

Use and Protection of the Gulf Islands Marine Environment:
Residents' Attitudes, Perceptions and Values

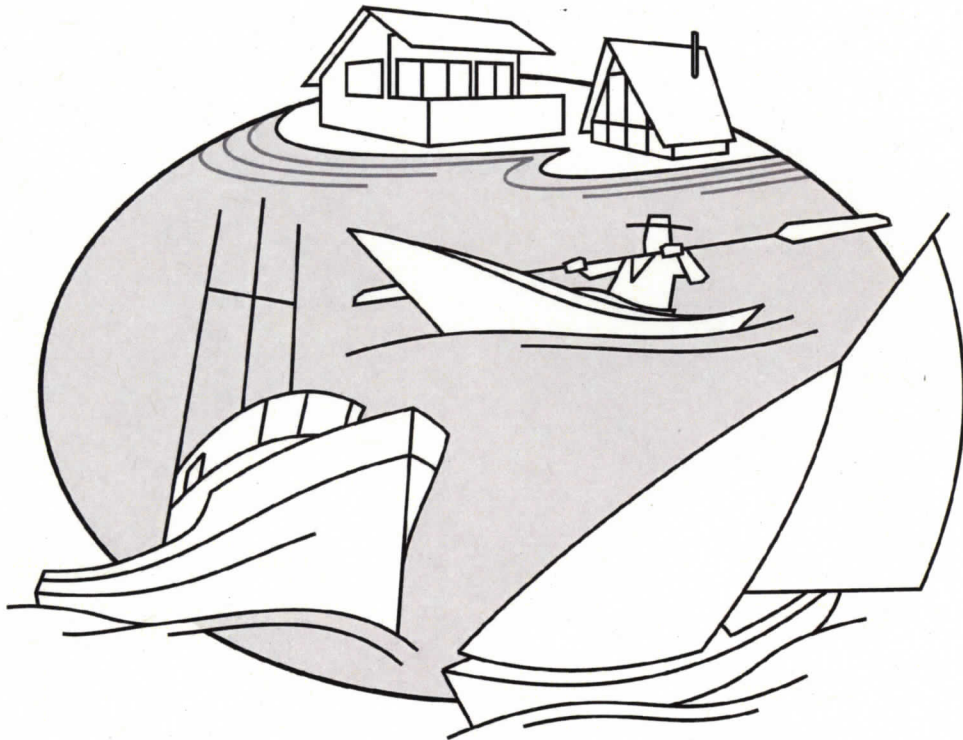
by

David Elliott McCallum
B.Trmt., Malaspina University-College, 2003

A Thesis Submitted in Partial Fulfillment of the
Requirements for the Degree of

MASTER OF ARTS

in the Department of Geography



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Abstract

Recent concerns about the health of marine environments have led to the worldwide creation of new marine conservation initiatives. Multiple-use marine protected areas (MPAs) are one potential solution; however, they may be perceived by some as 'economic sterilizers' and threats to certain livelihoods, such as marine tourism or aquaculture. For instance, shellfish growers may perceive MPAs as favouring tourism as an economic activity, attracting recreational boaters who may inflict a negative impact on shellfish health through sewage or chemical discharge. Conversely, recreational boaters may perceive shellfish aquaculture as a threat to safe navigation and desirable anchorages. One significant challenge for resource managers then, is to design MPAs in ways that are acceptable to different stakeholder groups. This research, a partial application of the "Limits of Acceptable Change" (LAC) visitor management framework, examines acceptability of recreational boating and shellfish aquaculture within a proposed MPA from a community stakeholder perspective.

This study examined Gulf Islands residents' attitudes, perceptions and values towards the Gulf Islands marine environment. Gaining a clear understanding of the views of stakeholders is key in allowing coastal planners and marine resource managers to proceed effectively towards achieving their mandates. Specifically, this knowledge allows them to (1) identify what is important to different users; (2) determine public

relations needs; (3) justify management decisions; (4) promote resource protection; (5) identify potential conflict areas; and (6) address negative concerns and build on positive perceptions. This project samples the views of a random selection of residents (n = 302) from Thetis, Salt Spring and Saturna Islands during the summer of 2004. This research applies respondents' values towards the marine environment as an independent variable in the analysis of (1) perceptions of threats towards the marine environment; (2) attitudes towards recreational boating and sewage from boating; (3) attitudes towards shellfish aquaculture; and (4) attitudes towards different strategies for zoning the marine environment.

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Today is April 25th, 2006. This day is significant for two reasons: (1) it is my Mom's birthday (¡Felíz cumpleaños mi Madre!), and (2) it is the day after my successful thesis defence (¡the first day of the rest of my life!). It feels great to finish and I'm sure that my fellow graduate students will agree when I pronounce that completing a Masters thesis is indeed an absolute mission! Blood. Sweat. Tears. And reward.

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Dedication

This piece of work is dedicated to my boy, Noah, and his subsequent sibling. I'll teach you kids everything you need to know about use and protection of marine environments.

1.0 Introduction and Study Overview

1.1 Marine Conservation Concerns

Traditionally, the world's oceans have been viewed as sources of limitless resources, immune to the pressures induced by human use. Such vast ecosystems as they are, the concept of marine resource sustainability was not questioned until the mid-1900s. By the mid-1900s, it became apparent that marine resources are sensitive to human and environmental pressures. Resource planners and the general public, some informed by Rachel Carson's (1961) *The Sea Around Us*, became aware of the immense complexity, and therefore vulnerability of the world's oceans. Today, there is a global understanding that marine resources are in peril and that marine resource sustainability is in question. To ensure long-term sustainability of marine resources, new paradigms for marine conservation must be developed and supported by local stakeholders and the general public.

Until recently, there have been few checks on use of marine environments and resources. However, after decades of opportunistic exploitation, it has become apparent that marine resources are in peril around the world (National Research Council, 2001). Industrial pollutants now threaten marine mammals, major fisheries stocks have collapsed under the weight of over-harvesting and other factors, and whole ecosystems are being lost to invasive coastal development.

Many factors influence the health of the marine environment, and managing marine environments for sustainability has been acknowledged as both complex and challenging (Cicin-Sain & Knecht, 1998). Cooperation and holistic thinking have become necessary strategies for successful management. The integration of terrestrial and marine policies, as well as the integration of programs of economic development and environmental management, is today seen as necessary for long-term success of management regimes. A modern tool that applies these concepts is the Marine Protected Area (hereafter referred to as MPA) which attempts to balance the need for ecological

conservation with the demands of human activity on the marine environment (Agardy *et al.*, 2003).

Despite the apparent need for effective marine management tools, MPAs have hardly been embraced by managers. While considerable effort has been put into terrestrial parks, marine equivalents are in their infancy. In the terrestrial environment, national parks (and other protected areas) are viewed by the public as effective frameworks for conserving biodiversity. The national park concept has considerable public support around the world, and especially in Canada where nearly half of all Canadians are dissatisfied with the shortage of park and wilderness areas in the country (Environics International, 2000 as cited by Dearden & Rollins, 2002).

In contrast, MPAs are not yet well established and few exist in Canada despite 243,792 kilometres of coastline. While legislated protection of terrestrial environments has existed in Canada since the creation of the first National Park in 1885 (Banff, Alberta), protection of marine areas only began in Canada with Fathom Five National Marine Park (Ontario) in 1987. Of the over 4,000 MPAs that exist worldwide (WCMC, 2003 as cited by Belfiore *et al.*, 2004), some authors (Kelleher *et al.*, 1995; Agardy, 2000; Belfiore *et al.*, 2004) say that many are not managed effectively or are not effective in their protection mandate. Legislated protection and effective management of marine environments has generally not been given as much attention as that of their terrestrial cousins. This underdevelopment of marine protection and lack of marine environmental literacy (the understanding of marine conservation needs) within the human race may be attributed to our inherent terrestrial nature (Sloan, 2002).

1.2 MPAs as Protection Tools

MPAs are intertidal or subtidal areas reserved by legislation for protection purposes. Various types of MPAs exist, ranging from small in size and with the mandate of protecting a specific endangered or threatened species, to vast areas designed to accommodate a range of conservation, economic, and social (multiple-use) objectives, and encompassing different levels of protection (Agardy, 2000). Under such broad applications, MPAs can accommodate a range of management needs. In areas with

multiple demands, including human economic activity, MPAs can be a powerful tool for protection that allows room for public support. This balance is achieved through spatial separation, or *zoning*. A tool developed in terrestrial land-use planning, zoning has been further developed and adapted in attempts to apply the concept to the unique attributes of the marine environment.

In addition to design challenges (such as questions of size or the development of zoning plans), many social factors influence the success or failure of an MPA. For instance, restricting traditional uses has been challenging in some regions, due to the perceived loss of access by various stakeholder groups (Cocklin *et al.*, 1998; Agardy *et al.*, 2003). Indeed, an important lesson learned from MPA efforts worldwide is that social factors (such as traditional uses or stakeholder education) are the primary determinants of successful conservation initiatives (Fiske, 1992; Kelleher & Recchia, 1998; Agardy, 2000; Mascia, 2003). With this knowledge, MPA managers are making significant attempts to incorporate stakeholder input into the planning and management of MPAs.

One of the important challenges for MPA planners and managers is the necessary process of incorporating different uses and activities in ways that are acceptable to different stakeholder groups, including the local communities. The MPA literature indicates that successful implementation of MPAs requires local community support and an understanding of their attitudes, perceptions and values towards the marine environment (Cocklin *et al.*, 1998; Mascia, 2003; McClanahan *et al.*, 2005). Therefore, this study samples residents of three coastal British Columbian Gulf Islands, in order to understand their values towards the marine environment and their attitudes towards various activities and protection strategies therein.

1.3 Parks Canada's NMCA Model and Gulf Islands Activities

An area of the Gulf Islands marine environment is currently being considered as a candidate for a large-scale, zoned MPA: Parks Canada's proposed Southern Strait of Georgia National Marine Conservation Area (NMCA). Under the *Canada National Marine Conservation Areas Act* (2002), each NMCA shall have a zoning plan that

provides at least one zone designated for strict protection and at least one zone that fosters ecologically sustainable use, in which the latter may include both recreational and industrial activities (Parks Canada, 1994). Guided by the notion of a proposed NMCA in the Gulf Islands marine environment, this thesis focuses on two specific and potentially compatible and/or conflicting marine activities: recreational boating and shellfish aquaculture.

The Gulf Islands are a very attractive area for many different types of human usage. At present, waterfront and rural property values are increasing rapidly due to demand for the 'island' lifestyle and their aesthetic qualities. Mainly occurring in the summer months, recreational boating (including activities such as kayaking, motor and sailboat cruising, and organized events such as rendezvous or regattas) is a key activity in the Gulf Islands. To support this boating activity, a series of marine parks were established in the 1990s, providing the opportunity for accessible, protected anchorages along the coast; an effort that is attributed to the Council of BC Yacht Clubs and the BC Parks Department. These marine parks are generally located in undeveloped bays and allow boats to anchor or moor overnight and access the shore for hikes or other activities. The majority of the marine parks were established and managed by the provincial park agency, BC Parks. While the BC marine parks offer some protection of habitats and ecosystems, they are only allowed incidental protection of species that are not of commercial or recreational harvest interest (Jamieson & Levings, 2001). Thus, their legislated protection mandate is thought to be not as strong as the national agencies such as the Fisheries and Oceans Canada, Environment Canada, or Parks Canada (Jamieson & Levings, 2001).

In addition to marine recreation, considerable industrial activity occurs in the Gulf Islands marine environment. For instance, given the Gulf Islands' geographic location within a triangle of urban development (Vancouver, Victoria, and Seattle) (see Figure 1.1 and Figure 3.5), there is much commercial marine traffic and shipping. The area is also attractive to resource extraction industries such as commercial fishing and forestry, and agricultural industries such as farming or aquaculture. One industry, shellfish

aquaculture, may be an allowable use within the NMCA, if it is deemed by Parks Canada as 'ecologically sustainable', as it is by some authors (Costa-Pierce & Bridger, 2002; Lindahl *et al.*, 2005). Shellfish need healthy marine environments to thrive and therefore shellfish aquaculture shares similar goals with MPAs and is potentially compatible within the proposed NMCA. The shellfish aquaculture industry has been slow to develop on the BC coast and unlike the finfish aquaculture industry, which is dominated by major multinational corporations, the shellfish industry is still dominated by 'mom-and-pop' operators (Kingzett & Salmon, 2002). Due in part to this local ownership, the shellfish aquaculture industry does not appear to be as highly controversial as the finfish industry at this point in time. However, while there is potential for diversified and increased economic activity through further development of the shellfish aquaculture industry (Kingzett & Salmon, 2002), there is also the potential for conflict between this and other activities in the marine environment. A zoning plan within the proposed NMCA is one potential way to minimize the conflicts between incompatible uses (Salm *et al.*, 2000; Jones, 2002).

In addition to recreational and industrial uses of the Gulf Islands marine environment, there is also interest in marine conservation initiatives. In 1995, the Governments of Canada and British Columbia created the Pacific Marine Heritage Legacy fund in order to establish the new Gulf Islands National Park Reserve (GINPR), which would protect the ecological integrity and represent the uniqueness of the Gulf Islands on a national level. In this agreement, two former BC provincial park campgrounds and eight former BC provincial marine parks were transferred to the federal government for management by Parks Canada. In addition, much private property was purchased to build the area of the new national park, which was officially established in May 2003. Parks Canada's long-term vision for the area is to create a more significant marine component of the GINPR: the proposed Southern Strait of Georgia National Marine Conservation Area (NMCA). Both the terrestrial and marine protected areas managed under Parks Canada and other agencies are broadly intended to protect and maintain ecological integrity by managing the impact on the environment from human activity, and to allow continued 'sustainable' use, but to minimize conflict between

incompatible uses. This thesis was designed with the existing Gulf Islands National Park Reserve and the proposed Southern Strait of Georgia NMCA in mind. The map in Figure 1.1 is Parks Canada's representation of the Gulf Islands; the red areas depict the area of the Gulf Islands National Park Reserve, and the dark blue represents the anticipated marine areas of the proposed Southern Strait of Georgia NMCA.

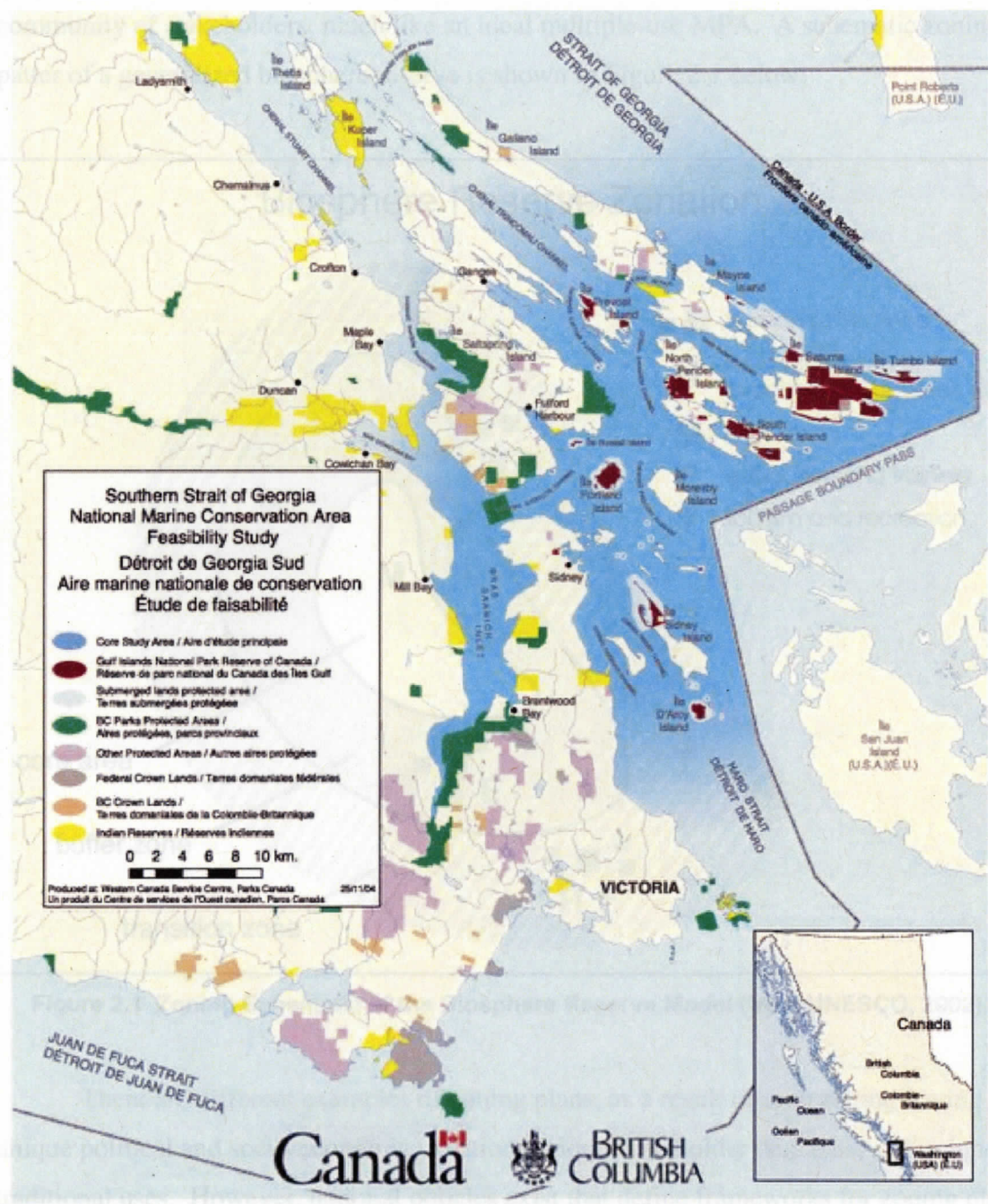


Figure 1.1 Parks Canada's Map of the Gulf Islands (Source: Parks Canada)

1.4 Multiple-Uses: Compatibility and Conflict

Some of the variables that make the Gulf Islands marine environment attractive to Parks Canada as a candidate for an NMCA may be similar variables to those that make it attractive to both recreational boating and shellfish aquaculture. Hence, this thesis focuses on these three specific activities: MPAs (protection strategies), recreational boating, and shellfish aquaculture. Various potential conflicts and compatibilities exist between each of these activities, as noted below.

Potential compatibilities between the Parks Canada's proposed Southern Strait of Georgia NMCA and recreational boating include:

1. Aesthetic and recreational values; and
2. Protection of unique ecosystems and allowing public access to the shore.

Potential compatibilities between the NMCA and shellfish aquaculture include:

1. Proximity to at least three major urban centres (Vancouver, Victoria, Seattle) – and therefore labour and resources supply;
2. Clean, relatively healthy marine environment – however threatened by over-use; and
3. Both share the goal and necessity of healthy water quality.

Potential compatibilities between recreational boating and shellfish aquaculture:

1. Aquaculture workers may be able to provide assistance to mariners in distress; and
2. Potential positive relationships regarding tourism and aquaculture – for example tours to aquaculture farms (e.g. Stephanou, 1999).

However, potential for conflict exists, as follows:

1. Recreational boaters may see industry as unacceptable. Specifically, shellfish aquaculture may locate in existing boat anchorages. Visual and sound impacts might also be of concern;
2. Shellfish growers may see both marine conservation and recreational boaters as conflicting with their goals. They may perceive that the creation of a NMCA will only attract recreational boaters as an elite tourism destination (Rollins & Randall, 2004). Also, recreational boaters are a source of sewage to the marine environment, which is bad for water quality, negatively affecting shellfish health.

1.5 The Limits of Acceptable Change (LAC) Framework

This research is grounded in the “Limits of Acceptable Change” (LAC) (Stankey *et al.*, 1985) resource management framework. The LAC approach advances traditional visitor management frameworks by providing a framework of systematic techniques for managing social and resource conditions in outdoor settings (Needham & Rollins, 2005). This contemporary framework changes the traditional management (i.e. carrying capacity) question of “How much use or impact is too much?” to “How much use or impact is acceptable or should be allowed?” In a LAC managed area, opportunity classes (or zones) are established, and measurable indicators and standards for each indicator are established in each zone, along with management actions should that standard be exceeded. LAC incorporates both environmental indicators (e.g. water quality) and social indicators (e.g. local values and perceptions about the marine environment).

Another component of the LAC process is the incorporation of stakeholder input into the determination of indicators, standards, and management actions. Stakeholders are those individuals or agencies with an interest in the management of the area. For example, in the Southern Strait of Georgia NMCA, stakeholders may include commercial or recreational fishers, marine tourists, residents, or shellfish growers. Other stakeholders may include NGOs such as the Georgia Strait Alliance or the Canadian Parks and Wilderness Society. Another type of stakeholder may be the agencies involved in the management of the area including Parks Canada, BC Parks and Fisheries and Oceans Canada (DFO). In an LAC process, these individuals and agencies are invited to participate in the planning process. Ideally, the result is movement towards consensus with regard to how an area will be managed. This sharing of responsibility and consensus is referred to as “transactive planning”, and contrasts with the traditional top-down approach to planning. In this way, the LAC framework comprehensively addresses the complexities of planning for integrated coastal management, and allows managers more depth of knowledge about the stakeholders involved, and the geography of the area proposed for marine conservation.

1.6 Stakeholder Perceptions and Involvement

People's attitudes and perceptions of different activities and management paradigms within the marine environment will vary, as will the values that they assign to different ways of using the resource. Since there is variation in people's views there will also be variation in how they respond to management actions (or inactions). By understanding these views, managers are able to build more effective management plans. Experience has shown that without broad stakeholder consultation and participation, there is a danger of the MPA either not fulfilling its conservation objective, or worse, the demise of the program altogether (e.g. Lien, 1999). Alternatively, where stakeholders have a high degree of involvement and influence in planning decisions throughout all phases of management, a stronger and more successful conservation initiative is created. By providing input into management plans, stakeholders may take ownership of the initiative and therefore may be involved in voluntary enforcement, fundraising or other planning initiatives, as well as being more cooperative with management plan regulations. Sampling stakeholder perceptions of threats to the marine environment provides a measure of potential support of conservation initiatives. If there is no perception of threat, then there is likely no support for strict conservation measures.

Residents of an area proposed for significant managerial changes (such as new marine conservation regulations) are a key stakeholder group. Research has indicated that resident input is essential to the success of any coastal management plan (Fiske, 1992; Suman *et al.*, 1999; Katranidis *et al.*, 2003). Indeed residents (who may also represent other stakeholder groups, such as commercial fishers) have exerted, in various cases, strong enough will to halt government plans for marine conservation initiatives (Lien, 1999). Lessons such as these have proven the importance of understanding the attitudes, perceptions and values of the local stakeholders. One way of achieving this understanding is through survey research. Therefore, this thesis endeavours to understand the viewpoints of one key stakeholder group, Gulf Islands residents, towards different activities that may take place in the waters surrounding the Gulf Islands. In doing so, this thesis builds on an existing LAC process and contributes to the LAC literature. This thesis is part of a larger study that examined the views of other

stakeholder groups, including marine tourists, shellfish growers, First Nations representatives and protected areas scientists.

1.7 Summary and Research Objectives

In coastal BC, there is tremendous potential for further development of (1) marine tourism, (2) other marine industry such as shellfish aquaculture, and (3) MPA initiatives. However, care must be taken to address potentially competing interests and public perception, before polarization of opinion is established. Shellfish are an indicator of a healthy marine environment, hence the potential compatibility with MPAs; however, shellfish aquaculture may be seen as a threat to marine tourism by being visually unacceptable, or competing for space with desired boating anchorages or beach accesses. Recreational boating is already a significant activity and economic driver in the Gulf Islands and is likely to increase in popularity. However, some may view recreational boating as having a negative impact on the marine environment through its impacts such as sewage discharge and damage to the ocean bottom from anchors. A proposed large-scale MPA (e.g. Parks Canada's proposed Southern Strait of Georgia National Marine Conservation Area) would contribute to marine conservation, and may be a way to reconcile these differences through spatial zoning and activity regulation.

