A REVIEW OF THE DEPARTMENT OF FISHERIES AND OCEANS AND PARKS CANADA'S MARINE PROTECTED AREAS PROGRAM AND THEIR ROLE IN CANADIAN FISHERIES MANAGEMENT

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A Review of the Department of Fisheries and Oceans and Parks Canada's Marine Protected Areas Program and Their Role In Canadian Fisheries Management

By

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Abstract

The term "Marine Protected Areas" (MPAs) is a generic phrase which has been used worldwide for over two decades to describe marine reserves, marine parks, marine sanctuaries and marine areas with special protection, although the concept of MPAs has been around for nearly a century. MPAs serve many different purposes and are established for a variety of reasons. Essentially, they are regions that have been reserved by law to protect all, or parts, of a designated marine environment.

MPA programs throughout the world have been well received by a growing number of countries and have been actively promoted by a variety of organizations such as the United Nations Environmental Program (UNEP), International Union for Conservation of Nature (IUCN), World Wildlife Fund (WWF) and the United Nations Educational, Scientific and Cultural Organization (UNESCO). Currently, there are approximately 1300 MPAs worldwide.

The approaches used for planning and managing MPAs have evolved considerably over time and have provided an additional management tool to protect, maintain, or restore natural and cultural resources in coastal and marine waters. The phrase MPA, when used in its generic sense, can hold many different meanings based primarily on the level of protection provided. These levels of protection can range from areas closed to public access, to sites that permit access but do not allow consumptive uses. They have been used effectively both nationally and internationally to conserve biodiversity, manage natural resources, protect endangered species, reduce user conflicts,

provide educational and research opportunities, and enhance commercial and recreational activities.

Canada has adopted its own MPA program that is administered through the Department of Fisheries and Oceans (DFO) under the authority of the *Oceans Act,* with a mandated responsibility to establish and create protected areas. The DFO acts as the lead federal authority for Canada and has adopted the traditional generic term "Marine Protected Areas" as the title for their own departmental program. Other federal departments are also involved in MPA programs in Canada, but under different names, and are designed with long-term goals similar to those of the DFO.

This paper will review the development of MPAs from an international perspective, and will also review the role of two federal protected area programs in Canada, Parks Canada's National Marine Conservation Areas program (NMCA) and the Department of Fisheries and Oceans Marine Protected Areas program, in advancing marine conservation in an efficient and effective manner. In this paper the DFOs MPA and Parks Canada's NMCA programs will be integrated and referred to by the generic term MPAs.

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List of Abbreviations

AOI – Areas of Interest

DFO - Department of Fisheries and Oceans Canada

ICZM – Integrated Coastal Zone Management

MCA - Marine Conservation Area

MPA - Marine Protected Area

NMCA -National Marine Conservation Area

NRC – National Research Council

TAC – Total Allowable Catch

WWF – World Wildlife Fund

IUCN – International Union for the Conservation of Nature

Chapter I: Introduction

1.1 Introduction

Marine Protected Areas (MPAs) are an important tool for conserving Canada's marine heritage. Eight of Canada's provinces and territories are coastal and its coastline stretches 244,000 km along the Atlantic, Arctic and Pacific Oceans, making it the largest coastline of any country in the world (DFO, 1999a). Canada's continental shelf covers 3.7 million km^2 and is the second largest in the world, representing approximately one percent of the surface area of the world's ocean (DFO, 1997). The ocean has had a huge impact and has influenced the very history and culture that identifies Canada as a nation. These marine and coastal areas are important for activities such as fishing, recreation, tourism, transportation, subsistence, hydrocarbon and mineral production. Given the broad spectrum of marine resources and ecosystems, the need for Canada to responsibly manage its oceans is evident.

The management of Canada's coastal and ocean waters is a shared responsibility among federal, provincial and territorial agencies, stakeholders, interested persons and communities. In Canada the federal MPA program is administered and implemented by federal government departments with mandated responsibilities to establish protected areas. For the purposes of this paper both the DFOs MPA program under the *Oceans Act* and Parks Canada's NMCA program under the *National Parks Act* will be integrated and referred to as the generic term MPAs. These protected area programs are distinct but share one common objective: to further conservation and protection of living resources

and their habitats (DFO, 1998), each contributing with its own particular focus. Although many departments and groups are involved in MPA set up and design, this paper will review two departments involved in the program. Parks Canada's National Marine Conservation Areas (NMCA) program and the Department of Fisheries and Oceans Marine Protected Areas (MPA) program are directed by the Oceans Act to ensure that federal departments works together with provincial and territorial governments, stakeholders, aboriginal groups, interested parties and communities to advance marine conservation in an efficient and effective manner.

In the past many MPAs have been selected primarily on the basis of their local biological characteristics or coastal features. However, protected areas should not be restricted to sites about which the most is known or to those easiest to declare. A carefully planned, scientifically based network of representative natural areas, that protects the habitats and ecological processes on which species depend, can help ensure that marine biodiversity is conserved (Day and Roff, 2000). The identification of marine habitat types and the delineation of their boundaries in a consistent classification is a basis for selecting marine areas that can contribute to a network of protected areas (Day and Roff, 2000).

Each of Canada's three marine regions (Arctic, Pacific and Atlantic) contain a wide range of habitats and biological communities, consisting of both high-energy and low-energy zones and ranging from exposed rocky shore, sandy beaches, alga reefs, kelp forests, coral reefs, estuaries, bays, sea-grass beds, coastal marshes and mudflats of the temperate waters to the ice covered environments. These ecosystems are home to a

remarkable diversity of species, from commercial fish to marine mammals and a variety of invertebrate species and plants (Neis, 1995).

The success of MPAs as a conservation tool has been generally good (Gregory and Brown, 1999). Established MPAs have aided in the long-term protection of the ocean environment and resources. MPAs allow for the protection of commercial fishing stocks, which are in serious decline, sensitive habitats that are being modified by activity, and protection from persistent organic pollutants resulting from insecticides, commercial applications and chemical byproducts, threatening the biodiversity and ecological integrity of the marine environment. All of these activities, along with many others, have impacted coastal communities and regional economics. MPAs have provided protection for historical and cultural resources, preservation of natural communities from exploitation and the ability to conduct scientific research. There is now increased interest in protecting the marine environment and agencies, both public and private, are developing programs to provide conservation of important coastal and ocean areas.

1.2 Development of Canada's Marine Protected Areas Program

MPAs are not a new idea; in fact the earliest known MPA, which was established in Glacier Bay, Alaska, has been around since 1910 (Morton, 1996). Parks Canada currently has twenty-nine proposed sites, each representing a marine region in Canada, known as National Marine Conservation Areas (NMCA). The Department of Fisheries and Oceans currently has twelve proposed sites developed or being developed by its Marine Protected Areas Program (Comfort, 2004).

The recent increased growth in Canada's ocean sector has resulted in increased pressures on the ocean environment and in many regions the biodiversity and ecological integrity of marine ecosystems are being threatened (DFO, 1998a). As a result of this increased growth there is a need for a proactive approach to conserve and protect marine ecosystem functions, species and habitats for future generations.

Since the Oceans Act identifies the Minister of Fisheries and Oceans as the lead federal authority responsible for oceans, DFO leads in the development of a national system of Marine Protected Areas (DFO, 1999a) and the responsibility for establishing this network is shared between federal departments. The various programs together represent a variety of marine protected area approaches with varying levels of protection and purposes. Although the protected areas designated by each department serve somewhat different purposes, each has conservation of the marine environment as a central focus (DFO, 1997).

Within Canada there exists a spectrum of legislative and policy tools to manage and conserve Canada's marine resources. MPAs have become increasingly regarded as a valuable conservation tool, which can contribute to the improved health, integrity and productivity of ocean ecosystems.

In 1997, Canada established its commitment to the marine environment by passing the Oceans Act. The purpose of this Act was to provide Canadians with the tools they needed to develop a Canadian Oceans Strategy and allow for the precautionary principle to conserve and protect the oceans when scientific information is lacking or incomplete. Canada's Ocean Strategy was developed within the realm of the Oceans Act

and was established to ensure a healthy, safe and prosperous ocean for the benefit of both current and future generations of Canadians (DFO, 2002).

1.3 Research Goals

Due to the importance and emphasis now being placed on marine environment issues, including the protection of marine habitats, a number of sites in Canada have been designated as existing or potential MPAs. The goal of this paper is to look at the development of an MPA along with its purpose, context and approach. It will review both the Parks Canada National Marine Conservation areas program and the Department of Fisheries and Oceans Marine Protected Areas programs to examine the development and establishment of a MPA through each agency. This review will examine the emphasis placed on priorities and management plans for the two agencies in protecting and setting aside protected areas. Finally, this paper will contrast and compare the framework goals and responsibilities of each agency.

The ability to establish MPAs has provided beneficial management tools that can be utilized for better stewardship of marine resources and their habitats. MPAs have been identified, established and managed using existing environmental and ecological data that has often been collected for other purposes. There have been few attempts made to identify what the real information requirements are, due to the cost of data collection and the need to expedite MPA creation (Ng'ang'a & Nichols, 2002). It has been well documented that accurate information on the marine environment, its resources and its use is critical in identifying, evaluating and managing MPAs.

1.4 Research Methods

This paper includes an extensive literature review of existing documentation, including scientific and non-scientific journals and publications from several government agencies, non-government organizations and the fishing industry regarding the general setup, implementation and goals of MPAs. This paper examines the policy and associated documentation concerning the Canadian Government's Parks Canada Agency and the Department of Fisheries and Oceans MPA programs. Information obtained from government organizations, personal communications with agency employees and others involved in the protected areas programs will also be analyzed. This will allow the evaluation of MPA programs, as well as the development, importance and purpose of the individual programs. MPA design in a general context and Canadian perspective will be reviewed in order to evaluate the idea of what an MPA is and the differences in the DFO and Parks Canada programs, along with their mandate for development.

