouth is', there would be no credible argument left for them to continue their opposition to the hunt. If seal hunters truly value the cultural and

heritage aspects of the hunt, they would be under no obligation to accept any offer of financial compensation to curtail the hunt. If, however, their decisions were based on a narrower financial cost-benefit calculus and they were willing to accept compensation not to hunt seals, conflict levels would decrease because they entered into a voluntary agreement. With freely transferable rights it is conceivable that additional coalitions could enter the market as well. For example, those with strong interests in preserving rural fishing culture and heritage would be free to purchase harvest rights, outbidding hunt opponents, to ensure that sealing was able to proceed unimpeded. A move to a market-based ITQ system and bargaining solutions should also allow DFO to step back and remove itself from the confrontational – and expensive – role it now has as chief guardian of the seal hunt.

Conclusions

Effective governance of natural resources requires a systematic framework for conceptualizing human activities and linking those activities with societal impacts, thereby aiding in the design, implementation and monitoring of policy experiments in support of adaptive management. Using capital assets to describe the state-of-the-world in a modified IAD framework allows analysts to consider the full spectrum of resource flows from the coastal environment and how their use (or non-use) helps define and improve human well-being. The capital asset approach also facilitates transparent discussions regarding sustainability and makes explicit people's willingness to accept trade-offs between different capital assets, a crucial factor in economic analyses and policy decisions.

Systematically studying institutions allows researchers to develop adaptive management models and test hypotheses about the causal relationships between institutions and human behaviour in coupled human-ecological systems. This institutionally-based framework is broad, incorporating the Sustainable Livelihoods and Pressure-State-Response frameworks (see Rudd 2004). It also incorporates the standard terminology of results-based management thus linking sustainability-oriented policy analysis with mainstream private and public sector evaluation frameworks.

We have illustrated the capital asset-based IAD framework using the example of the Atlantic Canadian seal hunt. Our focus in this short article has been on an operational-level analysis of the hunt. Further analyses could be undertaken at different links in the seal fur supply chain (e.g., at the provincial processing and exporting stage) or at higher levels (e.g., regulatory decision-making processes by DFO or the formation and role of advocacy coalitions in the policy process). Indeed, given our suggestion to consider the use of inter-sectoral transfer rights between opponents and proponents of the seal hunt, a much deeper analysis of the implementation and political levels would be in preparation for the policy experiment.

The ongoing conflict surrounding the seal hunt is untenable and needs to be resolved. Even without considering the potential for serious conflict during the hunt and the potential for consumer boycotts of Canadian products, there is a strong need to consider changes to the governance of the seal hunt strictly from an economic efficiency perspective. The hunt likely generates less than \$3 million annually in producer surplus yet the transaction costs of seal hunt governance appear high due to the inordinate amount of time and effort that DFO spends managing the hunt and countering hunt opponents. It is possible that a policy experiment taking a stepped approach towards implementation of an inter-sectoral ITQ system for the seal hunt might reduce transaction costs and reduce or eliminate conflict over the hunt. Such an experiment would also provide critical information on the benefits of preserving the rural fishing heritage of Atlantic Canada and on the economic value of human amenities provided by coastal natural capital to different segments of society.

Acknowledgements

We are grateful to DFO colleagues in Ottawa and Atlantic Canada for providing valuable information and input regarding the management of the seal hunt as well as comments on the evolving versions of this framework. MAR's research is supported, in part, thanks to funding from the Canada Research Chairs Program.

Literature Cited

- Acheson, J.M., 1988, *The lobster gangs of Maine*. Durham, NH: University Press of New England.
- Adger, W.N., Hughes, T.P., Folke, C., Carpenter, S.R. and Rockstrom, J., 2005. Social-ecological resilience to coastal disasters. *Science*, 309, 1036-1039.
- Batstone, C.J. and Sharp, B.M.H., 1999. New Zealand's quota management system: the first ten years. *Marine Policy*, 23 (2), 177-190.
- Berkes, F., Hughes, T.P., Steneck, R.S., Wilson, J.A., Bellwood, D.R., Crona, B., Folke, C., Gunderson, L.H., Leslie, H.M., Norberg, J., Nystrom, M., Olsson, P., Osterblom, H., Scheffer, M. and Worm, B., 2006. Globalization, roving bandits, and marine resources. *Science*, 311, 1557-1558.
- Best, S., 2005. *Influencing Canadian seal hunt policy with a consumer boycott of Canadian seafood*. Toronto: Animal Alliance of Canada. Available from: http://www.sealhunt.ca/Reports/CDN_Fish_Boycott_Analysis.pdf [last accessed 13 April 2008].
- Bjorndal, T., Conrad, J.M. and Salvanes, K.G., 1993. Stock size, harvesting costs, and the potential for extinction: the case of sealing. *Land Economics*, 69 (2), 156-167.
- Brown, C. and Harwood, H., 1972. *Death on the ice*. Toronto: Doubleday Canada.
- Candow, J.E., 1989. *Of men and seals: a history of the Newfoundland seal hunt*. Ottawa: Canadian Government Publishing.
- Castle, E.N., 1998. A conceptual framework for the study of rural places. *American Journal of Agricultural Economics*, 80 (3), 621-631.