Given increasing demands for recreational and industrial use, in addition to growing concern over the health of marine environments, it has become a complex and challenging time for coastal and MPA managers. Sound and rigorous science (both natural and social) is absolutely crucial to create effective MPA initiatives that both appease the concerns of stakeholders while achieving protection mandates. By understanding the attitudes, perceptions and values of local stakeholders, managers are better able to (NOAA, 2005):

1. Identify what is important to different users of the marine environment;
2. Determine public relations, outreach, and education needs;
3. Justify management decisions;
4. Promote resource protection;
5. Identify potential conflict areas that need management attention; and
6. Address negative concerns and build on positive perceptions.

Therefore, the overall objective of this study is to gain an understanding of the views of Gulf Islands residents towards selected issues of interest within the Gulf Islands marine environment so that area coastal and MPA managers are better informed and thus, more effective in achieving their mandates. Data collection objectives of the questionnaire included:

1. To gain an understanding of respondent characteristics:
 - a. Preferred marine activities;
 - b. Most important values towards the marine environment; and
 - c. Other demographic variables (residential and employment information).
2. To identify perceptions of threats:
 - a. Perceptions of the level of impact from a selection of potential threats towards the marine environment; and
 - b. Overall perception of the level of impact from human activity;
3. To sample attitudes and perceptions of two specific and contrasting uses of the marine environment: recreational boating and shellfish aquaculture:
 - a. Attitudes towards the visual acceptability of (1) common recreational boats, (2) whale watching boats, and (3) shellfish aquaculture. These activities are applied as indicators of desired conditions; and
 - b. Perceptions of the benefits and concerns associated with shellfish aquaculture.
4. To understand levels of support for different types of management strategies:
 - a. Attitudes towards potential solutions to the issue of sewage from recreational boats; and
 - b. Attitudes towards different zones that allow or disallow certain uses, along with perceptions of the spatial allocation of these zones.

Specific research objectives include:

1. To examine variability in responses by using values towards the marine environment as an independent variable in analysis. By doing so, this thesis may inform park managers about a way of examining variability in attitudes and perceptions that has not previously been reported in the literature.
2. To contribute to gaps in the MPA social science literature generally. To inform planners and managers of the proposed Southern Strait of Georgia NMCA about management options based on (1) how residents value their marine environment, (2) stakeholder preferences for standards towards recreational boating and shellfish aquaculture, and (3) stakeholder views towards different types of management zones. Without knowledge of public support or opposition to these issues, it is difficult for coastal planners to develop draft management plans.
3. To inform agencies responsible for the planning and management of recreational boating and shellfish aquaculture with regards to attitudes and perceptions of those activities. This information may be useful in marketing or public relations initiatives associated with these activities.
4. To contribute to planning theory regarding the LAC framework.

1.8 The Geographical Focus of this Thesis

The word geography literally translates from Latin to mean ‘writing about the earth’ – *geo*, the earth and *graphy*, to write. In the discipline of geography today, of course much more work is done than simply ‘writing about the earth’, yet the discipline itself is not easy to define. Indeed, it has been stated that geography has become so characterized by excess internal diversity that, “some Geographers would be hard-pressed to identify the distinctly geographical component of their work” (Guelke, 1989 in Cloke *et al.*, 1991: 21).

Geography is unique in academic disciplines in that it spans both the natural and social sciences, since landscapes are characterized by both physical and cultural variables. This thesis, written in fulfillment of the academic requirements for a Master of Arts in Geography, is a social science work addressing attitudes, perceptions and values of one particular stakeholder group: residents of the Gulf Islands. Therefore, the research

approaches geographical enquiry from a social perspective and falls under the part of the discipline entitled human geography.

One definition of human geography states that it is “the spatial differentiation and organisation of human activity and its interrelationships with the physical environment” (Johnston *et al.*, 2000: 353). All human activity has an impact on the environment, some activities more than others. Any development or use should be viewed as manifestations of the relationship between natural landscapes and the values people have about landscapes, natural or developed. An early and oft-cited geographer, Carl Sauer (1889-1975) delivered a sound argument regarding the complexity of landscape, stating that each one is unique relative to other landscapes and, defining them as “singular, unorganized, or unrelated has no scientific value” (Sauer, 1925: 301).

The landscape of the Gulf Islands marine environment has been affected by human activity. Residential development, commercial shipping, resource extraction, aquaculture, and marine tourism and recreation are just a few of the more significant activities in the area. Each of these uses has unique environmental or sensory (i.e. visual, sound) effects, and each individual perceives these effects in their own way. This study, through the LAC framework, will build on both natural and social science studies to contribute to resource and environmental management of the area. It contributes to the discipline of geography through its examination of stakeholder values and perceptions of the place known as the Gulf Islands marine environment.

1.9 Chapter Summary and Conclusion

Given the complexity of MPA planning and management, this research will build on existing literature and add to the knowledge that is necessary to better manage these areas in the future. The intent of this project is to focus on applying LAC to a marine environment and to address issues associated with recreational boating, shellfish aquaculture, and zoning in a marine environment. These issues are explored using Parks Canada’s proposed Southern Strait of Georgia NMCA as the conservation paradigm that drives the research. Attitudes, perceptions and values of one particular stakeholder group, Gulf Islands residents, are sampled. The perceptions of this stakeholder group are

important, and understanding them will contribute to more effective coastal management and marine conservation in the Gulf Islands marine environment.

This thesis is organized into five chapters that (1) introduce the study, (2) describe the theoretical framework through a comprehensive literature review, (3) present the methodology, (4) describe the results, and (5) discuss conclusions, including how the study contributes to academic literature.

2.0 Literature Review

2.1 Introduction

Historically, the world's oceans have been viewed as sources of limitless resources, immune to the pressures induced by human use. So vast are these ocean ecosystems that the concept of marine resource sustainability was not questioned until recently when it has become frighteningly clear that marine resources are finite and vulnerable to human activity. Now, it is apparent that marine resources are in peril around the world (National Research Council, 2001).

While some threats to marine environmental health are naturally caused (i.e. tectonic activity), the majority are a direct result of human activity. Population growth and densification in coastal areas has increased pressure on coastal resources leading to habitat degradation, fragmentation, and destruction. Gray (1997), in his review of literature on threats to coastal ecosystems, provides the following comprehensive list of threats to marine environments: (1) habitat loss, (2) global climate change, (3) overexploitation and other effects of fishing, (4) pollution, (5) invasive species introductions, (6) watershed alterations due to development, (7) coastal tourism, (8) marine litter, and finally (9) "the fact that humans have little perception of the oceans and their marine life" (Gray, 1997: 161). It is noted that these threats are frequently interlinked and resulting from human activity that takes place in both terrestrial and marine environments. Holistic ways of urgently addressing several of these threats in concert are necessary if we are to reverse the negative trend.

Marine environments and resources have historically been viewed as 'open-access' (Cocklin *et al.*, 1998: 214), based on the difficulties associated with regulation and control of marine resources. This results in a situation of Hardin's (1968) 'Tragedy of the Commons', whereby incentive exists for individuals to exploit resources even when extinction of those resources is inevitable. An example of this is the problem of abalone poaching, as described by Hume (2005) in a Globe and Mail newspaper article. Northern abalone in BC is designated as threatened on the *Species at Risk Act* (SARA)

and was prohibited from being harvested in 1990. Despite the ban on harvesting, stocks have continued to decline due to poaching – deemed the biggest contributor to the decline by Fisheries and Oceans Canada's (DFO) abalone recovery team (DFO, 2004). Sometimes, humans will continue to over-harvest until there is nothing left to harvest – an act of selfish short-term gain.

Restricting activities, such as abalone harvesting or boat anchoring, has been challenging due to the perceived loss of access by various stakeholder groups (Cocklin *et al.*, 1998; Agardy *et al.*, 2003). Indeed, an important lesson learned from MPA efforts worldwide is that social factors, such as traditional uses or stakeholder education, are the primary determinants of successful conservation initiatives (Fiske, 1992; Kelleher & Recchia, 1998; Agardy, 2000; Mascia, 2003). With this knowledge, MPA managers are making attempts to incorporate stakeholder input into the management and zoning of MPAs. Indeed it has been noted that natural resource management is based on political decisions that are influenced by the interests of various stakeholder groups (Orbach, 2000). Widmer *et al.* note that since stakeholder viewpoints are based on perceptions that may or may not match scientific facts about a resource, “it is therefore important to understand and consider these perceptions in order to promote more comprehensive managerial initiatives” (2002: 22). Orbach states the obvious regarding the formulation of public policy: “we do not directly change the behaviour or condition of the physical environment; what we change is the behaviour of the people” (2000: 49). Social science research on attitudes and perceptions then can help managers by allowing more effective resource management decisions (NOAA, 2005).

One might say that conservation of marine environments has been ignored for too long, and today there is awareness among marine resource managers that more significant protection of marine environments is both urgent and necessary (Kelleher & Kenchington, 1992). Over the past century, various methods of marine conservation have been introduced. These include species-specific fishery restrictions; regulation of detrimental marine activities; and the legislation of Marine Protected Areas (hereafter referred to as MPAs), involving special protection for specific areas within broad areas

subject to other (or non-existent) regulation. Generally, MPAs are viewed as one of the most potentially effective solutions to the problems associated with the effects of human use on the marine environment (Agardy *et al.*, 2003).

MPAs are established in intertidal or subtidal areas through government legislation, and have protection purposes as their foremost objective. Various types of MPAs exist, ranging from small in size and heavily protected, to large-scale and multiple-use. Multiple-use MPAs can apply the framework of zoning as a management tool to the marine environment to achieve management objectives without alienating human economic activity. One example of an MPA development is the proposed Southern Strait of Georgia National Marine Conservation Area (NMCA), which will be a multiple-use, zoned marine conservation paradigm. A study to assess the feasibility of this proposal is presently being conducted by Parks Canada, including the provision of opportunities for public comment through community information sessions and 'Marine Mixers'. In relation to the Southern Strait of Georgia NMCA proposal, this thesis is unique in that it gathered stakeholder input well in advance of the establishment of the MPA (the proposed Southern Strait of Georgia NMCA). However, since the NMCA proposal is in such early stages of development, this research did not ask for viewpoints directly related to it.

This chapter begins with a discussion of Integrated Coastal Management and MPAs, and proceeds to a review of stakeholder participation in MPA planning and management, the concept of zoning, and then to a review of papers focussing on stakeholder involvement in zoning. Then, the Limits of Acceptable Change (LAC) framework is described, and linked to MPA planning and management.

2.2 Integrated Coastal Management

The complexity of oceans governance is exacerbated by the notion that decisions are made in an environment of uncertainty. The inherent terrestrial nature of humans has hindered our ability to generate a deep understanding of the condition of the ocean and the processes that occur therein. Without a complete understanding of such processes, decision makers are challenged by their responsibility to regulate use and consumption of

oceanic resources. Indeed, the fluid nature of the ocean contributes to our inability to 'fence' or claim ownership of mobile marine resources. Further, many marine resources occupy multiple political jurisdictions, compounding the difficulty in restricting access.

Attributes of the coastal zone that are attractive to human use and development (such as the provision of a range of resources to a range of different users) are the very attributes that influence management complexity. In coastal areas, uses and impacts within one ecosystem have the potential to impact other ecosystems downstream. Within such a complex resource management paradigm, it is imperative to incorporate programs that can simultaneously address the issues associated with the marine environment. Conventional 'sectoral' management – the management of a single resource or use (e.g. fisheries, aquaculture, agriculture, shipping, and others) by one unit of government – is not effective in addressing complex coastal management issues associated with multiple uses (Chua, 1993). In order to control and regulate some of these challenges on a broad scale, coastal nations have developed Integrated Coastal Management plans. In Canada, the adoption of the *Oceans Act* in 1997 sets out a framework for an oceans strategy that supports sustainable economic opportunities in conjunction with conservation and pollution prevention initiatives.

The concept of Integrated Coastal Management, hereafter referred to as ICM, is fundamental to sustainable oceans governance. ICM is broadly defined as the integration of the programs of economic development (such as fisheries and tourism) and environmental management (such as conservation) (Cicin-Sain & Knecht, 1998), aligned with the social goals and including the full participation of those affected. ICM is a complex paradigm involving participation by all levels of government (local, regional, national, and international), various economic sectors (tourism, aquaculture, oil and gas development, and others), non-governmental organizations, and the general public (Clark, 1995). In terms of knowledge, cooperation is also essential between the disciplines of engineering, and the natural and social sciences (Anutha & Johnson, 1996). The necessity to involve such a complex mixture of organisations and themes requires that an umbrella ICM body facilitate consultation and integrated planning (Chua, 1993).

The framework for ICM is seen as a “continuous and dynamic process that unites government and communities, science and management, private and public interests in preparing and implementing integrated plans for the protection and development of coastal ecosystems and resources” (K. Brown *et al.*, 2002: 18). One of the critical features of this statement is its focus on uniting the input from an array of stakeholder groups. While incorporating stakeholder input has been shown to be an effective method of planning within ICM, it does not ease an already complex decision-making process. Stakeholders in oceans management decisions may have interests in either of the broad categories of economic development or environmental protection, or both. Rarely are all stakeholder groups satisfied with the results of a planning process, but certain frameworks for facilitating stakeholder input do exist such as the Limits of Acceptable Change (LAC) management framework, described later in this chapter.

2.3 Marine Protected Areas (MPAs)

One conservation tool within the ICM toolbox is marine and coastal protected areas (MPAs). While it is deemed necessary to manage MPAs in the broader context of ICM (White *et al.*, 2002), this is a challenge that is not easily accomplished. Recognizing the need for better understanding of the linkages between MPAs and the wider context of ICM, Belfiore *et al.* (2004) produced a document outlining principles and guidelines for managers. Published by IUCN, the document emphasizes the need to incorporate a variety of approaches to promote the incorporation of MPAs in broad ICM plans. It presents nine guiding principles and guidelines under three main categories, summarized below (Belfiore *et al.*, 2004):

A. Strengthening linkages between MPAs and the wider coastal/marine area

- 1. Connectivity between terrestrial and marine areas of the coastal zone should be recognized and maintained;*
- 2. MPA management should be based on the best available knowledge drawn from broader ICM programs;*
- 3. Success depends on management that produces perceived benefits and tangible outcomes that contribute to improved quality of life and ecosystem integrity. This*

thesis applies this principle in that it samples stakeholder perceptions of threats to the marine environment and potential realistic solutions.

B. Developing governance arrangements to incorporate MPAs into the broader framework of ICM

4. *Strengthened stakeholder relationships to produce effective participation at all stages of MPA development and implementation.* This thesis is one project associated with stakeholder involvement in planning the NMCA. As well, it is taking place in the initial feasibility stages of NMCA development
5. *An integral part of ICM governance is cooperation across agencies and sectors. MPA managers need to relate to managers of watersheds, fisheries, tourism, etc.*
6. *Planning of individual MPAs should be participatory and integrated so that functionally connected networks of MPAs are established*

C. Fostering implementation of MPAs through enhanced policy and management tools

7. *Mobilizing resources and capacity is essential for successful implementation, sustainability, and integration of MPA and ICM programs;*
8. *MPA effectiveness must be assessed. Evaluation should be conducted at local, regional, national, and international levels;*
9. *Ecologically sound MPA networks provide a spatial management tool to prioritize biodiversity conservation and ensure maintenance of environmental goods and services, which are essential objectives of ICM.*

Within the broad approach to coastal management, MPAs focus on core conservation and use designation in a wider program of oceans governance. Two main types of MPAs exist, based on their size and intensity of protection. The first model is a small-scale and highly protected MPA designed for strict protection of a specific species or habitat. The second is a large-scale and multiple-use MPA designed to include zones ranging from strict protection through to areas that allow for different types of activity, including sustainable resource harvesting (Agardy, 1993; Laffoley, 1995). Much debate exists in the literature on which of these models is the most effective (Agardy, 2000), but

it is understood that certain situations are more appropriate for either model. This thesis focuses on an application of the multiple-use MPA model.

Although there are numerous different ways to define MPAs (Agardy *et al.*, 2003), one definition suitable for this thesis is as follows: Multiple-use MPAs are discrete geographic areas that have been designated to enhance the conservation of marine and coastal resources and are managed by a stakeholder-advised, integrated zoning and management plan that includes MPA-wide restrictions on some activities (such as ocean dredging, oil and gas extraction and others), and higher protection in delimited zones (such as fishery reserves) within the MPA (National Research Council, 2001). Multiple-use MPAs may allow managers to protect, maintain, and restore the natural and cultural resources of marine environments (Salm *et al.*, 2000) and allow multiple uses to coexist in areas of a diversity of pressures (Jones, 2002). In addition, by way of a zoning plan, they are effective tools in minimizing conflicts between uses, providing educational and research opportunities, and enhancing commercial and recreational fisheries (Salm *et al.*, 2000; Pomeroy *et al.*, 2003).

Salm *et al.* (2000) suggest that MPAs are better protected and more effective if they are included as part of an overall ICM program. A key distinction is that ICM programs are primarily directed at area-specific development management (such as within the four Canadian coastal regions: Pacific, Atlantic, Arctic, and Great Lakes) (Clark, 1995), while MPAs focus more specifically on resource management and use regulation within smaller-scale areas (Salm *et al.*, 2000). MPA planning and management has much to learn from ICM (Cicin-Sain & Belfiore, 2003), specifically with regards to stakeholder participation and zoning. For instance, the framework for ICM emphasizes the importance of incorporating stakeholder input (K. Brown *et al.*, 2002). Likewise, many international MPA case studies have highlighted the necessity of incorporating local stakeholders' perspectives when proposing changes to traditional management approaches (Fiske, 1992; Suman *et al.*, 1999; Delaney, 2003; Helvey, 2004 and others). In addition, ICM introduced the concept of zoning the marine environment, having borrowed it from terrestrial land-use planning processes.

2.3.1 Zoning the Marine Environment

Zoning is a legislative way to designate appropriate spatial or temporal locations to accommodate acceptable activities (such as tourism, fishing, boating, diving, and research), separate incompatible activities, protect resources, and reduce conflict between users (Laffoley, 1995; Cicin-Sain & Belfiore, 2003; Doherty, 2003). This can be accomplished “(1) by limitations or restrictions on activities carried out in the same area, (2) by spatial or temporal separation of activities, or (3) by a combination of these approaches” (Tisdell & Broadus, 1989: 48). The concept of zoning may be seen as having two separate purposes: (1) protection and (2) maximizing visitor experience. For instance, in National Parks, zoning is used primarily to allocate different levels of protection in terrestrial environments. However, a secondary purpose of National Park zoning is to provide a range of visitor experience opportunities, varying from car-accessible ‘front-country’ experiences to physically challenging ‘back-country’ experiences.

Zoning is essentially a spatial planning tool for the marine environment, similar to land-use planning for the terrestrial environment. In urban environments for example, uses are designated into residential or commercial areas and incompatible uses are spatially separated. Through zoning, managers are essentially able to allocate areas to allow or disallow specific activities, depending on their apparent suitability within such areas. Unlike a single purpose marine reserve, whose primary objective is protection, a multiple use MPA can address multiple objectives, including allowing recreational or other types of uses (Doherty, 2003) through an effective zoning plan.

The United Nations Education, Scientific, and Cultural Organisation (UNESCO), seeking to reconcile the challenge of mixing conservation objectives with use of natural resources, established the biosphere reserve concept in the mid 1970s. This model, though mainly driven by the need for terrestrial protected areas to provide scientific opportunities, also recognises that human development and the associated cultural values must be maintained (UNESCO, 2002). The model therefore proposes that each biosphere reserve should contain three elements (or, zones). First, there must be ‘core’ protected

areas, specifically for preserving biodiversity, monitoring disturbed ecosystems, and for undertaking non-destructive research. The second element is a 'buffer' zone surrounding each of the core protected areas, which is appropriate for low-impact activities compatible with conservation values. The third and final element is a flexible 'transition' area, designed to accommodate a variety of human uses including agriculture and settlements. This transition area is ideally developed according to the desires of a community of stakeholders, much like an ideal multiple-use MPA. A schematic zoning pattern of a generalized biosphere reserve is shown in Figure 2.1 below:

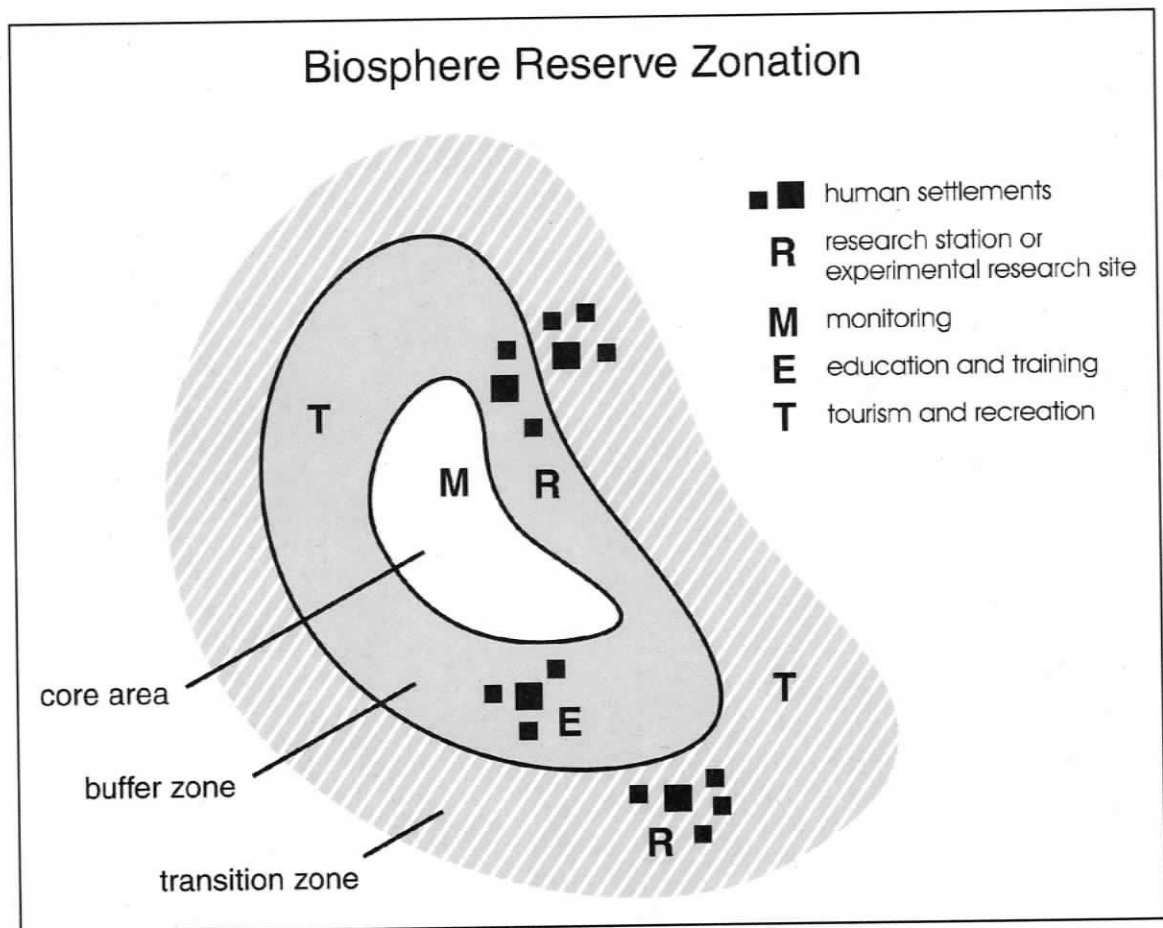


Figure 2.1 Zoning Schematic of the Biosphere Reserve Model (from UNESCO, 2002).