Chapter II: Marine Protected Areas

2.1 Definition of a Marine Protected Area

Maine Protected Areas are legally designated areas designed to protect marine plants, animals and ecosystems. As such, human activity may be limited in certain ways in these areas. MPAs are formed by a part of the sea and (often) shoreline habitat designated as a conservation area. Each MPA has boundaries and a declaration of permitted and non-permitted uses within it. The main difference between a terrestrial and an MPA is its location. Terrestrial protected areas are normally located in remote areas where there is less dependency on the resource. MPAs, which are seen as important for conservation, are often located in highly biologically diverse and populated coastal environments (Lien, 1998). A broad spectrum of MPAs exist worldwide ranging from closed or "no-take" areas, to where resource extraction is permitted. Also MPAs vary greatly in size from only a few hectares and protecting a single coral reef, to the 350,000 km square multi-use Great Barrier Reef Marine Park in Australia.

The term Marine Protected Area has been used to describe a diversity of applications, thus providing a precise definition is not an easy task (Billard, 1998). The International Union for the Conservation of Nature (IUCN) identified the following definition in 1998 as:

> "Any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment" (IUCN, 1988).

Gubbay (1995) goes on to say that while the definition is a good one, it by no means describes all the structures that use this name. The phrase MPA has become a generic term and use of the terminology can hold different meanings. In many countries, the term has been used to represent protected areas, marine parks, marine wildlife areas, marine sanctuaries, marine conservation areas and marine reserves (Parks Canada, 1997; DFO, 1997; Gubbay, 1995).

According to Salm *et al.*, (2000) MPAs may be designed for any one or a combination of reasons including:

- It is the best example of an important ecosystem or habitat type
- It is needed for sustainability of fisheries such as "no-take" zones
- It has high species diversity
- It is a location of intense biological activity
- It is a "natural wonder" or a tourist attraction
- It provides a critical habitat for a particular species or groups of species
- It has special cultural values
- It protects the coastline from storms
- It facilitates necessary research or determination of "natural" baseline conditions.

The overall goals of these identified regions range from the protection of rare or endangered species to protecting the genetic diversity of an area. Other objectives could include protecting a region that is an important life cycle stage for economically important species, education and facilitating the interpretation of marine regions or identifying regions for scientific research and training to take place (Gubbay, 1995).

Often more than one goal or objective is desired in the implementation of an MPA and each case is modified to accommodate the specific interest of the stakeholders involved. The success of an MPA depends on the existence of appropriate legal

frameworks, acceptance by coastal communities, an effective and well-supported management system and the delineation of areas so that their boundaries are clear and can be treated as self-contained units. There is an increasing need to justify MPAs in measurable terms to satisfy social, commercial, development and planning interests. It is essential that conservation agencies and MPA planners have a well-defined policy and a clear idea of the purpose of each protected site, stressing the practical aspects (Salm *et al.*, 2000).

2.2 The Need for Marine Protected Areas

As marine management becomes more integrated, holistic and focused on ecosystems, MPAs will take on greater importance as a tool for conserving marine resources. MPAs have been proposed as an integral component of marine and coastal zone management, with establishment of regional networks of MPAs as a means to improve overall governance of the coastal ocean (Done & Reichelt, 1998). This has led to the need for policy development in the area of marine conservation (Cole-King, 1993).

The extent of current threats to the marine environment and resources may justify the establishment of an MPA using an adaptive management approach to modify the design as knowledge and experience increase. MPAs can be used to protect critical or threatened habitats in order to foster restoration of biological communities and their productivities. The challenge is to prevent overfishing, protect marine habitat and restore biodiversity. Establishment of MPAs may in turn motivate communities to increase their stewardship of the ocean through stricter land use policies and pollution controls (NRC, 2001).

MPAs are essentially "islands" of controlled and sustainable use and conservation of biodiversity surrounded by a sea of mismanagement, overexploitation and open access (MacArthur and Wilson, 1963) and is an important component of the overall strategy for conserving marine biological diversity. MPAs will not promote marine conservation unless they are designated in a systematic way that takes into account the entire ecosystem. MPAs will not solve all the problems associated with the ocean but are an important foundation. Alternatively, an MPA will be rendered ineffective if the surrounding seas are degraded due to the trans-boundary flow of currents, water and pollution (NRC, 2001).

One of the purposes of an MPA is to help conserve the biodiversity and ecological integrity of plants and animals that live within them. This allows control over human activities within the area and ensures that it is conducted in a way that is consistent with achieving this purpose. An MPA is an area of the marine environment that will receive long-term protection, often legal. These areas may include refuge areas that are closed to all consumptive and possible human activities, to multiple use areas which allow for human use compatible with the conservation objectives of the area (C-PAWS, 2003). MPAs can help by potentially increasing the biomass of commercial and recreational fishery resources, increasing tourism, furthering scientific research programs and boosting employment opportunities for local communities (Murray *et al.*, 1999).

2.3 A Strategic Approach for the Creation of Marine Protected Areas

Strategies for establishing networks of MPAs fall under three categories including: (1) preservation of ocean or coastal areas (2) resolution of conflicts among users or (3) restoration of degraded or overexploited areas. Most existing MPA networks follow the first strategy (Parks Canada, 1995). It is best to think of Marine Protected Areas as a single node within a framework of networks that act to counter some of the threats facing individual protected areas and assist in laying the groundwork for national, regional and global policies that prevent further degradation of the seas around them.

The outlining design of an MPA is not fixed, but varies from area to area depending on the level of protection and traditional use activities. The beneficiaries of MPAs can consist of many individuals including; tourists who want to see intact natural areas and the animals that live in them, divers who seek such habitat as coral reefs and the fishers who want long-term yields of their catch (NRC, 2001). The area ensures that conservation is the priority and is tailored to the needs of the users on an individual case basis.

Chapter III: The Use of Marine Protected Areas as a Management Tool

3.1 Marine Protected Area Management

Although the idea of creating MPAs is not new, interest in marine conservation is now at an all time high. The notion of providing protection and management of marine resources lags several decades behind the land-based environmental movement (Agardy, 1997; Cole-King, 1993). Truly effective marine conservation requires that the current preoccupation with conserving structure needs to be removed and more focus is required on safeguarding the critical ecological processes that are responsible for maintaining that valuable structure.

MPAs allow managers to invoke the precautionary principle - that is, what drives managers to err on the side of conservation when scientific uncertainty looms (Kelleher, 1999; Ludwig *et al.*, 1993). Along with the precautionary approach is the idea that activities that have the potential to produce irreversible damage to marine habitat should be avoided. MPAs also have the ability to provide protection to areas that lack scientific knowledge and act as a buffer against unforeseen yet potentially disastrous management mistakes.

The most important role MPAs serve is as a starting point for exploring and delimiting functional linkages in coastal systems (Dayton, 1993). Ensuring that marine resources and ocean space remain sustainable over time is accomplished by harnessing the science currently available in developing rigorous management. Agardy (1997) states that the conservation of marine biodiversity is dependant on seven entity points:

1. Defining the ecological bounds of the system and thus the appropriate geographical framework for management.
2. Identifying ecologically critical processes and areas; and allowing relative ranking of an area's importance based on biodiversity or other criteria.
3. Assessing the scientific feasibility of the conservation or management project, including whether enough baseline information exists to develop ecologically based management plans.
4. Defining management units for species of special concern, such as those that are threatened or endangered, have important ecological roles, have high commercial value or are crucial to local culture, or act as indicator species.
5. Determining what levels of resource use can be sustained and using which technologies.
6. Highlighting the sectors in which integration of resource management is required (i.e. where the utilization of one resource will affect another).
7. Monitoring to see if conservation objectives, both nature-centric and human-centric, are being met.

Scientifically based, process-oriented conservation will allow the opportunity to protect critical processes and allow human communities to continue to rely on vital ecosystems. Ecosystem management typically means looking at the functional linkages between the target ecosystem and habitats or ecological communities outside in order to define functionally viable management units (Kenchington and Agardy, 1990).

MPAs have the ability to build on the framework that already exists for applying the idea of adaptive management. Agardy (1997) lists two conditions that must apply for resource management to be adaptive: (1) an explicit feedback loop between science and the management must be maintained so that the management can be flexible and responsive to both environmental and social changes; and (2) management measures must provide a setting for experimental manipulation of regulations so that their effectiveness can be objectively tested.

MPAs can act as a means to preserve traditional uses of resources or space that have remained sustainable over time. In addition MPAs have the ability to establish management-science links and provide a laboratory for testing. Successful MPAs not only resolve local management issues but also provide examples of how to manage our impacts on the seas in regional and perhaps even global scales. MPA monitoring will provide the means to assess global change and field test theoretical models of global scale progress (Agardy, 1992) and certain areas within reserves or protected areas, such as protected core areas, could serve as necessary controls against which the rate of environmental deterioration can be gauged (Yurick, 1988).

MPAs can develop into a starting point for creating forums to resolve conflict and establish a basis for responsible use and attitudes (Kelleher & Kenchington, 1992). In this context an MPA will act as a publicly recognizable space, which allow users to become actively involved in planning and in management through partnerships between regulatory agencies and user groups (White & Palaganas, 1991). An MPA can be used to help provide a means to avoid the Tragedy of the Commons, as suggested by Hardin

(1968), which stated, "Ultimately, as population grows and greed runs rampant, the commons or resource that is shared by a group of people collapses". Also, MPAs will help foster a sense of stewardship for ocean resource space among the people who rely on the coastal system.

