

*Edited by Derek Armitage, Fikret Berkes,
and Nancy Doubleday*

Adaptive Co-Management: Collaboration, Learning, and Multi-Level Governance



UBC Press · Vancouver · Toronto

8

Integrating Holism and Segmentalism: Overcoming Barriers to Adaptive Co-Management between Management Agencies and Multi-Sector Bodies

Evelyn Pinkerton

In January 2005, I and another evaluation team member,¹ Anita Bedo, delivered an evaluation of a three-year pilot initiative in adaptive co-management to the co-managing body, the West Coast Vancouver Island Aquatic Management Board (AMB).² This body is attempting to move towards integrated ecosystem-based management of a coastal area covering some two-thirds of the west coast of Vancouver Island in British Columbia. The evaluation was intended to inform not only the co-management board itself but also the four levels of government that fund and sponsor it, as the pilot project was to end in March 2005 (and to be up for renewal). The sponsoring governments are the federal Department of Fisheries and Oceans (DFO), the Province of British Columbia, the Regional Districts of Alberni-Clayoquot and Comox-Strathcona, and the Nuu-chah-nulth Tribal Council. By far the most important funder (50 percent) and sponsor (because they have the legal mandate to manage most aquatic resources) was the DFO.³

The DFO eventually opted to continue supporting the AMB, at least for another two years beyond the three-year pilot, but their continued support and vision for the future of the AMB is uncertain. The nature of these differences exemplifies the difficulties in coordinating the perspectives of government bureaucracies and community-based (or regionally based) co-managers. This discussion explores key dimensions of these difficulties and options for overcoming them. After briefly noting how these difficulties surfaced in our evaluation and the discussion surrounding it, I review some aspects of what the literature on organizational behaviour contributes to the discussion. This review is not comprehensive but is meant to highlight key aspects relevant to adaptive co-management.

Local and Non-Local Differences in Perspective on Appropriate Scope and Scale of AMB Issues

Among the challenges facing the Aquatic Management Board that the evaluation team identified was the frequent insistence by DFO board members

Box 8.1.**Objectives of the WCVI Aquatic Management Board**

- Protect, maintain, and rehabilitate aquatic resources
- Manage aquatic resources on an ecosystem basis
- Respect and protect First Nations' food, social, and ceremonial requirements, and treaty obligations
- Support a precautionary approach to aquatic resource management
- Consolidate information relating to different aquatic resource uses and utilization to provide a holistic picture of the health of ecosystems within the management area
- Integrate expertise and knowledge from First Nations, local, scientific, and other sources
- Ensure opportunities for coastal communities and other persons and bodies affected by aquatic resource management to participate in all aspects of integrated management, protection, and restoration of aquatic resources
- Foster initiatives that maintain or enhance opportunities for coastal communities to access and benefit from local aquatic resources, while achieving sustainable social, cultural, and economic benefits from the integrated management and harvesting of aquatic resources for British Columbians and other Canadians.

that the AMB not involve itself in coast-wide issues or migratory species. This prohibition was frustrating to most non-DFO board members, since the principles guiding their vision were to take steps towards integrated management and ecosystem-based management, meaning that they would look broadly at connections among multiple species and their habitats. Box 8.1 summarizes the objectives of the AMB.

Board members were mostly local residents of the WCVI from Aboriginal, commercial, recreational, environmental, and local government sectors (First Nations, regional districts). A smaller number of non-local members were from processing, aquaculture, labour, and senior governmental sectors, and some of them agreed with the local members on this issue. Local members who had worked for some seven years to create the AMB were certain that migratory species such as salmon, many of which spawned in their watersheds, were part of the WCVI ecosystem. Furthermore, they felt that coast-wide decisions made in non-local forums regulating access to migratory and non-migratory species such as halibut in their adjacent oceans also had an important effect on WCVI ecosystems. They repeatedly requested inclusion in advisory processes dealing with these issues, but were denied.⁴ Our evaluation reflected on this frustration and connected it to some of the

difficulties the board was experiencing in being able to significantly engage with an issue of appropriate scope and scale. The broader question being raised implicitly was: "How does a local body based on holistic principles co-manage with a senior governing body based on segmental principles?" Here, this question is considered in the context of a co-management arrangement at a formative stage (after the initial negotiation stage, but long before the mature institutionalized stage). The discussion is relevant to theory building because it involves an arrangement with an unusually broad vision and scope of objectives, operating at a regional scale and involving a complex mix of parties (see Day 2003 for a discussion of the developmental stages of the arrangement).

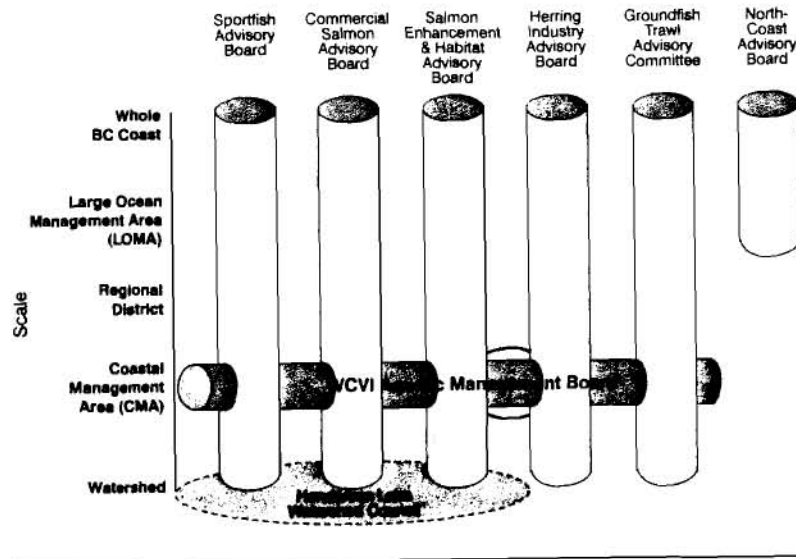
An Alternative Vision: Multi-Sector Involvement at the Coastal Management Area Scale

Reflections on segmentalism versus holism in our draft evaluation report to the AMB meeting (Pinkerton et al. 2005), and other comments by board members, elicited an open and helpful response from a new DFO representative on the AMB at one meeting. He drew a chart to illustrate the DFO's traditional consultative arrangements with stakeholder groups, and how the AMB differed from other stakeholders in the scope of issues considered, the geographic scale covered in planning, and the complexity of parties involved. Figure 8.1, adapted from his drawing, illustrates these contrasts. It is meant to represent the more than fifty traditional "stovepipe" arrangements whereby the DFO attempts to solve problems with (usually) single-sector parties over single-species management for the entire coast. For example, the DFO works separately with the Herring Industry Advisory Board, the Commercial Salmon Advisory Board, and the Sportfish Advisory Board, each of which is a body representing fishers in that sector coast-wide.