There are different examples of zoning plans, as a result of each setting having a unique political and socio-economic situation, unique stakeholder demands, and unique traditional uses. However, national policies exist that define frameworks for zoning plans

that generically apply to systems of MPAs. For instance, in their National Marine Conservation Areas Policy document, Parks Canada proposes a simple three-zone format (similar to the biosphere reserve concept discussed above), representing a continuum of protection and use. Adopting an adaptive management paradigm, one that approaches complex situations with flexibility, they have proposed the following three zoning provisions, but state that they are intended to serve as a guide only, and may change as experience warrants (Parks Canada, 1994):

- Zone I (Preservation) – Renewable resource harvesting is not permitted. Only where public education is high are visitors allowed supervised access.
- Zone II (Natural Environment) – Objectives involve creating a ‘buffer’ around Zone I in order to enhance protection. Renewable resource harvesting is prohibited, but low-impact recreation and education initiatives will be permitted. Only minimal facility development is allowed.
- Zone III (Conservation) – Provisions will be made to allow reasonable use (such as sustainable resource harvesting) consistent with the functions of ecological integrity. Public facilities for administration, visitor services, and accommodation are allowed.

In more generic terms, the *Canada National Marine Conservation Areas Act* states that NMCA zoning plans must include, “at least one zone that fosters and encourages ecologically sustainable use of marine resources and at least one zone that fully protects special features or sensitive elements of ecosystems, and may include other types of zones” (“*Canada National Marine Conservation Areas Act*,” 2002). Similarly, in the United States, there is legislation that mandates the National Oceanic and Atmospheric Administration (NOAA) to develop temporal and spatial zoning plans. For example, the Florida Keys National Marine Sanctuary Zoning Action Plan proposed five distinct zone types: (1) Replenishment Reserves, (2) Sanctuary Preservation Areas (SPAs), (3) Wildlife Management Areas, (4) Special-use Areas, and (5) Existing Management Areas (Suman *et al.*, 1999).

One of the largest and most complex MPA zoning plans in the world is in the Great Barrier Reef Marine Park (GBRMP), Australia. The GBRMP Authority has used a

range of management tools to regulate human use throughout its 25-year history, including: zoning plans, permits, education, and management plans. Although there have been many challenges with zoning, and it has evolved and changed over time (Day, 2002), multiple-use zoning is considered to be the most effective conflict and use management approach. In 1989, Tisdell & Broadus described the three broad categories of zones in the GBRMP as “(1) preservation and scientific research zones (only human activity for *controlled* scientific research is permitted); (2) national park zones (scientific, educational, and recreational use permitted); and (3) general use zones (commercial and recreational fishing allowed subject to some limitations)” (1989: 49). After the realization that the GBRMP was not adequately protecting representative areas of biological diversity, in 1998 the Authority embarked on a major review to develop a new Zoning Plan for the entire GBRMP (Thompson *et al.*, 2004). Day (2002) offers an updated outline of zoning provisions in the GBRMP as shown in Table 2.1, below.

Table 2.1 Zoning Provisions in the Great Barrier Reef Marine Park

General Use Zone / <i>General Use 'A' Zone</i> – least restrictive of all zones; it provides for all reasonable uses, including shipping and trawling. Prohibited activities include mining, oil drilling, commercial spear fishing and spear fishing with SCUBA
Habitat Protection Zone / <i>General Use 'B' Zone</i> – provides for all reasonable uses, including most commercial and recreational activities. Shipping and trawling are prohibited as well as those activities not allowed in General Use 'A' Zone.
Conservation Park Zone / <i>Marine National Park 'A' Zone</i> – provides for appreciation and recreational use, including limited line fishing (one line/hook per person). Spear fishing and collecting are prohibited as well as those activities not allowed in General Use 'B' Zone.
Buffer Zone / <i>Marine National Park 'Buffer' Zone</i> – similar to and adjacent to MNP 'B' zones, but allows pelagic trolling. All those activities not allowed in Marine National Park 'A' Zone are also prohibited.
Marine National Park Zone / <i>Marine National Park 'B' Zone</i> – provides for appreciation and enjoyment of areas in their relatively undisturbed state. It is a 'look but don't take' zone, in which all forms of extraction (including fishing) are prohibited.
<i>Scientific Research Zone</i> – set aside exclusively for scientific research; entry and use for other reasons is prohibited
Preservation Zone – provides for preservation in an undisturbed state. All entry is prohibited, except in an emergency, with the exception of permitted scientific research which cannot be conducted elsewhere.

Most recent zone names shown **bold**; older zone names in *italics*.

Source: (Day, 2002)

While it has been suggested that management of the marine environment should provide for both protection and human use (Kelleher & Kenchington, 1992), these opposing goals inherently demand spatial separation. Where possible, zoning could allow commercial uses within MPAs on a controlled basis if deemed sustainable (Salm *et al.*, 2000). Agardy (1997) notes that scientifically based and realistically planned zones can be integrative and therefore may allow continued exploitation of marine resources while accommodating other potential users without conflict. A two or three-zone scheme (such as proposed for the Galapagos Islands (Tisdell & Broadus, 1989) and Parks Canada's NMCA program) is worthy of attention for its simplicity and economy. Indeed, one of the many challenges of implementing successful MPA zoning programs is the ability of managers to develop a high level of understanding and compliance with the users of the areas (Laffoley, 1995). Parks Canada recognizes that while zoning must be comprehensive, it must also be simple enough for the public to understand (Parks Canada, 1994). Doherty (2003) and other authors suggest that like other phases of the MPA planning process, stakeholders must be involved in the zoning process to assess public goals for use of a given ocean space.

2.3.2 Stakeholder Involvement and Participation

Approaches to management of MPAs vary depending on the needs and conditions of each site. Management regimes of MPAs are influenced by ecological, cultural, and political variables unique to each region where an MPA is established (Kessler, 2004). Jones (2002) points out that there are two opposing approaches to MPA management: 'top-down' (government-led and science-based) and 'bottom-up' (community-based and science-guided – as in the LAC approach). In a traditional 'top-down' approach, scientific investigation guides the process of identifying candidate MPAs and best management practices therein. Conversely, the 'bottom-up' approach emphasizes the need to acknowledge local values and perspectives (Kessler, 2004), and other cultural variables and how they influence the creation of MPAs (Fiske, 1992). There are strengths and weaknesses to each approach; the 'top-down' model, while centralized and less complex, can lead to controversy or lack of compliance, and may produce 'paper parks' where conservation is ineffective due to lack of compliance to rules and regulations (Kessler, 2004). The 'bottom-up' approach is typically a combination of

scientific and traditional / local knowledge. While more complex and time consuming, it is often considered more desirable due to the incorporation of stakeholder interests which may create a sense of pride and responsibility (and therefore compliance) among other benefits in marine resource protection (Kessler, 2004). Table 2.2 below presents the polarized aspects of both these approaches.

Table 2.2 Different Approaches for the Selection, Design and Management of MPAs

<i>Top-down: based primarily on empirical science, government-led</i>				
Emphasis on enforcement	Executive cross-sectoral authority	Education to justify restrictions and promote compliance	Reliance on comprehensive scientific information	Little scope for compromise
↓	↓	↓	↓	↓
↑	↑	↑	↑	↑
Emphasis on stakeholder participation and cooperation	Community-based partnership	Education to promote support and participation	Science used for guidance where available and appropriate	Greater scope for compromise
<i>Bottom-up: based primarily on socio-economic priorities and guided by science</i>				

Source: (Jones, 2002: 212)

Norton & Hannon (1997) also refer to these different approaches in their discussion of environmental valuation. They associate the ‘top-down’ approach with colonialism and exploitation across (real and metaphorical) political boundaries, and contrast it with the ‘bottom-up’ approach, wherein values are formulated locally and a resistance to enforcement from a centralized authority may be apparent (Norton & Hannon, 1997). It is noted by some authors that the optimal situation in most multiple use MPA cases is a combination of these management approaches (Kelleher & Recchia, 1998; Kelleher, 1999) (neither entirely ‘top-down’ or ‘bottom-up’), given (1) the diversity of stakeholder interests, (2) the high degree of scientific uncertainty, and (3) the high stakes involved in marine resource management decisions (Jones, 2002). An ideal approach is one that is government driven with a high degree of stakeholder involvement (Kelleher & Kenchington, 1992; Kelleher & Recchia, 1998), as in Parks Canada’s NMCA program.

Since many authors (Wells & White, 1995; Kelleher & Recchia, 1998; Kessler, 2004) have noted the importance of stakeholder involvement in marine conservation initiatives, it is important to provide a context for these terms. Brown *et al.* offer a comprehensive definition of 'stakeholder':

"Stakeholders are a person, organisation, or a group with an interest in an issue or resource. Stakeholders include both people with power to control the use and management of a resource, and those with no power or influence (but) whose livelihoods are affected by the changing use or management of the resource. Stakeholders vary in the degree of influence they have, and they can be broadly categorized according to whether they have relatively more or less influence or importance with regard to the success of (the initiative in question)" (2002: 65).

In the context of this thesis, the term is defined as anyone who has an interest in, or who is affected by the establishment of an MPA. This includes not only those living next to it or those relying on the resources in need of protection, but also extends to outsiders who may be indirectly affected by the MPA (such as tour guides for instance). 'Involvement' and 'participation', used interchangeably, denote,

"A process by which individuals and groups come together in some way to communicate, interact, exchange information, provide input around a particular set of issues, problems, or decisions, and share in decision-making to one degree or another" (Ashford & Rest, 1999: III-3).

A key point regarding stakeholder involvement is that the level of involvement is unique to each situation. Arnstein's (1969) seminal work, "A Ladder of Citizen Participation", about citizen involvement in planning processes helps us visualize the continuum (see Table 2.3). Her 'ladder' consists of eight 'rungs', or different levels and types of participation, ranging from non-participation, through citizen control of planning. In their process of conducting a feasibility study for the creation of a NMCA in the Southern Strait of Georgia, Parks Canada uses various methods to gather and incorporate stakeholder input. Their present feasibility study (whereby feedback is sought from the public to determine acceptance of their marine conservation proposal) may be viewed as being situated on the fourth of eight rungs, namely 'Consultation'. Arnstein considers consultation as a 'degree of tokenism', allowing stakeholders a voice

about the future but denying further power in terms of follow-through and assurance that input is utilized (Arnstein, 1969). For instance, while this thesis provides stakeholders with an opportunity to voice their opinions, there is no assurance that management actions will reflect the significant opinion based on the results of this thesis. However, as time proceeds and planning progresses towards establishment of the NMCA, the level of citizen participation may change.

Table 2.3 Arnstein's Ladder of Citizen Participation

8. Citizen control	Degree of citizen power
7. Delegated control	
6. Partnership	
5. Placation	Degrees of tokenism
4. Consultation	
3. Informing	
2. Therapy	Non participation
1. Manipulation	

Source: (Arnstein, 1969)

Salm *et al.* (2000) indicate that one of the most significant new trends in MPA planning is that of stakeholder involvement / community participation mechanisms. Indeed, perhaps the most effective strategy to develop stakeholder support and understanding (and therefore compliance) of MPA proposals is through a participatory planning process (Wells & White, 1995). If they are to support new policies and management plans for coastal resources that are likely to have significant impact on their livelihoods, communities must be consulted through an accessible, thorough process. Indeed, success of MPAs in the past decade has been attributed not to increased scientific knowledge of marine ecosystems, but to increased stakeholder participation in the management process (Morin, 2001, Orbach, 2000). While the work of involving stakeholders in natural resource management is important in any land or water planning process, some authors (Brown *et al.*, 2002), using common sense, are reluctant to completely shift resource planning responsibility to local communities, as in the top of Arnstein's ladder, 'Citizen control'. This sentiment is echoed by Bradshaw (2003) who questions the capacity of local stakeholders to determine the best use of local resources, along with the effectiveness of the community-based management paradigm.

Although not a direct case study of stakeholder involvement in zoning, Doherty (2003) conducted a study that provides the perspectives of a range of stakeholders (n=21) (resource users, conservationists, and academics from both Canada and the US) on the implementation of ocean zoning. Although she found that the concept of ocean zoning is not clearly understood by most stakeholders, her key recommendation is that “stakeholders must be involved in the development and application of a zoning process and their perspectives should be considered in management decisions” (Doherty, 2003: 21). To address misconceptions of the term, ‘ocean zoning’, she suggests, “Clarity of definition is essential.... To get people to accept the vision of zoning (we need)... further debate and workshops that address topics such as comparing the cost of zoning to not zoning, explaining exactly what zoning is and what it is not, what zoning means for industry and other stakeholders, and the benefits / disadvantages of zoning” (Doherty, 2003: 21). Though there is much discourse regarding general stakeholder participation in MPA development and management in recent academic literature (for a review, see Kessler, 2004), there are only a few documented examples specific to examining stakeholder involvement in zoning the marine environment (Morin, 2001).

In the United States National Marine Sanctuaries Program, opportunities for participation in zoning MPAs have increased. Sanctuary Advisory Councils (SACs) are being created, on which appointed members of the public serve to provide assistance and advice to sanctuary managers. Morin (2001) describes an example where, in the Florida Keys National Marine Sanctuary (FKNMS), a working group has been established to address the topic of zoning, but “the extent and effectiveness of this public involvement in influencing policies has yet to be determined” (Morin, 2001: 335). Delaney (2003) provides four key recommendations learned by the process of involving stakeholder recommendations on the size, shape and placement of the Tortugas Ecological Reserve. The recommendations, similar to existing literature, suggest an open and involved process, commitment to collaboration, provision of the best available science, and a ‘bottom-up’ process that garners support from the governing agencies (Delaney, 2003). Contrary to the successful stakeholder involvement in the Tortugas, Helvey (2004) reports that what was supposed to be a ‘bottom-up’ approach for the Channel Islands

Marine Reserve, ended up being 'inverted' and alienated much of the fishing community. The author speculates that the Marine Reserve Working Group's ineffectual efforts may be attributed, "to their directive to only consider 'no-take' marine reserves as the sole... option" (Helvey, 2004: 186). Helvey's (2004) conclusions highlight (1) the importance of keeping the fishing community engaged as being critical, since the alternative is unsuccessful in terms of marine conservation; (2) that MPA planners need more effective outreach options to harness more than just those at the table, and (3) that consideration should be given to other planning options, such as 'multiple use' designations.

As mentioned, Australia's Great Barrier Reef Marine Park (GBRMP) is the most significant example of a multi-use MPA in the world. In 2002, the GBRMP Authority began the process of a major revision to the Zoning Plan. The process, involving two formal (statutory) phases of public consultation, was considered one of the most extensive marine conservation public planning processes in the world (Thompson *et al.*, 2004). A draft zoning plan was created based on public submissions during the first phase, and revisions were made based on public submissions during the second phase and the final Zoning Plan was approved by Parliament and came into effect on July 1, 2004. The process (a total of 31,500 submissions, and over 600 community meetings) ensured, "zoning plans [were] prepared with an understanding of the range of uses and issues people might have for the area to be zoned" (Innes *et al.*, 2004: 5). Thompson *et al.* (2004) and Innes *et al.* (2004) provide a detailed analysis of the challenges involved with stakeholder consultation, both in disseminating information to the public, and in accepting, understanding, and managing public submissions. Even though public participation is a legislated requirement, planners with the GBRMP Authority recognise that positively engaging all people who have an interest in the area was one of the most significant lessons learnt (Thompson *et al.*, 2004). These examples show how stakeholder involvement, due to attitudes and perceptions that may or may not match scientific research data, is not an easy task for managers to tackle.

While stakeholder involvement is key to successful conservation initiatives, on the other hand, there have also been examples where MPA proposals were abandoned by

the planning agency due to overwhelming stakeholder opposition because of a perceived loss of access to traditional resources (Lien, 1999; Suman, 2001). Regarding the potential for enforcement challenges due to weak stakeholder involvement, Brown *et al.* state, "The causes of resource depletion can sometimes be traced to the marginalization of important stakeholders who feel excluded and withhold support for the protected area" (2001: 418). The challenge for managers then, is to channel community response into support for the project (Wells & White, 1995). However, Salm *et al.* (2000) remind us that public participation processes are not intended to influence opinions of stakeholders or lead to predetermined outcomes. While public participation has been used more frequently in recent years for various resource management scenarios, it is not always an easy process. Salm *et al.* state blatantly to facilitators that, "... participation that is not actively encouraged is not real participation. You've got to get out there. You've got to go through the process of distrust before you get to the process of trust... Be prepared to be insulted, contradicted, even threatened" (2000: 111).

Clearly, there are both benefits and challenges associated with stakeholder participation. Benefits include (1) increased understanding of new regulations (Cocklin *et al.*, 1998); (2) increased compliance and voluntary enforcement and therefore a reduction of enforcement responsibility by the coordinating agency (Fiske, 1992; Wells & White, 1995; Cocklin *et al.*, 1998; Brown *et al.*, 2001); (3) increased legitimacy in the project (Cocklin *et al.*, 1998); (4) increased assurance that the regulations cater to the needs of those who rely most on the resource (Kessler, 2004); and (5) increased community pride and intrinsic value of involvement in a conservation initiative (Wells & White, 1995). On the other hand, challenges of stakeholder involvement include (1) delays in decision making (Kessler, 2004); (2) increased expenses and organizational difficulties (Kessler, 2004); (3) potential for conflict and tension between stakeholder groups (Suman *et al.*, 1999; Kessler, 2004); (4) unfair representation of unique interests and an imbalance among the level of 'stake' that is apparent (Wells & White, 1995; Cocklin *et al.*, 1998); (5) ineffective involvement due to an uninformed public (Cocklin *et al.*, 1998); and (6) increased potential for a lack of consensus (Helvey, 2004; Kessler, 2004). The predicament for managers then, is to weigh the benefits and challenges of

stakeholder involvement and understand how they will affect each step in the planning process and the possibilities for maximizing the benefits and minimizing the challenges.

While many authors highlight the importance of incorporating stakeholder input into zoning plans, there are no empirical studies such as this thesis that examine stakeholder attitudes towards different types of proposed zones.

2.4 Attitudes, Perceptions, Values and Resource Management

Attitudes, perceptions and values are important factors in the success or failure of any conservation program (McClanahan *et al.*, 2005). It is also stated in the literature that managers are better capable of managing natural resources if they understand the attitudes and perceptions of the affected stakeholder groups (Wolfenden *et al.*, 1995; Cocklin *et al.*, 1998; Orbach, 2000; Widmer *et al.*, 2002; Mascia, 2003). Salz & Loomis (2004) note that attitudinal data collected early in an MPA planning process can (1) help identify preferences among stakeholder groups, (2) identify management alternatives, justify management actions, and (3) reduce the likelihood of alienating important stakeholder groups. Additionally, by understanding attitudes, perceptions and values throughout all phases of MPA management, managers are better able to (1) identify what is important to different users of the marine environment; (2) determine public relations, outreach, and education needs; (3) justify management decisions; (4) promote resource protection; (5) identify potential conflict areas that need management attention; and (6) address negative concerns and build on positive perceptions (NOAA, 2005).

Attitudes are an opinion or individual way of thinking (a position towards an issue), while *perception* (as opposed to reality) is an interpretation or impression based on one's view and understanding of an issue. Since perceptions may not necessarily match truth (as judged by those with specialized knowledge), it is important for managers to understand and consider perceptions and incorporate them into management decisions that affect the stakeholder groups (Widmer *et al.*, 2002). Understanding attitudes is particularly important because they have been theorized to assist in predicting human behaviour (Ajzen & Fishbein, 1980). The theory suggests (1) that if attitudes are known (i.e. pro-marine conservation), predicting behaviour (i.e. participation in marine

conservation initiatives, support for certain politicians or policies, etc) is possible, and (2) by understanding attitudes, it is possible to manipulate them and consequently affect human behaviour (such as park visitation or regulatory violations) (Manfredo *et al.*, 2004). Attitudinal research has been applied to studies on recreation conflict, crowding, trip satisfaction, wildlife acceptance capacity, and willingness to pay (Manfredo *et al.*, 2004) to name only a few. Though an equally important aspect of research on marine conservation, attitudinal studies are not as prevalent in the MPA literature.

Values on the other hand are of interest because they “reveal the fundamental basis of an individual’s thoughts, attitudes, and opinions” (Manfredo *et al.*, 2004: 275). Values are defined by Rokeach as, “an enduring belief that a specific mode of conduct is personally or socially preferable to an opposite or converse mode conduct or end state of existence” (1973: 5). As abstract social cognitions, values represent the foundation from which attitudes and behaviour are formed (Vaske & Donnelly, 1999). Theory suggests that there is a hierarchical relationship of values, attitudes, and behaviours, as in the cognitive hierarchy model of human behaviour as conceptualized by Fulton *et al.* (1996). It is proposed that values underlie value orientations (i.e. patterns of basic beliefs), which influence attitudes, and therefore may affect behaviour (Vaske & Donnelly, 1999).

Rolston & Coufal (1991) present a more specific series of values including a new orientation – that of beliefs/existence. They present the statutory multiple-uses of forest resources as (1) recreation, (2) timber supply, (3) range, (4) watershed, and (5) fish and wildlife, and expand them to ten categories that incorporate both human and biotic values, described poetically below in Table 2.4. This original conceptualization of a comprehensive list of values is used in this thesis and other studies to understand stakeholder environmental valuation.

Table 2.4 Expanded and Defined Human and Biotic Values

1. Life support values. “Underlying all economic values are the timeless natural givens that support everything else – forests, sunshine, wind, rain, rivers, soils...”
2. Economic values. Humans are driven by economic activity. “This fundamental utility is so well established that there is no need to emphasize it”
3. Scientific values. “At least half of what there is to know about forests remains undiscovered”. The same is true about oceans.
4. Recreational values. “Forests are recreational theatres as well as gymnasiums, and this runs past ‘uses’ to appreciating ‘values’.” The same is true about oceans.
5. Aesthetic values. “Forests are never ugly; they are only more or less beautiful; the scale runs from zero upward with no negative domain.”
6. Wildlife values. “Wildlife is already a designated ‘use’ but we do not always ask what use we can make of a wild animal; we value wildlife for its inherent value”.
7. Biotic diversity values. “About 500 faunal species and subspecies have become extinct in the US, and another 500 taxa are of concern... Hardly a forest is not impoverished of its native species”.
8. Natural history values. “A pristine forest is prime natural history, a relic of the way the world was for vast stretches of time”.
9. Spiritual values. “A wild forest is a sacred place, yet most foresters have been reluctant to profess this publicly or to manage for such a value”.
10. Intrinsic values. “Surrounded by politicians, citizens, customers, planners, economists, and surrounded by the manufactured environments of human culture, one is lured into the superficiality of anthropocentrism. Value enters, exists, and exits with the fashions of human perception and preference. Nothing counts until humans count it. Surrounded by the forest, this anthropocentric conclusion seems even more superficial. Rather, the forest is value-laden.”

(Adapted from Rolston & Coufal 1991: 38, 39)

Rolston and Coufal (1991) stress (as in Aldo Leopold’s land ethic) that biotic values should be placed alongside, instead of behind, anthropogenic values of the natural environment. Though their paper is directed at foresters (*Journal of Forestry*), their list of values has been modified and applied to both terrestrial and marine environments. Their discussion emphasises recognition that forests should be seen as a community, rather than a commodity or amenity. Like forests that are “originally and objectively a community” (Rolston and Coufal 1991: 36), so are the oceans. Likewise, “only with human needs and preferences projected onto it does a forest become a commodity” (Rolston and Coufal 1991: 36). They state in reference to forest resource management

that, "The deeper natural resource problem is as philosophical as it is technical. The problem lies in treating as mere resource that toward which one ought to have a land ethic" (Rolston & Coufal 1991: 38). The authors propose a paradigm shift whereby foresters stop thinking only in terms of 'uses' of forest resources, but move towards thinking of the intrinsic 'values' of forests. Vaske & Donnelly (1999) present a similar discussion in their paper examining value orientations towards either biocentric or anthropocentric value orientations. Applying these variables to the values-attitude-behaviour model, value orientation predicted respondents' attitudes, providing a useful theoretical framework for addressing natural resource issues (Vaske & Donnelly, 1999).