3.2 Management Goals of Marine Protected Areas

The ultimate goal of any MPA is marine conservation, which according to Agardy (1997), is determined by and includes:

> "the protection of critical ecological processes that maintain the ecosystem and allow for the production of goods and services beneficial to mankind, while allowing for the utilization of ocean space and resources that is sustainable in an ecological sense."

There are specific objectives and goals for an MPA establishment. Kelleher and Kenchington (1992), suggest that much of the scientific and sociological literature pertaining to MPAs and ocean conservation contains objectives for various types of protected areas. Jones (1994), suggests that the objectives are dependant on the whether they are scientific or economic based and included the following:

Scientific Based

1. Maintain genetic/species diversity
2. Promote research
3. Allow creation of educational and training areas
4. Conserve habitat and biota
5. Allow for base line monitoring
6. Protect rare/important species

Economic Based

7. Promote tourism and recreation
8. Promote sustainable development
9. Recognize exploited areas

10. Protect coastlines
11. Allow for alternative economic development
12. Preserve aesthetic value
13. Protect historic/cultural sites
14. Exert political influence or assert jurisdiction
15. Protect intrinsic and/or absolute value of an area

While scientific and economic activities are mutually exclusive, the management and regulatory regime of MPAs can mitigate these objectives.

Most MPAs will be established to accomplish several of the objectives listed above. To analyze the usefulness of MPAs and reserves as tools for management, it is important to recognize that these objectives have been proposed to meet a wide variety of goals. Typically, MPAs will be established to meet multiple goals, enhancing and optimizing the value of the area in the context of coastal and marine area management.

3.3 Objectives for Marine Protected Areas

Agardy (1997), further breaks down the objectives developed by Jones (1994), producing five broader goals dealing with human value of marine resources and obstacles involved in effective management of marine resources. First, MPAs deal with the potential social benefits to local communities. The creation of a new jurisdictional entity may empower local users who might not otherwise have a collective voice in local decision-making processes regarding resource use and allocation. The establishment of an MPA that involves local communities in planning and implementation often allow for more equitable sharing of benefits to the community that otherwise may not have existed.

The second objective is to establish a protected area as a tool to regulate levels of natural resource harvest. The idea is to enable development of an area or a resource and

allow it to be taken in a sustainable fashion. This is not a new idea and most communities involved in MPAs have expressed interest in the sustainable development of the area. This will allow sensitive or ecologically valuable areas to be preserved while allowing regulated use in other areas.

The third objective is to overcome the "out of sight, out of mind" phenomenon that plagues would-be stewards of the marine resource. This will provide a sense of place in which people can relate to. By delimiting a clearly defined, concrete and manageably sized area, protected area planners and managers can focus attention, concern and management resources on a particular site.

The fourth objective and one that is receiving much attention is in providing a testing ground for management. A testing ground would provide answers to questions that commonly arise about marine conservation. If management of marine and coastal protected areas can be undertaken efficiently and with maximum benefit to the users in an MPA, such management could be expanded to include larger areas that may include provincial, regional or even national coastal zones.

The final objective for designating MPAs is to allow such areas to act as buffers against unforeseen future management mistakes. This will allow managers to put the precautionary principle into practice (Gubbay, 1995). This area of protected resource will allow managers to conserve at least one type of ecosystem or habitat in perpetuity and even if uncontrolled development alters or destroys other similar areas, representative areas will be left intact. This will allow managers to err on the side of conservation and avoid irreversible extinction or degradation.

3.4 Marine Protected Areas as a Fisheries Management Tool

MPAs have become of great interest both as a fisheries management tool and as a tool for "integrated ocean management" (Charles, 2001), although fisheries enhancement was initially seen as a secondary benefit (Gregory and Brown, 1999). Many people once believed that the sea was inexhaustible and human activities, especially those associated with fishing, did not damage ocean resources (Davis, 1999). The truth is, however, that fishing can seriously impact fish stocks, even to the point of collapse (Bohnsack, 1996). In North America, many populations of exploited species are endangered and declining in size and number due to over-fishing. Habitat destruction is of particular importance to habitat specific species, which may deplete or extirpate local populations if heavily exploited (Musick, 1997), despite fisheries management efforts (Murray *et al*, 1999).

There is growing experience internationally in the use of MPAs to protect and sustain fisheries resources. It is an effective way to incorporate precautionary and ecosystem approaches into fisheries management. MPAs will provide two main arguments for their use as management tools. First, MPAs act as an insurance policy against management failures resulting from insufficient knowledge and understanding of the fishery system, lack of resources or political will to implement and enforce restrictions on catch and effort (Sumaila, 1998). Secondly, MPAs and other spatial controls on fishing activities can increase the net sustainable value derived from the resource beyond that which can be achieved with a non-spatial management system (Auster and Shackell, 2000). Weakness in both arguments emerge when they are moved from theory to application of MPAs, and the use of MPAs in fisheries management raises

broader questions concerning the data and models currently relied on to provide management advice (Holland, 2000).

Sumaila and Charles (2002), go on to state that on one hand, an MPA can be used for specific fishery management ends such as; restricting the fishing fleets impact on a fish stock, protecting an ocean area where a certain fish population spawns or an area where juvenile fish congregate. But, on the other hand, MPAs often involve much more than fisheries. This may require an MPA to be subdivided into zones to provide protection for a coral reef, allow opportunities for fishing in other areas, yachting and recreational activities, and general purpose areas. This is an example of the dual nature of MPAs in which there is a focus on fisheries matters but also on the role of multi-use marine management. Analyzing maps creates a broader set of issues to be addressed than is the case with most management measures that focus solely on the fishery, such as total allowable catches (TACs), quotas, effort controls, gear restrictions and limitations. It is believed that the use of MPAs in fisheries is an effective means of protecting resources for the future by reducing fishing pressure, increasing abundance, size, weight and diversity of fisheries resources (DFO, 1999a).

From a fisheries management point of view, the function of an MPA is to change or pre-empt the distribution and likely the overall level of fishing effort in space and time. MPAs are also likely to change the relative level of fishing mortality across an age class of a given species either as a direct consequence of differences in the abundance of a species inside and outside the area of closure, or due to changes in the targeting behavior of fisherman (Holland, 2000). MPAs can be expected to provide protection for species

inside the boundaries of a protected area, but we can also expect increased pressure on stocks and habitat outside the MPA. Caution in selecting the site for an MPA should be considered due to the fact that incorrectly placing an MPA may actually increase the risk for depletion or total collapse of the fish stock, and can easily reduce the sustainable value of the system of fisheries it impacts (Parash, 1999). Alternatively, correctly selected MPAs may ultimately result in an increase in harvestable fish in waters outside the MPA. The overall economic benefits of an MPA will depend not only on the size, shape and location of the protected area but also the physical, biological, socioeconomic and regulatory characteristics of the fisheries in and around it.

Chapter IV: Economic Model for a Marine Protected Area

4.1 Economics of a Marine Protected Area

The economics of MPAs allow the opportunity for academic, government and private sectors to share ideas, information and modeling related to economic analysis of MPAs as tools in fisheries management and marine ecosystem conservation (Sumaila and Charles, 2002). Hoagland *et al.* (2001), explains that the primary focus of MPAs from an economic scale is on the conservation of marine living organisms and their habitats, as well as ecological systems and functions. This is accomplished through the regulation of "extractive" or potentially polluting commercial uses such as fishery harvests, waste disposal and mineral development, among others. The establishment of an MPA is one of the ways that the benefits of natural areas can be preserved, however many of the benefits are difficult to measure economically because they are not directly exchangeable in markets.

The economic aspects of MPAs is a subject that has only recently received the attention of environmental economists who report that access restrictions are "potentially justifiable" when the benefits of these restrictions outweigh the costs (Farrow, 1996). Biological criteria are often used as an argument for conservation, and many economists would argue that economic arguments carry the most weight for development planners, aid agencies and government (Dixon and Shermen, 1990). Because the benefits of MPAs are often difficult to measure, this makes the determination of the economic value of a protected area very elusive. An understanding of the benefits and costs can help to ensure

that efficient resource management and sustainable economic development are a part of the MPA in question (Hoagland *et al.*, 1995).

Traditional economic analysis does not take into account the social benefits of a region or the potential future benefits obtained from natural products or the persecution of alternative fisheries. As such, the long-term economic values of conservation in MPAs are often unavailable, so the short-term exploitation of biological resources will often appear more attractive (Dixon and Sherman, 1990). Also, traditional analysis does show that greater financial returns would be gained from putting these regions to an applied use rather than maintaining them in a natural state.

The problem with assigning economic values to MPAs has been allayed by the development of numerous techniques that allow valuation. A summary of these techniques as suggested by Dixon and Sherman (1990) include: (1) Those based on market prices, which changes the quantity and quality of goods that are exchanged in the market (2) Those based on surrogate market prices, which estimate the value of environmental goods by using the price paid for a closely associated good (3) Those that are based on surveys, where values are assigned based on survey responses (4) Those that are cost based in nature, which focus on the costs if areas were converted to alternative uses.

These techniques are useful but are only estimates and therefore subject to many criticisms. However, the nature of these benefits prevents the derivation of a more precise evaluation (Billard, 1998).

4.2 Economic and Biological Benefits of Marine Protected Area Design

Traditionally, marine conservation has been based on ecological concerns and goals. As human pressure on marine and coastal ecosystems has intensified, economic approaches have come to play an increasingly important role in the establishment and operation of MPAs (Salm *et al.*, 2000). It is now recognized that questions of financial viability and economic stability are of central importance to the success of MPAs.

