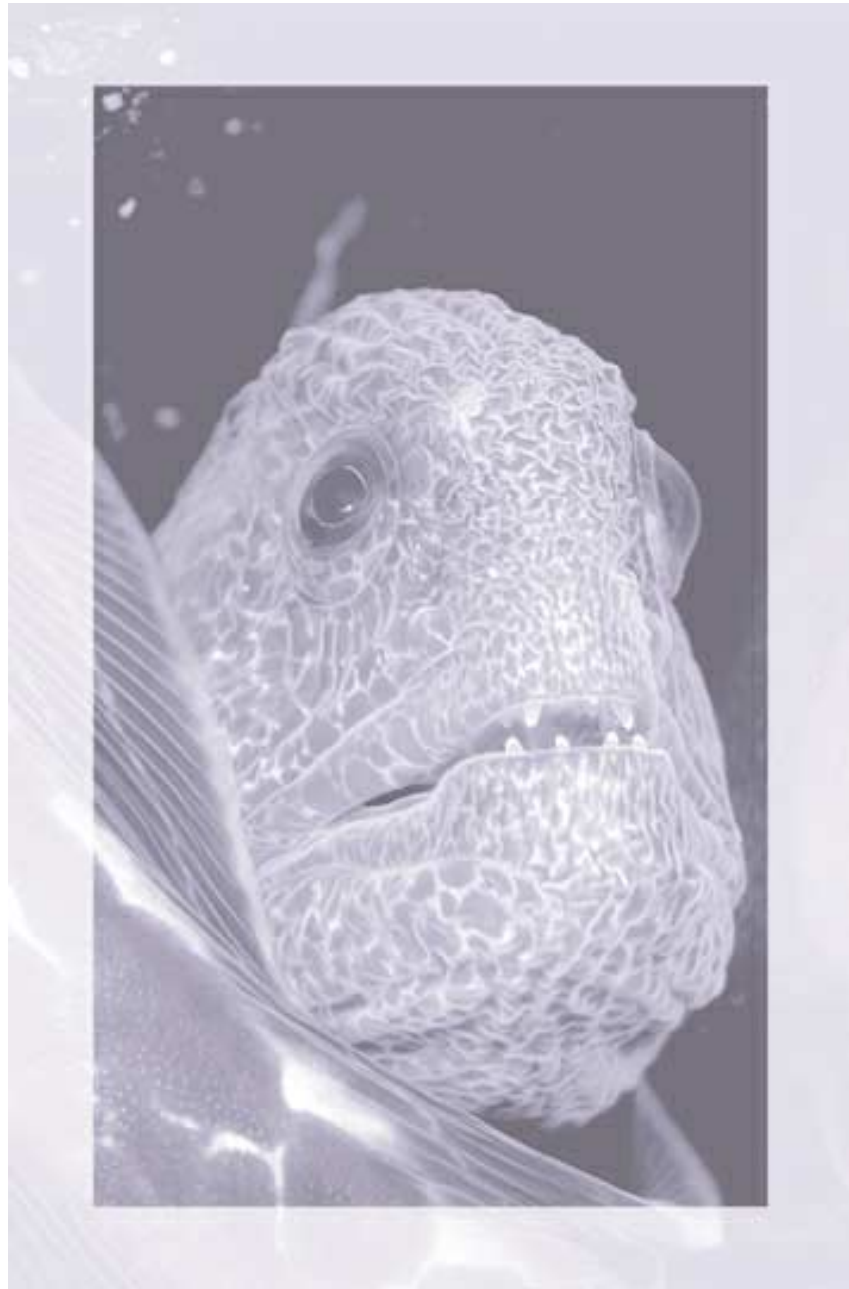


Out of Sight, Out of Mind and Almost Out of Time

Towards an effective system of Marine Protected Areas in British Columbia



Scott Wallace and David R. Boyd





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A brief to the Sierra Club of British Columbia

by

Scott Wallace and David R. Boyd

April, 2000

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Preface

Canadians have difficulty grasping the magnitude of our collapsing fisheries, especially Atlantic cod and Pacific salmon. The sheer magnitude of the original resource, and the depth of the collapse are almost beyond belief. Somehow, we managed to turn some of the most astounding resources in the world into economic liabilities. Aside from the damage done to our marine ecosystems, the economic and social costs, the loss of livelihoods, lifestyles, traditions and communities has been staggering. These tragic failures are driving attempts at reforming marine stewardship in Canada, including renewed efforts to create Marine Protected Areas.

This report was produced for a number of reasons: a concern that current Marine Protected Areas (MPA) initiatives may repeat the mistaken assumptions made in terrestrial protected area strategies; a fear that Canada was creating yet another layer of inadequate marine policy; and confusion about what MPAs can and cannot accomplish. The Sierra Club of BC felt it could play a helpful role by addressing these concerns through an independent review by Dr. Scott Wallace and David R. Boyd, who have looked critically at the effectiveness of MPAs in protecting marine biological diversity.

The document clearly shows what makes MPAs effective, and describes some of their limitations. MPAs alone cannot prevent the further collapse of fisheries from over-harvest. They can only protect marine habitat relative to the spatial scale of the designated MPA and the scale of the activities that threaten them. Their effectiveness in preserving biological diversity and function depends on the adequacy of restrictions on human activities within the MPA.

How effective MPAs prove to be will depend on the clarity and intent of the legislation that drives them. For MPAs to work well will also require a broad base of public and sectoral support. That support will be linked to the effectiveness of the federal and provincial government's consultation with First Nations and communities to develop effective legislation, practical programs of site selection, designation and management. An effective MPA can be a critical component of a much needed larger policy framework that protects biological values on a coastwide scale. Marine protected areas are worth doing, but more importantly, they are worth doing right.

The Marine Campaign of the Sierra Club of British Columbia is directed by a committee with the following members:

Gerald Amos, *Honorary Board Member, Sierra Club of British Columbia Foundation*

Kate Brauer, *Director, Sierra Club of BC*

John Broadhead, *Chairman of the Board, Sierra Club of BC*

Sharon Chow, *Marine Campaigner, Sierra Club of BC*

Bruce Hill, *Marine Campaigner and Researcher, Sierra Club of BC*

Vicky Husband, *Conservation Chairperson, Sierra Club of BC*

David Loewen, *Chairman, Haida Gwaii Group, Sierra Club of BC*

Bill Wareham, *Executive Director, Sierra Club of BC*

Executive Summary

What can marine protected areas protect?

There have been numerous efforts in recent years to create a system of marine protected areas (MPAs) in British Columbia. Although it is assumed that MPAs are useful tools for protecting and restoring our marine environments, the question of “What can they really protect?” has not been fully explored. Clarification as to the best use of MPA to mitigate human threats to marine ecosystems is necessary to focus the discussion about the location, size, and management of MPAs. The current process is concerned with designating areas that accommodate the needs of interest groups, with insufficient attention given to protecting ecological values.

Over-fishing of resident species is the single greatest threat to marine biodiversity in BC that can be mitigated through the establishment of MPAs.

To be effective, an MPA system should be built around a core of long term “no take” areas. It has been conclusively demonstrated worldwide that “no take” MPAs are the most effective in meeting ecological restoration and protection objectives. The main reason is that fishing of resident species is one of the few threats which occur at the same spatial scale of protected areas. Many of the other threats to marine ecosystems simply cannot be addressed or controlled at small spatial scales.

Everyone, including resource users, has a shared interest in responsible management of our marine waters.

Almost every fishery – First Nation, commercial, sport – is a beneficiary of the biological health and functioning of marine ecosystems. By definition, any initiative to protect biodiversity in the long-term also protects all of our fisheries. Because we all have such a shared direct interest in proper marine management, the process of MPA creation should be one of cooperation not conflict.

Minimum protection standards in current MPA legislation are inadequate.