Alongside the notion of valuing the natural environment are theories of environmental valuation. One such theory is a 'place-based' theory that builds on the notion suggested by recent authors that 'sense of place' should become an important concept in our evaluation of environmental policies (Norton & Hannon, 1997). Norton and Hannon (1997) proposed a theory of environmental valuation based on a commitment to, or sense of place wherein value intensity is discounted from the home perspective across both time and space, a form of geographical discounting. The theory proposes a scientific hypothesis stating that there is a relationship between value judgements and the physical distance of a person's residence from a subject. In addition, they propose, "a social-scientific hypothesis that allows us not only to predict how people will value certain things, but also to measure changes in local preferences as a result of experiences in democratic formulation of management goals" (Norton & Hannon, 1997: 231). Their paper also re-introduces the concept of NIMBYism (Not-In-My-Back-Yard); the notion of locally formulated values "expressed as strident opposition" to proposed developments, often perceived by outsiders "as a hindrance to formulation of a rational environmental policy" (Norton & Hannon, 1997: 228). Their theory proposes that any democratically supportable policy must take NIMBYism into account as a given, and therefore managers must harness local values in policy formulation. They admit that their theory, "suggests no less than an about-face in current trends in environmental planning and policy formulation" (Norton & Hannon, 1997: 244), but as the literature shows, effective stakeholder consultation leads to more effective resource and

environmental management (K. Brown *et al.*, 2001; Mitchell, 2002; Kessler, 2004). Norton & Hannon's paper is neatly summarized by their statement, "good management requires, in the immortal words of Leopold, learning to 'think like a mountain' – or like a bay" (Norton & Hannon, 1997:235), or in the case of this thesis, 'like an ocean'. In the context of this thesis, 'thinking like an ocean' is akin to understanding that humans are but one component of a functioning ecosystem. Ideally, the ways in which we use the marine environment should be placed alongside, rather than in front of, ecological functions.

Brown has pursued the topic of measuring values in various studies both descriptively as in this author's study, and by applying Norton and Hannon's place-based theory to community value judgements as part of the planning process for the Chugach National Forest in Alaska (Brown *et al.*, 2002). One of their research methods presented 13 of the best known values of national forests (modified from Rolston & Coufal's 1991 typology) and asked respondents to 'spend' a hypothetical \$100 among the 13 values, to indicate which were most important to them. In addition, after allocating the budget on their most important values, respondents were asked to spatially locate their values on a map by placing coloured dots at the places that best represent their most important values. Their intent with this method was to have respondents select and weight their most important values, and indicate where they exist on the landscape of the Chugach National Forest area (Brown *et al.*, 2002). Interestingly, they compared results by responses from three communities with contrasting cultural and geographical settings and found that proximity of values to the community varies by community. Also, values involving direct or active human-use of the landscape (recreation, aesthetic, therapeutic) are located nearest the communities, and values involving indirect or passive human-use are located furthest from the communities (Brown *et al.*, 2002). Another one of their significant findings is that for every value, the null hypothesis of spatial randomness is rejected which indicates a tendency towards values clustering around certain landscape features.

Perhaps the pioneering work in landscape valuation was conducted by O'Connell & Keller (2002) whereby the authors combined quantitative and reductionist techniques (allocating numerical values to land attributes) with holistic techniques (allocating value based on experience and personal judgement). The authors apply the 'Gestalt method' of landscape valuation, which (though it suffers from subjectivity and nonreplicability) allows homogeneous parcels of land to be judged for value relative to each other. Their pilot method used topographical maps, overlaid with transparent mylar on which respondents drew polygons representing areas of 'low', 'medium', 'high', or 'exceptional' land value. The product of this research was a collaborative spatial decision support system (CSDSS) which allows facilitators to "capture, compare, and evaluate perceived value of landscape as expressed by stakeholders and experts" (O'Connell & Keller, 2002: 609).

It has been stated that social science is as important (if not more) than natural and biological sciences, to informing natural resource management (Haider & Morford, 2004) and to ensuring the success of marine conservation initiatives (Tisdell & Broadus, 1989; Fiske, 1992; Kelleher & Recchia, 1998; Bunce *et al.*, 1999; Agardy *et al.*, 2003). However, one research project has made an attempt to determine similarities between social values and perceptions, and empirical scientific data (Brown *et al.*, 2004). These researchers compare perceptions of biological value to scientific assessment of biological value. Their purpose was to determine the usefulness of local values in conservation planning in comparison to biological assessment of the marine environment of Prince William Sound, Alaska. Results indicate a moderate degree of spatial coincidence (with obvious geographic areas of agreement and disagreement) and support the need for conservation planning that incorporates both methodologies (Brown *et al.*, 2004). Brown *et al.*'s study (whereby they sampled respondent values towards the marine environment of Prince William Sound) influenced the development of the values section of this thesis research.

A number of studies have been published on attitudes towards, and perceptions of existing MPAs. For instance, Cocklin *et al.* (1998) provide a discussion of various

studies conducted to monitor attitudes of New Zealanders towards established marine reserves. Similarly, Suman *et al.* (1999) report on surveys conducted with various stakeholder groups' (commercial fishers, dive tour operators, and local environmental groups) perceptions and attitudes regarding the Florida Keys National Marine Sanctuary. McClanahan *et al.* (2005) examine the factors that influence perceptions of existing MPAs. Some studies (i.e. Elliott *et al.*, 2001), through social impact assessments, examine the impact of existing MPAs and marine reserves on the livelihoods of local people. Salz & Loomis (2004), noting the opposition to 'no-take' marine reserves by sportfishing interest groups, investigated anglers' attitudes towards several hypothetical alternatives to existing MPAs – a worthy effort to lessen opposition by establishing reserves based on their interests.

In this thesis research, values towards the marine environment are used as an independent variable to explore respondents' attitudes across a range of issues, including potential solutions to the problems associated with sewage from recreational boats, visual acceptability of recreational boating and shellfish aquaculture, and zoning the marine environment.

2.5 Activities within the Marine Environment

2.5.1 Shellfish Aquaculture

Influenced by global demand for increased food production and concern of the capacity of wild fisheries to sustain human protein demand, commercial aquaculture – the cultivation of aquatic species for human consumption - has become a worldwide norm. Aquaculture is viewed by some as a sustainable source of food that will help avoid natural resource depletion and scarcity, while others challenge it for its real and perceived negative environmental (e.g. Jamieson *et al.*, 2001; Krkosek *et al.*, 2005) and social (Katranidis *et al.*, 2003) effects. Much research has been conducted, due to questions around the balance between global food security and the environmental and resource costs of aquaculture production. Shellfish aquaculture, if conducted responsibly, has the potential to be an economically profitable industry without negatively affecting coastal ecosystems (Deal, 2005). In BC, the government has developed a Shellfish Development

Initiative with the objective of increasing tenure area allocation for shellfish aquaculture facilities. Indeed, the industry is interested in expansion and is working towards better product development and marketing initiatives (Kingzett & Salmon, 2002). However, local concerns over shellfish aquaculture expansion include potential resource use conflicts, environmental and wildlife conflicts, and the lack of effective consultation (Emmett, 2002).

In Australia, a large project has been undertaken to understand community perceptions of aquaculture. The project, commissioned by the Australian Government, Bureau of Rural Sciences, aimed to build a sustainable aquaculture industry by understanding community perceptions and thus providing information on how to improve the social acceptability of aquaculture (Mazur, 2004). In the literature review Mazur (2004) identifies trends in aquaculture and its related industries, as well as examples of stakeholder perspectives and their influence on outcomes of resource management decisions. Results interpreted from this literature review indicate that Australian stakeholders identify aquaculture's key benefits as economic and employment opportunities (Clark, 1996) and key disadvantages as potential negative environmental impacts (Wilson, 2001). Mazur (2004) concludes that Australians, when faced with trade-offs in balancing economic and environmental priorities, generally seem to favour environmental priorities.

Likewise, Katranidis *et al.* (2003) conducted a study in Greece to determine both local residents' and visitors' perceptions of aquaculture. They indicate that although there are negative perceptions of the activity, this perception may be due to severe competition for available resources (i.e. access to coastline), and thus the problem lies in poor planning of the land and sea. They suggest a solution might be to introduce an integrated approach to coastal planning whereby economic, social, and environmental issues are integrated, as in the ICM discussion earlier in this chapter. An ICM plan, ideally, would identify the most appropriate zones to locate aquaculture and therefore diffuse negative perceptions. The researchers found also that since development in their research area was not directed towards tourism, aquaculture was initially able to develop

without much opposition. However, they note that if in the future the islands choose to re-examine their tourism potential, more opposition to aquaculture is to be expected (Katrinidis, *et al.*, 2003). The study did reveal, however, that residents in the area do have negative attitudes towards the aquaculture development in terms of its environmental impact. The authors note additionally that the industry could be more acceptable if it paid more attention to communication with locals and the public in general.

In this thesis, visual acceptability of shellfish aquaculture was tested, as was perceptions of benefits and concerns associated with the industry, including overall perceptions.

2.5.2 Recreational Boating

Coastal areas hold a large attraction to people for residence, travel and commerce. Coastal and marine tourism forms a significant component of the wider tourism industry (Orams, 1999). Recreational boating, while only one activity associated with coastal tourism, is a significant and growing activity, and like most human activity it has both positive and negative environmental and social effects. Potential negative environmental effects from recreational boating include damage to the ocean floor and benthic ecosystems from anchoring (Backhurst & Cole, 2000; Leatherbarrow *et al.*, 2005), the effects of boating related facilities such as marinas (Widmer *et al.*, 2002), and the impact of sewage discharge from recreational boats (Shafer & Yoon, 1998), though this last issue is not well understood. Negative social impacts from recreational boating may include noise or visual impacts; however, very little research has been conducted in this regard. The majority of recreational boating research conducted has been limited to either demographic data of boat owners, driven or commissioned by the corporate boating industry (Shafer & Yoon, 1998), or to geographic usage and incident patterns, as is being conducted by the Maritime Activity and Risk Investigation Network (MARIN) to assist in search and rescue operations.

Some environmental concerns associated with recreational boating have been addressed in academic literature. For instance, in an effort to determine if levels of

recreational boat anchoring in New Zealand were unsustainable, Backhurst and Cole (2000) tested the impact from anchoring on the benthos. Indeed, they found damage from anchors to be significant; however, they concluded that at present levels in this particular study area, management actions are not necessary until a time when such activity increases.

A similar study is being conducted in BC's Gulf Islands whereby the benthic habitat is being mapped, and using GIS technology, recreational boat anchoring data are overlaid with ecosystem data to determine extent of impact (Leatherbarrow *et al.*, 2005). Since one objective of National Parks is to maintain ecological integrity, Leatherbarrow *et al.*'s study aims to inform the management plan in terms of anchoring within the Gulf Islands National Park Reserve. Finally, Schafer & Yoon (1998) conducted a study whose main objective was to determine the number of pump-out facilities necessary to adequately service the needs of the current recreational boater population in the Pennsylvania, USA area. Their results provide (1) recommendations to resource managers on the specific required number of pump-out stations, and (2) information to make more efficient decisions about resource allocation towards marine environmental protection.

Fields (2003) states that while there is an increase in boating stewardship programs to educate boaters about their environmental impact (such as the Georgia Strait Alliance's *Guide to Green Boating*), the rapid growth in number of recreational boaters is making the problem worse. His article concludes that impacts from recreational boats can be grouped into four primary areas: (1) operational hazards (such as damage from propellers and noise), (2) petroleum products spillage, (3) pollutants related to boat maintenance, and (4) sewage from recreational boats (Fields, 2003). When boating activity is concentrated (such as at marinas), these issues become more significant. With regard to sewage from recreational boats, Canada's regulations on discharge are not as strict as in the US. For instance, in American territorial waters (within three nautical miles from shore), federal law under the *Clean Waters Act* prohibits discharge of untreated sewage. While some local governments in British Columbia don't allow any

sewage discharge (treated or not) in certain areas, some boats are still not fitted with holding tanks, and those that are do not always use pump-out stations (Fields, 2003). Research has shown that high levels of faecal coliform (an oxygen-depleting bacteria) have been found in areas of high recreational boat concentrations (Fields, 2003).

While some research has been conducted on the environmental effects of recreational boating, very little has been conducted on social perceptions of the activity. However, one study sampled perceptions of potential environmental impacts due to recreational boating on Sydney Harbour, Australia (Widmer *et al.*, 2002). Using a questionnaire method, the researchers found that the distance of residence did not significantly influence interest or indifference to the harbour's environmental condition, implying that stakeholders from distant suburbs should not be excluded from consultations. The majority of respondents perceived the harbour to be overly polluted, suggesting a concern towards current managerial initiatives; however, accessibility to the harbour was perceived positively, suggesting public spaces and beach accesses are meeting demand despite the level of foreshore development. Recreational boating and its associated facilities were not perceived to be a major source of environmental impact, with exception of marinas. It was noted that the concern towards marinas may not be due to perceived environmental impact, but rather other factors such as visual impact, or urban encroachment. With regard to types of recreational boats, human or wind powered boats were seen as more acceptable and causing the least amount of environmental impact. The authors note however that, "it is not at all clear that public perceptions and opinions match environmental realities" (Widmer *et al.*, 2002: 26) since non-motorized yachts also have potential negative effects through sewage discharge, littering, or benthic disturbance by anchoring and others.

This thesis research contributes to other research related to recreational boating by (1) examining the issue of recreational boat congestion (i.e. crowding). In addition, it focussed on (2) attitudes towards potential solutions to the problem of sewage from recreational boats, and (3) perceptions of issues related to anchoring.

2.6 Visitor Management Frameworks

In a recent paper, Dearden & Dempsey (2004) describe major changes in Canada's protected areas system including increases in area, changes in legislation and policy, and adjustments in priorities for use. Providing a context for these major changes, the authors note the significant international factors (i.e. deterioration of the global environment, livelihoods and economies) and national factors (i.e. evidence of declining ecological integrity, increased effectiveness of national environmental NGOs) that have effected these changes. Despite progressive changes in legislation, funding and management, a significant challenge remains in the continued increasing visitation to protected areas (Dearden & Dempsey, 2004). Pivotal questions associated with visitor management within protected areas include: (1) how to maintain ecological integrity, while allowing for recreational use, (2) how to measure and quantify visitor experiences so that we can set standards of quality, and since visitor behaviour is a key factor in experiences, (3) what are the best methods of controlling behaviour to acceptable standards?

Intense recreational use of natural areas and resources often leads to problems related to (1) crowding, and (2) conflict with other user groups (i.e. recreational or non-recreational user groups). For instance, certain marine areas may be limited in space to cater to the demand for use, and therefore other uses may not be compatible in addition to existing uses (such as shellfish aquaculture facilities within popular recreational boat anchorages). Crowding and the resultant conflict have the potential to negatively impact experiences, potentially leading to other social impacts. The rise in interest for human use and exploitation of marine environments worldwide (Miller, 1993) has led to a necessity for tools that allow for both use and protection of marine environments. As a result, natural resource and protected area managers are challenged by the dual mandate of, and inherent tension between protecting ecological integrity while allowing for recreational use (Manning, 2004). Three particular problems associated with this increased recreational use are noted by Payne & Graham (1993) including (1) unregulated visitation which may cause damage to the natural environment such as erosion, trampling and introduction of invasive species, (2) chance encounters between wildlife and people which may cause unpleasant situations for both parties, and (3)

conflicts between people with different values, motivations, interests, or level of specialization, which may negatively impact the recreation experience. Based on these and other challenges, the dominant paradigm for management of protected areas has seen substantial evolution in recent years. Concerns about sustaining ecosystem integrity, while allowing for continued recreational use, have led to the development of sophisticated visitor management frameworks that provide decision-making support to agencies associated with protected areas and visitor management (Payne & Graham, 1993; Borrie *et al.*, 1998; Swinnerton, 1999; McCool & Lime, 2001).

The issue of how much use can be accommodated without threatening the ecological integrity of protected areas or degrading the recreational experience has traditionally been categorized as 'carrying capacity' (Freidmund & Cole, 2001). The concept originated in the disciplines of wildlife and range management (Manning, 2004), and is still used in that context, referring to the number of animals that can be sustained by a given habitat. In a parallel application with humans (i.e. how much human use is too much?), carrying capacity was first applied to protected areas and outdoor recreation planning in the 1960s. This early work hinted that as more people visit an area, not only are environmental resources affected (through trampling, erosion, etc), but so is the quality of the recreation experience (Wagar, 1964) (through social effects such as crowding). The early solution to this problem and the basis for the carrying capacity concept was the application of use-limits in certain areas. However, soon after the first implementation of use-limits, researchers began advising that their implementation be restricted and only used as a last resort (Lindberg *et al.*, 1997). A large body of research (Wagar, 1964; McCool, 1994; Freidmund & Cole, 2001; Manning, 2001) has shown that the carrying capacity concept has provided managers with little practical direction, since both ecological and social impacts are often influenced by variables other than a quantifiable level of use (Borrie *et al.*, 1998). Impacts differ depending on types and distribution of uses, specific site characteristics, management practices (McCool & Lime, 2001), and people's expectations and perceptions of norms (Vaske & Whittaker, 2004). It soon became apparent that it was necessary to shift the focus from establishing

numerical carrying capacities to evaluating acceptable resource and social conditions (McCool & Lime, 2001; Needham & Rollins, 2005).

Recognizing these challenges, protected area managers began to develop and apply visitor management frameworks that more clearly express management objectives based on established standards for acceptable conditions (Manning, 2004). Two important advances in visitor management are the Recreation Opportunity Spectrum and the Limits of Acceptable Change frameworks discussed below.

2.6.1 Recreation Opportunity Spectrum (ROS)

One of the first and most widely adopted frameworks developed from the carrying capacity concept was the Recreation Opportunity Spectrum (ROS). ROS is based on an understanding of the necessity to allocate different settings that provide for different recreation opportunities (i.e. zones). Hence, ROS distinguishes among six recreation opportunity classes in terrestrial settings: (1) urban, (2) rural, (3) roaded natural, (4) semi-primitive motorized, (5) semi-primitive non-motorized, and (6) primitive (Payne & Graham, 1993). These opportunity classes, ranging on a spectrum from developed (an area characterized by substantial modification) to undeveloped (large areas essentially unmodified) (Borrie *et al.*, 1998), vary systematically in the amount and type of use and modification. Orams (1999), building on ROS, categorizes marine recreational activities in a typology called the 'Spectrum of Marine Recreation Opportunities' (SMRO). This typology characterizes experiences by (1) distance that they occur from shore, (2) the characteristics of the environment in which they occur, and (3) the experiences sought by marine recreationists. Ranking opportunities like this along a continuum helps managers simplify the opportunities so that the role of each is more easily understood (Orams, 1999). By describing certain areas in terms of their opportunity classes, ROS and SMRO provide a basis for zoning to accommodate certain recreational uses. Interrelated with the opportunity classes are management factors (i.e. access, other resource uses, modification, etc) that vary according to each point along the spectrum.

ROS proved attractive to managers for its flexibility in which recreational opportunities are supplied by integrating the appropriate setting with visitor preferences

and priorities (Boyd & Butler, 1996). However, ROS zones differ from Parks Canada's NMCA policy zones in that ROS focuses primarily on the visitor experience, whereas NMCA zoning focuses on both strict protection of unique or sensitive ecological features and providing for different types of visitor experiences. ROS provided a foundation for further development of visitor management frameworks such as the Limits of Acceptable Change, described below.

2.6.2 Limits of Acceptable Change (LAC)

Given the inherent subjectivity in the question, "how much use is too much" (from the carrying capacity paradigm), the question has now become "how much impact from use should be allowed", or what are the desired conditions or *limits of acceptable change*? Initially developed by the United States Forest Service (Stankey *et al.*, 1985) as a wilderness management framework, the LAC framework was developed after the few instances where the carrying capacity concept was not truly successful. Indeed LAC was specifically designed to address the weaknesses of the carrying capacity paradigm (McCool, 1994). LAC is now the dominant paradigm in protected areas research (Moore *et al.*, 2003), but other very similar frameworks include Visitor Activity Management Planning (VAMP) (Payne & Graham, 1993), Visitor Impact Management (VIM), Visitor Experience and Resource Protection (VERP) and the most recent development in the literature, the Tourism Optimization Management Model (TOMM) (McCool & Lime, 2001).

Each of these frameworks emphasizes desired conditions rather than imposing use limits. While there are subtle differences in each framework as a result of each individual agency's requirements, policies and procedures, they do share a common set of basic elements. Each of them include a description of desired future environmental and social conditions; they each identify indicators and establish standards of quality that define minimum acceptable conditions; and they each require monitoring and implementation of management actions should conditions reach unacceptable levels. Additionally, they each incorporate the concept of zoning, where zones are allocated based on (1) the most appropriate opportunities that they provide to the users, and (2) the resiliency of the resource to different types of use. The LAC framework has been used as a model for

subsequent frameworks and provides the basis for their development. The initial seminal paper on LAC, written by Stankey *et al.* (1985), effectively describes the nine steps in the LAC process, and presents an oft-cited figure to visualize the process, modified by the USDA Forest Service below (see Figure 2.2).



Source: USDA Forest Service available online at <http://www.fs.fed.us/r8/boone/lac/aboutlac.html>

Figure 2.2 The LAC Process

Subsequent papers (Borrie *et al.*, 1998; McCool & Lime, 2001; Needham & Rollins, 2005) have declared the LAC process as well suited to modification, and adaptable to unique activities and settings, including national parks, areas of sensitive environmental concern, backcountry and wilderness areas, and even marine settings (Schafer & Inglis, 2000). The following discussion has been adapted from Borrie *et al.*, (1998) and describes the LAC process:

1. The **first step** involves identifying the site's special values, issues, and concerns through comprehensive stakeholder consultations and analysis of scientific natural

resource information. Issues and concerns noted in this step are addressed throughout the planning process.

2. Similar to the ROS system described above, **step two** involves identifying and describing the recreation opportunity classes for the area. Since different areas are attractive to different types of recreation or tourism use, appropriate management actions are required and will vary according to class. The classes that are defined by the ROS may be combined with LAC and effectively represent a range of desired conditions within the area.
3. **Step three** involves selection of indicators to represent the most appropriate social and environmental conditions in each opportunity class. Examples of types of indicators that could be measured include biophysical, governance, or socio-economic indicators (Pomeroy *et al.*, 2003).
4. After indicators have been selected, the **fourth step** involves an inventory of existing resource and social conditions such as level of development, existing uses, and level of human-induced impacts. This inventory, though potentially time consuming and expensive, provides a database of known conditions to inform the next step, the establishment of realistic and attainable standards.
5. **Step Five:** Standards are specific and measurable conditions as deemed 'acceptable' for each indicator. In some cases, a range of acceptable conditions is defined to allow for minimum and maximum acceptable conditions. The 'limit of acceptable change' is the maximum level of impact allowable for any one indicator. This should not be seen as explicit standards of degradation, rather if the condition is deemed to be at its limit, it is an opportunity to improve conditions through the establishment of more stringent standards.
6. **Step six** involves the opportunity to identify alternative opportunity class allocations. Involvement of policy makers, managers, and the public is key to examining how well the division of land into classes (or zones) meets the needs of the stakeholders.
7. **Step seven** involves the identification of management actions that are required to maintain desired conditions for each alternative opportunity class.
8. **Step eight** involves conducting an evaluation of the chosen alternatives and selection of the preferred option through a comprehensive benefit-cost analysis.

9. Finally, **step nine** involves implementing actions and monitoring conditions of selected indicators from step three.

While there is much theoretical literature on LAC, reports on complete application of an LAC process are difficult to find (Sidaway, 1994), though there are a few documented applications, such as in the Bob Marshall Wilderness Complex (Stokes, 1990) and other wilderness areas in the United States. More recently, the LAC framework has been applied in non-wilderness areas and in research associated with sustainable tourism development. For instance, Brunson (1998) argues that non-wilderness areas are more complex to manage given the broad spectrum of potential and allowable uses relative to wilderness areas. It is stated that the nine steps in the LAC framework are just as applicable in non-wilderness areas; however, the major difference lies in the way we conceptualize change in wilderness and non-wilderness areas. Since non-wilderness areas host more and different types of activities, the rate and type of change in such areas are more diverse. The author argues that while conceptual adjustments are necessary in non-wilderness LAC applications (primarily in the way change is conceptualized) an overall LAC visitor management framework is also applicable to non-wilderness areas (Brunson, 1998). Ahn *et al.* (2002) report on research conducted on the coast of Texas (another non-wilderness area) which examined regional attitudes towards tourism development. They use LAC as a guide to inform the process of sustainable tourism development on a regional scale. Their results indicate that the three subject communities differ in the way they feel about tourism development and as a result, the authors propose Tourism Development Zones (TDZs) that reflect the physical/geographical traits of the communities and stakeholder attitudes (Ahn *et al.*, 2002). The authors conclude that LAC can provide the necessary tools to define and operationalize sustainable tourism development in a regional non-wilderness area.