Economics and other social science models have a major role to play in the design, implementation and evaluation of MPAs. These areas have been proposed as an insurance policy against fishery mismanagement and as an integral part of an optimal management system for some fisheries (Holland, 2000). A wide range of models have suggested that MPAs will be most effective for species that are relatively sedentary as adults but produce offspring that disperse widely. Adult spawning stocks will be secure from capture in reserves, while their offspring disperse freely into fishing grounds (Roberts & Sargant, 2000). Species include reef fish, mollusks and echinoderms, and models typically indicate that when they are over-fished, catches will be higher with reserves then without. In contrast, the same models also demonstrate that MPAs are ineffective for animals that are mobile as adults such as cod, tuna and herring. They are trans-boundary fish and become vulnerable when they move outside the protected area. New models need to be developed that incorporate habitat and behavior to better explore the utility of MPAs for mobile species.

Direct value uses of MPAs come from the contact consumers have with fishery products or tourists have with the marine environment (Crosby *et al.*, 2000). MPAs can

improve fish yields through the protection of spawning stocks, enhancing recruitment and the spillover effect of the adults into nearby waters. This can contribute to the local communities by improving the commercial and recreational fishery and by providing great opportunities for tourism operators who provide this to the public. In addition, the products that can come from a protected and sustainable area are numerous, including marine plants and animals, cosmetics, food, industrial chemicals, dyes and construction materials (Crosby *et al.*, 2000).

An incorrectly designed MPA can increase the risk of depletion of some species and can reduce the value of the system of fisheries it impacts. MPAs may also alter structural processes that relate fishery outcomes to management variables and thereby compromise the models that are used to guide decisions. Up to date models and continued data gathering initiatives are imperative to the success of any MPA. The caution point to any model is that it lacks realism to effectively gauge MPA effects on migratory species (Roberts & Sargant, 2000). The models usually assume that individuals are homogeneously distributed in a uniform sea and move randomly and they also assume that fishers hunt at random. This is not the case at all. Also models have not, or have rarely taken into account the possible benefits from improvements in habitat in MPAs such as increased biomass and the complexity of bottom changes, which could alter fish movement patterns and reduce natural mortality rates in ways that enhance reserve benefits (Auster & Langton, 1999).

4.3 Economic Costs of Maintaining a Marine Protected Area

It is often difficult to justify the existence of an MPA on biological and ecological concerns alone. Coastal communities need to earn a living, marine based industries need raw material and other infrastructure and governments need to generate income, employment and foreign exchange, as well as win votes. Approval for the establishment of an MPA does not depend on the decisions of conservation or environmental protection agencies but must be acceptable to other economic and political interests. MPAs must be seen as financially and economically attractive options to government sectors, private industry and human populations who live in the region and must be justified in social, economic and development terms.

Dixon (1993), stated that in any economic analysis of costs, there are three different aspects that must be considered: (1) Direct costs (2) Indirect or External costs and (3) Opportunity costs. Dixon and Sherman (1990), suggest that indirect costs are those directly related to the establishment and the on-going management of a protected area. Indirect or external costs are these borne by the public as a result of establishment and daily operation of protected areas (Dixon, 1993). Opportunity costs are those represented by the loss of benefits that may potentially result from protecting the region in question rather then exploiting it (Dixon and Sherman, 1990). Examples of the three economic costs are summarized in Figure 1.

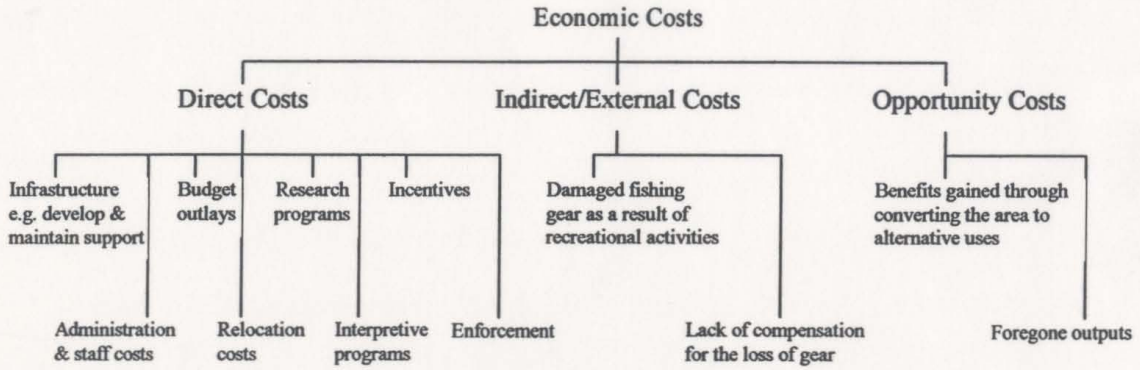

Figure 1. Examples of the economic costs that may be accrued within MPAs (Dixon and Sherman, 1990 and Dixon, 1993).

Economic valuation has proven to be an extremely useful tool in providing the broader justification for the establishment of MPAs. But, due to the costs involved in the layout of the funds for the establishment and management of MPAs, they fall subject to external pressure when resources are considered to be scarce (Dixon and Sherman, 1990). As a result this may jeopardize the initiative in establishing such an area. On the other hand, due to the nature of the indirect or external costs, which are normally spread over a number of individuals, this makes it difficult for those with questions to express their concerns in an organized manner. Opportunity costs can play an important role in the political decision-making, regardless of their extent (Dixon and Sherman, 1990).

The difficulties that are outlined above make it evident that creating an MPA on a purely economic basis is by no means a straightforward endeavor. In fact, in most cases, when the quantifiable benefits and costs are calculated, the benefits are frequently less than the costs (Dixon and Sherman, 1990). If the quantifiable benefits were greater than the costs the decision to establish these regions would be an easier one. This is rarely

true. Some of the points that are important for management to keep in mind in terms of the economic benefits and costs of these types of regions as summarized by Dixon (1993) include:

- MPAs can preserve biodiversity while continuing to generate economic benefits either through sustainable fishing practices, recreational uses or tourism activities.
- There is, however, a limit to the maximum sustainable economic and ecological uses of these regions.
- Management costs of these regions will more than likely be small compared to the potential benefits of these regions.
- User fees can be implemented to offset costs, though these may be met with public resistance.
- Any developments should be planned to provide a large proportion of the economic benefits to the public.

Economic variation highlights that MPAs are much more than a static biological or ecological pool of resources, but should be rather seen as stocks of natural capital, which if properly managed, can yield a wide range of economic benefits to human populations (Salm *et al.*, 2000). Often these values are far higher than the income accruing from unsustainable exploitation and development. If these points are considered in the management of an MPA, then the areas should be able to remain economically viable while continuing to protect the resources they contain.

Chapter V: The Role of the Community in Establishing a Marine Protected Area

5.1 The Importance of Public Support

In the past decade it has become obvious that coastal resource conservation benefits from decentralization of authority. This approach succeeds because empowering communities works better than commanding them (Clark, 1998). The importance of achieving public support for any protected area has been recognized with increasing frequency in government policies worldwide (Gubbay, 1995). It is important that any Marine Protected Area have the support of the local community, for without the cooperation of local residents that are most affected by its development, the concept cannot work (Brown and Pomeroy, 1999). Collaborative management requires networking and forging links to community leaders, local law enforcement, private business, government agencies, tourism, environmental and fishery agencies.

Federal Canadian agencies have realized the potential for conflict between local users with the establishment of any MPA and they have worked to develop methods to prevent conflict (Wells and White, 1995). Such preventive measures include encouraging stakeholder consultation, public awareness programs and providing forums to address concerns. MPAs must have the encouragement of the local community to be successful and allow for the necessary first step toward an attitude shift that is needed to save the oceans from further devastation and ruin (Agardy, 1997). The ocean is considered as "common property" and as a result there are issues with defining the boundaries of an MPA as the fluidity of the ocean makes it almost impossible to define and allow for the

allocation of property rights. The idea of common property along with the economic dependence of a community on the marine resources has been a form of protest by individuals and communities who will be affected by the development of an MPA (Wells and Brandon, 1993). Exploring the economic benefits and costs of an MPA in straightforward a manner as possible can help to achieve the support of harvesters because economic sustainability is generally the bottom line (Lien, 1998).

Public support is essential for the success of any MPA and is usually achieved though involvement of the public at different stages in both the establishment and management processes. Involving the fisher committees is perhaps the most vital aspect and is considered essential in ensuring the success of the process due to their attachment to the resource and it is imperative that managers make an effort to listen and understand the opinions of the fishers (Lien, 1998).

Securing the support of the local community requires more than simply raising their awareness of issues. To ensure a sense of ownership communities should participate in all stages of planning including resource assessments, identifying problems and defining actions to resolve them and formulating and approving a management plan. The communities need confidence that the management authority and MPA are there to help them. They also need confidence that the risks involved with change are manageable and worthwhile in the time context of their needs. Empowerment is another aspect of gaining community support. The community needs to know that support from the management authority, provision of exclusive rights to resources under their management and formal recognition of their role in resource management and harvest will reward their efforts.

5.2 Public Awareness

The success of conservation management often depends on local public support which is seen as a sign of understanding conservation objectives and can lead to adherence of MPA rules by the local population.

General conservation awareness is needed among all stakeholders and the most important goal is to explain, through public information and education, the long-term sustainable benefits that conservation can provide (Salm *et al.*, 2000). Awareness through education of the public is essential and should aim to provide the community with information and conservation ethic so that its members can make informed decisions about the use of their resources and should not be used as a propaganda tool to promote the MPA program. Participatory socioeconomic and resource assessments at the beginning of site identification and planning create a good foundation for starting work with a community. This will help in clarifying the critical issues and identifying their priorities.

