

Insight, part of a Special Feature on [Scale and Cross-scale Dynamics](#)
Vertical Interplay among Scale-dependent Environmental and Resource Regimes

*Oran Young*¹

ABSTRACT. Environmental and resource regimes, operating at different levels of social organization, vary in terms of factors such as the sources of actor behavior, the knowledge available to actors, the operation of compliance mechanisms, the use of policy instruments, and the nature of the broader social setting. Cross-level interactions among scale-dependent regimes can result in patterns of dominance, separation, merger, negotiated agreement, or system change. The mechanisms that determine which of these patterns will occur include authority/power differentials, limits of decentralization, dueling discourses, cognitive transitions, and blocking coalitions. Recurrent linkages or syndromes occur in this realm, e.g., limitations of authority and power regularly produce negotiated agreements in such forms as comanagement arrangements. The consequences of these interactions are often far-reaching as measured in terms of ecological sustainability, social welfare/efficiency, cultural values, and robustness.

Key Words: *cross-level interaction; institution; jurisdiction; regime; scale; scale dependence; vertical interplay*

INTRODUCTION

Are cross-level interactions among environmental and resource regimes affected by the extent to which the individual regimes involved are scale dependent? Does it matter, in other words, if there are fundamental differences in the dynamics of these institutional arrangements associated with the level of social organization at which they operate? If the answers to these questions are affirmative, what are the implications of this condition for our efforts to solve a variety of environmental problems, from the suppression of wildlife poaching at the local level to the protection of biological diversity at the global level, that obviously require cooperation or coordination among actors located at different levels of social organization? These questions are generic; they arise in connection with a wide range of environmental issues and problems of resource management. However, to illustrate and concretize the argument of this article, I shall resort throughout the discussion that follows to examples pertaining to living resources, including fish, marine mammals, terrestrial mammals, and birds.

To address these questions, I proceed as follows. The first substantive section of the article focuses on the concept of scale dependence and illustrates the nature of this phenomenon with reference to regimes dealing with living resources. The next section examines vertical interplay among scale-dependent environmental and resource regimes and identifies a number of distinct patterns that may arise from cross-level interactions among these management systems. The third section turns to the determinants of these patterned outcomes, seeking to identify forces or causal mechanisms that can be expected to give rise to one or another of the major patterns in specific cases. The following section addresses questions concerning the consequences of these patterns, measured in terms of ecological sustainability, social welfare, equity, and cultural values. The penultimate section raises questions about stability and change or, in other words, the likelihood that cross-level interactions will trigger fundamental changes in one or more of the regimes involved. The article concludes with a short discussion of policy concerns that come into focus in connection with vertical interplay among scale-dependent environmental and resource regimes.

¹Bren School, University of California, Santa Barbara

WHAT IS CROSS-LEVEL, SCALE-DEPENDENT INTERPLAY?

What does scale dependence mean in connection with regimes for living resources and other similar institutional arrangements (Gibson et al. 2000)? It is tempting to adopt a spatial perspective in responding to this question and, as a result, to make use of a scale whose levels encompass local, regional, subnational, national, and international arrangements. However, this way of thinking produces anomalous results. The State of Alaska, for instance, covers an area that is approximately one-sixth the size of all the lower 48 states together, and it is several times the size of relatively large countries such as France or Germany. Even the North Slope Borough, a kind of local government in Alaska, is larger than many of the states in the United States, not to mention a good many small countries. Therefore, although spatial distinctions may be workable as a first approximation in this realm, we need to ask whether the phenomenon in question is essentially spatial in nature.

A more appropriate scale, in my judgment, differentiates among levels of environmental or resource regimes along the dimension of jurisdiction. Each higher level on this scale expands the scope of jurisdiction and subsumes the level(s) below. Thus, all of the North Slope Borough lies within the jurisdiction of the State of Alaska; all of Alaska falls under the jurisdiction of the United States. The jurisdiction of the United Nations, in turn, covers all of the United States and more. As these examples suggest, it is important to draw a clear distinction between levels on the scale of jurisdiction and the allocation of political or legal authority among these levels. The U.S. Government, for instance, has authority over the State of Alaska with respect to some issues, e.g., human uses of fish located beyond the limits of the territorial sea and migratory birds, but not others, e.g., human uses of terrestrial mammals located on land belonging to the state. Similarly, the jurisdiction of the United Nations over its member states is sharply limited by the terms of the U.N. Charter and especially the language of Article 2 confirming domestic jurisdiction. As a result, the jurisdictional reach of the United Nations extends only to a limited set of interstate concerns, e.g., threats to or breaches of peace and security.

On this account, cross-level interactions among resource regimes occur when there is vertical interplay between or among regimes located at higher and lower levels on the jurisdictional scale. In many cases, such interactions will involve interplay between management systems located at adjacent levels, e.g., interactions between state-level regimes administered by the Alaska Department of Fish and Game and national-level regimes administered by the U.S. Fish and Wildlife Service. However, this is not always the case. To take a concrete example, there are important cross-level interactions between the traditional practices of local, Native Alaskan hunters engaged in the harvest of bowhead whales for subsistence purposes and the global regime for whales and whaling that has evolved under the terms of the 1946 International Convention on the Regulation of Whaling. A particularly interesting feature of this case involves the cross pressures that those associated with a national-level arrangement, i.e., the regime for marine mammals administered by the U.S. National Marine Fisheries Service and the Fish and Wildlife Service, experience in their efforts to explain and defend the practices of aboriginal subsistence whalers in deliberations of the International Whaling Commission (IWC) and, conversely, to explain persuasively the concerns of the IWC regarding the harvest of bowhead whales carried out by Alaska Native whalers in the Bering, Chukchi, and Beaufort Seas.

What makes environmental and resource regimes operating at different jurisdictional levels scale dependent or, in other words, more or less incongruent? At least five distinct, but by no means unrelated or mutually exclusive, sources of scale dependence are worth noting. There are, in some cases, differences among the actors in these regimes that have important behavioral consequences. This is not ultimately a matter of the character of the actors per se, although it is surely worth noting differences among individuals active in lower-level regimes, corporate actors participating in national-level regimes, and national governments operating as actors in international regimes. Rather, the distinction turns on matters relating to the roots or sources of actor behavior. The behavior of individuals, for example, may be more responsive than the behavior of corporations or government agencies to the logic of appropriateness in contrast to the logic of consequences (March and Olsen

Fig. 1. Interplay patterns.