In terms of the marine environment, Schafer & Inglis (2000) applied the LAC theoretical framework in the Great Barrier Reef World Heritage Area (GBRWHA). Their study describes variation of experiences of snorkellers at different types of settings in the Great Barrier Reef. By using a factor analysis of benefits associated with their reef

visit, they were able to determine which benefits significantly affected their experience with different operators and at different locations. Similarly, they conducted another factor analysis of reef conditions (natural and social) and ranked them by their influence on visitors' trip enjoyment. The condition with the most positive affect on experiences was the factor labelled *Corals*, including conditions such as size, diversity, and number of corals. The second most positive condition influencing visitor experiences was labelled *Staff* including social variables such as helpfulness, knowledge, and appearance. In terms of identifying opportunity class allocations (as in LAC step 6), their "results suggest the existence of at least two, possibly three, opportunity settings within the reef trips provided by the four operations studies" (Schafer & Inglis, 2000: 80). Overall, their results show that visitors perceive settings differently and therefore indicators and acceptable change of conditions may differ according to setting.

In a literature review and case study of the whale-watching industry in Kaikoura, New Zealand, Curtin (2003) proposes a sustainable model for further marine tourism industry development based on the LAC framework. Since the whale watching industry has grown rapidly from a once specialist eco-tourist activity to a mass tourism attraction, it is recognized that this growth could result in serious environmental and social consequences. A model is proposed which highlights the need for ongoing research to determine local limits of acceptable change. The author recognises that, despite control over the amount of whale watching activity in Kaikoura (i.e. limits have been set using a precautionary approach), there is evidence suggesting the industry is having an adverse effect on the whales (Curtin, 2003). It is also stated that establishing limits of acceptable *social* change is more complex given local politics and conflicting opinions over how the industry should further develop. However, the author concludes that Kaikoura may be viewed as a model for sustainable whale-watching industry given that controls on the number of whale watching operators exist, "impacts and changes are closely monitored, codes of conduct are followed, and regulations and licensing enforced" (Curtin, 2003: 191). While only a theoretical application of the LAC framework, this case study shows another potential application of LAC in a marine environment.

Borrie *et al.*, boldly state that, "LAC seems well placed to face the complexities of protected area management, particularly in this era of social and political change" (1998: 148). The Shafer & Inglis (2000) study results support the notion that LAC can be applied in marine environments where tourism and recreational uses are rapidly changing. Finally, as stated by Needham, "...this type of framework (LAC) currently represents the 'cutting edge' of recreation research" (2002: 50). However, as in any resource management paradigm where complex and variable conditions are apparent, the LAC framework has both strengths and weaknesses in its application.

Strengths of LAC

LAC is now the most widely used recreation-planning framework for wilderness areas in the United States and is also being applied in non-wilderness settings such as tourist destinations (McCool, 1994; Ahn *et al.*, 2002), ski hills (Needham & Rollins, 2005) and other areas. Indeed, it has been stated that LAC can be applied to any situation where (1) a conflict exists and at least one goal must be compromised, (2) a hierarchy of goals exists such that certain goals constrain others, and (3) it is possible to develop measurable standards (Cole & Stankey, 1997). LAC is a comprehensive framework. Like the ROS, it embraces the notion of zoning to accommodate and manage different types of uses. In addition, central to the process are the tasks of selecting indicators, specifying measurable standards, identifying management actions, and monitoring conditions. The comprehensiveness of the framework is exacerbated by the notion that it must formulate and monitor both social and environmental indicators. The LAC process is both a system that "addresses problems and forces explicit decision making" and a public consultation process "that is oriented towards consensus building" (Ahn *et al.*, 2002).

The LAC framework recognizes that there is variability in the way people feel about and react to different social and environmental issues. This variability in attitude and perception is reflected in the principles of both zoning (as in ROS) and the inclusion of stakeholders in the planning and management process (as in transactive planning). Transactive planning, originally proposed by Friedman (1987), is a contemporary planning approach that involves face-to-face interaction between planners and those who

are most affected by planning decisions (Mitchell, 2002). In an LAC framework, where transactive planning is applied, the idea is that stakeholders are involved in decision making and they aim for social justice and equity, and the planners' roles are more directed at facilitation of the process.

Challenges of LAC

Among the strengths of the LAC process are also challenges. Because it is such a comprehensive framework, it is also very time and resource consuming, and expensive to conduct thoroughly. Indeed, a thorough process involves expert planning and management. It is these reasons that have limited its application, especially in marine environments. The framework has been applied in numerous studies, but there are few systematic evaluations of LAC and, since most reports are written by LAC advocates, scarce are critiques on its effectiveness (Sidaway, 1994). Also, there is little evidence of true transactive planning being used in conjunction with LAC.

A completely rigorous LAC process is daunting because for it to be truly effective, managers must execute a lengthy and intensive sequence of steps. Using various methods and tactics, managers are charged with the tasks of drawing stakeholders out to identify local issues and concerns over resource use and how change may affect them. The task of identifying opportunity classes (zones) presumes that each zone will have unique social, natural resource, and managerial conditions. The process becomes more complex during the third step when the most effective indicators are to be selected. This may be executed by asking both experts and users of the resource to rate the importance of various conditions in the area (Ahn *et al.*, 2002). The challenge in doing this is that there are countless indicators and to maximize efficient use of resources, managers need to decide which indicators will provide the most input to the effectiveness of management. The task of selecting the best indicators is a challenge, though there are a number of articles available to advise the process (Merigliano, 1990; Roggenbuck *et al.*, 1993; Pomeroy *et al.*, 2003). In addition, there has been much research on methods of establishing standards (such as the normative approach described below), but the task remains a challenge since for many indicators, public preferences are highly variable.

The application of recreation specialization (Needham, 2002; Needham & Rollins, 2005) has helped to explain some of this variability, but more research is necessary to understand why different individuals vary in response to standard (norm) preference. This thesis looks at the role of values towards the marine environment as an independent variable to help explain why stakeholders vary in their views towards acceptability of different indicators.

Another challenge associated with the application of LAC in a marine environment is determining what management actions might be acceptable (i.e. quotas) to manage and maintain established standards. Finally, a challenge of applying a LAC framework, especially in marine environments, is the notion of designating 'opportunity classes' or zones. While zoning in terrestrial environments is common and has become acceptable to most people, it is not as well established, nor expected to be as acceptable in marine environments, since they have been traditionally viewed as 'open-access' (Cocklin *et al.*, 1998).

In conclusion, this thesis builds on existing LAC literature in a number of ways. First, it samples the attitudes, perceptions and values of one stakeholder group: residents of the Southern Gulf Islands. Second, it looks at three specific indicators – (1) recreational boats, (2) whale watching boats, and (3) shellfish aquaculture. These indicators were chosen for this study since they are each potentially compatible and conflicting activities within the Gulf Islands marine environment, as argued in chapter one of this thesis. Third, it uses a visual normative approach to determine standards of each indicator; and it tests this method by altering the background image in the shellfish aquaculture photo sequence. Fourth, it applies the concept of LAC to a marine environment, an application that is rare in the literature. Fifth, it is exploratory in nature in that it samples stakeholder input towards protection of the marine environment in advance of MPA establishment, and finally, it applies stakeholder values toward the marine environment towards explaining variability in responses between the standards for different groups of stakeholders. Having described and critiqued the LAC process, the

discussion will now focus on two specific areas of research within LAC: the establishment of indicators and standards and the normative approach to doing so.

2.6.3 Indicators / Standards of Quality

Common to each of the contemporary visitor management planning frameworks is the requirement of identifying, quantifying, and monitoring a host of indicators (Needham & Rollins, 2005) (such as water quality or local values towards the marine environment) which then reveal standards of quality for acceptable conditions (such as excellent water quality, or stakeholders rating economic values as very important). An indicator's standard of quality is a measurement that indicates the threshold at which conditions reach unacceptable levels (Manning, 1986). In an outdoor setting, the conditions that have the greatest potential to affect environmental integrity or social well-being are also the best indicators for use in an LAC management paradigm (Shafer & Inglis, 2000). Effective indicators, according to Merigliano (1990) and Pomeroy *et al.* (2003):

1. Must have both **long-term and short-term significance** – long enough to detect changes in conditions which cannot be reversed in five seasons with reasonable management effort; and short enough to detect changes within one season;
2. Must be **quantifiable and measurable**;
3. Must be **specific and concise**;
4. Must detect changes in conditions which **correlate with human use and are responsive to management actions**;
5. Must be **sensitive to change** in that they detect a reduction in an areas ability to provide expected conditions or experiences; and
6. Must be **feasible** enough for ease of measurement by field personnel, **reliable** enough so that different observers will collect the same information, and **economical** enough so that the information is worth the expense of measurement.

It has been stated that there is no single set of indicators that are best applied to all settings (Vaske *et al.*, 1995 as cited in Shafer & Inglis, 2000). Shafer & Inglis' (2000) study found that indicators to do with the natural environment (i.e. diversity of corals) have the greatest positive effect on visitor experiences, while social indicators (such as the influence of other people and infrastructure) had the most negative effect. They

conclude that these two types of conditions hold the most promise for effective indicators in coral reef settings (Schafer & Inglis, 2000).

Needham (2002) has conducted perhaps the most advanced study in this regard whereby he measured social and resource indicators of visitors to a ski area during the summer. The unique aspects of Needham's research were that standards of quality were compared across stakeholder interest groups and at different sites in an alpine region. In addition, he used specialization (the classification of individuals into homogenous groups based on level of skill and involvement in their chosen activity) (Bryan, 1977), as an independent variable in data analysis. His results suggest the need to manage and monitor each area differently, based on the significant difference of preferences at each location. Recent work by Rollins & Randall (2005) sampled scientific opinion of the best indicators of health for a marine setting. This work was derived from a list of biophysical, socio-economic and governance indicators, specific to determining effectiveness of MPAs (Pomeroy *et al.*, 2003), a key guidebook published by the IUCN. The Pomeroy *et al.* (2003) list includes the indicators listed in Table 2.5 on the following page.

Table 2.5 Indicators of MPA Effectiveness (source: Pomeroy *et al.*, 2003)

Biophysical Indicators	Socio-Economic Indicators	Governance Indicators
<ul style="list-style-type: none"> • Focal species abundance • Focal species population structure • Habitat distribution and complexity • Composition and structure of the community • Food web integrity • Type, level and return on fishing effort • Water quality • Area showing signs of recovery • Area under no or reduced human impact 	<ul style="list-style-type: none"> • Local marine resource use patterns • Local values and beliefs about marine resources • Level of understanding of human impacts on resources • Perceptions of seafood availability • Perceptions of local resource harvest • Perceptions of non-market and non-use value • Material style of life • Quality of human health • Household income distribution by source • Household occupational structure • Community infrastructure and business • Number and nature of markets • Stakeholder knowledge of natural history • Distribution of formal knowledge to community • Percentage of stakeholder group in leadership positions • Changes in conditions of ancestral and historical sites/features/monuments 	<ul style="list-style-type: none"> • Level of resource conflict • Existence of a decision making and management body • Existence and adoption of a management plan • Local understanding of MPA rules and regs • Existence and adequacy of enabling legislation • Availability and allocation of MPA administrative resources • Existence and application of scientific research • Existence and activity level of community organisation(s) • Degree of interaction between managers and stakeholders • Proportion of stakeholders trained in sustainable use • Level of training provided to stakeholders in participation • Level of stakeholder participation & satisfaction in management • Level of stakeholder involvement in surveillance • Clearly defined enforcement procedures • Enforcement coverage • Information dissemination

This thesis examines attitudes and perceptions of three specific visual indicators: (1) the presence of common recreational boats, (2) the presence of whale-watching boats, and (3) the presence of shellfish aquaculture. As argued in the introductory chapter of this thesis, recreational boating and shellfish aquaculture are both potential activities within a multiple-use MPA, though they may also be perceived by stakeholders as incompatible and conflicting. Standards for the level of acceptable development were determined using a visual approach to normative theory, as described below.

2.6.4 Norms / Normative Approach

The challenging of evaluating indicators to establish standards for those indicators is addressed using a theoretical model known as the normative approach (Manning *et al.*, 1996), which has become the dominant tool used to measure indicators and more effectively determine acceptable use levels and standards (Vaske *et al.*, 1993): a shift from a subjective numerical calculation to an objective, informed judgement (Freidmund & Cole, 2001). Homans provided an early definition of norms, stating they are, “an idea in the minds of members of a group... that can be put in the form of a statement specifying what the members... should do, ought to do, are expected to do, under given circumstances... Norms are not behaviour itself, but rather what people think behaviour ought to be” (1950: 123). Vaske & Whittaker (2004) further define norms by separating them into two categories: *social norms* - those standards shared by a group, and *personal norms* - an individual’s own expectations of what ought to be. Normative research has made important contributions to understanding recreation behaviour and perceptions of acceptability of the social and environmental conditions of outdoor settings (Heywood *et al.*, 2002). In 2002, *Leisure Sciences* dedicated a special issue to normative research in outdoor recreation, which included nine articles that commented on the understanding and utility of norms.

Normative theory has been applied using a variety of methods, and the framework for which it is applied most often is to study the relationship between encounters with others and perceptions of crowding (Heywood *et al.*, 2002). Vaske and Donnely (2002) have been significant contributors to the ‘encounter-norm-crowding’ concept, and in new research with other authors, have extended the concept beyond crowding to more general evaluations of the recreation experience (Vaske *et al.*, in press) and the effect of resource impacts such as litter, human waste, and noise from ATVs. The normative approach has proven effective at assessing quality of environmental conditions and crowding norms at frontcountry sites (Manning *et al.*, 1996) and at quantifying standards of quality (Freidmund *et al.*, 2002). Over 75 papers have been published on the normative approach, work that has mainly been done in the United States with a few exceptions (Needham, 2002). Early normative research focussed on encounters with others and

involved asking respondents to quantify acceptability by providing a number representing the moment their experience became 'unacceptable'. However, recognizing limitations of this traditional method, researchers began using visual approaches such as photographs, artistic renditions, and even videos (for a review, see Needham, 2002). This visual approach to normative theory has become a dominant paradigm for assessing norms because of its ability to allow encounters to be processed by respondents more realistically, and therefore has provided more statistically significant relationships (Manning *et al.*, 1996). Other benefits of the method include the ability of respondents to react to manipulated images with varying densities of activity, rather than be forced to articulate quantification based on intuition. Also, by presenting the same images to all participants, they are able to react to the same picture and its attributes, irrespective of whether they have seen such a facility or activity previously (Freidmund *et al.*, 2002).

Image Capture Technology (ICT), the use of photos to depict conditions has been used in many studies to assess social and ecological impacts, mainly in front and backcountry settings and in terrestrial protected areas (Manning & Freidmund, 2004). One of the first studies to apply the visual approach to normative theory in marine environments was conducted by Inglis *et al.* (1999). Advancing the ICT method, Freidmund *et al.* (2002) applied the normative approach to video to assess visitors' norms to various conditions and settings within Gwaii Haanas National Park Reserve. The researchers conclude that the use of video was effective in defining and articulating the desired social conditions. Respondent evaluations of the video method suggest that it enhanced memories of their trip, including feelings towards sound of certain activities, thereby reducing the effects of recall bias. Another benefit stated by the authors is the ability to personalize the research by including video welcome and thanks from the park superintendent (Freidmund *et al.*, 2002). Needham & Rollins state also that, "an improvement that warrants future research may come from using images of the exact study area" (2005: 7). With the technological advancement in recent years, perhaps it won't be long until researchers employ 'virtual reality' or other unforeseen methods to assess norms.

Since much research has been conducted using a visual approach to normative theory, advancements have been made in terms of developing the visual method, and in application in different settings and to different stakeholder groups (Manning & Freidmund, 2004). Needham & Rollins (2005) advanced the normative approach by applying it in a unique setting (summertime ski area) and across various stakeholder groups. Needham used specialization to explain variability in attitudes towards both social (hiker and mountain biker crowding) and resource (bare ground at campsites, trail conditions and litter) indicators. Randall (2003) built on this work and that of Inglis *et al.* (1999) by applying the normative approach to a marine setting and incorporating a specialization factor. Her work was able to determine that level of specialization is a factor in explaining some of the variability in norms – specifically with regard to acceptability of different densities of (1) tents on a beach, (2) kayaks, and (3) whale watching boats on the water. This thesis builds on these studies by using stakeholder values as an independent variable to determine norms. Additionally, it advances the literature by applying the concept of norms to recreational boating and an industrial activity (shellfish aquaculture).

2.7 Summary of Literature Review

This literature review has focussed on research and reports that address the topic of stakeholder involvement in use and protection of the marine environment. This thesis is a sample of Gulf Islanders' attitudes, perceptions and values towards the marine environment. Much of the literature on MPAs suggests the necessity for managers to understand stakeholder views so that they can better cater to these stakeholders and provide management options that are acceptable and enforceable. Although it is understood that this type of research is necessary, it is not as prevalent in the literature as is MPA management information from the natural sciences. Therefore, this study will add to a gap in the social science literature informing the management of MPAs.

Various tools are available to MPA managers in their duties of coordinating the planning and managing of MPAs. Many authors have emphasized the importance of harnessing stakeholder input into planning of MPAs but there have been few documented examples specific to zoning the marine environment, or at such an early stage of planning

such as is the case in the Gulf Islands. However, from the cases that have been documented, a few conclusions can be made. The process of incorporating stakeholder input into the creation of a zoning plan is a challenging and risky one, yet important and unique to each situation. Not only is it more time consuming and resource demanding, it also has the potential to create increased tensions between stakeholder groups and the planning agency. Since a goal of zoning is to minimize conflict between stakeholder groups, it is imperative that the process is transparent, fair and equitable to all interested stakeholders. A 'bottom-up' approach is best to create acceptability, understanding, and therefore compliance for the zoning plan. Each situation is unique in the level of stakeholder involvement necessary (or possible) and there is no 'textbook' method of harnessing and implementing such input.

The theoretical foundation for the thesis is based upon the Limits of Acceptable Change (LAC) visitor management planning framework, which requires multiple stakeholder input to establish and measure indicators and standards of quality. The comprehensiveness of the LAC framework may provide management benefits in areas where it is applied, but that same comprehensiveness challenges managers. For instance, a selection of indicators of health needs to be established, but how do managers determine what the best indicators are? Also, what are the best methods to use to establish standards for each indicator? In this thesis, recreational boats, whale watching boats, and the presence of shellfish aquaculture were used as indicators and a visual approach to normative theory was used to establish standards.

3.0 Research Design: Methodological Procedures

3.1 Purpose of Chapter

The methods described here build on a four year project examining compatibilities between shellfish aquaculture and MPAs. Previous studies in this project have sampled the attitudes, opinions, and perceptions of various stakeholder groups, including: (1) marine visitors to the Gulf Islands (Rollins & McCallum, 2003), (2) shellfish growers (Rollins & Randall, 2004), and (3) protected areas scientists (Rollins & Randall, 2005). While some of this work has involved qualitative data collection via focus groups and one-on-one interviews, the main data collection instrument chosen for these studies was a written questionnaire which produced mainly quantitative data. Justification for the decision to use a face-to-face written survey in this research is provided below.

3.2 Survey Methods

A variety of methods are available to gain an understanding of stakeholder attitudes and perceptions. These include focus groups and an array of survey methods such as mail, email, and face-to-face. Though the face-to-face method was chosen for this project, other methods were considered. Factors that affected this choice included primarily the human and financial resources available to the project, and the amount of time allocated to data collection. Since the *Telus Superpages* directory provided a relatively complete list of the population with both phone numbers and addresses, potential to conduct either mail or telephone surveys existed. Benefits and constraints of each method are discussed below, along with justification for the chosen method.

Mail Surveys

The main benefit of mail surveys is that they require the least amount of resources to conduct. No field staff are required and the duties of the person conducting the research remain largely clerical: managing mail-outs and processing correspondence. By this, minimized field expenses can be put towards a larger sample-size of mail-outs, thereby reducing sampling error (Salant & Dillman, 1994). A second strength of mail surveys is the sense of privacy and anonymity that they provide. By not interacting with a researcher directly, respondents are more likely to respond to sensitive questions such as

income, political attitudes, or mental health (Salant & Dillman, 1994). A final strength of this method is that it is less sensitive to biases introduced by in-person interviewers. The greatest weakness of mail surveys is the potential for large non-response error; depending on the topic of the survey, some respondents may choose not to complete the survey, perceiving it as a waste of time. The type of person not responding might be different than the type who does respond, thereby affecting survey results. Finally, a great challenge with mail surveys is the lack of control over (1) which person in the household completes it, and (2) whether they questionnaire is filled out completely (Salant & Dillman, 1994).

Telephone Surveys

The greatest strength of using telephone survey methods is the ability to produce results quickly. Unlike mail or face-to-face methods, there is no delay and data can be input and analyzed immediately. Also, using the telephone offers a higher degree of control over the interview, especially for issues such as encouraging the respondent to answer all the questions. One weakness of the telephone survey method is the sensitivity to measurement error as a result of what is communicated orally. Questions that ask respondents to rank a series of items, or respond to lists of items are difficult to communicate over the phone. Another weakness is that telephone survey respondents can be easily influenced by the interviewer's voice inflections and may respond according to what they perceive the interviewer wants to hear (Salant & Dillman, 1994). Finally, and a reason this method was not chosen for this research, telephone surveys are limited to only using oral and not visual communication.

Online / Email Surveys

Another method might have been to conduct the survey online. However, a list of Gulf Islands residents email addresses does not exist, so this method would involve combining a mail-out introductory letter directing respondents to the posting of the survey online. While in the field, the researcher was asked more than once if the survey was posted online. Doing so does allow those who spend time online to complete it and saves them the time spent sending it back in the mail or arranging a time for the researcher to pick it

up. However, there remain some people who do not (and choose not to) have access to the Internet.

The Face-to-Face Method

The self-administered, face-to-face survey method was chosen for this project because of the expectation of a higher response rate and the opportunity for interaction between the researcher and the respondents. This interaction served: (1) to convince those who might not have completed the survey that their input was important, (2) to allow questions pertaining to the research to be answered and (3) to provide a greater depth of understanding of resident perceptions than would have occurred otherwise. Since there was no intention of having a very large sample size (i.e. 1,000+), the mail-out and telephone methods were seen as unnecessary. Also, the researcher's personal experience in the field added to his deep knowledge of the places and people of the Gulf Islands.

Though the face-to-face method was chosen because it was deemed the most appropriate for this project, it too was not without challenges. One challenge of conducting a survey face-to-face is the necessity of time spent in the field and therefore cost to pay a researcher wage. Also, even more so than telephone interviews, the face-to-face method introduces a potential for measurement error – a result of the interviewer biasing respondents simply by the image he or she projects (Salant & Dillman, 1994). While a focus of the research was on protection of the marine environment, the wording of the survey was kept neutral and portrayed no bias for or against protection of the marine environment. Also, the focus on perceptions of shellfish aquaculture was balanced by a similar focus on recreational boating, both active yet different types of uses in the Gulf Islands marine environment. While in the field, a conscious effort was made by the researcher to be perceived as being as neutral as possible on all issues. Indeed, a great deal of care was taken not to disturb the privacy of residents, or become excessively casual in their company. Ethical protocol was established by the Human Research Ethics Committee at UVic (see Appendix A) in advance of fieldwork commencement.

3.3 Questionnaire Design and Testing

The main data collection instrument was a 12 page written questionnaire (see Appendix D), designed based on an established and reliable format conceptualized by Salant & Dillman (1994). Their 'Total Design Method' involves creating the questionnaire in booklet style with clear, simple formatting - a format that has been proven to enhance response rates and response quality (Salant & Dillman, 1994). Overall, the survey was designed to reveal:

- (1) Select demographic information about the sample;
- (2) Values towards the marine environment;
- (3) Perceptions of threats towards the marine environment;
- (4) Attitudes about recreational boating;
- (5) Attitudes and perceptions about shellfish aquaculture; and
- (6) Attitudes and perceptions towards protection strategies for the Gulf Islands marine environment.