5.3 Education as a Mechanism in Achieving Public Support

Education and awareness is fundamental in achieving the support of any conservation project and in many cases the responsibility lies with the sponsoring government. It is the government's responsibility to show the affected individuals and regions the benefits of such development (Atmosoedarjo *et al.*, 1982). Education should be ongoing throughout the establishment and management of an MPA and is most effective when the community is involved. Providing the residents with a sense of stewardship and responsibility for the environment and their livelihood (Agardy, 1997)

will promote better attitudes and pride toward the marine environment and help gain local support. Also, if residents are aware of the direct benefits such as the economic return predicted and the understanding of the possibility of improved fisheries through the establishment of a protected area, this will assist in gaining public support and acceptance.

Salm *et al.* (2000) state, "the education of local area stakeholders is usually done through one of two means: (1) A multifaceted approach, combining printed materials, audio-visual presentations and face-to-face interaction is probably the best way to start a specific education program. (2) For a general education program, a variety of additional options can be employed including: mass media, fixed exhibits, tours, training workshops, the sale of promotional items such as T-shirts and informal recreational activities with an educational focus."

5.4 Community Involvement

Community participation has many different interpretations and applications, ranging from just informing communities to encouraging full partnership in resource assessments, planning and management (Beaumont, 1997). Involving the community in a "bottom up" approach, and being collaborative in the development of a MPA, will prove to be more beneficial than the traditional "top down" approach used by officials in past fisheries management approaches (Brown and Pomeroy, 1999). Involving the affected community in the initial stages of the planning process is also seen as an effective means of reducing potential conflict (Andersson and Nagazi, 1995). Local residents have knowledge of the traditional resource and ecosystem, which can be important in

developing a management and enforcement plan for the area. This will ensure that the public is involved in the implementation process and has an understanding of what this means to them.

Involving the public has a number of potential benefits and community residents can be valuable with regard to potential management problems and resource information (Neis *et al.*, 1996) and the involvement of the community should and can be regularly encouraged through a continuous feedback system. Although involving the community may become as expensive as running an MPA entirely through the government, the rate of success is much higher and more long-term when the community is involved in the initiative (Wells and White, 1995).

Chapter VI: The Canadian Government's Marine Protected Areas Program

6.1 Departmental Responsibilities for Marine Protected Area Establishment

The objective of the MPA program is to conserve and protect areas and resources of special interest. The Oceans Act ultimately provides the Department of Fisheries and Oceans Canada (DFO) with a leadership role for coordinating the development and implementation of a national network of MPAs. Within Canada there exists a spectrum of legislative and policy tools to manage and conserve Canada's marine resources. MPAs have become increasingly regarded as a valuable conservation tool, which can contribute to the improved health, integrity and productivity of ocean ecosystems.

However, there are no automatically excluded activities in MPAs created by DFO, unlike National Marine Conservation Areas (NMCA) created by Parks Canada that are protected from such activities as ocean dumping, undersea mining, and oil and gas exploration and development. Both MPA and NMCA sites are individually managed and each may look quite different - some may be strict no-take zones, while others may be sustainably managed zones. The threats and conservation requirements of each site are determined on a case-by-case basis and the management measures necessary to achieve the conservation objectives are site dependent. This system of different but complementary programs contributes to a broader comprehensive network of MPAs and is designed to conserve and protect Canada's natural and cultural marine resources.

6.1.1 Canada's Oceans Act and Purpose

On January 31, 1997, Canada established its commitment to the marine environment by adopting the Oceans Act (DFO, 2000). The Act positions Canada to move to a more integrated national oceans management approach based on sustainability, the precautionary approach, and the integration of activities occurring in and impacting on Canada's oceans. The Oceans Act also sets the framework for an ecosystem approach to the management of Canada's oceans and oceans resources. An MPA under the Oceans Act (1996) is defined as:

> *"Any area of the sea that forms part of the internal waters of Canada, the territorial sea of Canada (12 nautical miles) or the exclusive economic zone of Canada (to 200 nautical miles); and that has been designed for special protection under the Oceans Act."*

Canada has made progress toward sustainable management of oceans through a range of complementary initiatives, some of which have been facilitated by the Oceans Act. These include reforming and revitalizing traditional arrangements for oceans management with an approach that emphasizes responsibility, leadership, participation, coordination and cooperation. The Act further seeks to reduce redundant or fragmented management, to ensure the participation of key stakeholders, and to forge cross-sectoral linkages.

The purpose of this Act was to provide Canadians with the tools they needed to develop a Canadian Oceans Strategy that was based on three main principles; (1) sustainable development that meets the needs of the present without compromising the ability of future generations to meet their own needs, (2) integrated management, which is an ongoing approach, brings together interested parties to incorporate social, cultural,

environmental and economic values and (3) the precautionary approach recognizes that caution must be exercised to safeguard our oceans. This means taking action to conserve and protect the oceans when scientific information is lacking or incomplete (DFO, 2000).

6.1.2 Canada's Ocean Strategy: Framework for Modern Oceans Management

Canada's Ocean Strategy was developed in 2002 within the realm of the Oceans Act and was established to ensure a healthy, safe and prosperous ocean for the benefit of both current and future generations of Canadians including: coastal communities, social, cultural, environmental and economic organizations, aboriginal groups, governments and other interested parties or stakeholders (DFO, 2002). This would allow these individuals to work together and develop an integrated management plan in order to balance social, cultural, environmental and economic values to ensure sustainable development, manage increasingly complex and diverse socioeconomic uses of Canada's oceans. Also, to engage communities and stakeholders in making decisions that affect them and their environment.

Canada's MPAs provide special protection to living marine resources and their supporting ecosystem. These areas or resources believed to be in need of special protection may be proposed by coastal communities, environmental, social or economic organizations, aboriginal organizations, governments or any other individual or group. Also, MPAs may be established for the conservation and protection of commercial or non-commercial fishery resources and their habitat, endangered and threatened marine species and their habitat, unique habitat, marine areas of high biodiversity and biological

productivity and any other marine resource or habitat requiring special protection (DFO, 2000).

Since the Oceans Act names the Minister of Fisheries and Oceans as the lead federal authority responsible for oceans, DFO leads in the development of a national system of MPAs, incorporating the Parks Canada programs (DFO, 1999a). The responsibility for establishing and maintaining this network is a shared between both departments (Table 1.).

Table 1. Department of Fisheries and Oceans and Parks Canada's Marine Protected Areas strategy.

Description	Agency	Objective
National Marine Conservation Areas (*Marine Conservation Areas Act)*	Parks Canada	Managed marine areas for sustainable use, containing smaller zones of high protection, established to represent and demonstrate how protection and conservation practices can be harmonized with resource use in marine ecosystems.
Marine Protected Areas *(Canada's Ocean Act)*	Department of Fisheries and Oceans	Protect and conserve commercial and non-commercial fisheries resources, including endangered or threatened species, areas of high biodiversity or productivity, unique habitats and marine mammals and their habitats.

The Department of Fisheries and Oceans and Parks Canada work to establish and manage a network of MPAs. These programs incorporate a variety of MPA approaches with varying levels of protection and purposes. The protected areas designated by each agency serve somewhat different purposes, but each has conservation of the marine environment

as a central focus (DFO, 1997). These include highly protected areas, multiple-use areas, representative areas, areas to protect high biodiversity or productivity, unique habitats, endangered or threatened species or key ecosystem components.

6.1.3 National System of Marine Protected Areas

Canada's marine ecosystems are vast and diverse, supporting many different activities; therefore MPAs must satisfy a range of needs in a variety of jurisdictional settings. Integrated management is an ecosystem-based approach that aims to ensure the sustainable development of coastal and marine resources. To this end, the Oceans Act provides basic authorities for the establishment of MPAs; the establishment and enforcement of marine ecosystem health and marine environmental quality guidelines, criteria, and standards; and the establishment of integrated management plans for activities in or affecting Canada's oceans.

The Oceans Act sets out the obligation to develop a national strategy for oceans management. This strategy will include coordinating an overall MPA program that will be administered and implemented by federal departments or agencies with mandated responsibilities to establish and create protection.

To ensure that MPAs are a part of a comprehensive initiative to protect the health and function of marine ecosystems, they are being developed and established within a context of integrated management planning. Such planning considers the protection of each area in light of both environmental and socio-economic benefits. A coordinated approach, as directed in the Oceans Act, will ensure that the federal government will work together with provincial and territorial governments, as well as with individual

communities, to advance marine conservation in an efficient and effective manner (DFO, 1998).

The Oceans Act provides the coordination and planning framework that enables key stakeholders to help create an overall system of protected areas for Canada's estuarine, coastal, and marine waters.

6.2 Department of Fisheries and Oceans: Goals and Code of Practice

The recent increased growth in Canada's ocean sector has resulted in increased pressures on the ocean environment and in many regions the biodiversity and ecological integrity of marine ecosystems are being threatened (DFO, 1998a). As a result of this increased growth there is a need for a proactive approach to conserve and protect marine ecosystem functions, species and habitats for future generations.

The Department of Fisheries and Oceans, under the authority of the Oceans Act, can establish Marine Protected Areas in marine waters under Canada's jurisdiction for any reason pursuant to the mandate of the Minister of Fisheries and Oceans (DFO 1999a). Section 35(1) of the Oceans Act (DFO, 1999) describes the reasons for which an MPA can be established under the Oceans Act:

An area of the sea...(that) has been designated...for special protection for one or more of the following reasons:

(a) The conservation and protection of commercial and non-commercial fishery resources, including marine mammals and their habitats;
(b) The conservation and protection of endangered or threatened marine species, and their habitats;
(c) The conservation and protection of unique habitats;
(d) The conservation and protection of marine areas of high biodiversity or biological productivity; and

(e) *The conservation and protection of any other marine resource or habitat as is necessary to fulfill the mandate of the Minister (of Fisheries and Oceans).*

The designation of MPAs will compliment existing conservation and protection measures under the Fisheries Act.