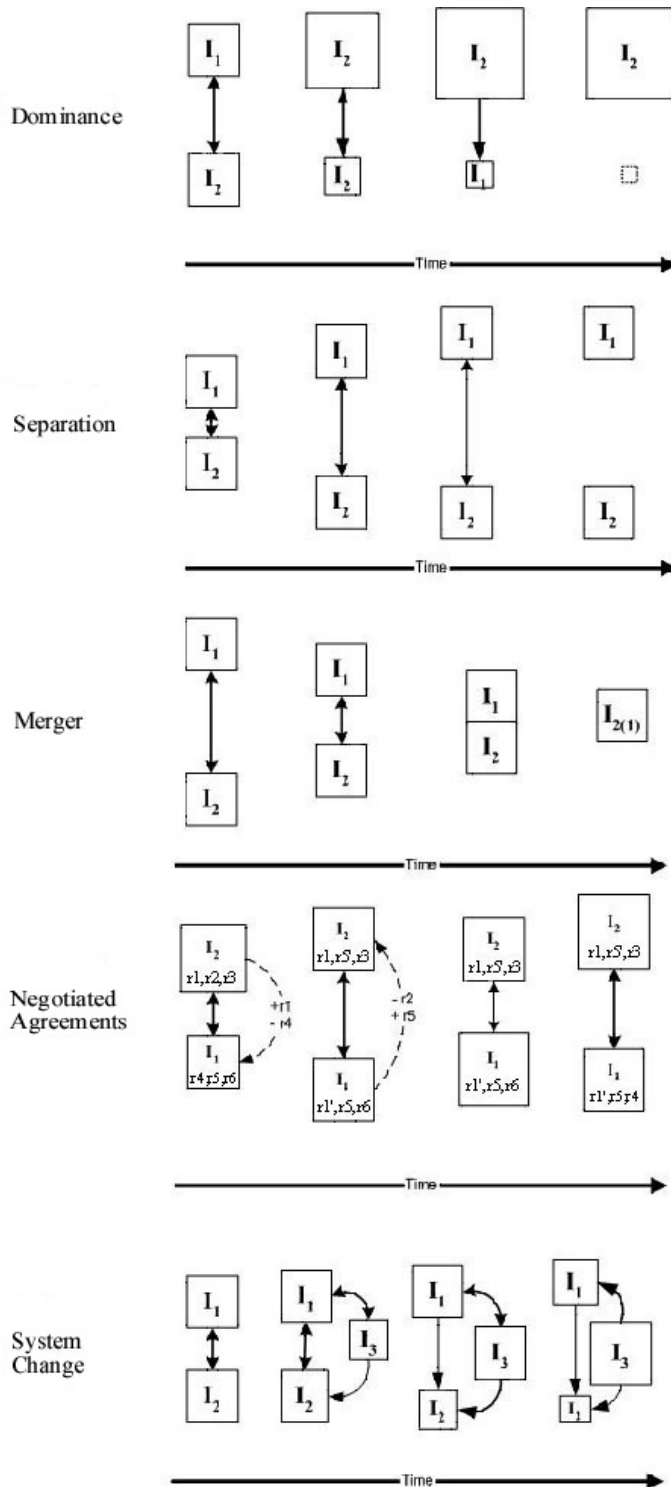


Fig. 1. Interplay patterns.

Five patterns of cross-level scale-dependent interplay.

In each panel four snapshots of the institutional arrangement to illustrate the different dynamics are shown.

- Boxes represent institutions operating at different levels, e.g. jurisdictional levels.
- Arrows indicate the presence of cross-level interplay.
- The size of a box reflects relative power of that institution.
- Thickness of arrows the strength of interplay and the distance between boxes the level of "independent identity" of the interacting institutions.
- In the fourth panel on negotiated agreements the relative power of institutions and the strength of cross-level interactions fluctuate over time. Harmonization and adjustment of rules to each other is represented by the rule sets indicated with small r 's.

In the final panel, changes in the wider system are represented, in this case, by a third institution. Note that the cross-level interaction can be both a cause and a recipient of changes elsewhere.

1998). Similarly, individuals may use different, typically higher, discount rates than corporate or governmental actors do in factoring future benefits and costs into present-value calculations (Scott 1953).

Somewhat similar remarks are in order regarding the nature of the knowledge systems that actors use as participants in environmental and resource regimes. Individuals operating in traditional lower-level regimes, for instance, typically make use of forms of experiential knowledge that place a high value on place-based insights gleaned from longitudinal observations that are relatively uncontrolled in nature. Most regional and national-level regimes, by contrast, grant priority to knowledge that conforms to the observational and methodological procedures characteristic of western science. The point here is not to assert that one approach to knowledge is superior to the other, though many existing environmental and resource regimes do privilege western scientific knowledge over traditional ecological knowledge (Usher 1987, Berkes 1999). Rather, we can expect problems of credibility and legitimacy to arise in cross-level interactions in which the regimes in question make use of fundamentally different types of knowledge claims and procedures for evaluating the applicability of these claims to specific situations (Dobbs 2000).

Scale may also have important consequences for the nature of the compliance systems available for use in administering environmental and resource regimes. Many small-scale or local arrangements, for instance, feature a high level of behavioral transparency together with culturally determined responses to rule breaking. When all the relevant actors can monitor each other's behavior, there is no need to introduce specialized procedures to monitor compliance with rules governing the use of natural resources. Customary practices often include well-defined sanctions imposed on those who violate prohibitions or fail to fulfill requirements. For the most part, these approaches to compliance are hard to use at the national level; they are almost irrelevant in connection with the administration of international regimes.

Additional sources of scale dependence arise from differences in the policy instruments that environmental and resource regimes use to manage human/environment relations and variations in the broader social settings within which individual

regimes operate. Whereas national-level regimes make use of formal, legally-defined rules and draw sharp distinctions regarding the contents of bundles of property rights, for example, lower-level regimes often depend more heavily on informal rules that evolve into social practices and develop structures of property rights that are difficult to understand in terms of simple distinctions between private property and public property (Ostrom 1990). What is more, differences in the broader socioeconomic and political settings in which specific regimes operate can prove highly important. This is a matter, in part, of the extent to which the resources in question are traded in competitive markets, as well as the extent to which the rules are made via procedures that are easily understood as democratic. However, perhaps even more to the point, is the fact that lower-level regimes often operate in social settings featuring a relatively strong sense of community, whereas higher-level regimes must generally achieve results through the manipulation of incentives in contrast to the imposition of social pressure.

Many factors affect the performance of individual regimes, quite apart from the occurrence of cross-level interactions. However, this article focuses on issues that arise when cross-level interactions become prominent, e.g., when traditional, lower-level regimes interact with modern national regimes or national regimes interact with innovative international regimes, and the individual regimes involved are scale dependent. In this connection, it is worth emphasizing at the outset that scale dependence is not a dichotomous variable. Although it is difficult to devise ways to measure degrees of scale dependence in a quantitative fashion, it is easy enough to see that some forms of scale dependence are more fundamental than others.