Questions were asked both with pre-coded Likert-style response categories, as well as open-ended questions which provided opportunities for further elaboration of responses. A portion of the survey focussed on attitudes towards the visual impact of two specific marine activities (recreational boating and shellfish aquaculture). The intention of this visual test was to build on (1) normative research and (2) knowledge of setting standards within an LAC framework. Two sub-samples were implemented to test differences in responses to different types of recreational boats and different levels of development within scene portraying shellfish aquaculture activity. The original survey (n=221) showed common recreational boats at anchor in a bay (Q.6) and shellfish aquaculture with an undeveloped background (Q.9). The alternate survey (n=81) showed whale watching boats (a type of recreational boat) under way (Q.6) and shellfish aquaculture with a developed background (including two oceanfront homes and a marina)(Q.9). These are discussed in more detail in the appropriate section below. All other questions on the questionnaires were identical within the sub-samples.

Many drafts of the questionnaire were scrutinized by faculty members supervising this project, and then the questionnaire was tested in two ways. First, it was brought to five one-on-one meetings with members of an external advisory committee. Representatives from (1) Parks Canada, (2) BC Parks, (3) the Georgia Strait Alliance, (4) the Islands Trust, and (5) the Department of Fisheries and Oceans were consulted for their feedback on the survey design and methodology. Once feedback from these stakeholder meetings was incorporated and final corrections were complete, the survey was brought to the field for a pilot study (n=23), conducted on May 18th-20th, 2004 on Salt Spring Island. The purpose of this pilot study was to determine if the language used and format was easily understood by respondents. Since the random sample of residents had not been selected yet, respondents for the pilot study were selected randomly on the BC Ferry between Swartz Bay to Fulford Harbour, and within the communities of Ganges and Fulford Harbour on Salt Spring Island. Pilot study respondents were approached and asked whether they were residents of the Gulf Islands. Feedback from this pilot study led to a small number of changes that improved clarity and flow of the questionnaire. The data from this pilot study were not included in the results of the study.

3.3.1 Section 1 and 2: Activities and Values

The first survey question asked respondents to indicate the type of marine-based activities they participate in. This question provided demographic information, as well as served to introduce the respondent to the survey topic by easing them in. The second question presented a list of 13 possible values towards the marine environment. This specific list of values has been applied in numerous studies by Brown (2002), and was altered here with language to suit the people, environment, and activities of the Gulf Islands. The question asked respondents to indicate how important each of the values were to them (Q.2) and then indicate the two most important values from the list (Q.3). Having a comprehensive list of values provided good variability of responses and has proven useful in the statistical analysis of the data.

3.3.2 Section 3: Threats to the Marine Environment

The next section (page five) focussed on questions regarding potential threats to the health of the Gulf Islands marine environment. The list of potential threats was drawn

from previous research (Rollins & McCallum, 2003), key informants, media sources, and experience in the field. Asking respondents to indicate their perception of the overall threat of human activity towards the marine environment is a way of determining support for protection – if there is a perceived threat, then there may also be the likelihood of support for measures to protect from the impact of that threat. The list of 21 potential threats (Q.4) can be roughly categorized into:

- (1) Threats from industrial activity;
- (2) Threats from recreational activity; and
- (3) Threats from contributing sources of sewage.

In addition, respondents were asked to indicate their overall perception of the impact from human activity on the Gulf Islands marine environment (Q.5). From this point forward in the questionnaire, the questions become focussed on three specific activities: (1) recreational boating, (2) shellfish aquaculture, and (3) marine protection strategies.

3.3.3 Section 4: Recreational Boating

The next section (pages six and seven of the survey) focussed on questions about recreational boating. Crowding related norms (Q.6) were examined using a sequence of photos depicting increasing densities of recreational boats (see Figures 3.1 and 3.2). This method, known as the visual approach to normative theory (Manning, 1996; Needham, 2005), has been used in a number of studies and has proven useful at measuring standards and determining user group norms. Literature indicates that this method provides a more valid measure of crowding-related norms by providing a visual cue; more valid and consistent than just asking, “How many boats are acceptable to you?” (Hall & Roggenbuck, 2002).

A series of six digitally altered photos (using Adobe Photoshop) was presented and respondents were asked to indicate how acceptable each photo was to them. Two recreational boat photo sequences were implemented (original and alternate) in two separate samples. In the original photo sequence (n = 221), the first photo (Photo A) showed a bay approximately 5,000 m² with no boats at all. The following five photos showed the background of the bay unchanged, but increasing densities of recreational

boats. The six photos in the original sequence with corresponding recreational boat densities were as follows:

<i>Photo A – 0 Boats</i>	<i>Photo D – 6 Boats</i>
<i>Photo B – 2 Boats</i>	<i>Photo E – 8 Boats</i>
<i>Photo C – 5 Boats</i>	<i>Photo F – 10 Boats</i>

Although the boat numbers did not increase consistently (i.e. 2, 4, 6, 8, 10, 12), the relative density of foreground to background coverage generally increases consistently throughout the sequence. In drafting the questionnaire, it was debated that having one type of recreational boat (i.e. power or sail, but not both) would be better – to minimize possible respondent bias. However, the choice was made to include both power and sailboats in the photo sequence as that is more representative of real situations in the Gulf Islands. The original photos as displayed in the survey are shown below in Figure 3.1.

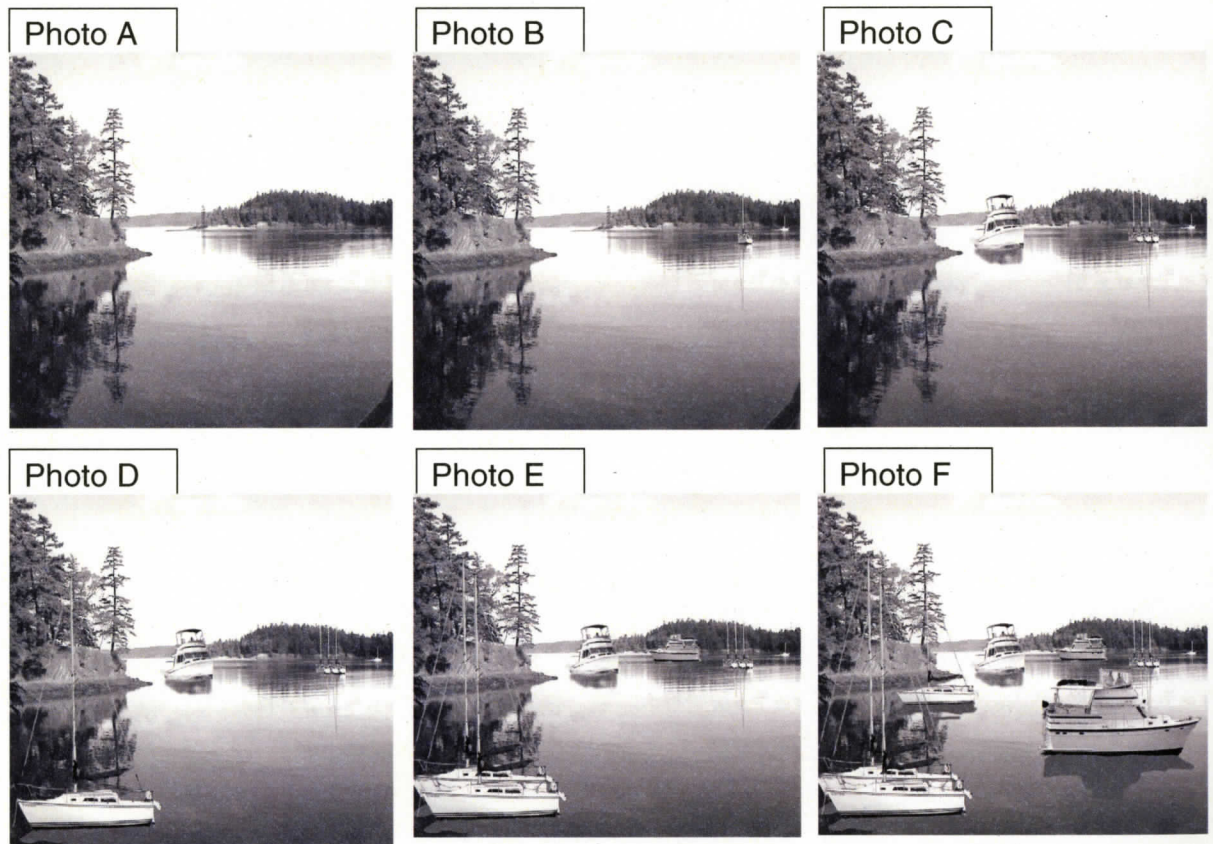


Figure 3.1 Recreational Boat Photos – Original Sequence (n = 221)

An alternate photo sequence was also implemented in the survey with a smaller sample size ($n=81$). The alternate photo sequence presented photos with a consistent background with increasing densities of motorboats (resembling whale-watching boats) within an area of about $1,500 \text{ m}^2$ as follows:

<i>Photo A – 0 Boats</i>	<i>Photo D – 3 Boats</i>
<i>Photo B – 1 Boat</i>	<i>Photo E – 4 Boats</i>
<i>Photo C – 2 Boats</i>	<i>Photo F – 5 Boats</i>

This photo sequence was created by Randall (2003), whose work sampled visitor attitudes and perceptions of crowding in the Broken Group Islands (BGI) component of the Pacific Rim National Park Reserve. The alternate photo sequence, as displayed in the alternate survey is shown below in Figure 3.2.

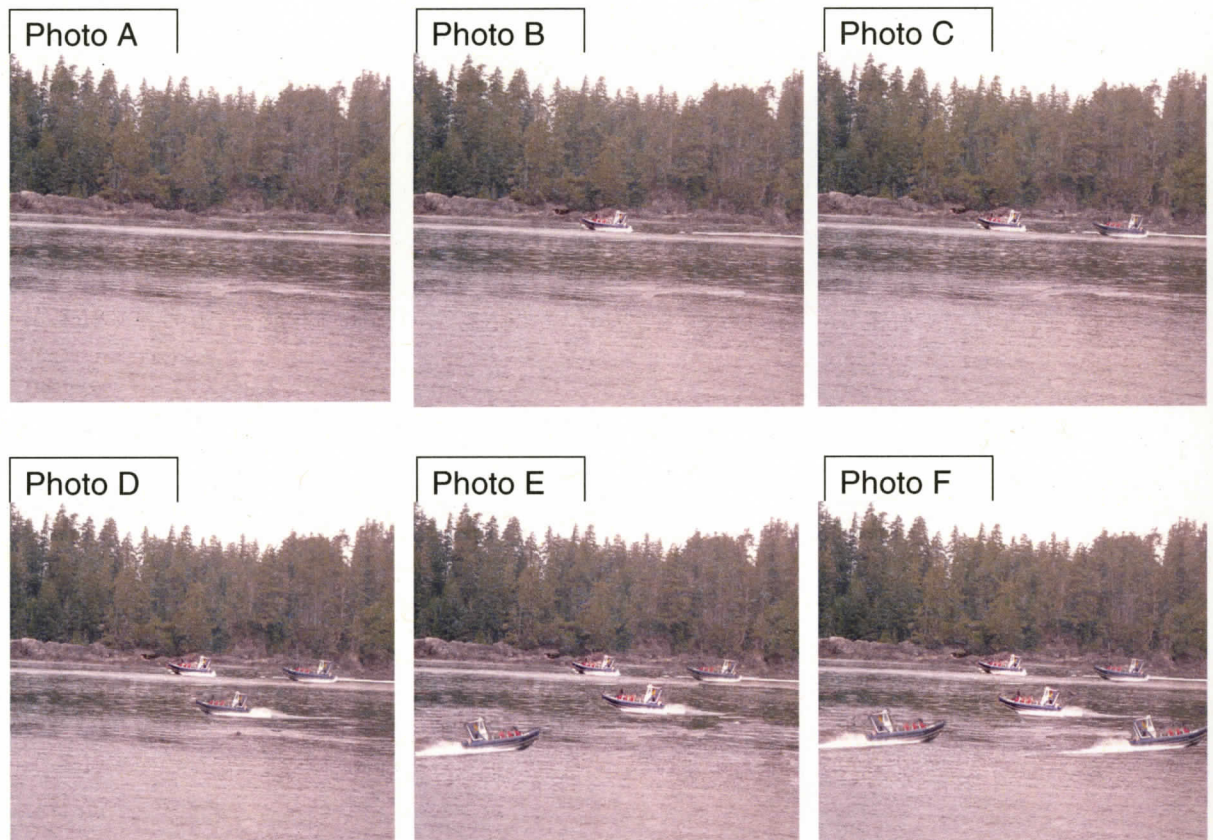


Figure 3.2 Recreational Boat Photos – Alternate Sequence ($n = 81$)

Support or opposition to potential solutions to the problem of sewage from recreational boats was presented in Q.7. Five potential solutions were proposed and respondents were asked to indicate their level of support or opposition to each. Finally within this section, Q.8 asked about attitudes towards the amount of different types of boats that respondents have seen in the past year in the Gulf Islands (response categories: too few, about right, too many), as a further measure of crowding, an extension of Q.6.

3.3.4 Section 5: Shellfish Aquaculture

Similar to the question on visual acceptability of recreational boats, a question was asked about visual acceptability of shellfish aquaculture (Q.9). Six digitally altered photos were presented and respondents were asked to rate acceptability for each. This same photo sequence was developed for an earlier study, a sample of marine visitors to the Gulf Islands conducted in 2002. The six photos showed the same undeveloped background (~15,000 m²), but with zero, one, two, three, four, and five rows of shellfish aquaculture, as shown below:

Photo A – 0 Rows

Photo D – 3 Rows

Photo B – 1 Row

Photo E – 4 Rows

Photo C – 2 Rows

Photo F – 5 Rows

The original photo sequence of shellfish aquaculture used in the survey is shown in Figure 3.3 below.

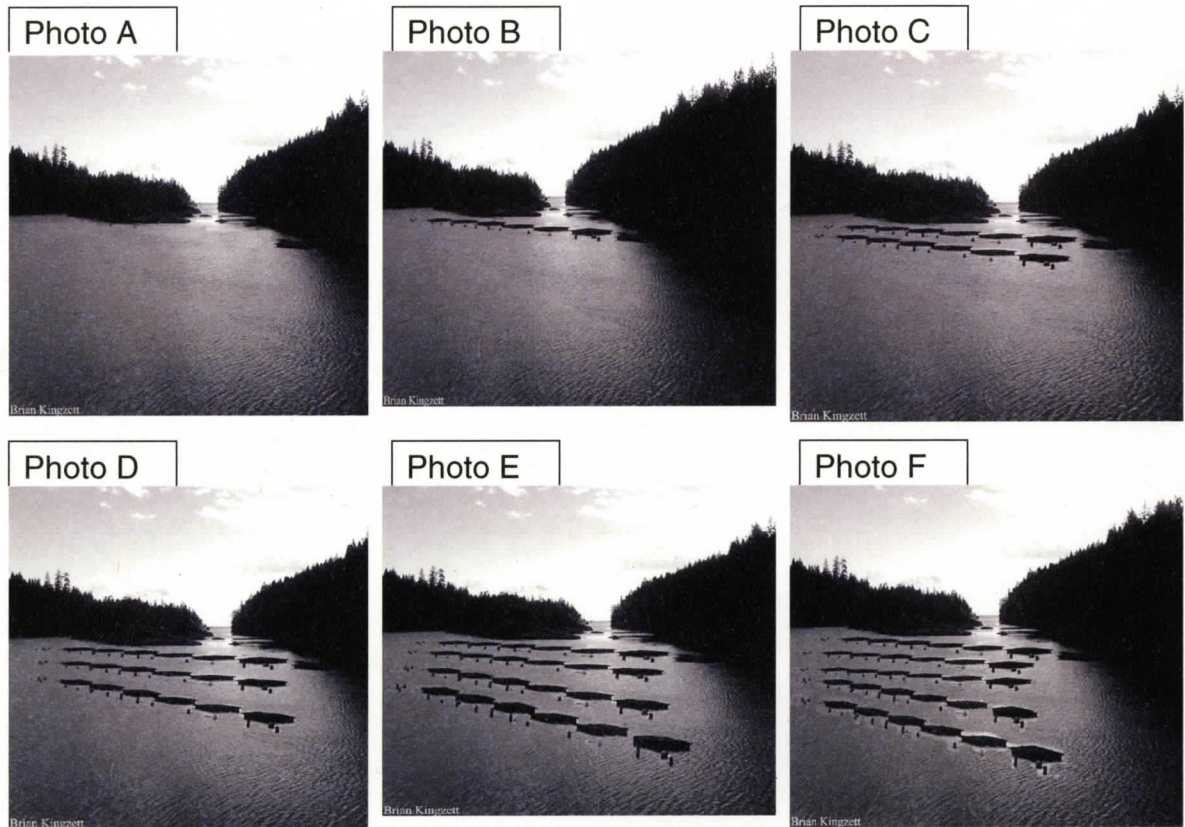


Figure 3.3 Shellfish Aquaculture Photos – Original Sequence (n = 221)

Feedback from the 2002 study indicated concern over the methodology to sample visual impact of shellfish aquaculture. Specifically, shellfish growers were concerned that (1) the type of aquaculture in the photos was not representative of all shellfish aquaculture, (2) the perspective of the photo was taken from an aerial angle, but most boaters would view such facilities from a very low angle, (4) the visual method did not address other sensory affects such as noise or smell, and (3) the background of the photo was pristine. Although these comments were useful, it wasn't possible to address each of their concerns in subsequent research. However, a sample of separate photos (n=81) was implemented in this project showing a developed shoreline, in contrast to the pristine background used in the other questionnaires. The background in each photo was the same except that two cottages and a marina were digitally introduced. This alternate

sequence showed the developed shoreline consistent throughout the six photos and the same shellfish aquaculture facilities were presented as in the original photo sequence (zero, one, two, three, four, and five rows of shellfish aquaculture). The alternate photo sequence, with a developed background is shown below in Figure 3.4.

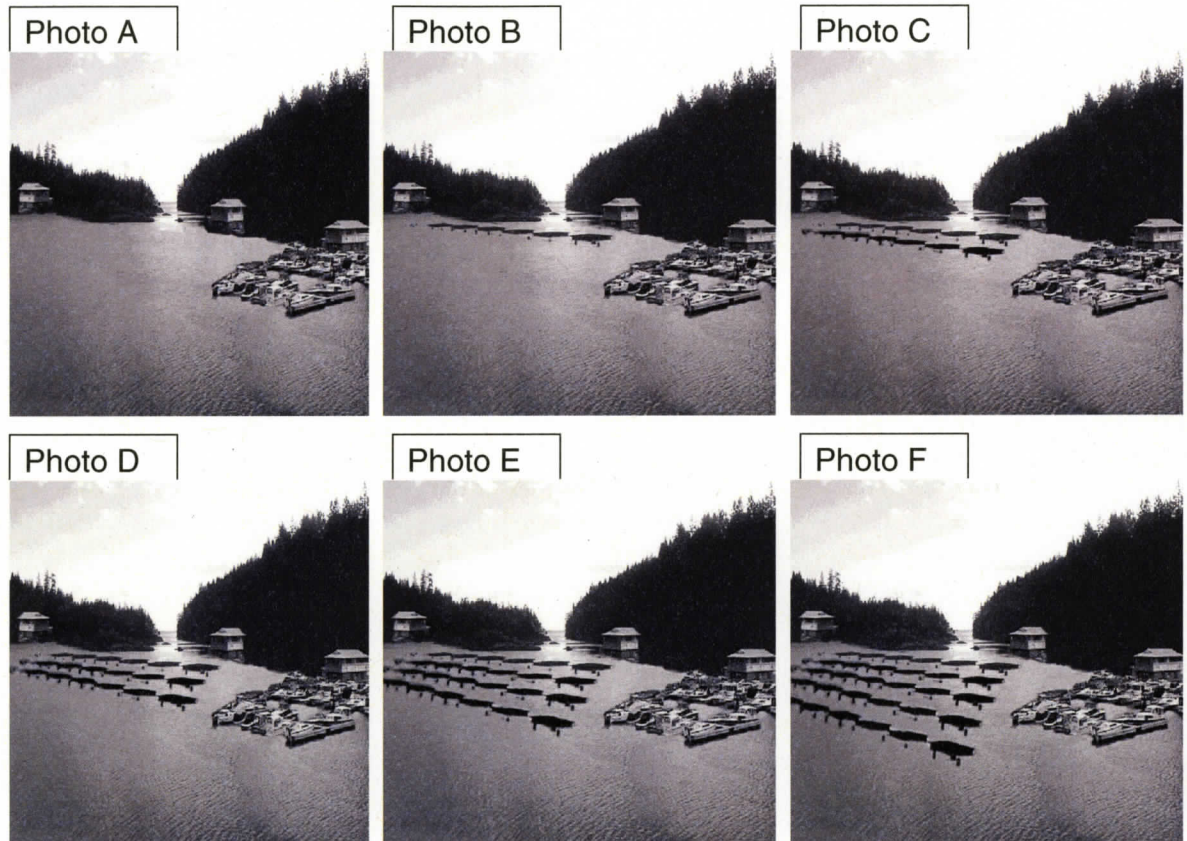


Figure 3.4 Shellfish Aquaculture Photos – Alternate Sequence (n = 81)

In order to further measure resident perceptions of shellfish aquaculture development in the Gulf Islands, the next question (Q.10) presented four potential benefits and four potential concerns associated with shellfish aquaculture and asked respondents to indicate whether they either somewhat or strongly agree or disagree with each statement. This list of benefits and concerns was established through consultations with people involved in shellfish aquaculture. However, the list may not be exhaustive and respondents were provided an opportunity to comment on any other benefits or concerns they could think of (Q.13). Through open-ended comments, the respondents

provided much input that is useful in interpreting the results as presented in the results chapter. Also, respondents were asked to indicate their overall perception of shellfish aquaculture (Q.11) and to indicate their awareness of existing facilities in the Gulf Islands (Q.12), results of which are useful in analysis of perceptions of the industry. All of these questions were developed based on the attempt to understand perceptions of compatibility of shellfish aquaculture within Marine Protected Areas (MPAs).

3.3.5 Section 6: MPA Management Zones

The questionnaire was developed in an attempt to understand attitudes towards both use and protection of the marine environment. Focussing now on protection, the questionnaire focuses on what types of management zones are supported by stakeholders. This question was driven by the type of MPA proposed for the research area (Parks Canada's Southern Strait of Georgia NMCA) which is anticipated to be large-scale and zoned to accommodate multiple uses. Q.14 asked respondents to indicate their level of support or opposition for five different types of management zones, derived and modified from Parks Canada's (1994) NMCA guiding principles and operational policies. In their policy document, Parks Canada proposed a three-zone scheme to represent a continuum of use and protection. This research built on this three-zone scheme, adding two other proposed types of zones that incorporated focus elements from other areas of this research (i.e. *areas to allow for only low-impact forms of shellfish aquaculture and other low-impact commercial activity*).

The term 'areas' was used in the questionnaire instead of 'zones', as it was thought that 'zones' is laden with the notion of overwhelming bureaucracy and might elicit negative bias towards the questionnaire. In an effort to spatially orient these different zone types within the research area, respondents were also asked to indicate a percentage of total Gulf Islands marine environment area that they would allocate to each type of management zone proposed (Q.15). Additionally, an open ended question solicited responses about attitudes towards allowing or disallowing certain activities in the Gulf Islands marine environment (Q.16).

3.3.6 Section 7: Demographics and Involvement

The last section of the questionnaire (Q's 17-22) addressed various factors that might help explain responses to the questions throughout the survey. Q.17 asked about respondent involvement in marine use and protection. Questions about residential status were asked including years resided in the Gulf Islands (Q.18), whether they consider themselves full time, part time, or temporary residents (Q.19), and whether they own or rent their residence (Q.20). Employment situation was queried (Q.21), especially with the goal of determining if respondents were involved in either tourism related industries, or marine resource harvesting industries. It was also thought that boat ownership (Q.22) might influence opinions and perceptions. Finally, on the back page of the questionnaire, respondents were provided the opportunity to comment on anything else to do with use and protection of the Gulf Islands marine environment (Q.23).