These traditional consultative arrangements are like stovepipes in several ways. First, they separate one species from another, even though one species (herring) is the prey of another species (salmon), and their relationship could affect management considerations. Second, they separate one sector of fishers from another (commercial versus sport versus Aboriginal), although these sectors all fish many of the same species. Third, they make decisions on a coast-wide basis regarding situations that are complex and varied in different parts of the coast because of both societal and ecological variability. Advisors elected to these sectoral processes represent sector-wide economic interests but not communities or geographical regions. At the opposite end of the spectrum, occasional watershed-based pilot projects are not integrated into larger regional processes, and represent small, geographically isolated stovepipes. These stovepipe aspects of the consultations give the decisions a narrowness and a top-down configuration, even though stakeholders are involved, because of what the decisions have to ignore.

Figure 8.1

The “stovepipe” consultative processes of the Department of Fisheries and Oceans. There are approximately fifty stovepipe consultative processes of the DFO functioning at different geographical scales. This figure illustrates how the WCVI AMB includes sectors and species at the Coastal Management Area scale.



The DFO representative explained that the DFO found its stovepipe consultations frustrating, because they were costly (involving around fifty separate processes) and often unproductive. That is, even if they resolved conflict within one sector, the decisions of one sector were often in conflict with the decisions of another sector. For example, Aboriginal groups had considerable power to question decisions made by the commercial and sport sector (because of constitutionally protected Aboriginal rights), sometimes causing those sectors to have to rework their solutions to problems within their sectors (thus, making their first efforts a waste of time and resources).

As discussed above, some of the dilemmas with stovepipe consultation resulted from the *scope* at which a problem was defined – for example, how many species and how many sectors were really involved in and affected by a problem. Other stovepipe dilemmas resulted from the coast-wide geographical *scale* of the consultations. The DFO member reminded the meeting attendees that the DFO’s Oceans Strategy called for management units at several geographical scales: (1) the watershed, (2) the Coastal Management

Area (CMA; six on the BC coast), and (3) the Large Ocean Management Area (LOMA; two on the BC coast). The DFO is already dealing with a BC North Coast LOMA, attempting to reach agreement on a few major policy issues at a large scale and to do coastal planning involving eight First Nations’ tribal councils. The DFO member considered the AMB to be an example of the second-order scale of management, a CMA, and spoke to the importance of working on co-management at this scale.⁶ The implication was that it might be possible to deal with more complex issues at the CMA scale, especially if only one tribal council were involved.

For the DFO to make management decisions with a co-managing partner at a CMA scale would be a significant departure from the stovepipe model in three ways. First, more decisions would be made at a much smaller geographical scale. A large co-management literature documents how a relatively small geographical and human scale of interactions enables more meaningful and manageable dialogue across many sectors/stakeholder groups (Pinkerton and Weinstein 1995). This possibility creates the second major difference from the stovepipe model: decisions at the CMA scale cut across and include sectors usually operating in separate stovepipes. Decisions would thus be integrated, *multi-sectoral* decisions (instead of single-sector), bringing together, in addition to the four levels of government, commercial, sport, Aboriginal, processor, aquaculture, environmental, and labour interests. Having these sectors reach agreement among themselves at one table and plan jointly would mean that this particular CMA could potentially have the sort of cross-sectoral management that is called for in Canada’s Oceans Act and Oceans Strategy (in language that is general and vague, however). The DFO’s 2004-05 Report on Plans and Priorities (RPP) to the Treasury Board of Canada clearly states the priority for the Aboriginal fishery: “Assisting Aboriginal people to build the capacity to participate more effectively in the *multi-stakeholder processes* used for aquatic resources and oceans management will help to *avoid separate management solitudes*” (10, emphasis added).

The AMB, then, is an example of a body at a second-order geographical scale (CMA) that cross-cuts many of the stakeholder sectors. It is an appropriate vehicle for coordinating non-Aboriginal stakeholders with Aboriginal governance processes in the same geographical area. It operates at a scale that is of great interest to government agencies because it is large enough that there would be only about six such areas on the whole west coast of Canada. If the DFO could find stakeholders able to make agreements in areas this large, it would have a relatively efficient means of consulting that would bypass a number of the stovepipe dilemmas and contribute to management solutions. Stovepipe processes that effectively solved other problems would remain, but a different model for addressing the types of complexity outlined above would emerge, including ways to link processes

operating at different scales (e.g., integrating watershed-scale processes with CMA-scale processes).

Third, and finally, the CMA geographical scale would presumably be large enough to include significant aspects of ocean and freshwater ecosystem structure and function. The DFO would then be responding to the call in the Oceans Act to do "integrated management," moving beyond the single-species models in the stovepipe consultations to consider species interactions, habitat linkages, and broader questions of coastal planning such as cumulative effects.⁷ Some natural scientists have built ecosystem-based models at the CMA scale, including a first-generation one for an area somewhat larger than the WCVI (Pauly et al. 1996; Christensen and Walters 2004). Others believe either that our knowledge of coastal ecosystems is not sufficient to know at what scale we should be studying them (de la Mare 2005) or that there are inherent difficulties in models at this scale but a better chance of modelling them at a smaller scale (Cox et al. 2002a, 2002b). We do know something about the scale at which multi-party boards can function, however, so a reasonable approach is to be guided by this scale. This scale could indicate what is politically and socially feasible, providing an opportunity to learn what we can about ecosystems in the process (de Young et al. 1999).

It should be noted that the level of power being exercised by all the aforementioned processes is officially only advisory, since the Minister of Fisheries and Oceans has the authority to make all decisions. Decision making that results from agreement across sectors is inherently powerful, however, because senior governments are relieved of the burden of resolving conflict among those sectors and can bless as well as help craft their agreements. While a senior government may, in order to further an agenda, make a different decision than the one recommended, doing so would weaken the power of both government and the consultative body, because trust will have been weakened and parties will become less willing to collaborate. A major policy role of government is always to broker agreements among conflicting users. As suggested by the discussion below, there can be more power for both stakeholders *and* government in such multi-party agreements.⁸

How Can Shifts in Governance towards This Vision Occur?