Interactions of the type that Peter Usher and others have described in accounts of differences between indigenous systems and the state system of managing living resources, for instance, are affected at one and the same time by scale dependencies involving a number of the factors identified in this section (Usher 1987, Berkes 1999). Not only do these systems differ in the choice of regulatory instruments, they typically make use of different forms of knowledge, and often rest on radically different, albeit frequently tacit, models of the behavior of the human actors in coupled human/environment systems. Lesser scale dependencies, by contrast, may boil down to disagreements among

similar actors regarding the suitability of one or another criterion of evaluation or policy instrument in connection with specific situations. The debate about the relative merits of pursuing the biophysical goal of maximum sustainable yields (msy), the economic goal of maximum economic yields (mey), or the multidimensional goal of optimal yields (oy) in fisheries management constitutes a case in point. Other things being equal, it is to be expected that tensions arising from cross-level interactions will increase as a function of the degree or extent of scale dependence. Although managers engage in vigorous debates about the pros and cons of criteria such as msy, mey, and oy, for instance, the issues at stake in such debates are far less profound than those underlying the differences between indigenous and western perspectives on wildlife management.

CAN WE IDENTIFY DISTINCT TYPES OF CROSS-LEVEL, SCALE-DEPENDENT INTERPLAY?

Cross-level, scale-dependent interplay is ubiquitous, and each case has its own distinctive features. However, it is worth asking whether we can discern types of interplay that belong to this general universe of cases, but differ from one another in significant ways. My goal at this stage is simply to identify recurrent patterns that can and do occur in this context; I will take up the challenge of analyzing the forces likely to produce one or another of these patterns in specific situations in the next section. Although the following account is far from ideal from a taxonomic perspective, five major types or patterns of scale-dependent interplay can be identified from an examination of actual cross-level interactions among regimes designed to manage human uses of living resources (see Fig. 1).

De jure/de facto dominance

Some cross-level interactions produce a pattern characterized by dominance in the sense that an environmental or resource regime operating at one level dominates one or more regimes operating at other levels, whenever scale dependence gives rise to frictions or conflicts among them. Dominance may arise from the allocation of formal authority. Thus, constitutive rules sometimes specify that decisions made at one level take precedence over or trump decisions taken at other levels. Something of

this sort has occurred in the case of wildlife management on federal lands in Alaska following a determination that management under the terms of the state-level regime would violate the provisions of the governing federal statute, i.e., the Alaska National Interest Lands Conservation Act of 1980. However, statutory provisions are by no means the only source of dominance. Dominance may be a de facto result of hegemony in relations among the principal levels of social organization, either in the form of power differentials arising from sharp disparities in the control of material resources, or in the form of cognitive or Gramscian hegemony resulting from the influence of dominant discourses. In countries with centralized political systems, for instance, the allocation of material resources generally ensures that national-level regimes will dominate in cases of cross-level conflict. However, there are other cases in which dominance is as much a matter of the ability to control the discourses embedded in environmental or resource regimes as of superiority in the control of material resources. Just as msy models, focused on individual fish stocks, dominated fisheries management for many years (Larkin 1977), for example, the rise of ecosystem-based management is displacing msy models today as a dominant discourse or paradigm.

Separation

An alternative response to conflict arising from cross-level interactions is to focus on the delineation of jurisdictional boundaries and to specify as precisely as possible the scope of the authority of scale-dependent regimes operating at different levels of social organization. Something of this sort constitutes a common approach to alleviating institutional conflict in the marine fisheries. In the case of the United States, for example, state governments have jurisdiction over fishing that takes place within three miles of the coast; the regimes they create to govern inshore fisheries take precedence over the federal regime governing fisheries. The federal regime set forth in the Fishery Conservation and Management Act (FCMA) of 1976 as amended, on the other hand, governs fisheries occurring in the rest of the Exclusive Economic Zone, or Fisheries Conservation Zone, and takes priority over both state-level regimes and international regimes in this realm. However, as this example suggests, creating separate spheres of influence may be easier said than done when it comes to managing actual human uses of living

resources in a sustainable manner. Consider the example of wild salmon in Alaska as a case in point. Salmon spawn in streams that are under the jurisdiction of local governments, but they migrate during the course of their lives through the territorial sea, the exclusive economic zone, sizable segments of the high seas, and, in some cases, into the exclusive economic zones of other coastal states. In a case such as this, separation cannot work in functional terms, whatever its status on paper as a response to vertical interplay among scale-dependent regimes.

Merger

In the private sector, a common response to situations of this sort would be to opt for vertical integration or, in other words, to place under joint management separate arrangements that exercise influence over upstream and downstream segments of product chains (von Moltke et al. 1998). The essential idea here is to internalize problems of cross-level conflict and to replace them with some sort of integrated or merged process. Whatever its attractions for those operating in the private sector, and they are by no means clear-cut, it is apparent that such an approach will have limited relevance in coming to terms with problems arising from cross-level interactions among environmental and resource regimes. These limitations are dramatic at the international level where individual countries resist ceding any jurisdiction to regimes created to address large-scale environmental problems, e.g., climate change and variability. However, similar problems often arise at lower levels of social organization. Not only do states frequently resist the flow of authority and power toward central governments, there is now a popular trend toward decentralization, or subsidiarity as it is called in Europe, construed as a form of devolution of authority from central governments to regional, or even local, governments in the name of placing the decision-making power as close to relevant environmental concerns as possible (Ribot 2002, Gibson and Lehoucq 2003). This is not to say that decentralization will produce better outcomes, but it certainly runs counter to arguments suggesting that vertical integration can alleviate conflicts associated with cross-level interactions among scale-dependent regimes.

Negotiated agreement

An increasingly popular response to the problems of scale-dependent interplay is to negotiate some sort of hybrid regime that provides recognized roles for players at more than one level of social organization, and that stresses the need to devise mutually agreeable rules and procedures in contrast to the imposition of regimes located at one level on those operating at other levels. Sometimes lumped together under the broad and somewhat ill-defined concept of comanagement, such arrangements can vary along several dimensions (Berkes and Folke 1998). Whereas some comanagement regimes governing human uses of living resources involve a sharing of formal authority across levels of social organization, for instance, others feature a commitment to consensual decision making without any sharing of authority in formal terms. Much like the idea of adaptive management, comanagement has become a fashionable concept that is used by many to provide cachet for arrangements designed to ameliorate various problems arising from cross-level interactions. It is too soon to pass judgment on the performance of comanagement regimes in any general sense, but comanagement has certainly emerged as an important pattern in cross-level interactions (Berkes 2002).