- Caswell, J.A. and Mojduszka, E.M., 1996. Using informational labelling to influence the market for quality in food products. *American Journal of Agricultural Economics*, 78 (5), 1248-1253.
- Cochrane, P., 2006. Exploring cultural capital and its importance in sustainable development. *Ecological Economics*, 57 (2), 318-330.
- Crawford, S.E.S. and Ostrom, E., 1995. A grammar of institutions. *American Political Science Review*, 89 (3), 582-600.
- DFO, 2005a. *Stock assessment of northwest Atlantic harp seals (Pagophilus groenlandicus)*. Ottawa: Fisheries and Oceans Canada, CSAS Science Advisory Report 2005/037.
- DFO, 2005b. *Public views on commercial hunting and current Federal seal hunting policy*. Ottawa: Fisheries and Oceans Canada. Available from: http://www.dfo-mpo.gc.ca/misc/fp_858_seal_e.htm [last accessed 13 April 2008].
- DFO, 2006a. *Atlantic seal hunt 2006-2010 management plan*. Ottawa: Fisheries and Oceans Canada.
- DFO, 2006b. *Potential socio-economic implications of adding porbeagle shark to the list of wildlife species at risk in the Species at Risk Act (SARA)*. Dartmouth, NS: Fisheries and Oceans Canada.
- Ekins, P., Simon, S., Deutsch, L., Folke, C. and de Groot, R., 2003. A framework for the practical application of the concepts of critical natural capital and strong sustainability. *Ecological Economics*, 44, 165-185.
- Fink, S. and Sinclair, R., 2005. *Survey on Canadian's attitudes towards the seal hunt*. Guelph, ON: International Fund for Animal Welfare. Available from: http://www.ifaw.org/ifaw/dfiles/file_571.pdf [last accessed 13 April 2008].

- Gallon, G., 2001. *The economics of the Canadian sealing industry*. Montreal: Canadian Institute for Business and Environment.
- Goudie, A., 2005. *The human impact on the natural environment: past, present and future*. Oxford, UK: Blackwell.
- Hammill, M.O. and G B. Stenson, 2003. *Harvest simulations for 2003-2006 harp seal management plan*. Ottawa: Fisheries and Oceans Canada, CSAS Research Document 2003/068.
- Hammill, M.O. and G B. Stenson, 2007. Application of the precautionary approach and conservation reference points to management of Atlantic seals. *ICES Journal of Marine Science*, 64 (4), 702-706.
- Healey, M.C. and Hennessey, T., 1998. The paradox of fairness: the impact of escalating complexity on fishery management. *Marine Policy*, 22 (2), 109-118.
- Helliwell, J.F., ed., 2001. *The contribution of human and social capital to sustained economic growth and well-being: International Symposium report*. Hull, Quebec: Human Resources Development Canada and Organisation for Economic Co-operation and Development.
- Hutchings, J.A. and Reynolds, J.D., 2004. Marine fish population collapses: consequences for recovery and extinction risk. *BioScience*, 54 (4), 297-309.
- Jenkins-Smith, H.C. and Sabatier, P.A., 1994. Evaluating the advocacy coalition framework. *Journal of Public Policy*, 14 (2), 175-203.
- Kaplan, R.S. and Norton, D.P., 2000. *The strategy-focused organization*. Boston: Harvard Business School Press.
- Kim, H.N., 2007. *Transferable rights in a recreational fishery: an application to the red snapper fishery in the Gulf of Mexico*. Thesis (PhD). Texas A&M University.