A number of questions arise from the project of co-managing at the CMA scale. Some of them on the "community" side concern matters such as how to have enough face-to-face encounters among stakeholders at the CMA geographical scale to make and implement agreements effectively on an ongoing basis. And what types of agreements? On the senior government side, different questions arise, ones posed sincerely by the DFO representative at the meeting. Can the agency actually shift to another way of working with stakeholders? What would be required to get beyond the stovepipe way of dealing with stakeholders? Would new models co-exist with or

replace the stovepipe consultations (thus potentially altering long-standing power and client relationships)? Are third-order aggregations of coast such as Large Ocean Management Areas (LOMAs), which are twice as large as CMAs, too large for reaching and implementing more than very general agreements effectively? The North Coast LOMA appears to be driven mostly by government's desire to bring stakeholders to agreement on possible oil, gas, and aquaculture development, possibly the kinds of issues that *could* be dealt with fruitfully at a LOMA scale. More complex issues, such as dealing with species and habitat/species interactions, may be more effectively handled at a CMA scale. In the discussion below, I show how some actions undertaken by the AMB (or which the AMB aspired to undertake, but was prevented) either counteracted some of the problems in senior levels of governance or could have done so.

Identifying Types of Barriers to Achieving Adaptive Co-Management

Here I conceptualize the types of barriers that the senior governing agency, a large federal bureaucracy, would have to overcome in order to move in the direction of greater use of multi-stakeholder boards at the CMA scale. The key barriers are a feature of the behaviour of complex organizations, of which government bureaucracies and agencies are one class. Government agencies are predominantly hierarchical structures functioning according to instrumental values and technical considerations (Cyert and March 1963). In order to deal with the complexity and diversity of an ecosystem, the hierarchy would have to be able to delegate a great deal of control and initiative to various local arms of the bureaucracy. These would need to have the capacity to be adaptive, learning bodies with considerable autonomy, even while being coordinated in their operational objectives at a policy level from the top (de la Mare 2005). Wilson (1989) has shown that battles are won by armies that have the capacity for intelligent autonomous actions at the lowest level, informed by an overall strategic plan coordinated at the highest level. Clarke and McCool (1996) have noted that the most successful federal resource management agencies have adopted these key aspects of military structure. Yet, this optimal practice may be more honoured in the breach than in the observance, if we consider the usual *modus operandi* of government agencies. Wilson (1989) shows as many failures as successes of government bureaucracies in achieving this type of structure and coordination.

Some analysts focus on how government agencies have moved from failure to success in their attempt to cope with complexity in their policy environment. In his analysis of the US Forest Service's transition to ecosystem management, alternative dispute resolution planner and policy analyst Steven Yaffee (1997) identified five "behavioural biases" or tendencies (which a sociologist, following Max Weber, might call forms of "bureaucratic

rationality") of government agencies: (1) preference for short-term rationality over long-term rationality; (2) preference for competition over cooperation; (3) fragmentation of interests and values; (4) fragmentation of responsibilities and authorities; and (5) fragmentation of information and knowledge. These behavioural biases inform the ways agencies tend to make decisions, ways that unfortunately lead to ineffective outcomes, and in this case make adaptive co-management impossible.

In the discussion below, I conceptualize these five tendencies as barriers to adaptive co-management, and include Yaffee's and others' ideas about which practices show promise for overcoming these tendencies. Yaffee's approach is supplemented especially by the complementary approach of political scientist William Ascher (2001), which examines policy failures through "perverse learning." It is instructive to review how these two scholars, who do not cite each other's work and draw on different aspects of the literature, have reached remarkably similar conclusions, based on their experience with natural resource management agencies. The similarities make their findings more convincing, especially because Yaffee's experience is mostly in North America while Ascher's is mostly in developing countries. Both authors have drawn upon at least some of the literature on the behaviour of complex organizations, a literature that appears most frequently in the fields of political science, sociology, and administrative science; relatively little of this literature has focused on how natural resource management agencies behave. Finally, I will note how various authors recommend dealing with these behavioural tendencies and how the AMB either responded or had the potential to do so.

Behavioural Bias 1: Preference for Short-Term Rationality over Long-Term Rationality

Management agencies seek to minimize the energy needed to respond to a situation while maximizing control and predictability. These are reasonable short-term responses but miss the long-term objective of solving the problem at hand or creating the conditions to do so. For example, agency leaders often try to force controversies into organizational procedures that are not effective at dealing with these particular controversies. They tend to stifle productive dissension and protect ongoing organizational processes from disruption, resulting in reduced creativity and effectiveness. They then rationalize past behaviour and become entrapped in bad decisions. These procedures reduce the agency's fitness over time by limiting innovation and adaptation. This bias towards short-term rationality parallels the prisoner's dilemma and the tragedy of the commons tendencies, in which individually rational choices lead to socially undesirable outcomes.

Ascher calls this tendency "complexity reduction" or "oversimplification," leading to "perverse learning." He attributes oversimplification especially

to institutional convenience, because the lessons that the agency needs to learn in order to solve a problem run counter to established institutional *modus operandi*. The planning and reward structure of the agency is based on short-term considerations: rewards for immediate results are often enhanced at the expense of rewards for long-term performance. Likewise, natural resource management agency decision makers often do not face the consequences of poor decisions whose outcomes may not appear immediately, such as the decline of fish populations.

Behavioural Bias 2: Preference for Competition over Cooperation

Government agencies tend to protect their power preserves at all costs and to perceive the sharing of power and resources as always a zero-sum game: if some is shared with stakeholders, they believe they will enjoy exactly this much less (Clarke and McCool 1996; Yaffee 1997; Songorwa et al. 2000). This mode of thinking inhibits the sharing of information and resources, promotes biasing or misrepresentation of information that is shared, and perpetuates the protection of turf even within divisions of the agency, even when there is a clear mutual benefit to be derived from cooperation. Such competitive behaviour leads to stalemates, low morale, and low legitimacy in the eyes of the public. Turf protection can also determine the models that management agencies are willing to entertain. Insistence on the use of conventional agency models limits the way partners can think of co-management, disallowing traditional forms of access or scales of knowledge of community members. For example, many communities have traditionally used regulation of gear and allocation of fishing space to limit fishing effort. This approach is often based on detailed local knowledge of stocks and may be a highly effective regulatory approach in certain situations (Wilson et al. 1994). Agencies' conventional regulatory tools, such as limited entry and quantifiable stock models, provide predictability over large scales and are thus preferred (Degnbol 2003). Combinations of these approaches are seldom attempted because of a perceived competition between them.