System change

Finally, problems arising from cross-level interactions among scale-dependent environmental and resource regimes can become catalysts that trigger efforts to create synthetic arrangements and lead to wider and deeper changes in the overarching institutional settings in which they are embedded. Because both specific environmental and resource regimes and broader institutional arrangements are normally dynamic, it can be difficult to arrive at convincing judgments regarding the direction of the causal arrow in this realm. Did the creation of the North Slope Borough in the early 1970s bring about changes in the rules in use regarding aboriginal subsistence whaling within the framework of the international regime for whales and whaling? Alternatively, did changes in the position of the U. S. government and subsequently the International Whaling Commission exempting aboriginal subsistence whaling from the general moratorium on killing great whales serve to empower the North Slope Borough during the 1970s and 1980s? Of course, there is no need to turn this into an either-

or choice. There is much to be said for the proposition that the growing influence of local or borough government in Alaska and changes in the international rules in use pertaining to aboriginal subsistence harvesting of whales constitute interactive and mutually reinforcing trends (Huntington 1992). Nevertheless, the point of these observations with regard to the issues addressed in this article is clear.

Cross-level interactions among scale-dependent environmental and resource regimes can play a role as well in bringing about larger changes that have the effect of restructuring the broader institutional landscape within which such interactions take place. In the United States, for example, the growth of federal authority over migratory wildlife during the late nineteenth and early twentieth centuries played a prominent role in the general expansion of federal authority in a variety of issue areas (Lund 1980). Issues pertaining to wildlife were not determinative by themselves in this regard. However, there is no denying that they formed part of the broader stream of developments leading to the form of federalism that we frequently take for granted today.

WHAT FORCES PRODUCE THESE PATTERNS?

The identification of recurrent patterns of the sort described in the preceding section is a step in the right direction; it allows us to pinpoint targets of special interest to those concerned with vertical interplay among scale-dependent environmental and resource regimes. However, it tells us nothing about the forces that determine which of these patterns will emerge under real-world conditions, the consequences for the path of human/environment relations, or the robustness of specific patterns or types of interplay once they arise. In this section, I deal with the first of these concerns. What are the driving forces that give rise to specific patterns or types of cross-level interactions? What are the causal mechanisms through which these forces operate? I reserve the issues of consequences measured in terms of well-defined criteria of evaluation and robustness or stability for consideration in the sections to follow.

In some cases, the sources of patterns in cross-level interactions are readily identifiable. When constitutions vest superior authority in a central government and the central government also

controls the lion's share of the material resources available to the public sector, for example, it is to be expected that national-level environmental and resource regimes will dominate institutional arrangements located below them, e.g., state or provincial regimes, or above them, e.g., international regimes, on the jurisdictional scale. However, as the following paragraphs will demonstrate, actual situations are apt to be highly complex, even when central governments are dominant in terms of the allocation of formal authority. Even apparently simple cases harbor enough complexity to make it clear that patterns emerging from cross-level interactions typically reflect the influence of a number of distinct but interactive variables or, in other words, what we may think of as causal clusters (Young 2002).

It is not feasible at this stage to present an exhaustive account of the drivers and mechanisms underlying observable patterns in cross-level interactions. Nonetheless, it is possible to identify some of the factors that occur frequently, generating patterns or types of cross-level interactions that are both prominent and distinct. This account is not sufficient to explain or predict the occurrence of situations featuring well-defined links between mechanisms and patterns, or what some would call syndromes. However, at the end of this section, I offer some preliminary observations regarding this matter.

Authority/power differentials

Regimes sometimes grant decision-making authority to actors who have little or no ability to guide or control the behavior of those who are nominally subject to their authority. Consider, in this connection, the case of migratory birds that fly over western Alaska during their spring and fall migrations (Osherenko 1988). Management authority regarding migratory birds rests with the U.S. federal government, which has entered into and endeavors to implement a number of international, mostly bilateral, agreements designed to introduce measures needed to sustain populations of migratory birds that cross international boundaries (Young 1994). The problem is that the federal government has little capacity to enforce rules dealing with migratory birds with regard to the actions of subsistence harvesters who are located over a wide area in western Alaska, who have needs that are quite different from those of higher-level stakeholders, and who engage in harvesting

practices that reflect more traditional, local-level social norms and practices (Fienup-Riordan 1990). Launching effective enforcement actions under federal auspices would be prohibitively expensive. Also, since the harvest is distributed largely via informal networks rather than ordinary market exchanges, there is little opportunity to regulate harvesting through measures aimed at controlling markets in birds. What is to be done? Not surprisingly, the federal government has shown little willingness to share formal authority in this area, even in the face of serious questions about the effectiveness of the relevant regimes. However, pragmatism requires some effort on the part of federal authorities to negotiate arrangements that grant local stakeholders a meaningful voice in actual decision making regarding the use and management of these resources. The result increasingly is a move toward relying on negotiated comanagement arrangements, e.g., the Yukon-Kuskokwin Delta Goose Management Regime, in which local stakeholders are accorded a meaningful voice, even though the federal government maintains, as a matter of principle, that the resultant regimes do not entail any devolution of authority from national level to regional or local level management arrangements (Osherenko 1988).

Dynamics of decentralization

Recent years have witnessed a worldwide movement aimed at transferring authority regarding the use of living resources from national governments to regional and even local governments (Ribot 2002, Gibson and Lehoucq 2003). Not only are such measures expected to produce results that are more responsive to the concerns of local stakeholders, advocates also expect such measures to lead to more sustainable human/environment relationships. In the Arctic, to take a concrete case, this movement has taken a number of forms, including the creation of home rule governments, e.g., Greenland and the Faroe Islands, the establishment of new territorial governments, e.g., Nunavut, and the development of regional governments, e.g., the North Slope Borough in Alaska. What have been the results of this movement in the circumpolar world? It would be incorrect to argue that the movement has failed to strengthen the hand of local stakeholders, especially in cases where local authorities have access to significant material resources. Even so, it is striking how hard it is to break out of established

patterns of dominance in this realm. For the most part, outside actors, e.g., industrial fishers, fish processors, dominate the markets for fish and other living resources. Moreover, in cases such as the sale of sealskins and the use of leg-hold traps, non-state actors, e.g., the International Fund for Animal Welfare, that are largely ignorant of and insensitive to the concerns of local/regional stakeholders, have acquired the capacity to institute effective bans and boycotts targeted on these products. In many cases, the dependence of local/regional governments on transfer payments from central governments makes it difficult for these actors to chart a course that conflicts in any fundamental way with the preferences of influential decision makers located in the national capitals. Although decentralization has certainly affected preexisting patterns of core-periphery relations in the circumpolar world, the dominance of the core remains a significant fact of life in de facto terms.