3.4 Sample Description

This project is one component of a group of projects that have incorporated a Limits of Acceptable Change (LAC) approach, in which each study sampled from different stakeholder groups. This thesis samples Gulf Islands *residents'* attitudes, values and perceptions towards various issues concerning the Gulf Islands marine environment. For the purpose of this research, a resident is defined as anyone who lives in the Gulf Islands either full time, part time, or temporarily. Residents are viewed as a very important stakeholder group because they represent the dominant users of the area, and they have both financial and emotional investment in the location. Obviously not all residents could be sampled given financial and time constraints, so a stratified random sample was chosen to represent the population. Residents were selected from three of the Southern Gulf Islands: Thetis, Salt Spring and Saturna Islands. These islands were chosen for the sample based on the existence of shellfish aquaculture facilities nearby (see Map of the Gulf Islands in Figure 3.5 below). It was rationalized that there was no need to sample from islands without any shellfish aquaculture nearby as those people would have had less opportunity for exposure to it.



Figure 3.5 Map of the Gulf Islands

The sample was selected from the *Telus Superpages* (2004) digital directory that contained the telephone listings of those residents on Thetis, Salt Spring and Saturna who had a registered phone line as at March, 2004. A systematic random sample (i.e. choosing a random start location, and then selecting every 10th telephone listing thereafter) was conducted to select the sample respondents. This type of database, as opposed to a property tax (home ownership list), was seen as the most comprehensive,

even though it too has a few limitations. Primarily, this type of database limits respondent selection to those residents who have a registered land-based telephone listing. Unfortunately those who do not have a phone line have no chance of selection. However, at the time, it was a very current list of residents that included name, address, and phone number information, and the database is not limited to only those who own their residence.

Data were collected between June 15th, 2005 and September 12th, 2005. A total of 302 surveys were completed out of 409 requested, providing a 73.8% response rate . It is speculated that non-response occurred due to lack of interest in the questionnaire topic, a perception of being ‘harassed’, general distrust towards researchers and questionnaires, or other factors. Based on the overall population of 5,506 households of Salt Spring, Thetis, and Saturna Islands that have a telephone listing, the study’s margin of error is computed to be + or - 5.5% at a 95% confidence level. Obtaining 302 completed questionnaires from a population of 5, 506 allows the researcher to be 95% confident that the results will have an error of no more than plus or minus 5.5%. In other words, 19 out of 20 times (i.e. 95% of the time) that we select a random sample of 302 Gulf Islands residents from the population of 5,506, a range within plus or minus 5.5% can be expected to contain the population value for all 5,506 people (Salant & Dillman, 1994). To place this statement in context of the results, an example from the results is 33.1% of the sample “Strongly Support” areas that allow for strict protection with no access unless with a permit (Q.14.A). This infers that between 27.6% and 38.6% of the population also “Strongly Support” this type of management zone and we would be 95% sure (confident) that the sample results are this accurate. Table 3.1 provides sample and response rate details.

Table 3.1 Population, Sample Size and Response Rate by Island

	Population	Surveys Requested	Completed Surveys (Sample Size)	Response Rate
Island:	N		n	(%)
Salt Spring	5, 017	272	201	73.9
Thetis	211	63	51	81.0
Saturna	278	74	50	67.6
Totals	5,506	409	302	73.8 *

* Overall response for the total sample.

3.5 Implementation

Each house that was randomly selected in the sample received a cold-call knock on the front door. If someone answered, the researcher introduced himself and described the project. The potential respondent was given (1) a cover letter (Appendix B), (2) a participant consent form (Appendix C), and (3) a copy of the questionnaire (Appendix D), and if possible, a time was arranged for the researcher to return to pick up the completed questionnaire. If nobody was home, the cover letter and the questionnaire were left behind in a conspicuous spot (such as on the front door-mat, or in the mailbox) and a follow-up phone call was made that evening. During the follow-up phone call, the researcher scheduled a time, at the respondent's convenience, to return to pick-up the completed questionnaire.

As data were collected throughout the summer of 2004 (June through August), it was input directly into a data spreadsheet, using the Statistical Package for the Social Sciences (SPSS), Version 12 statistical analysis software. SPSS was used for all analysis reported in the results chapter.

4.0 Results

4.1 Introduction

The purpose of this chapter is to present the results of a 2004 study that sampled attitudes, perceptions and values towards various issues and activities occurring in the Gulf islands marine environment. The study instrument was a 12-page written questionnaire, administered face-to-face with a random selection of 302 respondents, living on three Gulf Islands: Thetis, Salt Spring and Saturna.

A word of caution is necessary before these results are described and interpreted. In the analysis of these results, ordinal data is treated as ‘quasi’ interval data so that more complex analyses could be conducted, thereby producing more powerful results. The author recognizes that doing so is a breach of the fundamental laws of statistical analysis. However, it is not uncommon for this rule to be broken – indeed many authors unapologetically ignore the rule (Jamieson, 2004) without even acknowledging their offence. Heated debate exists in the literature. For instance, some claim that applying parametric statistical techniques to ordinal data highlights a flaw in the dominant paradigm of attitude measurement, and researchers do so “at the expense of the advances in measurement practice that we need so badly” (Fisher, 2005: 1220). Statistical laws state that for ordinal data (which do not justify equal distances between response categories as do interval data), a mean cannot be calculated as a measure of central tendency, and only non-parametric tests may be used for inferential statistics. However, other authors contrarily argue that “the validity of parametric statistics... is often affected very little by even relatively gross departures from (the assumptions of randomness, independence, homoscedasticity and minimally interval data)” (Harris, 1975 as cited by Pell, 2005: 970). Pell goes on to state that it is acceptable to apply parametric analysis techniques to non-parametric data, “provided that the assumptions are clearly stated, and the data is of appropriate size and shape” (2005: 970). In this thesis, ordinal data are applied to non-parametric tests including a factor-cluster analysis and subsequent t-tests. Interpretations of the results shall be considered as exploratory in nature and caution shall be employed in their application to real management decisions.

Throughout this chapter, tables and figures are used to present the results, and interpretation of the results is discussed. Qualitative input from respondents is at times weaved through the discussion to supplement the quantitative data. Results of this research are presented in this chapter in four sections.

1. The first section presents descriptive results of residents' characteristics, the type of activities they are involved in, and the values that they associate with the marine environment of the Gulf Islands. The section then presents statistical analyses of the values (Factor and Cluster analyses) that are used as an independent variable in subsequent analysis.
2. Presently, there are many different activities that occur in the Gulf Islands marine environment, some of which are more or less of a threat to the marine environment than others. The second section describes residents' perceptions of threats towards the marine environment and the impact on the marine environment by human activity. Much of the focus of this research was driven by questions about the shellfish aquaculture industry. Perceptions of benefits and concerns towards the shellfish aquaculture industry (including overall perception of the industry) are also presented in section two. These descriptive results are analyzed for differences in responses between cluster groups.
3. The third section describes the residents' attitudes towards the visual impacts of two unique marine activities: recreational boating and shellfish aquaculture and results are compared by cluster group and with other independent variables from the research.
4. The fourth and last section describes the residents' attitudes towards management of the marine environment in terms of zoning, as well as perceptions of potential solutions to the issue of sewage from recreational boats. Once again, results are analyzed for differences by cluster group and other independent variables from the research.

4.2 Resident Characteristics (Descriptive Results)

4.2.1 Canada Census Data (2001)

It is important to understand who the sample population is in terms of basic demographic information. As a supplement to the research instrument, data from the 2001 Canada Census are presented below in Table 4.1.

Table 4.1 Census Canada Data, 2001

	Salt Spring Island		Saturna Island		Thetis Island	
	n	%	n	%	n	%
Population Data						
Population, 2001	9,381	100	319	100	349	100
Canadian Citizens	8,675	92.5	290	90.9	345	98.9
Total population, 20 years and over, by level of schooling						
Less than grade 9	180	1.9	15	4.7	0	0.0
Grades 9 to 13	1,740	18.5	60	18.8	50	14.3
Trades certificate or diploma	855	9.1	55	17.2	70	20.1
College certificate or diploma	1,250	13.3	25	7.8	70	20.1
University bachelor degree or higher	1,995	21.3	80	25.1	80	22.9
Financial Variables						
Average employment income of residents 15 years and over who worked full time (\$)	\$34,890		\$36,418		\$40,898	
Average value of dwelling (\$)	\$274,821		\$307,241		\$221,542	

Source: Canada Census, 2001

BC's Southern Gulf Islands include those East of Vancouver Island and South of Nanaimo to the Canada / USA border. In this area there are about 20 residential Islands, but the main BC Ferry accessible Islands include, from North to South: Gabriola, Thetis, Galiano, Salt Spring, Mayne, North and South Pender, and Saturna. Of these, Salt Spring is the most highly populated at 9,381, and Saturna the least populated at 319. Because of the attractive lifestyle that the Islands offer, there is significant and growing foreign ownership. 7.5%, 9.1% and 1.1% of the population of Salt Spring, Saturna and Thetis respectively does not have Canadian citizenship. In terms of education, the population is well educated with the majority of the population reporting at least high school education with many more having completed a university degree. On each of the three islands, at least 20% of the residents report a university bachelor degree or higher. Canada Census (2001) also reports that average incomes ranged between \$34,000 and \$41,000 and

average property values ranged between \$220,000 and \$307,000. However, it is noted that these numbers are considerably low compared to 2005 values, given the increase in property values that occurred between 2001 and 2005.

4.2.2 Questionnaire Results Data – Sample Characteristics

As a way to introduce the questionnaire and the topic of use of the marine environment, the first question (Q.1) asked about the types of activities that respondents participated in, over the past 12 months. A list of 15 activities was presented as well as a 16th item, ‘other’. Descriptive results are presented in Table 4.2, ranked from high to low participation according to response percentage.

Table 4.2 Participation in Marine Activities (Q.1)

Activity:	Frequency (n)	Response (%)
Beachcombing	213	70.5
Bird Watching	197	65.2
Other Nature Appreciation	195	64.6
Swimming	161	53.3
Marine Mammal Viewing (e.g. Whale Watching)	131	43.4
Kayaking or Canoeing	113	37.4
Motorboat Cruising	90	29.8
Using Boats for Transportation (Excluding the Ferry)	81	26.8
Crabbing	76	25.2
Sailboat Cruising or Racing	59	19.5
Sport or Recreational Fishing	57	18.9
Shellfish Gathering	54	17.9
Other	47	15.6
SCUBA Diving or Snorkelling	19	6.3
Personal Watercraft or Jet-Skiing	10	3.3
Windsurfing	3	1.0

n = 280 (22 cases missing data)

Over half of the respondents indicated that they have participated in any of the top four activities (*Beachcombing*, *Bird Watching*, *Other Nature Appreciation*, and *Swimming*). In terms of marine resource harvesting, 18.9% of respondents indicated they had *sport or recreational fished* and 17.9% indicated they had *gathered shellfish* in the past 12 months. The same data from Q.1 are presented below (Figure 4.1) according to the total number of activities that each respondent indicated they participated in. The majority (74.3%) of the sample indicated that they participated in at least four different activities, while 8.3% indicated that they participated in 10 or more. Only 1.1% of the sample indicated that they did not participate in any of the activities listed in the

questionnaire. The mean number of activities that were participated in is 5.38 with a standard deviation of 2.61.

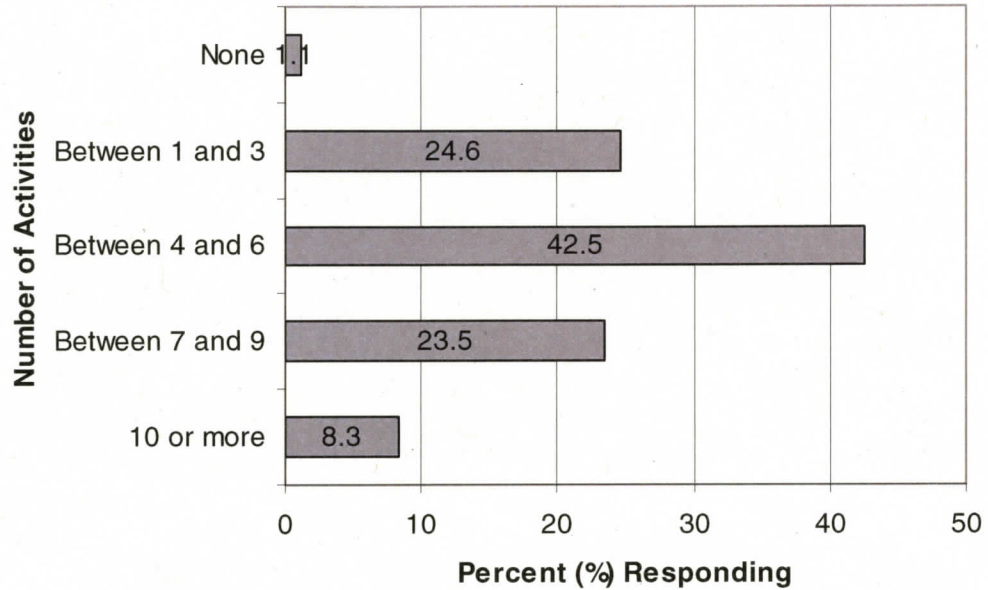


Figure 4.1 Number of Activities Participated in over the Past Year.

Over half (55.6%) of the respondents indicated that they do own a recreational boat. Though no definition of a recreational boat was provided in the questionnaire, if respondents answered “Yes”, they were asked to indicate which type. The qualitative responses show that over half of all respondents own some type of boat, many indicating that they own more than one. The type and number of boats owned by the sample are presented below in Table 4.3. If respondents indicated they own more than one boat, each different type was recorded into one of four categories, but if they indicated they own more than one within the same category, it was only recorded as one. The significance of the division at the six metre (19’ 8”) length is consistent with that of Transport Canada’s regulations for minimum required safety equipment.

Table 4.3 Type of Boat (Q.22 Qualitative Response)

Type of Boat:	Frequency (n)	Percent (%) of Sample
Rowboat, canoe, kayak, dingy (non-motorized)	77	25.5
Runabout with motor (under 6 metres / 19' 8")	67	22.2
Sailboat	41	13.6
Powerboat (over 6 metres / 19' 8")	30	9.9
No Boat	132	43.7
Missing	2	0.7

n = 302

Of those in the sample that indicated they own a boat (168 respondents), nearly half own either non-motorized boats such as rowboats or kayaks, or a motor boat under six metres in length. Fewer than 10% of the respondents who indicated they own a boat, own a powerboat over six meters in length. Boat ownership is used as an independent variable in analysis later in the chapter. Additional residential status and employment data are presented in Table 4.4 below.

Table 4.4 Sample Characteristics (Q.19, 20, 21)

Characteristic:	Frequency (n)	Response (%)
Residential Status		
Full-time resident	249	82.5
Part-time resident	45	14.9
Temporary resident	4	1.3
Other	1	0.3
Household Ownership		
Own	269	89.1
Rent	31	10.3
Employment		
Unemployed	3	1.0
Employed in tourism related industries	38	12.6
Employed in marine resource harvesting industries	9	3.0
Employed in a career unrelated to tourism / marine resource harvesting	95	31.5
Retired	107	35.4
Other	49	16.2

n = 302

The majority of the sample (82.5%) considers themselves full-time residents, while 14.9% consider themselves part-time residents. 89.1% of respondents indicated that they own their residence, while 10.3% rent. Finally, in terms of sample

characteristics, data was collected regarding their level of involvement in marine use and protection in the past year. Results of this question are shown below in Figure 4.2.

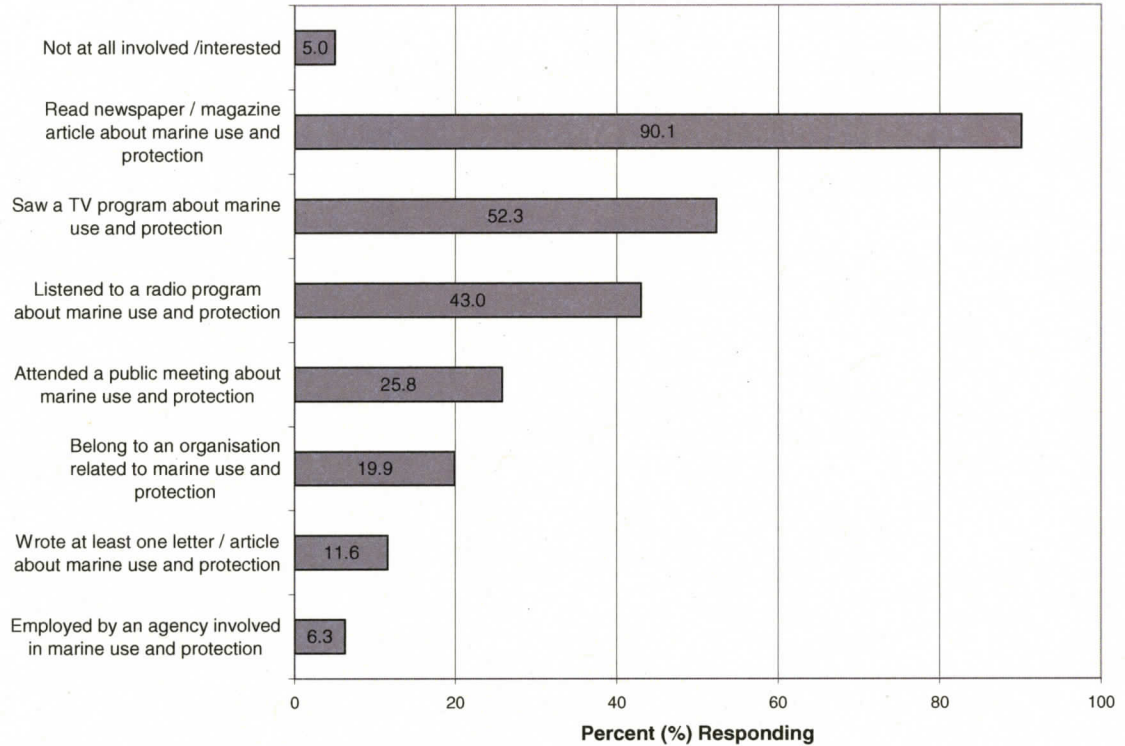


Figure 4.2 Involvement in Marine Use and Protection in the Past Year (Q.17)

In Figure 4.2, the level of involvement begins at the top with “not at all involved / interested” and proceeds down to the highest level of involvement “employed by an agency involved in marine use and protection” at the bottom. As is shown in the figure, very few respondents (5.0%) perceive themselves to be “not at all involved” in marine use and protection. Many respondents (90.1%) have at least “read a newspaper or magazine article about marine use and protection”, while the next level of involvement, “saw a TV program about marine use and protection” has 52.3% of respondents. In terms of “attending a public meeting” one quarter of respondents (25.8%) have done so in the past year. The highest level of involvement “employed by an agency involved in marine use and protection” shows 6.3% of respondents.

4.2.3 Values towards the Marine Environment

Much of the literature on MPAs emphasises the necessity to understand stakeholder values towards the marine environment (Wahle *et al.*, 2003). From a list of 13 potential values of the Gulf Islands marine environment, respondents were asked to indicate how important the values were to them (low, medium, or high importance). Raw data, including mean and standard deviation, for responses to the importance of the values are presented in Table 4.5 below. Values are ranked in order of importance based on mean response (“Low” = 1; “Medium” = 2, “High” = 3). The author recognizes that treating ordinal data as ‘quasi’ interval data is a violation of key statistical assumptions. However, establishing a mean and standard deviation for this data allows them to be more meaningfully ranked than it would by using the median or mode responses.

Table 4.5 Values towards the Marine Environment (Q.2)

Value:	Importance (%)			Not Sure	No Response	Mean**	SD
	Low 1	Medium 2	High 3				
1. Aesthetic	0.0	4.6	93.4	0.0	2.0	2.95	0.21
2. Conservation	1.0	9.3	88.4	0.0	1.3	2.89	0.35
3. Life Sustaining	1.7	10.3	84.4	2.3	1.3	2.86	0.40
4. Future	2.0	11.9	82.5	1.3	2.3	2.84	0.42
5. Intrinsic	4.0	12.3	76.5	5.3	2.0	2.78	0.51
6. Therapeutic	5.6	19.9	72.5	0.0	2.0	2.68	0.58
7. Recreation	4.3	24.2	70.2	0.0	1.3	2.67	0.56
8. Learning	5.0	31.8	60.9	1.0	1.3	2.57	0.59
9. Subsistence	15.6	41.4	38.7	2.6	1.7	2.42	0.72
10. Economic	20.2	39.1	37.1	1.3	2.3	2.18	0.75
11. Historic	22.2	41.1	33.4	1.3	2.0	2.12	0.75
12. Cultural	23.8	28.1	34.1	2.0	2.0	2.11	0.77
13. Spiritual	29.8	23.5	40.4	4.0	2.3	2.11	0.86
Other ***	0.0	0.7	4.0	0.0	95.4	2.86	0.36

* n = 302

** Calculation of mean considers that “not sure” and “no response” are missing data. Mean is calculated using Low = 1, Medium = 2, and High = 3.

*** Other values include Unique (n = 2), Escape from Urban Settings (n = 4), Peace & Quiet (n = 6), Climate (n = 3), First Nations Knowledge (n = 3)

In terms of mean response, the most important value towards the marine environment to Gulf Islands residents is *Aesthetic*. Indeed, not one respondent rated the *Aesthetic* value as “low importance”. The next most important values were *Conservation*, *Life Sustaining*, and *Future*. The least important value is *Spiritual*, followed by *Cultural*, *Historic* and *Economic*. For each of these values, there is a

relatively low uncertainty (“not sure”) except for perhaps the *Intrinsic* value, for which 5.3% responded “not sure”. In addition to the above ranking of values, Q.3 asked respondents to indicate their first and second most important values from the list. Results of this query are shown below in Figure 4.3, which shows variability of importance between the different values. With the two choices (first and second most important) combined, *Conservation* is deemed most important, followed by *Life Sustaining*, *Aesthetic* and *Recreation* values. Least important by choice are *Cultural*, *Historic*, *Learning* and *Economic* values. Considering the diverse uses and economic activity in the Gulf Islands marine environment, it is unexpected that the *Economic* value should fall at the low end of this figure. Indeed, only 6.0% of respondents chose *Economic* as their first and second most important value. However, it must also be noted that the *Economic* values is of high importance to many residents (from Table 4.5).

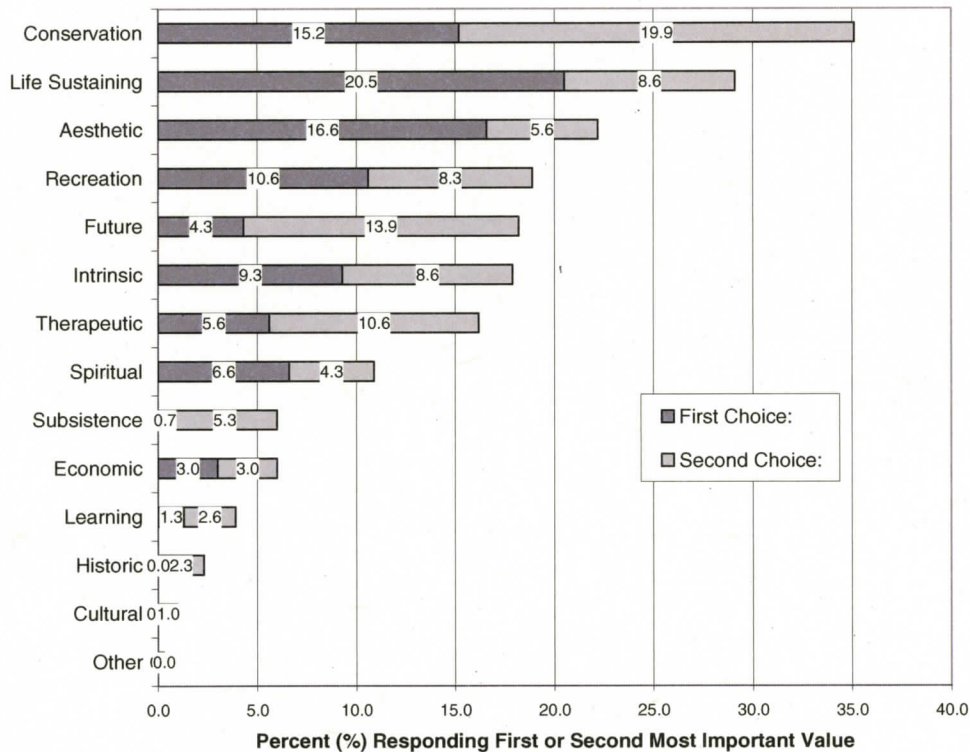


Figure 4.3 First and Second Most Important Values (Q.3)

4.2.4 Factor Analysis and Cluster Analysis of Values

The results of the importance of values from Q.2 were chosen for use as an independent variable in further analysis throughout this thesis. To do so, it was decided that a factor-cluster analysis would be used to segment the sample into a small number of categories based on the variation of values towards the marine environment. Smith (1989) suggests that too often, social scientists deny diversity among people. However, by segmenting a sample into groups that are similar with respect to an identified criterion, yet are different from other groups, new information about independent sub-samples may be useful to various agencies, including those involved in coastal planning. Subsequently, Smith (1989) suggest using the factor-cluster analysis to segment a sample into meaningful, unique groups.