Ascher points out that the "bias in favour of government control" causes all negative outcomes to be attributed to the lack of government control and consequently leads to a felt need to increase regulatory stringency: the possibility that poorly designed government policies could be the cause is not entertained. The feedback loop that would enable the agency to adapt its policies and practices is often missing or obscured by competitive behaviour.

Behavioural Bias 3: Fragmentation of Interests and Values

Interest groups lobby agencies for privileged access to the resource. The more energetic, powerful, or privileged these interest groups are, the more influence they tend to have. Agencies may respond by institutionalizing their response to the most powerful interest groups through formal consultative

mechanisms. In extreme cases, an agency may be "captured" by the most powerful interest group(s). In this case, the interests of the latter will have an influence on policy that is disproportionate to the public benefit of the latter's extraction activities (McFarland 1987). In cases where there are many conflicting interests, stakeholders will engage in turf battles as energetic as those within the agency: positions will be exaggerated, and non-productive conflict will predominate. Exaggerated positions make it impossible for government decision makers not to be attacked by all sides. This manner of dealing with management and allocation decisions is inherently competitive and allows no means of inter-sectoral communication or cooperation, especially not at the level of shared geographical territory. At this level, one would expect to find the greatest incentive to perceive a shared destiny and to recognize that the game may not be a zero-sum one – that there may be mutual benefits to joint problem solving. If fragmented interests are not brought together and forced to identify and integrate their common interests in sustainable management and ecosystem health, the decision-making process will reflect fragmented values rather than shared or program objectives, and conflict will be continually forced to higher and higher governmental levels. If conflicts are resolved for political reasons at higher levels, regional decision makers in the agency lose power, and decisions will be more informed by politics than by program objectives.

Behavioural Bias 4: Fragmentation of Responsibilities and Authorities

The structuring of agencies into divisions tends to divide up responsibilities but not to integrate them at a higher or lower level. Similarly, the legislation creating the mandates of an agency may be inherently contradictory or incompatible. The Oceans Act and the Fisheries Act, implemented by two different branches of the DFO, have not been reconciled. Turf battles among agency divisions and among different agencies with jurisdiction over different aspects of the resources and its habitat both create and reinforce stovepipe management structures within the agency. Decisions are focused on various statutorily defined questions that are much narrower than required for an effective problem-solving process. For example, commercial fisheries are regulated by the federal agency, the DFO, while freshwater and anadromous sport fisheries and aquaculture are mostly regulated by the province. In addition, forest management and coastal development planning, two of the largest threats to fish habitat, are provincial jurisdictions.

While some level of division of responsibility and authority is obviously necessary to develop expertise and accomplish specific tasks, it comes at a cost if not institutionally counterbalanced. Yaffee (1997) emphasizes the tendency for individuals in such situations to build niches for themselves as they seek turf. The goal of protecting their turf may then override the

goal of cooperative promotion of conservation goals. In addition, uncoordinated decisions are likely to lead to piecemeal solutions that are not effective at addressing larger problems, and to diminished accountability in dealing with overall issues. This tendency can be exacerbated by stovepipe sectoral processes, as discussed above. Conservation objectives, moreover, are often neglected when other mandated objectives (such as exploitation) are more consistent with the organization's institutional interests or the individual ambitions of leaders and staff (Ascher 2001). As March and Simon's classic analysis (1958) showed, there is a tendency to favour those aspects of their objectives that are most consistent with the agency's resource base. Thus, exploitation interests are likely to have priority over conservation interests, and the sustainable extraction rules for one species will ignore the impact of that extraction on other species and their habitats.

Behavioural Bias 5: Fragmentation of Information and Knowledge

Information and analysis are fragmented among professional disciplines, economic sectors, levels of government, and divisions of agencies. Because information is collected in response to specific needs, it is generally biased towards past problems and reflects particular organizational contexts and interests. It may not even be useful to other interests in its current forms. Furthermore, information as a form of power is hoarded by divisions and agencies; it is seen as a possible weapon in conflicts and as property not to be shared until it can be claimed by an author through publication. Government information-gathering resources will never be sufficient to obtain the information needed to make fully scientifically informed harvesting decisions (Wilson et al. 1994). Although the literature shows many cases of sustainable community-based management or co-management based on allocation of geographical space or other indirect means of keeping harvest effort at sustainable levels (Schlager and Ostrom 1993; Wilson et al. 1994), it is very difficult for governments to trust these proxies or the knowledge on which they are based (Finlayson 1994; Holm 2003; Wilson 2003). Harvesters' knowledge may be tacit, eluding the discursive world of scientific experiment, and dismissed because of dissimilar cognitive cultures and the use of alien rules, norms, and languages in the negotiation of validity (Palsson 1995; Neis and Felt 2000). Thus, government agencies often reject forms of knowledge that could help close the information gap, especially when combined with agency knowledge.

Ascher emphasizes the complexity of the classic "principal-agent problem" that arises when agency officials have both superior information and some autonomy. How does the "principal" (supervisor, administrator) monitor the performance of the "agent" (a party who implements the directives of the principal)? In a situation in which competitive behaviour results in

less flow of information on individual activities and resources, individuals within government have more opportunity to pursue their own individual or institutional interests rather than the public interest. The problem is complex, because "agents" have multiple motives that differ from one agent to the next, and the same incentives or monitoring strategy may not work for all. Ascher also notes that complexity, uncertainty, and limited resources will discourage analysis of new situations on their own terms, and promote their interpretation in terms of the most recent or familiar example at hand, often leading to inadequate analysis.

Dealing with the Behavioural Biases

Yaffee (1997) notes that visioning future undesirable states and binding oneself to alternative policies for achieving different outcomes is a large step towards long-term rationality (overcoming Behavioural Bias 1 towards short-term rationality). Table 8.1 demonstrates how the AMB has bound itself to alternative policies by spelling out its objectives. Ideally, board members are required to uphold the objectives as a condition of serving on the board, although in practice this has not always been the case with all non-local members. To monitor how much and how well such a step is made means implementing performance measures, with monitored results reported to remind agencies of their commitments. Although not focused on specific performance measures, the AMB has acted as a monitor of processes or commitments of government, and the action or inaction of the latter on a particular issue. It has monitored government's lack of response to requests for stakeholder input in various fisheries and planning processes, and has determined which elements are missing from planning processes that leave key concerns unaddressed.