Dueling discourses

Management regimes dealing with human uses of living resources reflect underlying premises or systems of thought dominant at the time of their creation. Sometimes these cognitive constructs focus on the nature of the most appropriate models or analytic tools to be used in guiding management decisions. The distinction between the maximum sustainable yield (msy) models embedded in most fisheries regimes and the ecosystem-based management approaches underlying the regimes for the conservation of Antarctic marine living resources and for the protection of biological diversity exemplifies this case (Safina 1997, Joyner 1998). However, dueling discourses pertaining to the management of living resources increasingly reflect fundamental differences in the normative precepts embedded in alternative perspectives on human/environment interactions. Nowhere is this divergence more dramatic than in the gulf separating local users who approve of the harvesting of marine mammals and call for management practices designed to maintain sustained yields and national and international groups that adopt preservationist positions that call for prohibiting any intentional killing of marine mammals as a matter of principle. Consider, in this connection, the discourses underlying the work of the International Whaling Commission (IWC), which is now dominated by preservationist thinking, the North Atlantic Marine Mammal Commission (NAMMCO),

which seeks to combine sustainable harvesting with ecosystem-based management, and the Alaska Eskimo Whaling Commission (AEWC), which endeavors to protect the rights of subsistence users to harvest whales in conformity with traditional practices (Friedheim 2001). What consequences can we expect to flow from cross-level interactions among such groups and the dueling discourses that animate their programmatic activities? Two distinct patterns are possible. One involves an effort to carve out separate spheres of authority for individual bodies in this realm. In the case of whaling, for instance, there is much to be said for differentiating between aboriginal subsistence harvests and all other harvests, leaving the management of the former to local or regional bodies such as the AEWC and of the latter to the IWC. But will the establishment of separate spheres of authority prove viable over time in a social setting increasingly dominated by preservationist forces? Current developments regarding the case of whaling seem likely to offer a major test of the feasibility of separation as a means of dealing with dueling discourses. It is not possible at this juncture to predict the outcome of this battle. Nonetheless, it is easy to imagine a breakdown of the current system of management arrangements dealing with whales and whaling, creating an opportunity to move toward a second pattern featuring an effort to reconstruct the system of institutional arrangements governing human interactions with whales and other marine mammals on some new basis.

Cognitive transitions

Situations of the sort described in the preceding paragraph can create opportunities to promote cognitive transitions aimed at devising new and improved systems for managing human uses of living resources in situations characterized by cross-level interactions. A striking case in point involves the gap between the perspectives of state/federal managers of fish and game rooted in mainstream forms of western science and the perspectives of local users informed by various types of traditional ecological knowledge or TEK (Berkes 1999, Dobbs 2000). It has become popular in recent years for state-level managers to assert that they are receptive to the inclusion of TEK in their decision-making processes and to create comanagement regimes designed to provide opportunities for users to inject TEK into the deliberations of decision makers. However, it is increasingly clear that merging

western scientific knowledge and TEK is easier said than done, especially in settings characterized by cross-level interactions. The fact that western science is strong in the realm of synchronic observations, whereas TEK offers strength in the area of place-based longitudinal observations suggests that there is much to be gained from integrating the two approaches to knowledge. Still, meaningful integration is typically elusive. There are profound epistemological differences between western science and TEK (Fienup-Riordan 1990). Whereas western science thrives on the development of analytical models and quantitative measures, TEK draws strength from experiential learning and from a kind of inductive approach to the identification of patterns. Under the circumstances, although the desirability of merging the two approaches to knowledge regarding the management of living resources is clear, the feasibility of doing so in concrete settings is another matter. At a minimum, success in such ventures requires a willingness on the part of state and federal managers as well as local stakeholders to proceed on a basis of trust and equality. The challenge at hand is to integrate different, but equally valid, approaches to knowledge rather than to start with a one-sided perspective and to add insights from the other perspective at the margin.

Blocking coalitions

Unless and until negotiated agreements or mutually beneficial mergers become feasible, there is a constant danger that two or more participants in cross-level interactions will be able to form blocking coalitions sufficient to veto the preferences of others but not powerful enough to override the opposition of others. Consider the case of wildlife management in Alaska in these terms. The U.S. federal government, which owns about 60% of the land in Alaska, has adopted a policy, articulated in the Alaska National Interest Lands Conservation Act (ANILCA) of 1980, that calls for granting preference to rural users in cases where harvestable supplies of living resources are not sufficient to satisfy the demands of all users. The State of Alaska, by contrast, asserts that implementing such a policy would constitute a violation of its constitution, which does not allow for differential treatment of users based on their places of residence. What is to be done? Although the management of fish and wildlife is ordinarily handled at the state level in the United States, the federal government has exercised

its authority under the terms of the ANILCA and taken over the management of wildlife located on federal lands in Alaska. At the same time, the Alaska Department of Fish and Game retains management authority over wildlife located on lands owned by the state, i.e., over 25% of the total, and by private parties, including the 12-13% of the state owned by Native corporations. This form of separation may seem, at first glance, to make sense. Those able to muster blocking coalitions resort, in effect, to a strategy of managing what they control and ceding authority to others to manage the rest. The problem is that animals, especially those such as caribou that are highly migratory, do not respect the jurisdictional boundaries of individual management agencies. Boundaries drawn for political purposes pose even greater problems for those endeavoring to manage living resources, in terms of the principles of ecosystem-based management. Under the circumstances, separation may constitute a stopgap measure in cases in which the actors, able to muster blocking coalitions, cannot agree on a negotiated system of management. However, it is highly likely that unsatisfactory performance will make these arrangements unstable over longer periods.

Are there identifiable syndromes or, in other words, combinations of conditions that connect the forces leading to specific patterns of cross-level, scale-dependent interplay and produce more or less predictable outcomes in the process? [For a somewhat different use of the idea of syndromes, see Schellnhuber et al. (1997) and Petschel-Held (1999)]. I am not prepared, at this stage, to speculate about necessary or sufficient conditions in this realm. Even so, some syndromes do seem to emerge from this account (see Table 1). Limited or truncated authority frequently leads to negotiations aimed at the creation of integrated environmental and resource regimes, e.g., the numerous regimes for migratory birds, or some form of comanagement. Decentralization in such forms as devolution of authority at the domestic level or the promotion of subsidiarity at the transnational level is a common response to real or perceived dominance of the core. However, as cases such as the growing influence of preservationist opposition to the killing of various marine mammals makes clear, it is hard to curb the power of de facto hegemony. Dueling discourses breed a desire for separation, and consequently, the building of barriers between or among distinct regimes. The determined opposition to proposals to extend the jurisdiction of the International Whaling Commission to cover all species of whales is

centered on maintaining separate spheres of influence for different management philosophies. Cognitive transitions, when they eventuate in new syntheses, can provide the basis for mergers of two or more preexisting regimes. The shift away from collections of species-specific regimes to integrated arrangements that establish procedures to manage human uses of large marine ecosystems exemplifies this syndrome. The persistence of blocking coalitions, by contrast, is apt to lead to institutional breakdown resulting either in the dominance of a new hegemonic system or in the evolution of a new synthesis transcending prior management options. The regime for whales and whaling appears to be caught in this syndrome today; the ultimate outcome hangs in the balance and is hard to forecast. Although these observations must remain somewhat speculative for now, they demonstrate the importance of this line of enquiry.