Currently, the only prohibitions applied within an MPA are: no dumping, dredging, or exploitation of non-renewable resources. In addition to these, at a minimum, bottom trawling, open pen finfish aquaculture, fishing for species with depleted populations, and sewage disposal should also be prohibited.

What are the aboriginal rights regarding MPAs?

On the basis of constitutionally protected aboriginal title and rights to fish, First Nations

must be involved in the selection, designation and management of new MPAs in BC. Consultation with First Nations will always be necessary in any instance where a restriction on aboriginal fishing is contemplated. Where fishing restrictions are based on conservation concerns, the legislation applies fully to everyone, including First Nations.

Restoration or protection

Most of BC's commercially exploitable marine life is fully, if not over-subscribed. By definition, any MPA with protection standards would function as a restoration area for local and regional fish populations. Terrestrially, this is something like protecting clear-cut forests. But unlike terrestrial protected areas, MPAs can directly benefit local fisheries in nearby waters by rebuilding regional fish populations.

Community involvement

There are no policies for meaningful community participation in the creation and management of MPAs. Although governments consult communities once an area is proposed, there needs to be a proactive process which allows for communities to establish local MPAs on their own. The success of any protected area ultimately depends on the support of communities, and it is more effective for communities to propose an MPA than for government agencies to present a plan to the communities.

Conservation or conversation?

The federal government (DFO) has authority to establish MPAs based on conservation concerns providing there is science to support the decisions. In BC, there is sufficient science to confirm large scale ecosystem changes from over-fishing (see page 12) and habitat degradation. Yet despite growing public awareness, concern and demand, there have been no new MPAs created in BC for over eight years. This is in part due to government decision-making policy whereby every sectoral interest needs to be consulted. The sectoral advisory process around MPAs needs to be simplified, clarified and given clear terms of reference to ensure the process does not delay effective action.

Introduction

British Columbia is in an enviable and unique position compared to most coastal jurisdictions of the world. We have 30,000 km (18,600 miles) of relatively undeveloped coastline and very productive marine waters. We still have options and choices to proactively protect marine ecosystems, a luxury too many countries no longer have. The majority of the world's coastal ecosystems are over-utilized by the Earth's six billion people, 60 percent of whom live within a narrow 100 km (62 mile) band of land along the world's coastlines.

BC's marine waters are not pristine nor are they free from human influences. Using commercial fisheries and industrial development as indicators, it is clear that there have been significant changes in our marine ecosystems over the last century. Conversations with old-time fishermen indicate that major changes have occurred, negative changes, and that the way we approach and use marine waters and resources must be re-examined. Our challenge is to make the changes before irreparable damage is done and we join the ranks of coastal peoples who have run out of options.

The extraordinary biodiversity of the North Pacific Ocean has provided sustenance to people for over 12,000 years. These waters, relatively pristine in comparison to much of the world, have been harvested and polluted over the last 200 years, resulting in a steady alteration and degradation of the ecosystem. The extinction of the Steller's sea cow in 1767 marked the onset of an era of over-exploitation and mismanagement of North Pacific waters. Although uncontrolled "gold-rush" mentality fisheries are hopefully a thing of the past, coastal waters are presently subject to heavier use and exploitation than during any other period in history. Over 130 species are fished in BC and new technologies and markets create incentives for exploration and exploitation of increasing numbers of new species. British Columbia's marine ecosystems are also threatened from pollution, habitat destruction, exotic species introductions, and global weather changes.

Fisheries directly benefit from the biodiversity embedded in a functioning ecosystem, and hence any initiative to conserve biodiversity or restore marine ecosystems also helps the fishery in the long-term. One method currently being explored to conserve marine biodiversity is the use of marine protected areas (MPAs). The ability of MPAs in BC to protect coastwide ecosystems is uncertain, particularly at the scales involved in the factors that threaten them.

Whether terrestrial or marine, protected areas established with the goals of protecting ecological integrity, biological diversity or individual species, all embrace the same underlying principle. That is, to provide a refuge from human threats. Where there is no

threat, either perceived or real, there is no need for protection. It has long been recognized that some human activities in terrestrial environments are harmful and hence protected areas have been created to mitigate these threats and their consequences. An obvious example in British Columbia is the widespread removal of old-growth forest, where protected areas are used to preserve some representative examples of these ecosystems. In order to devise an effective system of protected areas for the marine environment, it is essential to understand what threats can be managed at the spatial scale of protected areas and what threats require other approaches.

There are numerous differences between terrestrial and marine protected areas, which is a reflection of the different physical forces, biological characteristics, and in particular the human uses associated with these ecosystems. The issue of terrestrial protected areas has created numerous land-use conflicts between industry, interest groups, communities, and government. It is difficult to imagine how a terrestrial park could economically assist the forest commodities industry. Conversely, marine protected areas, due to the mobility of fish, and the interconnectedness of biodiversity, can theoretically enhance the production of fisheries while conserving ecosystem values (Plan Development Team 1990; see *Appendix A* for a list of fishery and ecosystem benefits). This difference in the basic ecological characteristics of terrestrial and marine protected areas suggests that the debate surrounding the creation of MPAs should not be one of conflict, but rather one of cooperation on a common goal of restoring and conserving marine resources. In order to achieve this goal, there must be clarification at the outset as to what MPAs can achieve given the physical and biological characteristics of marine environments.

The objectives of this document are to evaluate the effectiveness of the current system of marine protected areas in British Columbia, and to provide information to policy makers, legislators, resource managers, and environmental organizations about how the system can be improved and what should be taken into consideration when developing new MPAs. The information is organized in the following sequence:

- Identifying threats to marine ecosystems and evaluating the potential of MPAs to address them.
- Reviewing the results of MPAs from other jurisdictions.
- Examining the current system of MPAs in BC.
- Evaluating on-going federal/provincial initiatives.
- Identifying political, legal, and scientific obstacles to MPA creation.
- Recommending priorities for MPA legislation and policy development.



Threats to British Columbia's Marine Ecosystems

Numerous human activities impact the natural functioning of marine ecosystems (Norse 1993). In BC, examples range from over-fishing of old-lived species such as yellow-eye rockfish to the introduction of exotic species such as the European green crab. Obviously, only one of these examples can be controlled through the creation of a protected area. In order to understand the potential of MPAs to control threats and protect coastal values, threats must be identified and their spatial scales determined (*Appendix A*). Understanding the spatial scale of the threat allows for a judgment on whether an MPA is the appropriate management tool, and on the size of the protected area needed.

The Federal-Provincial Marine Protected Area Strategy (August 1998, <http://www.pac.dfo-mpo.gc.ca/oceans/mpa/disap.htm>) lists the threats to BC's marine ecosystems in five categories: (1) global environmental changes; (2) introduction of exotic species; (3) pollution; (4) habitat destruction; and (5) fisheries impacts.

So, which threats to BC's marine ecosystems can be effectively controlled using MPAs?

1. **Global Environmental Change** [NO]

Atmospheric and oceanographic research from the North Pacific suggests that large-scale changes have taken place over the last three decades (Francis et al. 1998). The underlying causes and dynamics of these changes are not well understood at this point, but regardless of the cause the large spatial scale involved (planetary) precludes the opportunity to use regional MPAs as an effective management tool to control the impacts of climate change.

2. **Introduction of Exotic Species** [NO]

Introduction of exotic species rivals habitat destruction as the largest threat to terrestrial and marine ecosystems (Enserink 1999). Numerous species have been introduced to BC waters over the last century, some intentionally (such as the Japanese oyster) and others by accident (sargassum, Japanese littleneck clam, soft-shelled clam). Most recently, the green shore crab has been observed on the west coast of Vancouver Island, posing a potentially serious threat to commercial shellfish species. But MPAs have little effect in controlling the introduction or spread of introduced species.

3. **Pollution** [SOMETIMES]

There are various sources of pollution on BC's coast, some of which are non-point sources entering marine waters from coastal watersheds. MPAs are not an effective tool in controlling this type of pollution unless upstream waters are also protected. Point sources of pollution originating from sewage outfalls, boating or industrial activities could possibly be zero-regulated within the boundaries of a MPA. But given that most of the pollution entering BC's marine ecosystems is from non-point sources, MPAs are not the ideal management tool.