- Lotze, H.K., Lenihan, H.S., Bourque, B.J., Bradbury, R.H., Cooke, R.G., Kay, M.C., Kidwell, S.M., Kirby, M.X., Peterson, C.H. and Jackson, J.B.C., 2006. Depletion, degradation, and recovery potential of estuaries and coastal seas. *Science* 312, 1806-1809.
- McLaren, I., Solange, B., Harwood, J. and Vardy, D., 2001. *Report of the Eminent Panel on seal management*. Ottawa: Fisheries and Oceans Canada.
- Munro, G. and Sumaila, U.R., 2002. The impact of subsidies upon fisheries management and sustainability: the case of the North Atlantic. *Fish and Fisheries*, 3 (4), 233-250.
- Myers, R.A. and Worm, B., 2003. Rapid worldwide depletion of predatory fish communities. *Nature*, 423, 280-283.
- Nguyen, L., 2008. Ship seizure, arrests deemed 'act of war': Sea Shepherd anti-sealing vessel, *National Post*, 14 April. Available online:
<http://www.nationalpost.com/news/story.html?id=443483> [last accessed 14 April 2008].
- O'Boyle, R.N. and Keizer, P., 2003. *Proceedings of three workshops to investigate the unpacking process in support of ecosystem-based management; February - July 2002*. Ottawa: Fisheries and Oceans Canada, CSAS Proceedings Series 2003/004.
- Ostrom, E., 1990. *Governing the commons: the evolution of collective action*. Cambridge, UK: Cambridge University Press.
- Ostrom, E., 2005. *Understanding institutional diversity*. Princeton, NJ: Princeton University Press.
- Pearse, P.H., 2006. *Allocation of catches among fishing sectors: opportunities for policy development*. Paper prepared for a Keynote address at the *Sharing the Fish Conference 06: Allocation Issues in Fisheries Management*, Perth Australia, 26 February to 2 March 2006.

Available from:

www.fish.wa.gov.au/docs/events/ShareFish/papers/abstracts/Peter%20Pearse.html

- Rivard, D., 2006. *Proceedings of the meeting of the Science Working Group on the Precautionary Approach, 20–21 October 2005, Ottawa, Ontario*. Ottawa: Fisheries and Oceans Canada, CSAS Proceedings Series 2005/027.
- Rose, G.A., 2007. *Cod: the ecological history of the North Atlantic fisheries*. St. John's, NL: Breakwater Books.
- Rudd, M.A., 2000. Live long and prosper: collective action, social capital and social vision. *Ecological Economics*, 34, 131-144.
- Rudd, M.A., 2004. An institutional framework for designing and monitoring ecosystem-based fisheries management policy experiments. *Ecological Economics*, 48, 109-124.
- Rudd, M.A., 2007. Ecological change - what's it worth? *Newfoundland Quarterly*, 100 (1), 44-46.
- Rudd, M.A., in press. A logic model for responsible entrepreneurship and sustainable development. *International Journal of Entrepreneurial Behavior and Research*.
- Rutherford, R.J., Herbert, G.J. and Coffen-Smout, S.S., 2005. Integrated ocean management and the collaborative planning process: the Eastern Scotian Shelf Integrated Management (ESSIM) initiative. *Marine Policy*, 29 (1), 75-83.
- Shelton, P.A., 2007. The weakening role of science in the management of groundfish off the east coast of Canada. *ICES Journal of Marine Science*, 64 (4), 723-729.
- Southey, C., 1997. *The Newfoundland commercial seal hunt: an economic analysis of costs and benefits*. Guelph, ON: International Fund for Animal Welfare. Available from: http://www.ifaw.org/ifaw/dfiles/file_225.pdf [last accessed 12 April 2008].

- Sturn, T.M., 2006. *Voices of the seal hunt: communicating our views of animals and ourselves*. Thesis (MEM). Duke University.
- TBS, 1998. *Benefit-cost analysis guide*. Ottawa: Treasury Board Secretariat.
- Turner, B.L., Clark, W., C., Kates, R.W., Richards, J.F., Mathews, J.T. and Meyer, W.B., eds., 1995. *The Earth as transformed by human action. Global and regional changes in the biosphere over the past 300 years*. Cambridge, UK: Cambridge University Press.
- Walters, C., 1997. Challenges in adaptive management of riparian and coastal ecosystems. *Conservation Ecology* [online] 1 (2), 1. Available from: <http://www.ecologyandsociety.org/vol1/iss2/art1/> [last accessed 12 April 2008].
- Walters, C.J., 2007. Is adaptive management helping to solve fisheries problems? *Ambio*, 36 (4), 304-307.
- Wholey, J.S., 1999. Performance-based management: responding to the challenges. *Public Productivity and Management Review*, 22 (3), 288-307.
- Wilén, J. E., 1985. Towards a theory of the regulated fishery. *Marine Resource Economics*, 1 (4), 369-388.
- Wood, A., Stedman-Edwards, P. and Mang, J., eds., 2000. *The root causes of biodiversity loss*. London: World Wildlife Fund and Earthscan.
- Woolcock, M., 1998. Social capital and economic development: toward a theoretical synthesis and policy framework. *Theory and Society*, 27 (2), 151-208.
- Worm, B., Barbier, E.B., Beaumont, N., Duffy, J.E., Folke, C., Halpern, B.S., Jackson, J.B.C., Lotze, H.K., Micheli, F., Palumbi, S.R., Sala, E., Selkoe, K.A., Stachowicz, J.J. and Watson, R., 2006. Impacts of biodiversity loss on ocean ecosystem services. *Science*, 314, 787-790.