WHAT ARE THE CONSEQUENCES OF CROSS-LEVEL, SCALE-DEPENDENT INTERPLAY?

Identifying patterns in cross-level interactions among scale-dependent environmental and resource regimes, probing the driving forces or causal mechanisms that produce them, and looking for syndromes or recurrent combinations of conditions leading to predictable outcomes constitutes an important enterprise. Among other things, an understanding of these matters will be critical in any effort to redesign or restructure regimes in the interests of producing outcomes that are more desirable. However, the analysis set forth in the preceding sections tells us little about the consequences of scale-dependent interplay. In other words, it does not answer questions concerning the extent to which it matters whether the regimes involved in cross-level interactions are scale dependent. Once again, it is not possible to provide definitive conclusions regarding such matters. Among other things, it is important to bear in mind that the criteria of evaluation for judging performance are socially constructed. Nonetheless, we can make a start, drawing as before on examples involving regimes for living resources. In this section, I offer some preliminary observations regarding the consequences of scale-dependent interplay with respect to ecological sustainability, social welfare, equity, and cultural autonomy.

Ecological sustainability/conservation

How does scale-dependent interplay affect the sustainability or robustness of key biophysical systems and especially those systems that are increasingly dominated by human actions (Vitousek et al. 1997)? Any serious attempt to answer this question must begin with an effort to clarify several conceptual/analytic issues. In part, this is a matter of specifying explicitly whether the primary focus of attention is the achievement of maximum sustained yields (msy) from targeted species or the management of stressors likely to trigger fundamental changes or regime shifts in complex ecosystems, including but not limited to changes in the status of targeted species. Partly, it is a matter of recognizing that complex ecosystems are typically subject to a wide range of sometimes-transformative pressures, quite apart from the impact of human actions (NRC 1996, 2003). However, that said, it is possible to make several initial observations about the consequences of different patterns of vertical interplay among scale-dependent regimes for ecological sustainability. Negotiated agreements can produce negative results for ecological sustainability for at least two distinct reasons. The compromises required to achieve acceptable bargains often lead to the setting of total allowable catches at levels higher than those deemed necessary by scientists to achieve msy, much less some broader measure of ecosystem-based management. Moreover, reaching a consensus on the reform of negotiated agreements is apt to be a slow process, posing problems for the maintenance of robustness in systems affected by rapid change events. Dominance, by contrast, typically leads to arrangements favored by powerful actors, yet it may open up opportunities for exercises in adaptive management that are beneficial in terms of ecological sustainability.

Somewhat similar observations are in order regarding the consequences of separation as a pattern of interaction. To the extent that complex ecosystems feature extensive biophysical linkages, any effort to divide these systems into components that are assigned for management purposes to different jurisdictions can be expected to produce results that are problematic from the perspective of ecological sustainability. Existing regimes dealing with fish and marine mammals exemplify this problem. For its part, the pattern called merger holds better prospects for managing human activities in such a way as to promote the maintenance of

ecological sustainability in human-dominated ecosystems. Even so, it is worth noting that mergers are generally justified by a desire to achieve efficiency through measures such as the elimination of excess harvesting capacity in the fisheries. This may or may not prove beneficial from the perspective of ecological sustainability; it can easily become an excuse to impose the preferences of dominant actors on other members of the relevant group.

Social welfare/efficiency

As in ecological sustainability, the idea of social welfare requires some clarification to make it useful in a discussion of the consequences of scale-dependent interplay. Ideally, the pursuit of social welfare would take the form of maximizing the sum of the welfare of all the individual members of a well-defined group. However, there is widespread agreement that we cannot construct a workable social welfare function of this sort under real-world conditions (Bromley 1989). As a result, analysts have introduced several weaker approaches to social welfare, emphasizing efficiency and including both the idea of Pareto optimality and the concept of cost effectiveness. Still, there is considerable debate about the application of these standards to specific situations. It makes sense, for instance, to argue that efficiency rises when the same harvest level is achieved with less effort, e.g., a smaller number of boats in a fishery. However, this may not meet the standard of Pareto optimality, which requires that no member of the relevant group is made worse off by efforts to improve efficiency. As I suggested in the previous paragraph, the incentives to merge preexisting arrangements are based primarily on the pursuit of efficiency, although there are also cases in which key actors pursue mergers to increase their market power and subsequently to extract economic rents. Dominance, whether formal or de facto, may produce conditions that are conducive to the pursuit of efficiency, if only because it lowers the transaction costs involved in making collective choices. However, there is no guarantee that this pattern will produce cost-effective outcomes, in contrast to creating conditions conducive to rent-seeking behavior. Many, perhaps most, negotiated agreements are more sensitive to considerations of equity than to the pursuit cost-effective practices in the use of living resources.

Table 1. Syndromes of cross-level, scale-dependent interplay. AEWK stands for Alaska Eskimo Whaling Commission; CCAMLR, Convention on the Conservation of Antarctic Marine Living Resources; IWC, International Whaling Commission; NAMMCO, North Atlantic Marine Mammal Commission; and Y-K, Yukon-Kuskokwim Rivers.

Driving force	Pattern/Type	Outcome	Example
Limited authority	Negotiated agreement	Comanagement	Y-K Delta Goose management
Dynamics of decentralization	De facto dominance	Hegemony	Ban on seal products
Dueling discourses	Separation	Competing regimes	IWC/NAMMCO/AEWK
Cognitive transitions	Merger	Institutional synthesis	CCAMLR/ecosystem-based management
Blocking coalitions	System change	Institutional breakdown	Alaskan wildlife

Equity/fairness

As the preceding observations suggest, situations featuring scale-dependent interplay often give rise to issues of equity or fairness, in contrast to concerns relating to ecological sustainability or to social welfare/efficiency. That said, complications begin to arise immediately as we seek to understand how these considerations play out under real-world conditions. Equity may be construed either as a matter of who gets what and whether the results conform to standards of distributive justice or as a matter of procedural justice or, in other words, the extent to which the processes leading to specific outcomes are regarded as legitimate or fair (Rawls 1971, Nozick 1974). Needless to say, there is often room for vigorous disagreement about the extent to which specific situations conform to requirements, both of distributive justice and of procedural fairness. Even so, a few specific observations are in order in this connection. Dominance can be expected to privilege the interests/preferences of the

most powerful member(s) of a group, and seldom leads to outcomes that fare well in terms of evaluations focusing on considerations of equity. Mergers, too, tend to reflect the distribution of power in a particular sector; there is little basis for expecting them to yield outcomes that fulfill familiar conceptions of fairness or justice. Negotiated agreements may seem equitable, especially when they require voluntary consent on the part of all members of the relevant group. However, as those who have studied bargaining processes know well, there is no reason to assume that bargains actually struck will conform well to normal criteria of equity. Interestingly, separation may actually generate favorable results in terms of distributive justice by protecting weaker players from the intrusion of more powerful actors, though this may come at a substantial cost in terms of other considerations such as ecological sustainability or efficiency.