4. **Habitat Destruction** [YES]

Habitat destruction in the ocean is of a different nature than on land. Habitat destruction on land originates from such things as urban sprawl, roads and forestry and usually does not occur in marine environments to the same extent. Marine habitat destruction in BC is primarily from activities in estuaries (log sorts, dredging, excessive sedimentation), and the alteration of soft bottom habitats from fisheries impacts, primarily from bottom trawling. By definition, habitat destruction is associated with a point on the earth's surface, and therefore, most forms of habitat destruction can be controlled by spatial protection.

5. **Excessive Harvest of Resources** [YES]

Fisheries impacts are the largest threat to marine biodiversity worldwide (National Research Council 1995), and there is no doubt that numerous species have been over-exploited in BC over the last century. Impacts from fisheries take place on a variety of spatial scales, some of which can be controlled with the implementation of MPAs. Worldwide, it has been shown that species that are long-lived and occupy a small home range during the adult stage of their lives benefit most from MPAs (Allison et al. 1998). British Columbia's fisheries were predominantly based on migratory species, primarily salmon and herring, species that are not easily protected using MPAs. However, in recent years there has been an increase in the proportion of non-migratory species in the catch, which clearly impacts fish populations at the small spatial scales that MPAs can address.

Figure 1 demonstrates this trend in the Strait of Georgia. Although the graph fluctuates, it does show the upward trend of the commercial fisheries' reliance on resident species. Furthermore, and perhaps worse, the catch of resident species has shifted from higher trophic level species to lower trophic level species, suggesting that "fishing down the food-web" is occurring in BC (*page 12*).

Overall, MPAs will only be effective in controlling localized threats that take place at the spatial scale of the MPA itself. In British Columbia, the largest threats that can be controlled by MPAs are over-exploitation of resident species, and habitat destruction from bottom trawling, aquaculture, wharf building, etc.

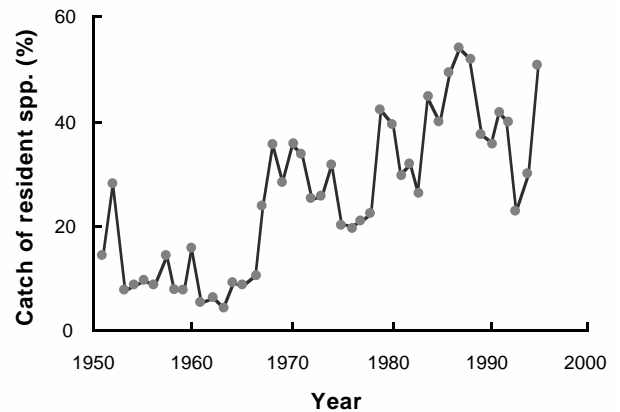


Figure 1: Percentage of total commercial landings in the Strait of Georgia comprised of resident species. Resident species are those that spend the adult stage of their life cycle within the confines of the Strait of Georgia (*Source: Wallace 1999*).

Fishing Down the Foodweb in British Columbia

In 1998, a paper in the journal *Science* (Pauly et al. 1998) described how global fisheries are targeting species further down the foodweb. In other words, commercial fisheries are shifting from predatory fish such as tuna and cod, towards lower trophic level herbivore species such as invertebrates. This has tremendous bearing on sustainability, as fishing down the foodweb precludes rebuilding populations of higher trophic level species whose food sources are now being caught by human fisheries.

Question: *Is fishing down the foodweb occurring in British Columbia?*

Answer: Yes. In a study of the Strait of Georgia, it was found that the mean trophic level of resident species has declined precipitously over the last 50 years (Figure 2). The fishery has shifted from one predominantly comprised of high trophic level species (salmon, lingcod, sole, and rockfish), to primarily an invertebrate fishery for clams, prawns, crabs, and urchins. If British Columbians wish to restore the Strait, large areas will need to be closed to fishing of resident species. There is no way populations of these species can recover while high levels of fishing effort are allowed to continue.

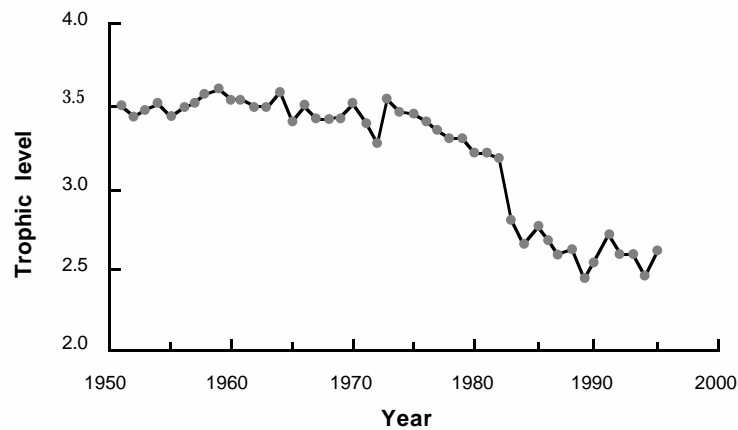


Figure 2: Trend showing "fishing down the foodweb" in the Strait of Georgia. Primary producers (i.e., plants and algae) are considered to be at trophic level 1, whereas lingcod (which eat herring, which eat krill, which eat phytoplankton) are at trophic level 4 (Source: Wallace 1999).



Experience with
Marine Protected Areas
from around the World

Protected areas, both terrestrial and marine, are established with a variety of objectives in mind, and as a result any protected area system includes a spectrum of designations. At one end of the spectrum are multiple-use zones with various permitted activities; at the other end is strict protection with limited or no human activities. Marine protected areas world-wide are primarily multiple-use, and are intended to meet objectives like education, historical site preservation (i.e. ship wrecks), recreation, fisheries enhancement, and biodiversity conservation. Although these are worthwhile reasons for establishing an MPA, this report only considers MPAs with the ecological objectives of biodiversity conservation and fisheries management

For MPAs to achieve ecological objectives, many activities need to be prohibited or strictly regulated, and therefore MPAs with these objectives are at the protection end of the spectrum. These types of MPAs (with a higher degree of restrictions) provide good research areas, and there is considerable scientific literature that describes the outcomes of MPAs with a high level of protection.

The general conclusion of scientific studies is that in areas where exploitation of all or some species is severely controlled, there is a significant change in ecosystem structure and function (see reviews by Roberts and Polunin 1991, Rowley 1994, Guénette et al. 1998). Conversely, MPAs with little or no restrictions have – not surprisingly – been ineffective in restoring diminished ecological values. In multiple-use MPAs where a wide range of protective zoning exists, it is only at the strictly controlled end of the spectrum where ecological changes can be measurably noticed. The message to people involved in planning MPAs with ecological objectives is: there needs to be a high degree of protection over timeframes measured in decades.

It is noteworthy that, without exception, all MPAs reported in the scientific literature have been situated in regions that have been over-exploited. Functionally, these MPAs are acting as restoration tools to establish a system of representative natural areas. To use a terrestrial analogy, it is like protecting clear-cuts rather than old growth forests. The analogy does not apply to the time it takes for ecosystems to recover. Whereas a clear-cut forest takes centuries to recover, in some MPAs the effects of restoration can be noticed in only two years (Roberts 1995).



MPAs in British Columbia:
What Ecological Objectives Are
They Meeting?

Background

There is much confusion in BC surrounding the question “What is a marine protected area and what is it supposed to do”? According to the Federal-Provincial MPA Strategy (June 1998), there are 104 MPAs designated in the province and regulated by ten different legislated acts (*Table 1*). Most were established in the late 1960s and early 70s, and are managed by the province. There have been no new MPAs created in BC since 1993.