Another step towards long-term rationality is to reward risk taking and experimentation with creative solutions, as is done routinely by successful companies such as 3M, which encourages all employees to allocate up to 15 percent of their time to innovation (3M policy on its website, <http://www.3M.com>). Co-management arrangements themselves have often been documented to serve the function of designing what the future commitments should be and then holding agencies accountable for these commitments (Pinkerton and Weinstein 1995). Thus, they can be helpful in overcoming this dysfunctional tendency in management agencies and in steering management towards longer-term goals. Co-management could open the door to "double-loop learning" (Argyris and Schon 1978): bureaucratic outsiders such as the AMB may redefine the problem or how to approach it, helping insiders (the management agency) consider how they could rearrange their standard operating procedures so as to allow themselves to consider a broader range of options or "to learn how to learn." As a discussion and learning

forum, and as a convener of processes to explore options, the AMB exemplifies this process.

Ascher (2001) recommends tying government officials' long-term benefits (such as pensions and professional recognition) to the continued and sustainable operation of resource extraction activities. He believes that reducing the rotation of officials to different locations will increase their involvement in long-term projects oriented towards sustainability goals. Westley (2002) goes further by showing how a manager who "goes local" can work effectively to change conflict with stakeholders into collaboration. Long-term familiarity with the problem and the stakeholders enables a manager to discover a way to engage stakeholders in scientific experiments and to discover windows and moments of opportunity, as well as the appropriate scale at which to define and solve problems. Ascher's belief and Westley's conclusions are consistent with my own (as yet unpublished) findings on the successful strategies of the Alaska Department of Fish and Game, in which area managers may have twenty years' service in the same area. This finding is also consistent with the human resources strategy of firms that invest in hiring the right people, rewarding them well, training and educating them, and sharing the rewards through means such as gain sharing, stock options, employee ownership, and so on. Some firms go further and tie top managers' bonuses to successful performance measured on an index agreed to and rated by subordinates (Bolman and Deal 1997). In a similar use of visible sustainability indicators, agencies could explicitly plan for sustainability goals and evaluate for sustainability achievements, thus improving and rewarding performance oriented towards longer-term objectives. Many scholars have noted the influence of budgetary cycles on the time frame of government agency planning, and even the influence of annual budgetary spending requirements on division or departmental performance. Rewards to agencies and even departments for budgetary carry-over and allocation to long-term projects and planning would help combat short-term rationality as it appears in spending patterns at the end of the fiscal year, for example.

As a corrective for Behavioural Bias 2, preference for competition over cooperation, Yaffee (1997) recommends the use of alternative dispute resolution with professional facilitation. Such processes would be additionally helped by a focus on superordinate goals and shared objectives (such as the sustainable management of the resource, habitat protection, and increased understanding of species interactions that affect the health of the resource). With leadership from the agency concerning program objectives in the public interest, but flexibility about how to achieve these objectives and help from facilitators in principled negotiation, competition could be reduced significantly. The AMB has played a significant role in

the WCVI region in a number of ways that have tended to counteract Behavioural Bias 2. In creating cooperation between government and local groups, it has played several roles. As a two-way communication funnel between governments and local bodies, it has provided information both ways to meet the needs of all parties; it has provided analysis of issues and options that consolidate opinion in the region and explain government perspectives to locals; and it has acted as a clearinghouse to which issues are referred for resolution.

In a more proactive role, the AMB has acted as a mediator of everyday interactions among the DFO, local fishers, and Nuu-chah-nulth Tribal Council biologists in developing a new fishery for gooseneck barnacles. The AMB has also facilitated formal meetings among the DFO, the province, and other actors by providing an educated balance through a neutral informed vision, conducting surveys in advance to identify the priority issues of attendees, and analyzing and framing issues in advance to promote problem solving at meetings. In its relations with non-governmental bodies, the AMB has also acted as a facilitator for groups inside and outside the region, as a convenor of processes for exploring options, as an umbrella under which groups in the region could come together, and as a culture broker promoting communication among parties with different values, perspectives, and worldviews.

My research on agency/tribal fisheries co-management in Washington State provides another surprising finding: leaders in the state fisheries agency believed that the agency was better off after co-management was established. One dimension of the perceived improvement was increased resources for management. Cooperation between the tribes and the agency enabled them to finally come together to negotiate a Pacific Salmon Treaty with Canada. The treaty produced new funds not previously available to the agency. In addition, the tribes were able to access funds from different sources and to hire their own professional biological and management experts. The tribes and agency then began to allocate tasks among themselves more effectively, spreading resources more efficiently. Finally, the entry into management of new colleagues who reported to different authorities stimulated debate and innovation (Pinkerton 2003). While a group such as the Aquatic Management Board is dependent on governmental support in the first few years, the charitable status it has obtained, the nature of its mission, and the record of other multi-party bodies suggests that it could eventually become self-supporting and a net contributor of management resources.

Possibilities for counteracting the last three behavioural biases, as variants of the bias towards competition over cooperation, are best discussed together, as these biases and their resulting behaviours overlap considerably (fragmentation of interests and values, fragmentation of responsibilities and authorities, fragmentation of information and knowledge).

Yaffee (1997) suggests the creation of coordinating mechanisms such as ecosystem-level multi-party policy councils, interagency management teams, revitalized regional planning bodies, and information clearinghouses to build a shared understanding of what is at stake. He emphasizes that such bodies would need some incentives, such as a substantive mandate and/or new resources. They would also require clear and shared measures of success and ways to monitor progress towards desired ends. They could overcome fragmentation of information through shared databases and interpretations that integrate information and different forms of knowledge.

The AMB provides an almost formulaic example of some of what Yaffee recommends. To the extent allowed by its limited funding, the AMB plays the role of a multi-party council, an interagency management team, a regional planning body, and an information clearinghouse. Because it did not receive the funding originally budgeted for project management, the AMB has acted mostly to coordinate with and provide perspectives on projects of other bodies. For example, it contributed to the Kyuquot Coastal Zone Plan, where it observed and reviewed the Provincial Coastal Use Plan, provided recommendations, and participated in follow-up activities. The AMB's participation in the plan was acknowledged as resulting in a more truly integrated plan than was initially envisioned.