Cultural autonomy

Although ecological sustainability, efficiency, and equity cover a wide range of concerns, they fail to capture some important cultural considerations. Consider the following familiar issues regarding human uses of living resources in these terms. How should we resolve conflicts between those advocating consumptive uses of living resources and focusing their efforts on the achievement of sustainable yields and those preferring some form of preservationism and opposing the killing of individual animals or, at least, individual members of charismatic species, e.g., whales, elephants? Should we grant priority to subsistence users in cases in which allowable harvest levels of specific stocks of fish or animals are not sufficient to accommodate, simultaneously, the demands of subsistence, commercial, and recreational users? Is there a compelling case for establishing community development quotas in major fisheries to strengthen the economic and social systems of small or remote communities whose economic base is narrow and whose options are limited? These are often the most difficult issues to address effectively, and cross-level, scale-dependent interactions are likely only to intensify the difficulties of resolving such issues. Whether we like it or not, issues of this sort are ordinarily determined by the exercise of power. When dominance shifts from consumptive users to preservationists, as in the case of the international regime for whales and whaling, we can expect a subsequent shift in the attention accorded to cultural preferences. On the other hand, when subsistence users have succeeded in persuading courts to rule that their practices are based on indigenous or aboriginal rights that are infeasible, subsistence preferences are likely to flourish. This suggests that scale dependence will seldom be a critical determinant of the outcomes of normative clashes of this sort. Vertical interplay among scale-dependent regimes will make issues of this sort even harder to resolve than is the case in the absence of such interplay. Ultimately, considerations of power and the influence of social norms are likely to explain the outcomes that occur.

HOW ROBUST ARE PATTERNS OF CROSS-LEVEL, SCALE-DEPENDENT INTERPLAY?

There is a sense in which types or patterns of cross-level interplay among scale-dependent environmental

or resource regimes produce tensions of their own. Separation or system change may prove effective as a means of coming to terms with such tensions in some specific cases. However, those steeped in the cognitive processes and decision-making practices associated with each level typically regard their way of doing things as preferable to others, and push more or less aggressively for changes that would move the whole, multilevel system toward conformity with their own mode of operation. Even so, scale-dependent interplay is not only a common occurrence, patterns of interplay arising in this context also demonstrate considerable staying power under a wide range of circumstances. What explains these results? Will this institutional stickiness continue to prevail during the foreseeable future? This section draws on the concepts of path dependence, resilience, adaptation, and learning to offer brief responses to these questions.

Although it is important to distinguish between specific institutions and the patterns of interplay among institutions, path dependence contributes to the tenacity of the patterns of institutional interplay in much the same way that it enhances the staying power of individual arrangements. Once a pattern of cross-level, scale-dependent interplay takes hold, stakeholders become attached to the way things are done, existing social practices become routines, and the status quo turns into the default option. What is more, intentional institutional changes are difficult to bring about under most circumstances. Efforts on the part of key stakeholders to achieve positions of dominance are apt to provoke fierce resistance on the part of others. Proposals for mergers are construed in many cases as hostile takeover bids rather than initiatives designed to promote mutually beneficial collaboration. Institutional bargaining is a highly uncertain process; it can easily drag on for years and ultimately lead to stalemate. Consider the situation in many marine fisheries from this perspective. Although we are well aware that existing fisheries regimes in many parts of the world leave a great deal to be desired in terms of criteria such as ecological sustainability and efficiency, it is difficult to make the fundamental changes in these arrangements, needed to avoid stock depletions and to control the negative side effects associated with industrial fishing. To put this point in other terms, patterns of cross-level, scale-dependent interplay can prove remarkably resilient, even when the results they produce are undesirable or costly from any of a number of points of view.

Nevertheless, this does not mean that we are saddled forever with existing patterns of cross-level, scale-dependent interactions and that we should simply acknowledge their existence and focus on ways to limit their negative consequences. For the most part, institutional change is nonlinear in the sense that relatively long periods of stasis are punctuated with occasional rapid change events. Just as cascades of change can lead to regime shifts in large marine and terrestrial ecosystems (NRC 1996), institutional arrangements that seem stable can reach thresholds or breaking points that trigger transformative changes over short periods (Young 1982). A particularly potent mix occurs when cascading changes in biophysical systems occur more or less simultaneously with transformative changes in institutional arrangements. Something of this sort may occur during the foreseeable future with respect to the management of whales and whaling at the global level (Friedheim 2001), and with regard to the governance of the Bering Sea region, treated as a large marine ecosystem (NRC 1996, Young 2005).

Although they are often anxiety producing, the resultant crises can produce opportunities for making significant changes in existing institutional arrangements. For this reason, there is much to be said for investing time and energy in the analysis of alternative futures, even, or perhaps especially, during periods in which the status quo appears to be deeply entrenched. The goal of such efforts is to move beyond relatively straightforward exercises in adaptive management to foster social learning that can come into play during those rare and ordinarily brief periods in which opportunities arise to introduce more fundamental changes in existing institutional orders (Haas 1990, Haas and Haas 1995, Social Learning Group 2001).

WHAT HAVE WE LEARNED ABOUT INSTITUTIONAL INTERPLAY?

I have argued in this article that under conditions prevailing today, cross-level interactions among scale-dependent environmental and resource regimes are widespread, and these interactions have important consequences for efforts to govern human/environment relationships. A preliminary analysis of this phenomenon yields three propositions that those responsible for administering these regimes should consider carefully. First, it is dangerous to focus attention exclusively on one level, to assume that higher-level arrangements will

take the form of macrocosms of lower-level arrangements, or that lower-level arrangements are microcosms of their higher-level counterparts. This suggests the importance of skepticism about conclusions derived from studies that address only a single level on the scale of jurisdiction. Second, although the consequences are not always negative, it is easy to see that cross-level interactions among scale-dependent regimes will often give rise to serious problems, framed in terms of considerations such as ecological sustainability, efficiency, and equity. As a result, policymakers and managers alike need to be particularly vigilant in identifying such problems and be ready to take corrective actions when these problems become severe. Third, there is much to be said for analyzing alternative arrangements in advance and preparing to launch desirable reforms during brief windows of opportunity, even though the impact of path dependence ensures that the prospects for restructuring existing arrangements are ordinarily poor. There is no reason to treat cross-level interactions among scale-dependent regimes as a kind of pathology to be avoided or cured. However, we can and should make a concerted effort to improve our understanding of this phenomenon and to prepare in advance to take advantage of transient opportunities to restructure existing patterns of cross-level, scale-dependent interactions to improve the performance of the growing universe of individual environmental and resource regimes.