Table 1. Summary table of legislation affecting MPAs in BC

Legislation	Designation	Government Agency	Number of MPAs
Oceans Act	Marine Protected Area	DFO	4 proposed
Fisheries Act	Fisheries Closure	DFO	1
National Parks Act	National Park	Canadian Heritage	3*
Canada Wildlife Act	National Wildlife Area	Canadian Wildlife Service	1
Migratory Birds Convention Act	Migratory Bird Sanctuary	Canadian Wildlife Service	5
Marine Conservation Areas Act**	National Marine Conservation Area	Parks Canada	0
Ecological Reserve Act	Ecological Reserve	MELP	25
Park Act	Class A	MELP	69
Wildlife Act	Wildlife Management Area	MELP	
Environment and Land Use Act		MELP	
Total			104

* none of these are fully established. ** Bill C-8 pending (formerly Bill C-48)

Does the Existing MPA System Protect Ecosystem Values?

The definition of a marine protected area in the Federal-Provincial MPA Strategy is: “sites in tidal waters that enjoy some level of protection within their respective jurisdictions”.

The minimum requirements are no ocean dumping, no dredging, and no exploration for or development of non-renewable resources.

The vagueness of this definition, coupled with the minimal protection standards, provides the accounting context for the tally of 104 MPAs, the majority of which were not established to protect or conserve ecosystem values, but for recreational objectives such as safe moorage and scenic views. For the most part, in terms of allowable activities, there is nothing to distinguish these MPAs from any other area of the ocean. For example, in the 69 Class A provincial marine parks the only prohibited activities are the building of wharves, marinas, and aquaculture facilities. Although the legislation curtails development, 90 percent of the 104 parks have no species protection (Marine Life Sanctuaries Society, nd). Of the remaining ten percent, most of these protect less than five species, primarily invertebrates.

There are numerous areas on the coast that receive some special fisheries management, but are not considered MPAs. For example, in 1997 there were over 579 area-based single species fishing closures regulated by the *Fisheries Act*. The Department of Fisheries and Oceans is presently compiling this information for publication (Glen Jamieson, Pers. comm.).

There are only two small areas on the entire coast of BC where all species are closed under the *Fisheries Act*. These are referred to as “no take” MPAs. The two in BC are Whytecliff Park in West Vancouver, and Porteau Cove in the North end of Howe Sound. Whytecliff Park, only 20 hectares in size, is the only natural marine habitat in BC with complete closure of all harvest. Porteau Cove is an artificial reef popular for scuba diving. The closures at Porteau Cove were originally implemented to protect scuba divers from fishing gear, not to protect marine life. Considering that BC’s marine waters occupy 45 million hectares (176,000 sq. miles), 20 hectares (50 acres) of full protection is simply not adequate. Even if every one of the 104 MPAs were at the highly restrictive end of the protective spectrum they would only amount to 0.4 percent of the coast.

One of the causes of the minimal regulations in BC MPAs is jurisdictional confusion. The province has jurisdiction over inland marine waters such as Georgia Strait, but most of the coast is under Federal jurisdiction. Ninety-four of the 104 MPAs listed (*Appendix C*) are provincial designations (i.e., Class A Parks or Ecological Reserves), but most of the living marine resources in British Columbia are under federal jurisdiction. Provincial MPAs cannot protect ecological values, such as the conservation of long-lived resident species, without Federal cooperation. Conversely, the establishment of a Federal MPA in inland waters will require relinquishment of provincial jurisdiction to the federal government. In either case, cooperation on better protection standards is dependent on constructive relations between Canada and BC, which has been a rare occurrence.

In the last decade, increased awareness and concern about the state of British Columbia’s marine ecosystems has prompted new MPA initiatives at all levels of government. But given the significant political constraints, it is not surprising that the current MPA system is ineffective at addressing threats to marine ecosystems.

Current Initiatives: The New Generation of MPAs

In 1989, the Marine Life Sanctuaries Society (MLSS) was formed to convince governments to create “no take” MPAs. The first scientific justification for no take areas came from New Zealand, a country with a temperate marine environment similar to BC. Research from New Zealand’s no take MPAs showed that a complete closure of all fisheries resulted in dramatic changes to the ecology of the area (Ballantine 1991). It was found that lobster densities were on average eight times greater than outside the reserve.

In 1993, after two years of groundwork by the MLSS, DFO announced Whytecliff Park as a “no take” MPA. Although Whytecliff Park is small (20 ha), it was the first no-take MPA in North America created to protect a natural habitat, the others being artificial reefs

and ship-wrecks. Since then, the only other new MPA in BC is a half-hectare research closure off Point Atkinson in West Vancouver, the smallest MPA in North America.

However, there have been some positive steps toward creating a “new generation” of MPA policies. The two primary agencies involved are the Department of Fisheries and Oceans (DFO) and Parks Canada. It was these two agencies, along with other federal and provincial agencies (BC Land Use Coordination Office, BC Ministry of Environment, Lands and Parks, Environment Canada, BC Ministry of Fisheries) that developed the federal-provincial Marine Protected Areas Strategy (August 1998). The MPA Strategy proposes three key elements for making progress:

1. **A joint federal-provincial approach.** All relevant federal and provincial agencies will work collaboratively to exercise their authorities to protect marine areas.
2. **Shared decision-making with the public.** Commits government agencies to employ an inclusive, shared decision-making process with marine stakeholders, First Nations, coastal communities, and the public.
3. **Building a comprehensive system.** Build an extensive system of protected areas by the year 2010 through a series of coastal planning processes.

Initiatives by the Department of Fisheries and Oceans

(www.pac.dfo-mpo.gc.ca/oceans/mpa/.htm)

DFO's new initiatives are pursuant to the recently passed *Oceans Act* (December 1997), which gives DFO the authority to create Marine Protected Areas. It is important to note that this brief to the Sierra Club of BC uses the term “Marine Protected Area” generically to include all forms of reserves, parks, sanctuaries, or other areas with protective measures; however, the *Oceans Act* establishes a specific designation, Marine Protected Area, under s. 35 which states that:

1. A marine protected area is an area of sea that forms part of the internal waters of Canada, the territorial sea of Canada or the exclusive economic zone of Canada; and has been designated under this section for special protection for one or more of the following purposes:
 - a. conservation and protection of commercial and non-commercial fisheries resources, including marine mammals and their habitats;
 - b. conservation and protection of endangered or threatened marine species and their unique habitats;
 - c. conservation and protection of marine areas of high biodiversity or biological productivity;
 - d. conservation and protection of any other marine resource or habitat as is necessary to fulfill the mandate of the Minister of Fisheries and Oceans.

On September 1, 1998 DFO announced two nearshore MPA pilot projects to be designated under the *Oceans Act*. In December of 1998, two offshore MPA pilot projects were also announced. The intent of the four pilot projects is to initiate a process that can be used to create additional MPAs. The four pilot project areas are:

1. **Gabriola Passage** in Strait of Georgia;
2. **Race Rocks** in the Strait of Juan de Fuca;
3. **Endeavour Hot Vents**, 2250m deep off the southern BC continental shelf; and
4. **Bowie Seamount** 180 km west of the Queen Charlotte Islands.

As “new generation” MPAs, these will provide an opportunity to gauge the level of ecological rationale behind their selection and management.

The ecological rationale given for the selection of Gabriola Passage was its “abundance and diversity of marine life” (www.pac.dfo-mpo.gc.ca/oceans/mpa/pilots.htm). The rich marine life at Gabriola Passage is in part the result of strong tidal currents providing abundant nutrients to filter-feeding invertebrates like clams, mussels and barnacles. As long as the daily tide persists, there is no apparent reason to suspect that this assemblage of marine life will decrease. Higher up the trophic level, resident rockfish and lingcod provide the basis for recreational and food fisheries. For this MPA to be different from the “last generation” of MPAs will require, at a minimum, that the harvest of resident fish and invertebrates be significantly curtailed. Anything less has questionable ecological value.