Wright, G., 1952. *Sons and seals: a voyage to the ice*. St. John's, NL: Institute of Social and Economic Research.

Yandle, T. and Dewees, C.M., in press. Consolidation in an Individual Transferable Quota regime: lessons from New Zealand, 1986–1999. *Environmental Management*.

Titles for Captions

Figure 1. Operational-level framework for adaptive management (adapted from Rudd 2004)

Figure 2. Vertical linkages in the adaptive management framework

Figure 1

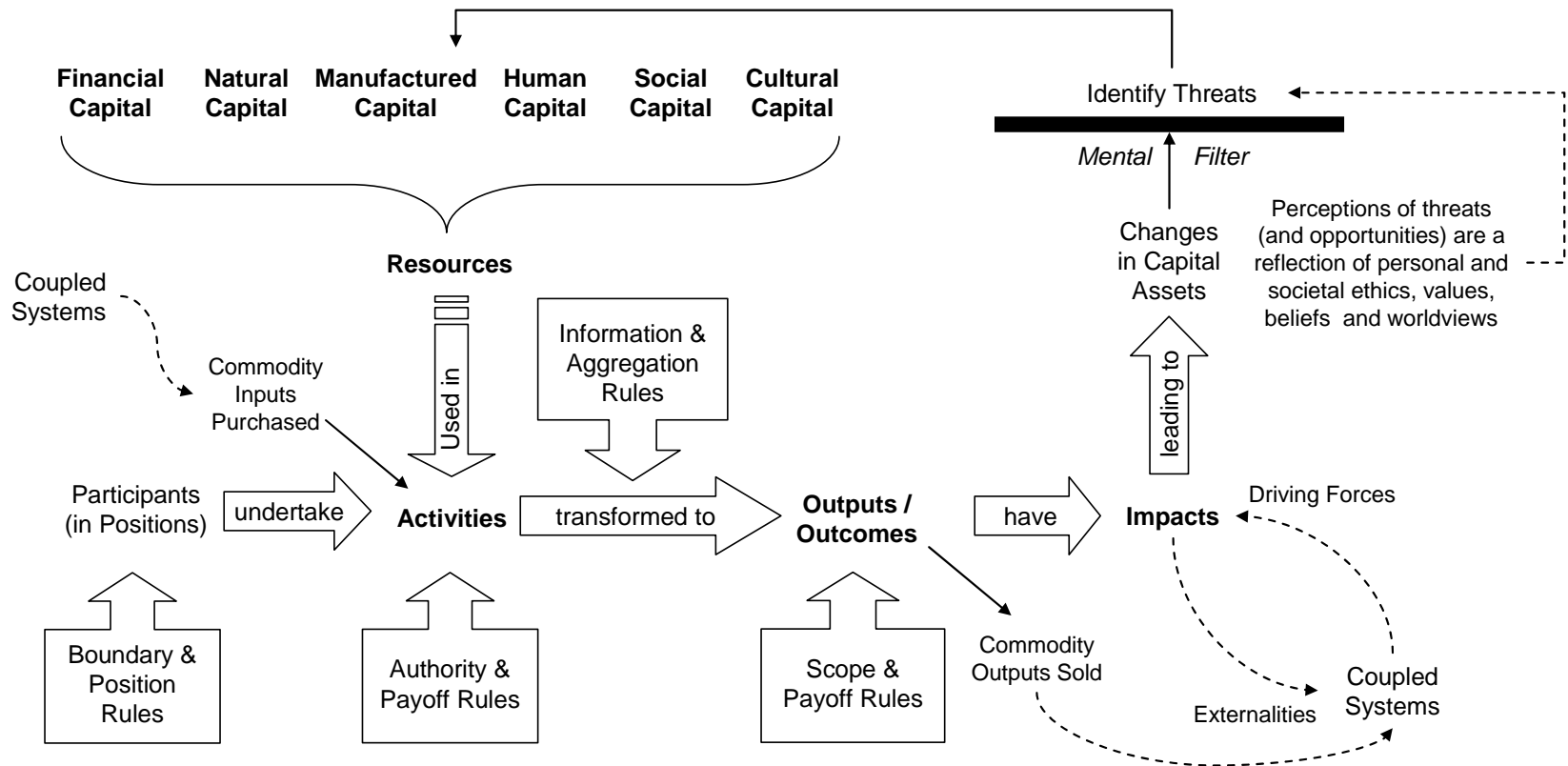


Figure 2