Responses to this article can be read online at:
<http://www.ecologyandsociety.org/vol11/iss1/art27/responses/>

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LITERATURE CITED

- Berkes, F.** 1999. *Sacred Ecology: traditional ecological knowledge and resource management*. Taylor and Francis, Philadelphia, Pennsylvania, USA.
- Berkes, F.** 2002. Cross-scale institutional linkages: perspectives from the bottom up. Pages 293-321 in

- E. Ostrom, T. Diez, N. Dolsak, P. C. Stern, S. Stonich, and E. U. Weber, editors. *The drama of the commons*. National Academy Press, Washington, D.C., USA.
- Berkes, F., and C. Folke, editors.** 1998. *Linking social and ecological systems: management practices and social mechanisms for building resilience*. Cambridge University Press, Cambridge, UK.
- Bromley, D. W.** 1989. *Economic interests and institutions: the conceptual foundation of public policy*. Blackwell, London, UK.
- Dobbs, D.** 2000. *The great gulf: fishermen, scientists, and the struggle to revive the world's greatest fishery*. Island Press, Washington, D.C., USA.
- Fienup-Riordan, A.** 1990. *Eskimo essays: Yu'pik lives and how we see them*. Rutgers University Press, New Brunswick, New Jersey, USA.
- Friedheim, R. L., editor.** 2001. *Toward a sustainable whaling regime*. University of Washington Press, Seattle, Washington, USA.
- Gibson, C., E. Ostrom, and T. K. Ahn.** 2000. The concept of scale and the human dimensions of global change: a survey. *Ecological Economics* 32:217-239.
- Gibson, C. C., and F. Lehoucq.** 2003. The local politics of decentralized environmental policy. *Journal of Environment and Development* 12:28-49.
- Haas, E. B.** 1990. *When knowledge is power: three models of change in international organizations*. University of California Press, Berkeley, California, USA.
- Haas, P. M., and E. B. Haas.** 1995. Learning to learn: international governance. *Global Governance* 1:255-284.
- Huntington, H.** 1992. *Wildlife management and subsistence in Alaska*. Belhaven Press, London, UK.
- Joyner, C.** 1998. *Governing the frozen commons: the Antarctic regime and environmental protection*. University of South Carolina Press, Columbia, South Carolina, USA.
- Larkin, P. A.** 1977. An epitaph for the concept of maximum sustained yield. *Transactions of the American Fisheries Society* 106:1-11.
- Lund, T. A.** 1980. *American wildlife law*. University of California Press, Berkeley, California, USA.
- March, J. G., and J. P. Olsen.** 1998. The institutional dynamics of international political orders. *International Organization* 52:943-969.
- NRC.** 1996. *The Bering Sea ecosystem*. National Academy Press, Washington, D.C., USA.
- NRC.** 2003. *Decline of the Steller sea lion in Alaskan waters*. National Academy Press, Washington, D.C., USA.
- Nozick, R.** 1974. *Anarchy, state, and utopia*. Basic Books, New York, New York, USA.
- Osherenko, G.** 1988. Can co-management save Arctic wildlife? *Environment* 20(6):6-13, 29-34.
- Ostrom, E.** 1990. *Governing the commons: the evolution of institutions for collective action*. Cambridge University Press, Cambridge, UK.
- Petschel-Held, G., A. Block, M. Cassel-Gintz, J. Kropp, M. K. B. Lüdeke, O. Moldenhauer, F. Reusswig, and H. J. Schellhuber.** 1999. Syndromes of global change: a qualitative modelling approach to assist global environmental management. *Environmental Modeling and Assessment* 4:299-314.
- Rawls, J.** 1971. *A theory of justice*. Harvard University Press, Cambridge, Massachusetts, USA.
- Ribot, J.** 2002. *Democratic decentralization of natural resources: institutionalizing popular participation*. World Resources Institute, Washington, D.C., USA.
- Safina, C.** 1997. *Song for the Blue Ocean: encounters along the world's coasts and beneath the seas*. Henry Holt, New York, New York, USA.
- Schellhuber, H. J., A. Block, M. Cassel-Gintz, J. Kropp, G. Lammell, W. Lass, R. Lienenkamp, C. Loose, M. K. B. Lüdeke, O. Moldenhauer, G. Petschel-Held, M. Plöchl, and F. Reusswig.** 1997. Syndromes of global change. *GAIA* 6(1):19-34.
- Scott, A.** 1953. *Natural resources: the economics*

of conservation. University of Toronto Press, Toronto, Ontario, Canada.

Social Learning Group. 2001. *Learning to manage global environmental risks: a comparative history of social responses to climate change, ozone depletion, and acid precipitation*. MIT Press, Cambridge, Massachusetts, USA.

Usher, P. 1987. Indigenous management systems and the conservation of wildlife in the Canadian North. *Alternatives* 14:3-9.

Vitousek, P., H. Mooney, J. Lubchenko, and J. Melillo. 1997. Human domination of Earth's ecosystems. *Science* 277:494-499.

von Moltke, K. K., O. Kuik, N. der Grjp, C. Salazar, T. Banuri, C. Mupimpila, C. Inman, N. Mesa, R. Oleas, and J. José de los Santos. 1998. *Global product chains: northern consumers, southern producers, and sustainability*. Environment and Trade Series No. 15, United Nations Environmental Programme (UNEP), Geneva, Switzerland.

Young, O. R. 1982. *Resource regimes: natural resources and social institutions*. University of California Press, Berkeley, California, USA.

Young, O. R. 1994. *International governance: protecting the environment in a stateless society*. Cornell University Press, Ithaca, New York, USA.

Young, O. R. 2002. Are institutions intervening variables or basic causal forces: causal clusters vs. causal chains in international society. Pages 176-191 in M. Breecher and F. Harvey, editors. *Millennial reflections on international studies*. University of Michigan Press, Ann Arbor, Michigan, USA.

Young, O. R. 2005. Governing the Bering Sea region. Pages 194-209 in S. A. Ebbin, A. H. Hoel, and A. K. Sydnes, editors. *A sea change: exclusive economic zone and governance institutions for living marine resources*. Springer, Dordrecht, The Netherlands.