One unique AMB contribution to counteracting these three fragmentation behavioural tendencies is its production of an Internet-accessible, integrated, geo-referenced database linked to a document database containing the principal key writings about any resource on the WCVI. Furthermore, a substantive mandate (to make progress towards ecosystem-based management) allowed comprehensive actions. For example, the AMB can coordinate habitat and stock status information in a comprehensive manner. It has recently been mapping the effects of activities in the uplands, such as agriculture and toxics; the effects of nearshore activities such as fish farms, sewage, and estuary drainage; and the effects of ocean conditions such as salinity and activities such as driftnetting to produce a map of the cumulative effects of upland, nearshore, and ocean conditions on salmon and other aquatic species. Two separate maps – salmon stock status and cumulative effects – are being produced and will eventually be integrated into one map.

Clarke and McCool (1996) found that the most successful agencies are those best able to mobilize and infuse their staff with a sense of the mission of the agency and to tie the programmatic goals closely to the mission. Such agencies were also able to deal with the principal-agent problem by identifying peer professional performance with the standing of the agency and with programmatic goals, which are seen also as consistent with those of the public. This finding is consistent with Westley's conclusions (2002) about the success of agencies that work closely with stakeholders and allow them to experiment and learn.

An AMB project exemplifying these findings is the creation of a new gooseneck barnacle experimental fishery. Previously a “lost” fishery under conventional management (closed because it could not be managed sustainably), the gooseneck barnacle fishery was opened in late January 2004 and, by April, showed substantial benefits in economic, ecological, and social terms. Economically, the fishery directly employs thirty-two harvesters and supports one full-time and eleven part-time additional jobs in monitoring, management, purchasing, transportation, and processing. The development of the project involved extensive research integrating local knowledge and natural science (a major AMB objective). Since the first three months of operations, the AMB has been able to introduce new buyers for gooseneck barnacles and develop new protocols for the fishery, and is in the process of creating a product-tracking system for which the AMB has a five-year plan and fundraising proposal. The AMB predicts that this fishery will be self-sustaining by its fourth or fifth year.

Ecologically, the experimental fishery is being conducted in a sustainable manner satisfactory to the DFO, the province, and the AMB, enabling effective monitoring of both the stock and its habitat. Detailed assessments on control and index sites, an adaptive management plan, and a decision framework to verify the sustainability of the fishery under a precautionary approach have been established, and all parties are satisfied that the AMB was able to revive a fishery that would otherwise be closed and probably poached.

Socially, the AMB worked closely with the DFO and the Nuu-chah-nulth Tribal Council and gained the confidence of the harvesters, who are now recommending a lower level of harvest on particular rocks that they feel are not growing back fast enough. This is a positive sign that the AMB has been able to develop a management regime that harvesters consider legitimate and effective, and thus a regime that will be able to elicit not only high levels of compliance but also intervention by harvesters to make the regime more precautionary in specific instances. This happened partially because the AMB staff worked closely with the harvesters to record and include their knowledge and gain their cooperation in the generation of harvest rules. The AMB has also developed an efficient method of recording stock and habitat conditions through scanned photographs and data, which are instantly recorded electronically and are easily viewed by managers, triggering warning signals if precautionary thresholds are passed.⁹

This method of creating a new fishery blazes a path for innovative ways of rule making, monitoring, and enforcement, and demonstrates the potential of bodies like the AMB to contribute to management in ways unique to their position as stakeholder representatives. It also demonstrates the use of performance measures, adaptive management, and transparency. At an AMB meeting, the DFO representative marvelled at the process surrounding the

re-creation of the fishery and stated that he “would never have thought this possible” (since the DFO had closed the fishery as being impossible to manage). The DFO was, of course, a partner in the creation of the new fishery and still exercises oversight, but the innovations that made it possible were led by the AMB.

Conclusion

In considering selected literature on five behavioural biases of resource management agencies, this discussion has identified sixteen ways by which agencies can overcome those biases. The first eleven of these relate directly to the creation of multi-party co-management bodies, particularly ones that could operate at a regional scale and that would have characteristics similar to those of the Aquatic Management Board. The biases may be overcome by the agency, in collaboration with a co-managing body, by:

- visioning future undesirable states and binding itself to alternative policies for achieving different outcomes
- designing what the future commitments should be, and then holding agencies responsible for these commitments
- monitoring how much and how well alternative activities are done by implementing performance measures, with monitored results reported to remind agencies of their commitments
- rewarding risk taking and experimentation with creative solutions
- practising “double-loop learning” (questioning standard operating procedures so as to consider a broader range of options)
- using alternative dispute resolution, with professional facilitation
- focusing on superordinate goals and shared objectives of multiple parties (such as the sustainable management of the resource, habitat protection, and increased understanding of species interactions that affect the health of the resource)
- leading by putting forth program objectives in the public interest, but being flexible about how to achieve these objectives
- reducing stereotypes and building concurrence across interest groups
- creating ecosystem-level multi-party policy councils, interagency management teams, and revitalized regional planning bodies to build a shared understanding of what is at stake
- creating information clearinghouses to build a shared understanding of what is at stake and interpretations that integrate information and different forms of knowledge.

In addition to these eleven classes of activities related to working with co-managers, there are five types of actions that management agencies could take internally to overcome the behavioural biases:

- creating incentives for agency staff to identify simultaneously with agency mission, program objectives, and professional peer expectations
- tying government officials' long-term benefits (such as pensions and professional recognition) to the continued and sustainable operation of resource extraction activities
- rewarding agencies and even departments for budgetary carry-over and allocation to long-term projects and planning
- reducing the rotation of officials to different locations to increase their involvement in long-term projects oriented towards sustainability goals; "going local" over the long term by building relationships that engage stakeholders in scientific experiments, discovering windows and moments of opportunity to create collaboration
- planning explicitly for sustainability goals and evaluation of sustainability achievements, through the use of visible sustainability indicators.

This discussion has identified the segmental tendencies of conventional resource management (as specified in the five behavioural biases) as a major barrier to achieving sustainable resource management and moving towards ecosystem-based management. I have considered how the conventional stovepipe consultative mechanisms of agencies tend to be produced by and to reinforce this segmentalism. I have also considered the capacity of multi-stakeholder boards such as the AMB to promote communication among the warring stakeholder sectors and to integrate stakeholder's concerns by discussing problems holistically. Although we may not know the scale at which we should be studying ecosystems, this discussion suggests that multi-party co-managing bodies such as the AMB operating at the Coastal Management Area (or what may be termed the "integrated management") scale are a workable human scale at which to take a productive first step in this direction. Such bodies can have the capacity to be managers themselves in innovative ways, as exemplified in the gooseneck barnacle fishery, and can also be effective co-managers, as exemplified in the many other roles they play both with government and within the region.