The Race Rocks pilot project was previously protected as a provincial marine Ecological Reserve. It was selected for MPA designation because of its extraordinary assemblage of subtidal and intertidal invertebrate life, seabirds on the exposed rocks, and abundant marine mammals. At present, the management of Race Rocks includes commercial and recreational fishing closures for all invertebrates, rockfish, and lingcod under the *Fisheries Act*. Recreational salmon and halibut fishing are the only permitted fisheries. As a designation under the *Oceans Act*, ecological protection standards could only be improved in this Marine Protected Area through the establishment of a complete no-take area, and an extension of the boundaries to include all of the adjacent reef area. Like Gabriola Passage, there are no major threats (*per Appendix C*), aside from fishing, that can be mitigated by the creation of an MPA at Race Rocks.

Bowie Seamount is a unique pelagic marine ecosystem, located 180 km west of the Queen Charlotte Islands. It was selected for its “significant populations of rockfish, sablefish, and halibut” (DFO 1999). There is no threat from pollution, habitat destruction, or any other human activity except fishing, which is difficult, but not impossible, to conduct in this remote, open-ocean location. As a result the seamount provides its own protection because of its inaccessibility. However, technologies and markets are constantly evolving, and it is reasonable to

assume that further exploitation will one day be economically viable. Anything less than designation as a “no-take” zone has no ecological rationale.

The Endeavour Hot Vents is a unique thermal hot vent ecosystem located 2250 metres below the ocean’s surface SW of the Strait of Juan De Fuca. This depth provides a refuge from human activity in comparison to other, shallower regions on the coast. The only way to access the vents is by deep sea submarine, which drastically limits the number of human activities in the region. Although research projects have caused some damage by excessive sampling of vents, the vents are a relatively low conservation priority given the onslaught of other conservation threats in more proximate and vulnerable coastal locations. Simply regulating the removal of hot-vent habitat is the only management required, and would certainly have public support.

The real test of the *Oceans Act* – and the federal commitment to marine conservation – will come in the next phase of MPA system development, where significant fishery closures will be the issue to reckon with.



Initiatives by Parks Canada

(parksCanada.pch.gc.ca/nmca/nmca/program.htm)

The objectives of Parks Canada’s National Marine Conservation Areas are: To protect and conserve for all time national marine areas of Canadian significance that are representative of the country’s ocean environments and the Great Lakes, and to encourage public understanding, appreciation and enjoyment of this marine heritage so as to leave it unimpaired for future generations.

On the West coast of Canada, Parks Canada intends to establish five National Marine Conservation Areas (NMCAs), based on an ecosystem classification system developed in the 1970s which identified five distinct large maritime ecosystems on the West coast, and a total of 29 in all of Canada. As with the federal terrestrial strategy, Parks Canada’s goal is to have a representative NMCA in each of the 29 marine regions. The five regions on BC’s coast are: the Strait of Georgia, West coast Vancouver Island, Queen Charlotte Shelf, Queen Charlotte Sound, and Hecate Strait. NMCAs will be designated and managed under the *Parks Act* and yet to be legislated *Marine Conservation Areas Act*.

Initiatives by Parks Canada are much larger in size than those considered by DFO under the *Oceans Act*, and NMCAs will necessarily be zoned for multiple-use.

Zone 1 – Preservation (i.e. no take)

In Zone I areas, renewable resource harvesting will not be permitted. Visitor use will not normally be allowed but in certain cases, where the public education benefits are high, provisions may be made for limited and closely supervised visitor access. Permanent facilities will not be permitted, unless they are essential for public safety or the protection of natural features.

Zone 2 – Natural Environment

In Zone II areas, renewable resource harvesting activities including recreational hunting and fishing will be prohibited. Research, public education and low-intensity outdoor recreation will be permitted. Where practical and safe, the use of non-motorized transportation would be encouraged. Only minimal facility development would be allowed.

Zone 3 – Conservation

In Zone III areas, provision will be made for reasonable use consistent with maintaining the structure and function of marine ecosystems. Hunting may be permitted in designated areas on a conservative basis, subject to ongoing population assessments and visitor safety concerns. Permanent facilities for conservation area administration, public education, visitor services and accommodation would be allowed.

The following goals for the *NMCA Act* will establish the new Parks Canada mandate:

- represent the diversity of Canada's oceanic and Great Lakes environments
- maintain ecological processes and life support systems
- provide a model for sustainable use of marine species and ecosystems
- encourage marine research and ecological monitoring
- protect depleted, vulnerable, threatened or endangered marine species and their habitats
- provide for marine interpretation and recreation
- contribute to a growing worldwide network of marine protected areas

Before designation, an NMCA candidate area must go through a 5-step process outlined in the National Parks Policy (1994). In each of the 29 marine regions, the first step is a regional analysis to identify opportunities and representative candidate sites (typically there are between 2 and 4 sites). Next, a rating process based on socio-economic criteria, representativeness, threats and constraints is used to identify the best potential site, which is then proposed as a NMCA. In the third step, the proposal undergoes a feasibility study which includes public input. If feasibility is determined, the fourth step is to negotiate a Marine Conservation Area agreement between all the affected governments. Finally, the area is legislated under the *Parks Act* or, presumably, under the pending *Marine Conservation Areas Act*.

There are two proposed NMCAs in BC:

1. **The Southern Gulf Islands NMCA** representing the Strait of Georgia, and,
2. **Gwaii-Haanas NMCA** representing the Queen Charlotte Shelf and Hecate Strait ecological regions.

A regional analysis of the central coast is also underway, and four potential NMCA candidates have been identified; Broughton Archipelago, Hakai Pass, Aristazabal and Queen Charlotte Strait.

The proposed Southern Gulf Islands NMCA was first announced in December 1998, and a feasibility study is underway. This stage requires that Parks Canada consult with and obtain support from other federal departments and agencies, provincial and territorial governments and First Nations. However, a problem exists as Parks Canada includes First Nations in the same category as local communities and stakeholders (see <http://parksCanada.gc.ca/nmca/nmca/program.htm>). Parks Canada will initiate discussions with local communities and user groups to seek their cooperation in conducting the feasibility study. The best timing and process for their participation is determined and ways for bringing local knowledge into the strategic plan is explored.

The Southern Gulf Islands is a productive ecological region. The productivity results from large daily water exchanges from the Strait of Georgia and Juan de Fuca Strait, coupled with high nutrient inputs originating from the Fraser River watershed. Parks Canada deserves to be commended for boldness in selecting an area that is heavily utilized, commercially and recreationally, and that is close to major population centres. There are intense developmental pressures on the whole Strait of Georgia ecosystem, and the Southern Gulf islands will require strong measures to protect ecosystem values. The question that needs to be asked in the feasibility study is: What are the threats and to what extent can they be controlled spatially?

The feasibility study will include recommendations about conservation and management objectives, boundaries, permitted uses and zoning options. Numerous ecological objectives are to be considered when configuring NMCA boundaries. These include:

- Protect a wide diversity of marine ecosystems representative of the marine region.
- Protect the habitat requirements for viable populations of marine species that are native to the marine region.
- Avoid fragmenting sensitive, highly diverse or productive marine communities.
- Protect exceptional marine phenomena, and rare, threatened or endangered marine wildlife and plants.
- Includes important sites for ecological research and monitoring.

Since 1993, Gwaii-Haanas has been in the fourth stage of the process, negotiation of a Marine Conservation Area agreement. This requires transfer of provincial interests to Canada, negotiation on boundaries and management goals and objectives, and prohibition of non-renewable resource extraction and development. Parks Canada has entered into a cooperative arrangement with the Haida First Nation for the eventual management of the NMCA. The present process deals with negotiating the management of fisheries in the NMCA. As there is much uncertainty as to aboriginal rights to harvest in protected areas, section 5 of this document confronts this issue directly.