The goal of the Department of Fisheries and Oceans MPA program is to proactively conserve and protect the ecological integrity of the MPA site while providing for compatible use, to further scientific knowledge and understanding of protected and unprotected marine ecosystems and to contribute to the social and economic sustainability of coastal communities (DFO, 1997). The DFO have stated that:

> "...during the implementation of the MPA program the department will adhere to the defined objective and goals of the program in establishing an MPA in a fair and transparent manner. The development of an MPA should adopt the principles of sustainable development, integrated management and the precautionary approach in decision-making and base decisions on the best available scientific information and traditional ecological knowledge. The department has mandated to adopt an ecosystem approach to planning, establishing and managing an MPA and they will plan and establish the area with the active participation of all interested parties while building upon existing programs and community structures. The program will be coordinated across jurisdictions and organizations to reflect the structure and functions of the marine ecosystem and its interaction with the land and will promote the use of partnering arrangements on managing the MPA..."(DFO, 1997).

There will be a need to continuously evaluate the design, management and effectiveness of the designated MPA on a regular basis to ensure that they are achieving their goals.

6.2.1 Objective of The Marine Protected Areas Program

The DFO has established MPAs to protect and conserve living marine resources, including critical fish and marine mammals and supporting habitats, endangered and

threatened marine species habitat, unique features and areas of high biological productivity or biodiversity (M.J. Comfort 2004, Personal Comm.). DFOs MPA program does not propose any single method of conservation and protection for proposed areas. This flexible approach maintains a balance between protecting an area ecologically, while supporting sustainable development, where possible. The MPA program seeks to examine and assess the ecosystem as a whole and develop tailor-made measures to ensure the conservation and protection of a specific aspect or species requiring protection (DFO, 1998a).

The DFO MPA program management plans are developed for individual MPAs through effective partnering with local resource users, interested and affected parties using the concepts of integrated management. Effective partnering means the DFO seeks the support of federal ministers, boards and agencies, provincial and territorial governments, coastal communities and other bodies and this cooperation is encouraged though all steps of the process.

The success of this program depends ultimately on the ability of various interests to work together through the gathering of information, development of public awareness of environment issues, conducting research and enforcement of regulations. The level of responsibility designated to organizations is dependant on the specifications or purpose of the MPA and its geographical location. MPAs under DFO will not necessarily be put in place for perpetuity and over the long term may be un-established if they have achieved their purpose; for example, when a species is no longer endangered or threatened (DFO, 1998a).

6.2.2 Framework for Establishing a Marine Protected Area

DFOs National Framework for the establishment and managing of protected areas provides the necessary steps (Appendix A). This guideline does however allow for flexibility in establishing and managing MPAs and may develop specific guides to suit local marine conservation and protection needs (DFO, 1999a). The establishment of an MPA is a six-step process (Figure 2), although additional steps in the establishment process may be necessary depending on the regional demographic. Once a site has been recommended for establishment it is then referred to as an MPA candidate site.

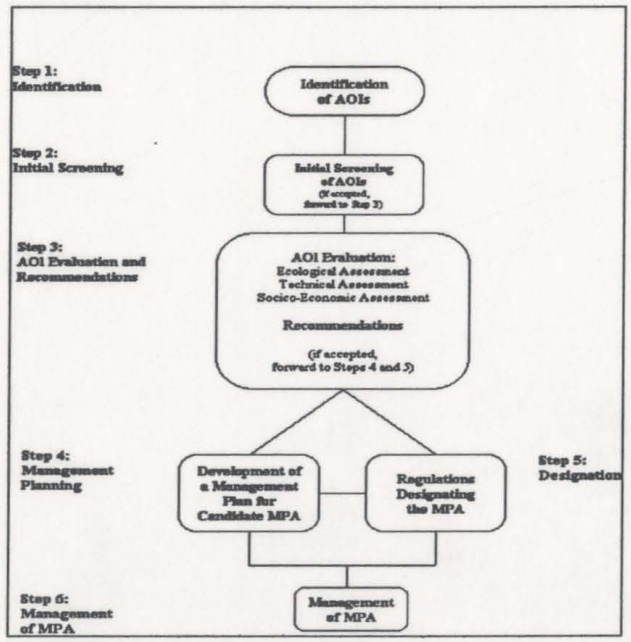

Figure 2. Framework for Establishing and Managing MPAs under the Oceans Act. Source DFO (1999a)

Establishing an MPA under DFO can be a complex multi-year process of consultation, information gathering and building of collaborative arrangements with stakeholders before becoming designated. As each MPA is different it will involve a learn-by-doing approach to development and following the principles of conservation, while at the same time developing and adjusting the overall MPA design based on this experience.

6.3 Parks Canada and National Marine Conservation Areas

Parks Canada Agency has established National Marine Conservation Areas (NMCAs) to protect and conserve a representative sampling of Canada's natural and cultural marine heritage and to provide opportunities for public education and recreation. NMCAs are a Parks Canada modification of the MPA concept and are considered multiple use areas and will be zoned with varying levels of protection, including an obligatory totally protected core (Parks Canada, 1997).

Parks Canada is responsible for setting up a national system of Marine Protected Areas, the NMCA program, to represent the full range of marine ecosystems found in Canada's Atlantic, Arctic and Pacific Oceans and the Great Lakes. Parks Canada has a responsibility, both at the national and international levels, to protect examples of its marine heritage.

Parks Canada (1997) has identified an NMCA as:

> *"A national marine conservation area is a marine environment which is managed for sustainable use. It includes everything from the seabed, including the sub soil, to the surface of the water and includes the living resources within that environment. The emphasis is on the ocean, although*

wetlands, river estuaries, uninhabited islands and some small amounts of coastal land may be included."

The Parks Canada concept allows for harvesting activities that are considered to be part of the region as long as they subject to "...protecting the conservation areas ecosystems, to maintaining viable stocks and to attaining the purpose and objectives of the Marine Conservation Area" (Parks Canada, 1998). This is considered necessary within the Parks Canada policy for these regions to be successfully implemented and to continue to support traditional harvesting activities responsible for local economic development.

Because many human uses continue within their boundaries, NMCAs do not try to protect marine ecosystems in a state essentially unaltered by human activity, which is the primary goal for national parks. NMCAs focus instead on ecologically sustainable use, which means harmonizing conservation practices with human activities. This approach involves working closely with others who use the coastal area and the water and striving to reach common goals - most importantly a healthy, sustainable ecosystem.

Human uses such as fishing and commercial shipping, for example, are allowed in NMCAs. But they would be limited or even eliminated from zones protecting sensitive features such as nesting areas, spawning beds, whale calving areas and cultural sites. And they would be carefully managed to protect the greater ecosystem. Other activities, namely ocean dumping, undersea mining and oil and gas exploration and development, are not permitted in a NMCA.

6.3.1 Goals for Parks Canada's National Marine Conservation Areas

According to Parks Canada (1998) the ultimate objective of a National Marine Conservation Area is as follows:

> *"To protect and conserve for all time national marine areas of Canadian significance that are representative of the countries 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."*

Waters of the Atlantic, Pacific, and Arctic Oceans - out to 200 nautical miles - and Canada's Great Lakes waters have been divided into twenty-nine marine regions. The long-term goal is to establish NMCAs representing each region.

The goals for establishing any NMCA has been outlined in the Parks Canada Policy (Parks Canada, 1995) and the program is designed to:

- Maintain marine ecological processes and life support systems
- Preserve biodiversity
- Serve as models of the sustainable use of both species and ecosystems
- Facilitate and encourage marine research and ecological monitoring
- Protect depleted, vulnerable, threatened or endangered species or populations
- Preserve habitat that are considered critical to the lifecycles of economically important species
- Provide for marine interpretation and recreation
- Contribute to a growing worldwide network of Marine Protected Areas

6.3.2 National Marine Conservation Areas

National Marine Conservation Areas are marine areas managed for sustainable use and containing smaller zones of high protection. They include the seabed, the water column above it and they may also take in wetlands, estuaries, islands and other coastal lands. NMCAs are established under the Canada National Marine Conservation Areas Act (2002) Section 4(1):

> *"Marine conservation areas are established in accordance with this Act for the purpose of protecting and conserving representative marine areas for the benefit, education and enjoyment of the people of Canada and the world."*

Established NMCAs demonstrate how protection and conservation is the main objective and can be harmonized with other resource use in marine ecosystems, such as traditional fishing. Their management requires the development of partnerships with regional stakeholders, coastal communities, provincial or territorial governments and other federal departments and agencies. NMCAs are established in a manner set out in the *Canada National Marine Conservation Areas Act* and guided by the national system plan (Appendix B). Parks Canada's goal is to eventually become established in each of the twenty-nine marine regions and its current focus is directed toward non-represented regions.

6.3.3 National Marine Conservation Area Zoning

Parks Canada maintains and monitors an NMCA system of zoning, which defines different levels of use and protection that can potentially be applied to a region and referred to as Zones 1, 2 and 3 respectively (Parks Canada, 1998):

Zone 1

These are regions are singled out for preservation and the harvesting of renewable resources is not permitted and visitors are restricted from the area. Construction of permanent structures within the regions is also prohibited. Zone 1 regions are selected based on any of several criteria including whether they are considered critical to the survival of threatened or endangered species, particularly sensitive to human activities, ecologically unique or of historical significance.