Acknowledgments

I warmly thank Tom Pater and Andrew Day for being willing to serve as the AMB reviewers of this chapter, and I am equally grateful to three DFO reviewers who prefer to remain anonymous. The internal workshops and review process organized by the editors were very provocative, stimulating, and helpful in herding us into a common corral. Everyone's comments have improved the chapter but only the author can be held responsible for any errors of judgment or fact.

Notes

- 1 The evaluation had three co-authors (Pinkerton, Bedo, and Hanson 2005) and is posted at <http://www.westcoastaquatic.ca>.

- 2 A detailed description of the AMB is beyond the scope of this paper, as it is meant here to serve as an example of the structural nature of problems with which government agencies have to cope, and potential solutions to these problems. Briefly, the AMB was formed following eight years of activism in the WCVI region by First Nations, commercial fishers, recreational fishers, and environmental interests, plus two regional districts. These parties had formed an organization to work together towards sustainable integrated aquatic management. The terms of reference that were finally negotiated with federal and provincial governments called for the inclusion on the AMB of members to broadly represent the interests of processors, salmon farmers, the province, and the federal Department of Fisheries and Oceans (DFO). All members agreed to support the principles and vision developed by the original WCVI members, consistent with the Nuu-chah-nulth First Nation's principle of *Hishukish Ts'awalk* ("Everything is one"), ecosystem management, and the Oceans Act principle of integrated management.
- 3 The Nuu-chah-nulth have been negotiating a treaty with Canada to clarify their own rights to co-manage and access aquatic resources, a process recently interrupted by their 2004 court proceedings against the DFO and the federal government for not allowing adequate commercial access to aquatic resources. Key Nuu-chah-nulth leaders consider the Aquatic Management Board an Interim Measures Agreement for their eventual treaty with Canada.
- 4 For example, the AMB requested inclusion in the three levels of salmon planning – the Area Harvest Committees, the Commercial Salmon Advisory Board, and the Integrated Harvest Planning Committees – but was denied. AMB members pointed out that Stephen Owen's Institute for Dispute Resolution, which had been commissioned to advise the DFO on their advisory processes, had identified the AMB as an important model for a new way to do policy work and had strongly recommended its connection to other advisory processes (and specifically salmon) (see Institute for Dispute Resolution 2001).
- 5 The term "stovepipe" is widespread in the organizational behaviour literature, and was also used by the DFO representative on the AMB.
- 6 Since this presentation, it has become evident that the WCVI region offers opportunities to conduct management activities far more complex and integrated than those envisaged in the CMA scale in the Oceans Strategy. The term for that scale that has come into DFO parlance is the "integrated management" scale. Management at this scale has elicited more interest from the province recently because of the opportunity it could offer the province to be involved as a partner with the federal government in integrated oceans planning, unlike the North Coast LOMA process, which does not include the province.
- 7 Although the DFO has gone through a second generation of strategies to achieve sustainable development, as required of all federal government agencies in Canada, there has been little implementation of these strategies so far.
- 8 The DFO was unwilling to abandon traditional stovepipe consultative processes, however, and, during summer and fall 2005, began exploring how to combine these processes with new Aboriginal co-managing bodies that were to receive significant funding under a new Aboriginal Aquatic Resource and Oceans Management (AAROM) Program (because of new court cases recognizing greater Aboriginal management rights). The West Coast of Vancouver Island was the first area in BC to pilot the AAROM program, partly because of its experience with the AMB and partly because of the proactive stance of the Nuu-chah-nulth. In this situation, the DFO saw the AMB in the limited role of an oceans planning body between the AAROM concept and the traditional stovepipe consultations, but with a project-specific versus a continuing mandate. At one point, the DFO decided to terminate all funding, but intense pressure from AMB supporters at federal and provincial levels restored it. AMB members did not agree with the proposed change to its mandate, and the nature of their role is under negotiation at this writing. The AMB currently cooperates with the Nuu-chah-nulth AAROM process on the operational level in projects such as stock status mapping, creating a stock assessment framework, and developing conservation units for the Wild Salmon Policy initiative.
- 9 The fishery was not pursued in 2006 because of competition from Chile in the Spanish market; the AMB hopes to identify other markets. The precautionary procedures adopted do not allow a fishery to occur at much lower prices for the product.