In March 1997, Parks Canada entered into an agreement with four oil companies – Shell Canada Limited, Chevron Canada Resources, Petro-Canada and Mobil Oil Canada –

transferring petroleum exploration rights in the Gwaii Hanaas area to the Nature Conservancy of Canada for ultimate return to the Crown. The relinquishment of these rights by the Nature Conservancy to the federal government is required before Parks Canada can confirm establishment of the National Marine Conservation Area.

Overall, the ability of NMCAs to achieve ecological objectives will be determined in the planning and zoning process. The large size of NMCAs suggests that there is clear potential for these areas to be managed as experiments in, and models of, marine sustainability. On the other hand, the size issue means that numerous stake-holders and interest groups are involved in the planning, which can easily result in a watered down, lowest common denominator outcome or “business as usual”. It seems unrealistic to expect NMCAs to achieve a high degree of protection(i.e. Zone 1) throughout its boundaries. The challenge will clearly be to ensure that ecological imperatives and the needs of local communities are not subverted by larger industrial interests.

Other Initiatives

There are other large land use planning processes occurring on BC’s coast which may result in the establishment of MPAs. On the central coast of BC there is currently a Land and Coastal Resource Management Plan (LCRMP) being negotiated with a large number of sectoral interests represented at the table. There are no site specific MPAs being proposed, however the Marine Conservation sectoral group is asking for no-take MPAs as the core of any MPA system in that region. Which agency carries it out is not important at this point. Parks Canada has halted the identification of a central coast NMCA proposal until after the LCRMP process; and BC Parks has identified numerous estuaries in the central coast region for potential designation as Class ‘A’ parks.



The Canadian Wildlife Service (CWS) can establish Marine National Wildlife Areas under amendments made in 1995 to the *Canada Wildlife Act*. There has yet to be any action taken although CWS is a participant in the provincial-federal MPA strategy, and is also involved with providing data for DFO’s pilot projects at Race Rocks and Bowie Seamount.

Ecological Planning Tools

In 1993, the BC government mandated a Protected Areas Strategy with the goal of protecting 12 percent of the province’s terrestrial and marine environments by the year 2000. To ensure that the terrestrial protected areas were representative of the province’s natural diversity, an ecological classification system was used to identify ecosystems that are poorly represented by protected areas. The BC Marine Ecosystem Classification system (MEC) was developed by the province in 1995 for the same reasons. This system has divided the coast into 12 large marine ecological regions called “Ecosections”, based on bio-physical characteristics. Within

the Ecosections, 619 smaller “Ecounits” are described based on five physical characteristics including: current, depth, exposure, relief, and substrate (Howes et al. 1996). These characteristics have been mapped at a scale of 1:250 000 and 65 Eco-Units with unique combinations of these five physical characteristics have been identified within the 12 Ecosections.

Day and Roff (in press) propose a national framework for a hierarchical ecological classification system for Canada’s marine waters. It is based on eight levels of classification: environment type, geographic range, temperature, sea-ice cover, segregation of pelagic and benthic realms, vertical segregation, mixing and wave action and benthic substrate. They propose dividing the marine environment into “seascapes” which are equivalent to the Ecounits in the BC Marine Ecosystem Classification System.

While both approaches are theoretically strong, and useful in gauging representation values, practically they do not describe ecosystems at the scale needed to make ecologically appropriate management decisions. There are two limitations. First, the scale of the physical processes and mapping units is much larger than the scale of the threats and pressures that need to be managed. Second, there is no reliable way to predict the biological diversity of communities of species associated with the physical habitat features presented at this scale. For example, the average size of a BCMEC Ecounit system is 45 square kilometres (~18 sq. Mi.), and within such large areas there are different substrates, currents, nutrient values and relief (i.e. habitat values). Consequently there will be several different biological assemblages even within a small Ecounit, some of which are more heavily utilized by people and hence are more vulnerable. The proposed Race Rocks pilot MPA is only 3.4 km², although it is part of an Ecosection that encompasses a much larger area. Within the proposed boundary there is rocky reef habitat, sand bottom, and cobble at varying depths, and there is no one biological assemblage that can be categorically associated with the ecosystem type.

At the present time, the spatial scale and research needed to articulate habitat and species associations would be prohibitively costly and would not be possible to undertake coastwide. But techniques for doing it on land are well advanced (Terrestrial Ecosystem Mapping), and applications to marine environments will probably preoccupy the next generation of marine ecosystem mappers. Without it, it is hard to imagine how fishing related threats to species can ever be addressed.

Day and Roff (in press) acknowledge that there are limitations to classification systems, and that their application depends on the goals of the MPA system. The BCMEC system is useful for large scale planning and gauging representation of physical features but not for site identification and fisheries management in MPAs. The hazard of using a large-scale classification system for setting management objectives is that everything within an Ecounit or “seascape” is not created equally, and if the truly vulnerable components of the larger ecosystem are not visible to everyone concerned, they can be easily overlooked and deleterious fishing pressure and appropriate locations for no-take areas will be difficult to identify.



First Nations and Marine Protected Areas: An Overview of the Legal Complexities

David R. Boyd

Introduction

Aboriginal people in British Columbia, particularly on Vancouver Island and the coast, have a long and ongoing relationship with the ocean. First Nations have always relied on oceans, aquatic vegetation, seabirds, fish and marine mammals as an important part of their sustenance and cultures. Recent legal developments in Canada make it clear that First Nations must play an integral role in selecting, designating and managing MPAs on the west coast.

First Nations in British Columbia enjoy certain legal rights by virtue of their historic occupation and use of the land, water and resources. Since 1982, aboriginal rights have enjoyed legal protection under s. 35 of Canada's Constitution. In addition to aboriginal rights, many First Nations are now in the process of negotiating treaties with the federal and provincial governments. Rights included in these modern treaties will also enjoy constitutional protection. Finally, there are 14 treaties signed in the 19th century, known as the Douglas Treaties, which grant certain rights, including fishing rights, to First Nations on Vancouver Island.



It is important to clarify the relationship between aboriginal rights and MPAs, particularly in light of uncertainty about the federal government's ability to regulate aboriginal fishing stemming from last fall's Supreme Court of Canada decision in the Marshall case.

Aboriginal Rights

Following the granting of constitutional protection to aboriginal rights in 1982, there has been extensive development of the basis and extent of the aboriginal right to fish.

The aboriginal right to fish can be divided into two broad categories: the right to fish for food, social and ceremonial purposes, and the right to fish for commercial purposes. In both cases the legal test is the same for establishing the aboriginal right: Is fishing an activity that is integral to the distinctive culture of the particular First Nation? It is clear from this test that the extent of fishing rights will depend on the unique history and practices of individual First Nations, and that rights in a particular situation will depend on the evidence that is available.

It is now beyond dispute that most, if not all, First Nations on Vancouver Island, Haida Gwaii and the BC coast possess an aboriginal right to fish for food, social and ceremonial purposes. The extent of the aboriginal right to fish commercially is not as well established. Recent Supreme Court of Canada decisions reached different conclusions for different First Nations. In the Gladstone case, the Court ruled that the Heiltsuk possess a commercial aboriginal right to fish for herring spawn on kelp, based on their long history of trading. In the Van der Peet and NTC Smokehouse cases, the Court ruled that the Sto:lo First Nation had not provided sufficient evidence to establish the commercial aboriginal right to fish for salmon.

Although aboriginal rights are protected by the Canadian Constitution, they remain subject to government regulation. This is a critical point. In the 1990 Sparrow decision, the Supreme Court established a framework for determining if a particular law or regulation infringes an aboriginal right. First, the onus is on the Aboriginal person or First Nation to establish the existence of an aboriginal right, by demonstrating that an activity is integral to their distinctive culture. The Aboriginal person or First Nation must also establish that the law or regulation in question “infringes” on their aboriginal right.