Zone 2

This designation defines regions that are singled out for the components of their natural environments. A Zone 2 designation prohibits fishing activity, although small amounts of research and public education are permissible with minimal support facilities. Zone 2 regions also include those that surround Zone 1 regions and regions where public education is an integral part of both environmental monitoring and research activities.

Zone 3

This region is considered a conservation area and fishing activity is permitted as long as the basic function of the ecosystem is maintained and hunting activities will be permitted at a conservation level. Permanent facilities to support public education activities will be permitted within the region.

All NMCAs will contain a core of both Zone 1 and 2 and that all zones of NMCAs can potentially be closed, if at any point in time they may require greater protection (Parks Canada, 1998).

Chapter VII: Summary, Conclusion and Recommendations

7.1 Summary and Comparison of DFOs and Parks Canada's Marine Protected Areas Programs

The management of Canada's marine ecosystem is a shared responsibility and it is therefore essential that different interests work together to ensure the conservation and protection of these areas. A national system of MPAs is being established between DFO and Parks Canada and both have mandated responsibilities that have a shared common objective: to further conservation and protection of living marine resources and their habitats (1998). Each contributes from its own particular focus. This means of coordinating the policies and programs of prospective sites between the agencies will ensure that the integrity and health of Canada's estuarine, coastal and marine waters will be better maintained.

The objective of both Parks Canada and DFO ultimately is to conserve and protect marine environments (Table 2). Parks Canada uses National Marine Conservation Areas to protect and conserve, for all time, marine areas of Canadian significance that are representative of the country's ocean environment and Great Lakes. Parks Canada's initiatives provide protected areas and conservation to encourage public understanding, appreciation and enjoyment of marine heritage so as to leave it unimpaired for future generations. The Department of Fisheries and Oceans Marine Protected Areas initiative offers protection and conservation that incorporates sustainable management of natural resource extract such as commercial and non-commercial fisheries.

Table 2. Comparison of Parks Canada and the Department of Fisheries and Oceans Marine Protected Areas programs.

Agency	Parks Canada	Department of Fisheries and Oceans
Designation	Marine Conservation Areas	Marine Protected Areas
Legislation	National Parks Act	Oceans Act
Overall Purpose of MPA Program	- Protect and conserve for all time marine areas representative of Canada's oceanic and Great Lakes environment and encourage understanding, appreciation and enjoyment of marine heritage, while ensuring long-term integrity	-Conserve and protect marine ecosystems, species and habitats -For purposes of integrated management, DFO will lead and coordinate a national system of marine protected areas on behalf of the Government of Canada
Primary Objectives	-Representation of marine natural regions (physical/biological/cultural) -Conserve/protect -On-site interpretation -Public education -Sustainability -Research	-Conserve/protect: -Marine resources -Species and habitats -Endangered species and habitats -Unique habitats -Areas of high productivity -Biodiversity -Sustainability
Secondary Objectives	-Endangered species and habitats -Unique habitats -Biodiversity -Productive areas -Monitoring	-Research -On-Site interpretation -Public education -Monitoring
In Perpetuity	Yes	No
Finite System	Yes	No
On-Site Management	Yes	No
General Prohibitions	-Non-renewable resource exploration and extraction -Ocean dumping	None
Management of Activities	-Zoning	-Prohibition of classes of activities depending on site and reason for establishment
Management	-Management plan -Regular management plan review -Management advisory committee	-Management plan -Regular management plan review
Management Plans Tabled to Parliament	Yes (amended plans subsequent to review)	No
Establishment	-Order-in-Council with Parliamentary review	-By regulation
Report to Parliament	Yes -"State of NMCAs" every two yrs	No
Consultations	-Establishment stage: -Feasibility study -Negotiation of agreement -Management plan & yearly review -Regulation development	-Establishment stage -Management plan -Regulation development -Management plan review
Agreements	-Generally, agreements negotiated with provincial/territorial governments, federal depts. Aboriginal groups	Yes

Partnerships and public involvement are defined as cornerstones of public planning and management practices in assuring sound decision-making, building public understanding and providing the public with opportunities to share their views, expertise and suggestions. The partnerships are also built and supported by federal ministers, boards and agencies, provincial and territorial governments and coastal communities. Cooperation between all members is encouraged during all steps of the framework. Without the support of the public and effective partnerships among all levels, both DFO and Parks Canada realize that they would be ineffective in establishing an MPA. One component of the consultation process is that The DFO offers a chance for the public to relay suggestions and recommendations on the establishment and management of an MPA. Parks Canada has also included the public consultation process as an important element in the selection, feasibility assessment and management of its NMCAs.

Public education is a technique used by both Parks Canada and the Department of Fisheries and Oceans to gain support. Education is conducted through a general education or a multifaceted approach and is ongoing throughout the establishment and management of the MPA, providing a sense of stewardship to residents. When dealing with public education and interpretation of NMCAs, Parks Canada works to establish marine conservation through public education and activities that will provide visitors with accurate information and provide opportunities to learn about unique marine environments. Here the emphasis is placed on educating visitors about the importance local residents place on the marine environment through on site interpretation. DFO considers education and awareness of ongoing MPA work as the utmost importance. The

department uses its science background to aid in gaining support and generating an understanding of its MPA concept through public meetings, brochures, web sites and education videos. The awareness and education component of MPAs differs in materials used for different audiences such as schools, resource users, and government agencies.

There are similarities between both Parks Canada's and DFOs ecosystem approaches. Both the DFO and Parks Canada recognize that there is many uncertainties involved in managing NMCAs and MPAs and have cited the need to incorporate a "learn by doing" approach in their efforts to successfully engineer the areas in question (DFO, 1999). Both systems recognize the need for public support as an integral part of the management plan and each site is managed on a case-by-case basis with a formal written plan outlining appropriate management requirements.

The Minister for the Department of Fisheries and Oceans is responsible for leading and coordinating the development, implementation, planning and management considerations for the MPA program on behalf of the Government of Canada. The Department recognizes the importance of including all affected parties and that gathering local support and cooperation of other agencies is a critical element of MPA success. Management groups responsible for the MPAs consist of interdisciplinary and cross-sectional planning teams who work cooperatively in effective partnering arrangements, jurisdictional coordination and enforcement capabilities where they have jurisdiction. The DFO is ultimately responsible for coordinating MPA activity back to the community including; overlapping and complex jurisdictional arrangements, establishing coordination among inland, coastal and marine management regimes, along with

establishing roles and processes for public and stakeholder involvement in marine and coastal management.

DFO has also made a commitment to a number of management tasks including: conducting consultations and developing partnering arrangements with interested stakeholders; cooperation and coordination amongst all federal agencies; establishing procedures for accepting nominations for proposed MPAs as a means of identifying possible priority sites; conducting regional overviews of resources and developing criteria for the selection of candidate sites in the MPA network; establishing "pilot" MPAs for further assessment and; developing national guidelines and strategies that further develop criteria and provide direction for the management of the development of an MPA management plan (DFO, 1999).

The DFO has suggested that each MPA will require its own unique zoning management plan and all activities permitted or not permitted in the zone will be delegated by specific conditions identified in each MPA. Buffer zones are established to help alleviate human encroachment on MPAs although no underlying protection standards are specified (DFO, 1999).

The MPA zoning system is utilized as a tool for effective management and each zones is monitored and examined to ensure both conservation and protection measures are met. The DFO recognize zoning as a fisheries management tool that could help conserve productive adult recruitment sites, act as refuge for depleted stocks and help in promoting genetic diversity (DFO, 2000). The establishment of zones through the DFO

could also be based on conserving endangered or threatened species habitat, unique habitat and conservation of productive ecosystems and biological rich areas.

The planning and management considerations for Parks Canada (NMCA) are characterized by open ecosystems as opposed to the semi-closed ecosystems for terrestrial parks (Canadian Heritage, 1994). At a political level, the marine environment is managed by legislation, such as the National Marine Conservation Areas Policy and *Canada National Marine Conservation Areas Act*, and jurisdictions. The impacts of the different characteristics of the marine environment on the NMCA policy are threefold. First, the management philosophy is changed from one of preservation of natural areas in a natural state, to one of conservation. The second differentiating characteristic is the explicit acknowledgment of the requisite for a flexible approach to planning and management. Finally, the policy emphasizes the importance of the public's support and cooperation for the achievement of the objectives of conservation. NMCA areas must make a meaningful contribution to the protection of Canada's marine heritage, and the objectives for these areas are unlikely to be achieved without the cooperation, support and continued involvement of those most directly affected by their establishment (Canadian Heritage, 1994).

The zoning system designated in the NMCA management plan applies to both the land and water areas and state the specific protection and use objectives of each designated zone. Parks Canada maintains and monitors NMCA system of zoning, which defines different levels of use and protection that can potentially be applied to a region, referred to as Zones I: Preservation, Zone II: Natural Environment and Zone III:

Conservation, respectively (Parks Canada, 1998). Parks Canada is responsible for monitoring the degree to which objectives are being achieved and assessing the viability of the designation during the review of the management plan. The zoning system is used as a guide and may change as planning and management experience becomes more extensive.

7.2 Conclusion

The establishment of Marine Protected Areas globally in the past twenty years has been prolific (Agardy 1997; Cole-King 1993). MPAs have ranged from small, specialized parks with a single objective, to vast multiple use areas with complex objectives. The initial reason for creating an MPA was strictly biological in nature, however, it was quickly realized that the unique characterises of the marine environment required a different approach then had been used in the terrestrial realm. The biological benefits of a correctly managed MPA should be explained to the local community in a straightforward manner. Since these benefits maybe numerous and linking biological benefits with the economic benefits is an effective strategy in obtaining support.