References

- Argyris, C., and D. Schon. 1978. *Organizational learning: A theory of action perspective*. Reading, MA: Addison-Wesley.
- Ascher, W. 2001. Coping with complexity and organizational interests in natural resource management. *Ecosystems* 4: 742-57.
- Bolman, L.G., and T.E. Deal. 1997. *Reframing organizations: Artistry, choice, and leadership*, 2nd ed. San Francisco: Jossey-Bass.
- Christensen, V., and C.J. Walters. 2004. Ecopath with ecosim: Methods, capabilities and limitations. *Ecological Modelling* 172: 109-39.
- Clarke, J.N., and D. McCool. 1996. *Staking out the terrain: Power differentials among natural resource management agencies*. Albany, NY: SUNY Press.
- Cox, S.P., S.J.D. Martell, C.J. Walters, T.E. Essington, J.F. Kitchell, C. Boggs, and I. Kaplan. 2002a. Reconstructing ecosystem dynamics in the central Pacific Ocean, 1952-1998. I. Estimating population biomass and recruitment of tunas and billfishes. *Canadian Journal of Fisheries and Aquatic Sciences* 59 (11): 1724-35.
- . 2002b. Reconstructing ecosystem dynamics in the central Pacific Ocean, 1952-1998. II. A preliminary assessment of the trophic impacts of fishing and effects on tuna dynamics. *Canadian Journal of Fisheries and Aquatic Sciences* 59 (11): 1736-47.
- Cyert, R.M., and J.C. March. 1963. *A behavioral theory of the firm*. Englewood Cliffs, NJ: Prentice Hall.
- Day, C.A. 2003. Building aquatic co-management on the West Coast of Vancouver Island, Canada: What does *hishukish ts'awalk* mean? PhD dissertation, School of Resource and Environmental Management, Simon Fraser University, Burnaby, BC.
- Degnol, P. 2003. Science and the user perspective: The gap co-management must address. In *The fisheries co-management experience: Accomplishments, challenges, and prospects*, ed. D.C. Wilson, J.R. Nielsen, and P. Dengbol, 31-49. Dordrecht, Netherlands: Kluwer Academic Publishers.
- de la Mare, W.K. 2005. Marine ecosystem-based management as a hierarchical control system. *Marine Policy* 29: 57-68.
- de Young, B., R.M. Peterman, A.R. Dobell, E. Pinkerton, Y. Breton, A.T. Charles, M.J. Fogarty, G.R. Munro, and C. Taggart. 1999. *Canadian marine fisheries in a changing and uncertain world*. Canadian Special Publication of Fisheries and Aquatic Sciences, no. 129. Ottawa: NRC Research Press.
- Finlayson, C. 1994. *Fishing for truth: A sociological analysis of the northern cod stock assessments from 1977-1990*. St. John's, NL: ISER Books.
- Holm, P. 2003. Crossing the border: On the relationship between science and fishermen's knowledge in a resource management context. *MAST/Maritime Studies* 2 (1): 5-34.
- Institute for Dispute Resolution. 2001. *Independent review of improved decision-making in the Pacific salmon fishery: Final recommendations*. Victoria: University of Victoria.
- March, J.G., and H.A. Simon. 1958. *Organizations*. New York: Wiley.
- McFarland, A. 1987. Interest groups and theories of power in America. *British Journal of Political Science* 17: 129-47.
- Neis, B., and L. Felt, eds. 2000. *Finding our sea legs: Linking fishery people and their knowledge with science and management*. St. John's, NL: ISER Books.
- Palsson, G. 1995. Learning by fishing: Practical science and scientific practice. In *Property rights in a social and ecological context: Case studies and design applications*, ed. Susan Hanna and M. Munasinghe, 85-97. Stockholm: Beijer Institute of Ecological Economics; Washington, DC: World Bank.
- Pauly, D., V. Christensen, and N. Haggen, eds. 1996. *Mass-balance models of northeastern Pacific ecosystems*. Fisheries Centre Research Reports, 4 (1). Vancouver: University of British Columbia. <http://www.fisheries.ubc.ca/publications/reports>.
- Pinkerton, E. 2003. Toward specificity in complexity: Understanding co-management from a social science perspective. In *The fisheries co-management experience: Accomplishments, challenges, and prospects*, ed. D.C. Wilson, J.R. Nielsen, and P. Dengbol, 61-77. Dordrecht, Netherlands: Kluwer Academic Publishers.
- Pinkerton, E., and M. Weinstein. 1995. *Fisheries that work: Sustainability through community-based management*. Vancouver: The David Suzuki Foundation.
- Pinkerton, E., A. Bedo, and A. Hanson. 2005. *Final evaluation report: West Coast Vancouver Island Aquatic Management Board (AMB)*. <http://www.westcoastaquatic.ca>.
- Schlager, E., and E. Ostrom. 1993. Property rights regimes and coastal fisheries: An empirical analysis. In *The political economy of customs and culture: Informal solutions to the commons problem*, ed. Terry L. Anderson and Randy T. Simmons, 13-41. Lanham, MD: Rowman and Littlefield.
- Songorwa, A., T. Buhrs, and K.F.D. Hughey. 2000. Community-based wildlife management in Africa: A critical assessment of the literature. *Natural Resources Journal* 40: 603-43.
- Westley, F. 2002. The devil in the dynamics: Adaptive management on the front lines. In *Panarchy: Understanding transformations in human and natural systems*, ed. L.H. Gunderson and C.S. Holling, 333-59. Washington, DC: Island Press.
- Wilson, D.C. 2003. Fisheries Co-Management and the Knowledge Base for Management Decisions. In *The fisheries co-management experience: Accomplishments, challenges, and prospects*, ed. D.C. Wilson, J.R. Nielsen, and P. Dengbol, 265-79. Dordrecht, Netherlands: Kluwer Academic Publishers.
- Wilson, J.Q. 1989. *Bureaucracy: What government agencies do and why they do it*. New York: Basic Books.
- Wilson, J., J. Acheson, M. Metcalfe, and P. Kleban. 1994. Chaos, complexity, and community management. *Marine Policy* 18 (4): 291-305.
- Yaffee, S. 1997. Why environmental policy nightmares recur. *Conservation Biology* 11 (2): 328-37.

Contents

Figures, Tables, and Boxes / vii

Acronyms / x

Preface and Acknowledgments / xi

- 1** Introduction: Moving beyond Co-Management / i
Derek Armitage, Fikret Berkes, and Nancy Doubleday

Part 1: Theory

- 2** Adaptive Co-Management and Complexity: Exploring the Many Faces of Co-Management / 19
Fikret Berkes
- 3** Connecting Adaptive Co-Management, Social Learning, and Social Capital through Theory and Practice / 38
Ryan Plummer and John FitzGibbon
- 4** Building Resilient Livelihoods through Adaptive Co-Management: The Role of Adaptive Capacity / 62
Derek Armitage
- 5** Adaptive Co-Management for Resilient Resource Systems: Some Ingredients and the Implications of Their Absence / 83
Anthony Charles

Part 2: Case Studies

- 6** Challenges Facing Coastal Resource Co-Management in the Caribbean / 105
Patrick McConney, Robin Mahon, and Robert Pomeroy
- 7** Adaptive Fisheries Co-Management in the Western Canadian Arctic / 125
Burton G. Ayles, Robert Bell, and Andrea Hoyt

- 8** Integrating Holism and Segmentalism: Overcoming Barriers to Adaptive Co-Management between Management Agencies and Multi-Sector Bodies / 151
Evelyn Pinkerton

- 9** Conditions for Successful Fisheries and Coastal Resources Co-Management: Lessons Learned in Asia, Africa, and the Wider Caribbean / 172
Robert Pomeroy

Part 3: Challenges

- 10** Communities of Interdependence for Adaptive Co-Management / 191
John Kearney and Fikret Berkes
- 11** Adaptive Co-Management and the Gospel of Resilience / 208
Paul Nadasdy
- 12** Culturing Adaptive Co-Management: Finding “Keys” to Resilience in Asymmetries of Power / 228
Nancy Doubleday

Part 4: Tools

- 13** Novel Problems Require Novel Solutions: Innovation as an Outcome of Adaptive Co-Management / 249
Gary P. Kofinas, Susan J. Herman, and Chanda Meek
- 14** The Role of Vision in Framing Adaptive Co-Management Processes: Lessons from Kristianstads Vattenrike, Southern Sweden / 268
Per Olsson
- 15** Using Scenario Planning to Enable an Adaptive Co-Management Process in the Northern Highlands Lake District of Wisconsin / 286
Garry Peterson
- 16** Synthesis: Adapting, Innovating, Evolving / 308
Fikret Berkes, Derek Armitage, and Nancy Doubleday

Glossary / 328

Contributors / 332

Index / 337