The onus then shifts to the government, which must first provide a “substantial and compelling” legislative objective. In the fisheries context, conservation is the primary objective, although other factors such as regional fairness are also possibly valid legislative objectives. In addition to demonstrating a legitimate legislative objective, governments must also act consistently with their fiduciary duty to First Nations by ensuring that there is minimal infringement to achieve the objective, prior consultation with affected aboriginal people, and, in some cases, fair compensation.

The bottom line with respect to MPAs is that aboriginal rights to fish will continue to exist, but will be subject to justifiable regulation for conservation purposes. The burden will be on the government, if challenged, to provide the evidentiary basis for the conservation concern.

Aboriginal Title

Aboriginal title is a distinct aboriginal right that is generally understood to be the legal right to land enjoyed by First Nations due to their longstanding use and occupation of land. Although title to marine areas in Canada is generally vested in the federal government, some BC First Nations, particularly the Haida, are claiming title to marine areas adjacent to their traditional terrestrial territories.

Aboriginal assertions of title and jurisdiction over marine areas reinforce the need for consultation and cooperation with First Nations in selecting, designating and managing MPAs.

Consultation

Court decisions on aboriginal rights (including title) have firmly established that both provincial and federal governments must consult with First Nations before taking any actions that affect their aboriginal or treaty rights. In some cases involving aboriginal title, consultation will be insufficient and the consent of an affected First Nation will be required.

Failure to consult with affected First Nations in creating MPAs could have serious consequences. For example, the Burrard First Nation sued the provincial government several years ago for failing to consult them prior to designating Indian Arm as a provincial park. The litigation was resolved through the negotiation of a co-management agreement.

Compensation

In the 1997 *Delgamuukw* decision, the Supreme Court of Canada decided that where aboriginal title has been infringed, the government will generally have to pay compensation to the affected First Nation because of the obvious economic element associated with land ownership. In the context of MPAs, compensation may be required if First Nations can establish aboriginal title, and would be subject to negotiation. There are no precedents to provide guidance on this point.

Douglas Treaties

Signed during the 1850s, the Douglas Treaties explicitly provide First Nations on southern Vancouver Island with the right to carry on their traditional fisheries. Decisions of the Supreme Court of Canada (most importantly *Nowegijick* and *Marshall*) make it clear that treaties are to be given a broad and generous interpretation.

In fact, one of the Douglas Treaties was used by a Vancouver Island First Nation in court to prevent the construction of a marina near Saanichton. The court prohibited the construction of the marina because of the First Nation concern that its treaty rights to fish and gather shellfish would be violated.

In the recent Supreme Court of Canada decision in the *Marshall* case, the Court interpreted a 1760 treaty with the Mikmaq people of Nova Scotia in a modern context. The decision interprets the treaty as giving the Mikmaq people the “right to earn a moderate livelihood” by fishing. However the Court was extremely clear in ruling that the Mikmaqs’ treaty right is not an absolute or unrestricted right, but is subject to government regulation for a broad variety of public purposes. In the fisheries context, the Court has repeatedly identified conservation as the overriding priority.

The key point is that Douglas Treaty fishing rights are still valid, but remain subject to regulation for conservation purposes, such as fishing restrictions in a Marine Protected Area. In the absence of conservation concerns, First Nations would be allowed to continue fishing.

Modern Treaties

The modern treaty negotiation process began in the mid-1970s after the Supreme Court of Canada’s landmark decision in the *Calder* case, dealing with the aboriginal title asserted by the Nisga’a First Nation. The Nisga’a Treaty was ratified in 1999 and contains extensive provisions relating to fisheries matters. The first paragraph of the Fisheries chapter of the Nisga’a Final Agreement explicitly states that the Nisga’a fishing rights are subject to “measures that are necessary for conservation”.

Although the Nisga'a treaty creates a new terrestrial park and establishes co-management regimes for several others, it does not create any new MPAs. However, Chapter 3, paragraph 121, states:

“At the request of any of the Parties, the Parties will negotiate and attempt to reach agreement on the establishment of a marine park in the Nass area, but, for greater certainty, Canada is not obliged to establish a national park, national park reserve, or a national marine park or to reach agreement on the establishment of a national park, national park reserve or national marine park.”

The BC Treaty Commission process began in 1993, when the provincial government finally acknowledged the existence of aboriginal rights and agreed to participate in treaty negotiations with First Nations. As of January 2000, only one Agreement in Principle (AIP) has been reached, with the Sechelt Indian Band. The provisions in the Sechelt AIP relating to fisheries matters explicitly state that treaty fishing rights are subject to regulation for conservation. The Sechelt AIP is silent on MPAs.

Based on the Nisga'a and Sechelt treaties, it is clear that modern treaties will explicitly preserve the government's ability to regulate aboriginal fishing for conservation purposes. Treaty negotiations may result in the creation of, or commitments to create, new MPAs.

Interim Measures Agreements

Because treaty negotiation is expected to take many years, the parties involved agreed at the outset of the process (in 1991) to negotiate interim measures agreements (IMAs) in specific areas of concern, including forestry and fisheries. IMAs with coastal First Nations could either include provisions for the creation of MPAs and associated co-management regimes, or fishing rights that may be affected by the creation of MPAs. There are no examples to date of IMAs creating MPAs.



Aboriginal Rights and Terrestrial Protected Areas

The Courts have ruled that Aboriginal people may continue to exercise their aboriginal rights in Canadian protected areas, subject to one critical caveat. If there are restrictions in place in a certain protected area that are based on conservation, then those restrictions will apply to Aboriginal people, thereby limiting their ability to exercise their aboriginal rights.

There is also a trend towards co-management of both federal and provincial protected areas in BC. Co-management is based on recognition of the legal rights of First Nations, and is negotiated on a park by park basis. Prominent examples of co-management include the Kitlope Heritage Conservancy (Huchsduwachsd Nuyem Jees), the Stein Valley Nlaka'pamux Tribal Heritage Park, Nisga'a Memorial Lava Bed Park, Ts'yl-os Provincial Park

and Gwaii Haanas (National Park Reserve). Negotiations are underway between the Haida and Canada to establish the Gwaii Haanas National Marine Conservation Area adjacent to the Gwaii Haanas Haida Heritage Site and National Park Preserve.

Conclusions

Several key findings can be drawn from this brief overview. First, on the basis of constitutionally protected aboriginal title and rights to fish, First Nations will have to be involved in the selection, designation and management of new MPAs in British Columbia. Second, consultation with First Nations will always be necessary in any instances where restrictions on aboriginal fishing are contemplated. Third, where fishing restrictions are based on conservation concerns, these restrictions will apply fully to Aboriginal people.



Conclusions and Recommendations

This document reviewed recent MPA initiatives on BC's coast. Although the ecological objectives of the agencies involved are valid, there has been little or no strategic planning for establishing a system of MPAs to best control human pressures and threats to species, habitats, and ecological processes. To date, MPA efforts have focused on social-political issues such as First Nations use and recreational fishing, and scientific data gathering for habitat mapping, ecosystem classification and inventories. What has yet to surface in the planning is the identification of threats to ecosystems, the spatial scale and location of these threats, and finally, the ability of MPAs to assist in controlling them. By geo-referencing the threats that can be spatially managed, the focus of MPA creation may be substantially narrowed, resulting in a more useful and well-designed system of MPAs.

The following are recommendations, observations and comments to decision-makers, MPA advocates, and the general public.