Based on the preceding descriptions of both federal MPA programs outlined in this paper, the Parks Canada initiative to create and implement NMCAs appears to be more focused than the Department of Fisheries and Oceans MPA program. The Parks Canada agency seems to have a clear vision of how they would like to accomplish the goal of establishing NMCAs through their primary objectives, perpetuity, finite systems,

on-site management and management plans which are tabled before parliament and amended subsequent to reviews. The Department of Fisheries and Oceans, on the other hand, seems, to have an idea of what it would like to do but does not have any clear objectives of how they will accomplish this goal and seem more intent to rely on a learn-by-doing approach.

Parks Canada presently has a number of NMCAs established across the country and have recognized that in order for the project to be successful, adaptive management practices have to be implemented. This will allow for a better understanding of how to successfully manage these areas so that the goals of preservation and conservation are met. The Parks Canada agency also has a clear distinction of how they are trying to conserve and protect these areas. Their mandate to protect marine areas of Canadian significance is much more direct than that of the Department of Fisheries and Oceans. The DFOs idea of how they are protecting the ecological integrity of marine environments for commercial interests is vague. It is unclear if the DFOs long-term objective is to protect marine environments to sustain commercial resource harvesting, or if they are interested in conserving the ecosystems for the sake of the system's integrity.

The DFOs mandate does not clearly state how these areas will be managed, unlike the Parks Canada agency that specifically states its management review plan and dedication to implementing adaptive management principles. Along with the Parks Canada management strategy is the development of the zoning system, which specifically regulates what types of activities can occur in each zone. This will prove to be an excellent tool for developing adaptive management practices in monitoring these areas to

see its effectiveness, or to determine if boundaries need to be expanded or contracted. The DFO is lacking in this regard and has no such system in the development of its MPA program, and if an MPA is to be developed successfully, then serious consideration will have to be put into a management plan in order to ensure proper management of marine resources.

Both the Parks Canada and Department of Fisheries and Oceans programs have been successful in their own right through gaining public support and the establishment of protected areas across Canada. Both programs have been successful in preventing the degradation of the marine environment while enhancing resources, both within and outside of their boundaries. MPAs potentially reap economic benefits for the region in question and can be opportune sites for marine research (Gubbay, 1995). The concept of MPAs can aid in the longevity of rural communities through continued traditional fishing activities and new industries such as eco-tourism.

Although MPAs cannot solve all conservation problems they can and have been recognized by scientists, managers and resource users as an effective tool in managing many successful marine areas around the globe, (WWF, 2002) if properly and judiciously employed. It is important to define and adhere to a specified development process for any future MPAs and the criteria should serve as a basis for formulating such a process. By setting aside unique and representative areas of adequate size, fisheries and biodiversity of the marine systems can be maintained or restored for future use and benefits. By restoring the productivity of the coastal systems it may be possible to correct past human misuse if proper management plays a part in a new conservation regime for the future.

7.3 Recommendations

After reviewing the necessary criteria for developing a Marine Protected Area, its context, structure and approach to establishment, along with a comparison of the DFO and Parks Canada structures and implementations, the following recommendations can be made in allowing the further establishment of MPAs in Canada:

- When attempting to establish an MPA in a region, management must look at the potential economic benefits of the MPA and emphasise these to the public during the consultation process.
- Scientifically based, process-oriented conservation will allow for the opportunity to protect critical habitat and allow communities to continue to rely on vital ecosystems. Harvesters should act as a vital link to enforce conservation measures of the region.
- Gathering local ecological knowledge of an area is essential to the successful development and positioning of an MPA, particularly regarding its physical and biological characteristics as a base for establishing and maintaining a region.
- MPAs allow managers to call on sustainable use and conservation of biodiversity for any area surrounded by a "sea of mismanagement", overexploitation and open access. Harvesters and the local community should be aware of this when seeking support for a proposed MPA.
- Economic analysis of a potential MPA should take into account social science models and benefits of a region or potential future benefits obtained from the prosecution of alternative fisheries. A long-term economic value of conservation in MPAs is often

unavailable, so short-term economic exploitation of biological resources often seems more attractive.

- Achieving public support is essential for the success of any MPA and the public should be involved in both the establishment and management process. Involvement of the community is the most vital aspect in ensuring the success of the process due to their attachment to the resource.
- Education and awareness of the MPA process is fundamental in achieving support of an MPA and the lead agency should take the responsibility in continually educating the affected individuals regarding the benefits of such development. This will promote better attitudes and pride in the community towards the project.
- Local residents have knowledge of the traditional resource and ecosystem, which is important in developing a management and enforcement plan for the area. They should be made aware of the importance of their contributions and how they will affect the project.
- When a community is contemplating establishing an MPA for a region they should closely consider both the DFO and Parks Canada concepts of MPAs and decide which is better for the local community. A key element of the DFOs idea of an MPA is a commitment to fisheries management and conservation, whereas Parks Canada must make a meaningful contribution to the protection of Canadian marine heritage.
- There is increasing need to justify MPAs in measurable and convincing terms to satisfy social, commercial, development and planning interests. It is essential that

conservation agencies and MPA planners have a well-defined policy and a clear idea of the purpose of each protected site, stressing the practical aspects.

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APPENDIX A

Framework for Establishing a Marine Protected Area

Framework for Establishing a Marine Protected Area (DFO, 1999a):

1. *Identification of Areas of Interest (AOIs)*
   This allows an opportunity for stakeholders or interested parties to participate and work with DFO in identifying AOIs within various initiatives and may include: ecosystem overviews, integrated coastal zone management (ICZM) processes, fisheries management planning, individual stakeholder proposals and other approaches.

2. *Initial Screening of AOIs*
   Any identified or requested AOIs would be screened to ensure that the purposes stated for the area of interest conforms to the reasons stated for MPAs under the Oceans Act. Areas of interest that then qualify for MPA status are placed on a AOI list and is made available to the public. The AOI is monitored to ensure that the ecological integrity of the proposed area remains intact while awaiting a final recommendation regarding its status. If a proposed site appears threatened at any point during the evaluation of the AOI the federal government may impose interim measures to protect the affected area.

3. *AOI Evaluation and Recommendation*
   The public are engaged in the process and allowed an opportunity to participate in assessing the AOI, which is a two step process consisting of: 1. The proposed AOI are evaluated through a series of assessments to determine its ecological, technical and socio-economic merits and 2. Once the assessments are complete the information will be reviewed by DFO and a recommendation will be made to whether a site should be either designated as an MPA candidate or if it should be considered for another form of protection.

4. *Development of a Management Plan for a Candidate MPA Site*
   The management plan explains why the MPA should be established. It lists its goals and objectives, how they will be reached and how the success of the MPA will be measured. Each management plan is different and tailored to the needs of the stakeholders and the proposed area. The management plan for a proposed area should provide details on how the MPA will be managed, the parameters for management and additional policies, strategies or management tools necessary to achieve the stated purpose for the MPA and relevant resource information to plan objectives. Proposed MPAs will be co-managed from a federal and local level and the management plan shall state the proposed arrangement and details on responsibilities and the role(s) of each organization.

5. *Designation of MPA*
   The designation step may proceed congruently with the MPA management-planning step and the Oceans Act allows for the designation of MPAs through regulations under Section 35 (3):

"The Governor in Council, on the recommendation of the Minister, may make regulations:

1. *(a) designating marine protected areas; and*
2. *(b) prescribing measures that may include but not be limited to*
    1. *(i) the zoning of marine protected areas*
    2. *(ii) the prohibition of classes of activities within marine protected areas, and*
    3. *(iii) any other matter consistent with the purpose of the designation."*

The Oceans Act also provides for enforcement and fines for violations and regulations concerning MPAs.

6. *Management of MPA*

The management of any MPA is conducted through the use of existing information, on-going research and traditional ecological knowledge. MPAs are managed on a site-by-site basis meaning that each MPA has its own specific management plan reflective of the attributes and needs of the area. Periodically the MPA will be evaluated with public input to determine if the MPA is fulfilling its intended purpose or if changes are needed to the regulations or management plan.

APPENDIX B

Framework for Establishing a National Marine Conservation Area

Framework for Establishing a National Marine Conservation Area (Parks Canada, 1998)

1. *Identifying representative marine areas (candidate sites) takes into consideration*:

- Geologic features (such as cliffs, beaches, and islands on the coast; and shoals, basins, troughs and shelves on the seabed)
- Marine features (tides, ice, water masses, currents, salinity, freshwater influences)
- Marine and coastal habitats (wetlands, tidal flats, estuaries, high current areas, protected areas, inshore and offshore areas, shallow and deep water areas)
- Biology (plants, plankton, invertebrates, fish, seabirds and marine mammals)
- Archaeological and historic features

2. *Selecting a potential NMCA from the candidate sites identified involves looking at*:

- Quality of regional representation
- Relative importance for maintaining biodiversity
- Protecting critical habitats of endangered species
- Exceptional natural and cultural features
- Existing or planned marine protected areas
- Minimizing conflict with resource users
- Threats to the sustainability of marine ecosystems
- Implications of Aboriginal claims and treaties
- Potential for education and enjoyment
- Value for ecological research and monitoring

3. *Assessing the feasibility of an NMCA requires the cooperation and support of:*

- Other federal departments and provincial or territorial governments, local communities and regional stakeholders

Extensive local consultations are undertaken. Working groups or advisory bodies may be set up to develop and assess proposals. Proposals may also be considered within other appropriate planning processes.

4. *Negotiating an agreement*:

If the feasibility study demonstrates support for the initiative, a federal/provincial or federal/territorial agreement will be negotiated to set out the terms and conditions under which the NMCA will be established and managed

5. *Establishment of an NMCA*

NMCA established under the National Marine Conservation Areas Act