1. **Identify the threats.** MPAs can be very effective in controlling some, but not all, of the threats to our marine ecosystems. At this time, the most effective use of MPAs will be for controlling over-exploitation of non-migratory resident species. A thorough process for building understanding of how MPAs can control these threats needs to be developed and widely implemented.
2. **No take areas.** Areas with a high degree of fishing restrictions have been the most successful in protecting ecological values. If the goal of establishing MPAs in the province is to protect ecological values and biological diversity, then our strategy has to be centered around the establishment of long-term "no take" areas.
3. **Conservation first.** There are numerous resident aquatic species on the coast that are over-exploited and desperately require conservation measures. For example, lingcod populations in the Strait of Georgia are estimated to be at 3 percent of their historical biomass (Martell and Wallace 1998). Similarly, many rockfish populations have been locally decimated and in such cases there is ample scientific justification for the federal government to establish MPAs based on conservation concerns.
4. **Minimum standards.** There needs to be consensus among government and the public as to what minimum protection standards are necessary for MPAs. Are activities such as open pen salmon aquaculture, bottom trawling, ballast water dumping, and sewage disposal appropriate or defensible in a MPA? Not really. Since the present standards are minimal, the number of existing MPAs gives a false sense of protection when in fact the activities that can cause significant harm are still permitted.
5. **Other marine sustainability issues.** Threats to marine ecosystems need to be examined critically as a coast-wide problem, not just within the boundaries of potential MPAs. For example, bottom trawling could be controlled within the boundaries of an MPA, but recent evidence from other jurisdictions suggests that bottom trawling is a form of fishing technology that perhaps should be phased out completely (Watling and Norse 1998).

6. **The risks associated with MPAs need to be recognized.** There are two significant risks associated with both terrestrial and marine protected area strategies: the shifting of additional harvesting efforts and associated impacts to unprotected areas, and creating the illusion of protecting larger scale, coastwide, ecological processes and values. MPAs will not prevent the fisheries collapses, like east coast cod and west coast salmon, that Canadians have witnessed in the last decade. In the continuing absence of federal and provincial marine policy that is clear in its conservation intent, the utility of MPAs as a conservation mechanism may be being severely over-stated. There is a danger that opponents of marine conservation will use MPAs as a mechanism for maintaining the *status quo*, or even intensifying harvesting activities on unprotected areas of the coast, precipitating a greater decline in coastwide ecological processes and values.
7. **Community based MPAs.** Mechanisms for communities to identify, select, and participate in the management of MPAs must be implemented. The current process allows for community involvement only after areas have been selected.
8. **Marine ecological classification systems should be integrated into MPA processes.** It is important that there is a consensus between agencies as to how to use available information. Currently, the BC marine classification system appears separate from the rest of the process.
9. **Restoration vs. protection.** There needs to be more recognition of the role of MPAs in restoring ecosystems, as most MPAs will be situated in areas that have been over-harvested.

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Appendix A

List of benefits to be expected with an appropriate system of “no take” MPAs accompanied by other management measures

(From “No-take” Reserves working group meeting, Lee Stocking Island, Bahamas, September 25-30, 1995, unpublished).

1. Protect ecosystem structure, function, and integrity

- physical structure of habitat
- ecological processes
- restore population structure and community composition
- biodiversity at all levels
- keystone species
- cascading effects
- vulnerable species
- threshold effects
- second order effects
- food web
- trophic structure
- incidental damage
- system resilience
- fishing gear impacts
- maintenance of high quality feeding areas

2. Improve fishery yields

- protect spawning fish stocks
- increase spawning stock biomass
- increase spawning density
- provide greater population fecundity (reproductive capacity)
- provides undisturbed spawning conditions, habitat, sites
- allows production of more eggs and larvae
- provides export of eggs and larvae
- enhances recruitment
- provides spillover of adults and juveniles
- reduces chances of recruitment overfishing
- reduces overfishing of vulnerable species
- protects diversity of fishing opportunities
- reduces adverse impacts on intraspecies genetics
- improves ability to recover from management failures
- reduces inadvertent fishing mortality
- reduces bycatch
- simplifies enforcement and compliance
- helps reduce conflicts among users
- maintains sport trophy fisheries
- provides better and more efficient management with limited resources
- increases understanding and acceptance of management
- facilitates stakeholder and user involvement in management
- provides information from unfished populations necessary for proper management

3. Increases knowledge and understanding of marine systems

- provides long term monitoring areas
- provides focus for study
- provides continuity of knowledge in undisturbed site
- provides opportunity to restore or maintain natural behaviours
- reduces risks to long term experiments
- provides synergism of knowledge, cumulative effect
- provides control areas for assessing anthropogenic impacts

4. Improves non-consumptive opportunities

- enhance and diversify economic activities
- enhance non-consumptive recreation
- improves peace of mind
- enhances aesthetic values
- improves wilderness opportunities
- spiritual connections
- social activity
- education
- enhances conservation appreciation
- increases sustainable employment opportunities
- diversifies and stabilizes the economy
- creates public awareness
- leaves less room for irresponsible development
- encourages holistic approach to management

Appendix B

Acronyms used in the text.

AIP	Agreement in principle
MPA	Marine Protected Area
IMA	Interim Measures Agreement
NMCA	National Marine Conservation Area
DFO	Fisheries and Oceans (formerly Department of Fisheries and Oceans)
LCRMP	Land and Coastal Resource Management Plan

Appendix C: Overview of threats to British Columbia's marine biodiversity and marine ecosystems. (EC-Environment Canada, DFO-Department of Fisheries and Oceans, MELP-Ministry of Environment, Lands, and Parks, MOF-Ministry of Fisheries, EMR-Energy, Mines, and Resources, CWS-Canadian Wildlife Service)

General Category of Threat	Activity	Habitat Type	Spatial Scale (km ²)	Ecological Impacts	Coast-wide Value	Government Agency	Suitability of MPA (low, medium, high)
Global Atmospheric Change	Ozone depletion	All	>1000	Uncertain	Uncertain	EC	Low
	Global Warming (CO ²)	All Continental shelf	>1000	Primary production Food web structure Salmon survival	Fisheries	EC DFO	Low
Exotic Species	Ballast water	All	>1000	Community structure, Competition with native species	Natural ecological communities Shellfish	DFO	Low
	Aquacultured Atlantic salmon	Streams Open ocean	>1000	Disease transfer Competition with native species (ND)	Native salmon stocks (ND)	DFO	Low
	Transport	All	>1000	As above	As above	DFO	Low
	Spreading from other areas	All	>1000	As above	As above	DFO	Low
Pollution	Municipal waste discharge	All habitats	<10	Nutrient loading Heavy metals	Shellfish closures Recreation Aesthetics	EC BCMELP	Medium
	Non-point sources	All	1->1000	Heavy metals Nutrient loading Fecal coliform	Shellfish Aesthetics	EC	Low
	Salmon aquaculture	Deep inlets	<10	Nutrient loading Anti-biotics	Marine mammals Visual	DFO MAF	High
	Oil spill	All	1->1000	Numerous	Wildlife Aesthetics Recreation	CWS EC DFO	Low
	Noise pollution	All	1-10000	Unknown	Marine mammals	None	Medium
	Large non-biodegradable debris	All	>10000 Coast-wide	Interactions with wildlife	Wildlife Aesthetics		Low
Habitat Destruction	Bottom trawling	Sandy/cobble bottoms	1-10000	Benthic food webs, micro-habitats	Juvenile fish habitat Rare species	DFO	High
	Log sorts	Estuaries	1-10	Benthic smothering	Juvenile salmon, birds, nursery areas	DFO MOF	High
	Shellfish aquaculture	Protected shallow bays	1-100	Nearshore community alteration	Natural community structures	MAF	High
	Salmon aquaculture	Deep inlets	<10	Smothering of benthic communities	Shellfish beds, naturalness	MAF DFO	High
	Oil exploration	Shelf	10-100	Numerous	Numerous	EMR	High
	Dredging	Sand bottom	1-100	Smothering	Shellfish	DFO	High
	Siltation	Estuaries	1-1000	Smothering	Shellfish	DFO	Medium
	Anchoring Trampling	Rocky intertidal	<1 1-10	Structural damage Intertidal structure Loss of species	Reefs Visual Recreation	None None	High High
Fisheries Impacts	Over-fishing	All	1->1000	Foodweb structure	Diving, Fisheries Coastal communities	DFO	High
	Bycatch and discards	Trawling and long-lining grounds	1->1000	Foodweb structure	Seabirds Unknown impacts Ecosystem structure	DFO	High

(ND) = not demonstrated