Exploratory (as opposed to *confirmatory*) factor analysis is a procedure that identifies a hidden and unknown pattern in a set of variables based on the correlations between them (Hinton, 2004). Its main purposes include (1) reducing the number of variables and (2) detecting structure between the variables (StatSoft, 2004). While there are several ways of extracting factors from a dataset, by far the most common method of factor analysis is Principle Components Analysis (PCA), as used in this thesis. PCA analyzes the total variance between the variables and seeks to explain the maximum amount of variance through a minimum number of underlying factors (Hinton, 2004). In other words, PCA summarizes the most defining components (factors) of the data whilst filtering out noise. A factor analysis can be conducted in various modes. 'R-mode', used in this analysis, is where the rows of data are the cases (respondents) and the columns are the variables. In 'R-mode' the factors are groups of variables, as opposed to cluster analysis (described following) which categorizes groups of cases (rows).

The first factor produced by the PCA explains the most variance within the data. Subsequent factors explain less and less variance, until all the variance is explained by the new factors. Consequently, the researcher needs to determine the best number of factors to choose and there are three primary sources of information to help do so. This information includes (1) the percent of variance explained by each new factor (usually a

minimum of 5%), (2) the *scree plot* produced by SPSS, which is essentially a visual representation of (3) eigenvalues, which measures of the explanatory power of the new factors in comparison to the original variables (Smith, 1989). The 'Kaiser criterion' suggests including all factors with an eigenvalue greater than one, as these are deemed to explain more of the overall variance than the "average" original variable, whereas an eigenvalue less than one is not as meaningful as the "average" original variable. Each factor is statistically independent of the other factors. After factors are established, a varimax rotation is performed by SPSS, which lines up the variables in the simplest way, providing a clear picture of how each variable 'loads' on (correlates with) each factor. A rule of thumb is that a variable makes a significant contribution to a factor if its loading is 0.3 or greater (Hinton, 2004).

Whereas the mean in Table 4.5 above (Values towards the Marine Environment) was calculated by excluding "Not Sure" and missing data, the mean importance of each value in this factor analysis was calculated where "Not Sure" and missing data = 0, "Low" importance = 1, "Medium importance = 2 and "High" importance = 3. Therefore, the factor-cluster analysis does not exclude any data. Table 4.6 below shows the loadings for each value on the three resultant factors. The higher the factor loading, the better fit within that factor.

Table 4.6 Factor Analysis of "Values towards the Marine Environment" (Q.2)

Values:	Factor Loadings		
	Factor 1 <i>Environmental</i>	Factor 2 <i>Feel Good</i>	Factor 3 <i>Human Use</i>
Life Sustaining – It is a place that helps preserve clean air, soil and water.	0.75	0.09	0.08
Aesthetic – It has wonderful scenery.	0.70	0.00	0.21
Conservation – It provides a variety of marine life, plants, waterfowl, and places for them to live.	0.70	0.24	0.14
Future – It allows for future generations to enjoy it as it is now.	0.57	0.33	0.05
Learning – It provides opportunities to learn about the marine environment.	0.54	0.27	0.18
Cultural – It is a place of important traditions, wisdom, and way of life.	0.17	0.78	0.14
Spiritual – It is a sacred, religious or spiritually special place to me	0.17	0.73	-0.05
Historic – It has places and things of human history that matter to me	0.05	0.72	0.28
Therapeutic – It makes me feel better, physically and/or mentally	0.48	0.54	0.05
Intrinsic – It is valuable in and of itself, no matter what others or I think about it	0.42	0.52	-0.11
Economic – It provides employment opportunities such as fisheries, tourism, and transportation	0.15	-0.05	0.81
Subsistence – It provides necessary food and supplies to sustain people's lives	0.01	0.26	0.70
Recreation – It provides a place for outdoor recreation activities	0.31	0.02	0.53
Eigenvalues	4.278	1.442	1.189
Alpha Reliability:	0.74	0.76	0.53
% Variation Explained:	32.91	11.09	9.15
Total Variation Explained by 3 Factor Solution = 53.15%			
Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.839			
Total Alpha Reliability = 0.81			

The three-factor solution shown above in Table 4.6 explains 53.15% of the variance among all the variables. The three factor eigenvalues loaded above one (4.278, 1.442, and 1.189 respectively). The Alpha Reliability for each factor is 0.74, 0.76, and 0.53 respectively; however the third factor's reliability is lower due probably to the small number of items (three values) loading on that factor. The Kaiser-Meyer-Olkin measure

of sampling adequacy of 0.839 indicates that this analysis is indeed useful for the data. It indicates the proportion of variance in the variables which is common variance - that which might be caused by underlying factors.

While it is necessary to provide a label to the new factors, it must be noted that the labels chosen here are a subjective interpretation and are only used for the purpose of identifying the factors. The first factor, labelled *Environmental*, includes the values: (1) *Life Sustaining*, (2) *Aesthetic*, (3) *Conservation*, (4) *Future* and (5) *Learning*. Each of these values reflects an advocacy of respect and appreciation for our physical surroundings. The second factor, labelled *Feel Good*, includes the values: (6) *Cultural*, (7) *Spiritual*, (8) *Historic*, (9) *Therapeutic* and (10) *Intrinsic*. These *Feel Good* values reflect the way of life and traditions of local people, and the positive feelings associated with sense of place and being in the Gulf Islands. Lastly, the third factor, labelled *Human Use*, includes the values: (11) *Economic*, (12) *Subsistence* and (13) *Recreation*. These *Human Use* values are associated with ways in which people employ the marine environment for specific purposes that satisfy their needs and wants – such as for employment, as a source of food, or as a place to spend leisure time.

The factor analysis described above was subsequently used to reduce and categorize all respondents into two groups via a cluster analysis. Specifically, the individual factor scores (the weight of each case as it applies to each of the three factors) were applied to a *k-means* cluster analysis, which is an exploratory data analysis and classification tool. Similar to an analysis of variance (ANOVA) ‘in reverse’, in a cluster analysis, the software (SPSS) tries to move cases in and out of groups to get the most significant ANOVA results (StatSoft, 2004). Cluster analysis classifies cases into meaningful categories (clusters) or taxonomies, in order to minimize the variability of cases within clusters and maximize the variability of cases between clusters. In other words, a good cluster analysis will categorize cases with strong associations in the same cluster and those with weak associations into different clusters. An exploratory *k-means* cluster analysis was conducted because it allows the researcher to choose the number of resultant clusters. This researcher conducted analysis of two, three, and four cluster

solutions. The two-cluster solution produced one cluster of 4 cases and another of 298 cases. This solution was not chosen because it resulted in unequal distribution between the clusters, which would not allow for good analysis by cluster group. The three-cluster solution produced clusters of 161, 3, and 138 cases respectively. In this solution there is good distribution between the first and third clusters but only three cases in the second cluster. The four-cluster solution produced clusters of 26, 124, 3, and 149 cases respectively, but the rotation stopped because the maximum number of iterations was preformed and the iteration centres failed to converge. The decision was made to use the three-cluster solution and the second cluster (only three cases) was dropped from the analysis; the remaining two-clusters (first and third clusters) appeared to offer the most substance for further analysis. It is recognized that doing so sacrifices a small selection of the data. However, this sacrifice was justified given the resultant cluster groups that allowed logical further analyses.

The clusters were labelled *Human Use Oriented* and *Environmentally Oriented* based on the way they loaded on the factors. At this point, it must be recognized that these labels are a subjective interpretation, similar to the way the factor labels were chosen. The labels were chosen (as described by their attributes below in Table 4.7) for lack of a more meaningful option. It is recognized that the labels are a stereotype, are not scientifically based and that it is completely unrealistic to assume that, say people who fall into the *Environmentally Oriented* cluster are against human use of the marine environment, and people who fall into the *Human Use Oriented* cluster are strictly pro-development and against conservation initiatives. There is likely overlap of the opinions of people in the two clusters and therefore, the analyses following should be viewed as exploratory in nature.

Comparison for significant differences between the two cluster groups was conducted on various dependent variables throughout this thesis. Table 4.7 below describes the differences on how the clusters load on the factors, and other basic demographic information.

Table 4.7 Comparison of Significance of Results to Two Cluster Solution

Variable	Cluster Differences:		Significance Tests
	Cluster One (n=161) <i>Human Use Oriented</i>	Cluster Three (n=138) <i>Environmentally Oriented</i>	
Factor 1 <i>Environmental</i>	Negative (-0.255)	Positive (+0.442)	t-test: -8.83 df: 297 sig.: 0.00 *
Factor 2 <i>Feel Good</i>	Positive (+0.420)	Negative (-0.461)	t-test: 8.48 df: 297 sig.: 0.00 *
Factor 3 <i>Human Use</i>	Positive (+0.566)	Negative (-0.560)	t-test: 13.057 df: 297 sig.: 0.00 *
Years Resided in Gulf Islands	Slightly longer (18.5 years)	Slightly shorter (15.9 years)	t-test: 1.693 df: 296 sig.: 0.05 *
Residence Ownership	Less likely (86.9%)	More likely (92.7%)	chi-sq: 2.68 df: 1 sig. 0.05
Employed in tourism	More likely (16.1%)	Less likely (8.0%)	chi-sq: 5.3 df: 2 sig. 0.04 *
Island of Residence	More likely to live on Salt Spring (60.1%)	More likely to live on Saturna (58%) or Thetis (58.8%)	chi-sq: 9.23 df: 2 sig. 0.01 *

* **Significant at $p < 0.05$ (1-tailed t-test)**

The results of the cluster analysis as shown in Table 4.7 are useful in describing aspects of the population, and how they value the marine environment. For instance, the *Human Use Oriented* cluster (n = 161) may be viewed as those respondents who are more in favour of human-use aspects of the marine environment since they responded more negatively towards the *Environmental* factor and more positively towards the *Human Use* and *Feel Good* factors. People within the *Human Use Oriented* cluster are more likely to have lived longer in the Gulf Islands and be employed in tourism. The *Environmentally Oriented* cluster (n = 138) is made up of those individuals who more favour non-use and environmental protection of the Gulf Islands marine environment. Also, respondents in the *Human Use* cluster group have lived on average slightly longer in the Gulf Islands, are less likely to own their residence, and are more likely to be employed in tourism. Additionally, residents of Salt Spring Island are more likely to be members of the *Human Use Oriented* cluster group while residents of Saturna and Thetis Islands are more likely to be members of the *Environmentally Oriented* cluster group. Analysis of survey data

by these two cluster groups will continue to be applied throughout the rest of the chapter, mainly by using the cluster groups as an independent variable.

4.3 Human Activity in the Marine Environment

4.3.1 Perception of Threats towards the Marine Environment

Question four (Q.4) of the survey changed the tone from introductory questions about how respondents use and value the marine environment, to questions about concerns towards various issues associated with human-use impacts on the marine environment. Testing stakeholder perceptions of the health of the marine environment is important because such perceptions may influence the necessity for creation of a MPA or other marine protection strategies. If perceptions indicate a high degree of concern towards the health of the marine environment, then support for protection strategies is likely. Perceptions of threats may also inform managers on the utility of different levels of protection, and therefore to what extent different zones should be applied within an MPA. In this research, a list of 21 potential threats to the marine environment was provided and respondents were asked to rate their perception of the current level of impact resulting from each potential threat. Descriptive results are presented below in Table 4.8, ranked by mean response from most serious perceived threat down to least serious perceived threat. Again, ordinal data is used to calculate a mean and standard deviation and it must be acknowledged that this violates key statistical assumptions.

Table 4.8 Perceptions of Threats to the Marine Environment (Q.4)

Threat to the Marine Environment:	Response (%)					Mean	SD
	No Impact 0	Moderate Impact 1	Serious Impact 2	Not Sure	No Response		
Over fishing due to commercial fishing	5.0	20.9	61.3	11.6	1.3	1.65	0.59
Pollution from pulp mills	7.9	25.5	57.9	7.3	1.3	1.55	0.65
Threat to wild salmon from finfish aquaculture	8.9	20.5	50.7	16.2	3.6	1.52	0.69
Loss of habitat due to residential development	7.0	41.4	46.4	3.6	1.7	1.42	0.63
Sewage from Vancouver Island communities	12.3	27.2	39.1	19.9	1.7	1.34	0.73
Chemical spills from commercial cargo vessels	15.9	19.5	42.4	19.9	2.3	1.34	0.80
Visual impact of logging	16.6	36.1	40.4	5.0	2.0	1.26	0.74
Petroleum spillage from overfills or bilges	12.9	33.1	31.1	19.9	3.0	1.24	0.72
Sewage from commercial vessels	13.6	28.8	32.8	22.5	2.3	1.23	0.74
Loss of habitat due to other shoreline development (marinas)	11.3	53.0	28.1	6.3	1.3	1.18	0.63
Sewage from recreational vessels	15.9	35.1	30.8	16.6	1.7	1.18	0.74
Disturbance of whales from whale watching	16.6	39.1	31.1	11.9	1.3	1.17	0.72
Sewage from Gulf Islands communities	14.9	38.1	27.5	17.9	1.7	1.16	0.71
Impact of garbage on beaches	13.6	55.3	24.5	4.6	2.0	1.12	0.63
Runoff from agriculture	19.5	39.1	20.9	19.2	1.3	1.02	0.71
Visual impact of shellfish aquaculture	21.2	39.4	19.5	15.9	4.0	0.98	0.71
Disturbance of shorebirds from boating	20.9	49.3	15.9	10.9	3.0	0.94	0.65
Over fishing due to sport fishery	25.2	43.7	19.2	10.6	1.3	0.93	0.71
Noise from recreational vessels (e.g. yachts)	19.5	62.6	10.9	4.3	2.6	0.91	0.57
Noise from commercial vessels (e.g. freighters, tugs)	26.2	56.3	11.3	5.0	1.3	0.84	0.61
Damage to the ocean floor from anchors	32.8	30.5	7.0	27.8	2.0	0.63	0.66

+ n = 302

++ Calculation of mean considers that "not sure" and "no response" are missing data.

The most serious perceived impact from the list is *over-fishing due to commercial fishing*, followed by *pollution from pulp mills*, *threat to wild salmon from finfish aquaculture*, and *loss of habitat due to residential development*. Of the lesser serious impacts, it is interesting to note that the fourth least serious is *over-fishing due to sport fishery*, a stark contrast to the most serious concern towards the *commercial fishery*. In this interpretation, the *visual impact of shellfish aquaculture* ranks as the sixth least serious impact. The least serious perceived impact to the marine environment is *damage to the ocean floor from anchors* followed by *noise from commercial vessels*, and *noise from recreational vessels*.

An important thing to note from Table 4.8 is the relatively high amount of “Not Sure” responses within this question. For instance, for 14 of the 21 impacts listed, the “Not Sure” responses were at least 10%, which consequently affects the mean for each variable since the mean was established without including the “Not Sure” and missing responses. The highest “Not Sure” response was for *damage to the ocean floor from anchors* (27.8%), which of course contributes to its placement as the least serious perceived impact. This high uncertainty is an important indication that either people are not aware of these potential issues, or they have not had a chance to educate themselves enough to form an opinion. Perhaps some of the threats listed in Q.4 were new to respondents (i.e. they had not previously put thought to forming an opinion about them). This uncertainty regarding impacts to the marine environment may influence people’s perceptions of the necessity for protection strategies. For instance, if people respond “Not Sure” to certain issues, it is possible they may perceive a need for more protection. Alternatively, if they are “Not Sure”, they may not be concerned enough to want more protection.

Analysis of the results of perceptions of threats (Q.4) was performed to determine if there are significant differences of responses between the two different cluster groups. From the list of 21 threats, only two resulted with significant differences in responses from the two cluster groups, as displayed below in Table 4.9. Perceptions were significantly different between the two cluster groups only for two variables. The

Environmentally Oriented cluster group had a higher mean perceived impact for *threat to wild salmon from finfish aquaculture (Q.4.C)*, while (counter intuitively) the *Human Use Oriented* cluster group had a higher mean perceived impact for *runoff from agriculture (Q.4.L)*.

Table 4.9 Perception of Threats (Q.4) by Cluster Group

Possible Threat to the Marine Environment:	Mean **		t-test	df	Sig. 1-tail
	Human Use Cluster	Enviro-Oriented Cluster			
Over fishing due to commercial fishing	1.60	1.70	-1.301	260	0.097
Pollution from pulp mills	1.58	1.51	0.832	274	0.203
Threat to wild salmon from finfish aquaculture	1.45	1.61	-1.847	240	0.033*
Loss of habitat due to residential development	1.41	1.42	-0.204	284	0.420
Sewage from Vancouver Island communities	1.38	1.30	0.869	235	0.193
Chemical spills from commercial cargo vessels	1.40	1.27	1.221	233	0.117
Visual impact of logging	1.26	1.26	0.009	279	0.497
Sewage from commercial vessels	1.31	1.18	1.314	225	0.095
Petroleum spillage from overfills or bilges	1.27	1.19	0.79	231	0.215
Loss of habitat due to other shoreline development (e.g. marinas)	1.19	1.17	0.267	277	0.395
Sewage from recreational vessels	1.21	1.15	0.672	245	0.251
Disturbance of whales from whale watching	1.15	1.18	-0.316	260	0.376
Sewage from Gulf Islands communities	1.22	1.07	1.594	241	0.056
Impact of garbage on beaches	1.17	1.05	1.564	280	0.060
Runoff from agriculture	1.09	0.93	1.794	238	0.037*
Visual impact of shellfish aquaculture	0.96	1.00	-0.41	240	0.341
Disturbance of shorebirds from boating	0.97	0.91	0.732	258	0.233
Over fishing due to sport fishery	0.93	0.93	-0.009	264	0.497
Noise from recreational vessels (e.g. yachts)	0.95	0.85	1.519	279	0.065
Noise from commercial vessels (e.g. freighters, tugs)	0.85	0.83	0.289	281	0.387
Damage to the ocean floor from anchors	0.68	0.57	1.218	210	0.113

* and **Bold** – Significant at $p < 0.05$ (1-tailed t-test)

** Calculation of Mean considers that No Impact at All = 0, Moderate Impact = 1, and Serious Impact = 2. Threats are ranked according to mean.

Overall there is concern surrounding the health of the Gulf Islands marine environment in general (see Table 4.10 below) and the majority of residents believe the marine environment is either moderately or seriously impacted by human activity. Only two percent of all respondents believe that overall, the Gulf Islands marine environment is *not at all impacted*. A potential result of this perception (Q.5) is a general degree of support for protection strategies as described in Table 4.26 of this chapter, even though Table 4.8 above shows relatively high uncertainty regarding specific potential impacts to the marine environment.

Table 4.10 Overall Impact of Human Activity on the Marine Environment (Q.5)

Amount of Perceived Impact:	Frequency (n)	Response (%)
Not At All Impacted	6	2.0
Moderately Impacted	170	56.3
Seriously Impacted	71	23.5
Not Sure	12	4.0
No Response	43	14.2

N = 302

The results from Q.5 were analysed for significance of differences in perception of overall impact by cluster group and there were no significant differences (t-test = -0.791; df = 245; 2-tailed sig. = 0.429).

4.3.2 Perceptions of Shellfish Aquaculture

Having described the results of perceptions towards a series of potential impacts to the marine environment and perceptions of the overall impact of human activity on the marine environment, the chapter will now begin to focus on more specific activities. A portion of this research was driven by an attempt to understand stakeholder perceptions of the shellfish aquaculture industry. A list of four potential benefits and four potential concerns towards the shellfish aquaculture industry (Q.10) was developed and respondents were asked whether, and to what extent, they agree or disagree with each statement. The list of benefits and concerns was developed in consultation with representatives of the shellfish aquaculture industry (during the 2003 focus groups). However, by asking representatives from the industry to determine benefits and concerns about their industry, biases are inevitably introduced. Therefore, it is recognized that the list is not exhaustive and an opportunity was provided for open-ended responses of other

benefits and concerns (Q.13) to be noted. Figure 4.4 presents results of perceptions of the four potential benefits of the shellfish aquaculture industry (Q.10).

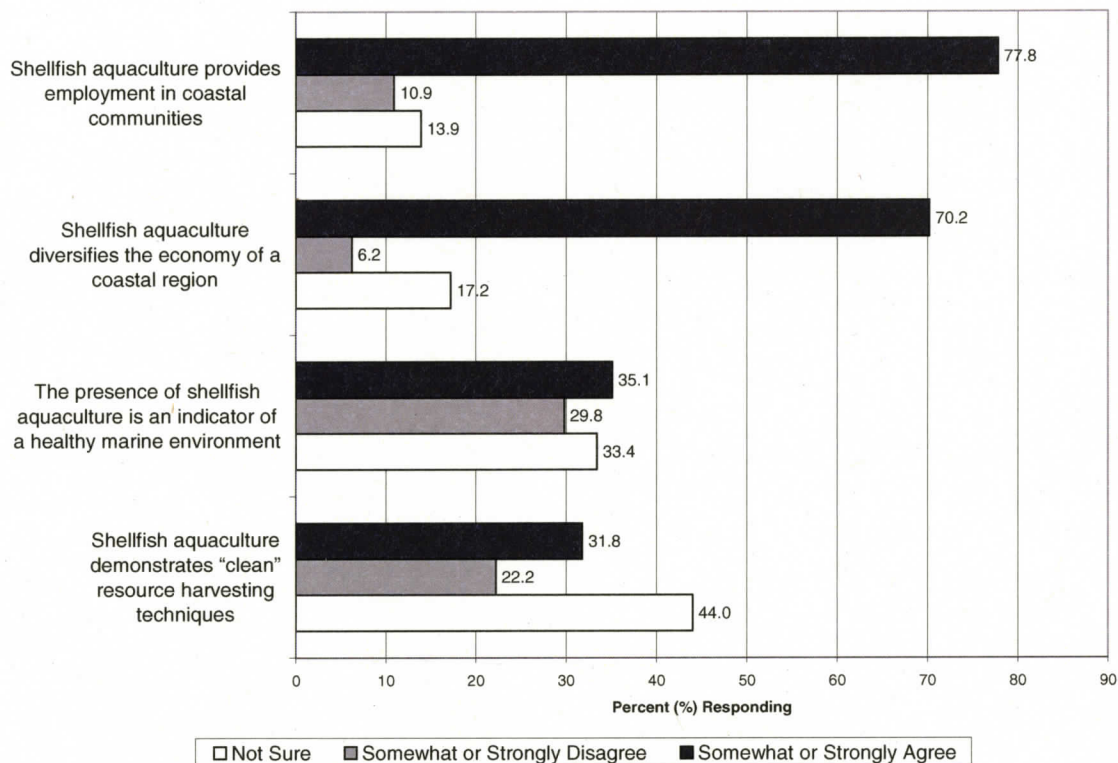


Figure 4.4 Perception of Benefits towards Shellfish Aquaculture (Q.10)

Respondents showed strong agreement with the economic benefits of shellfish aquaculture, but were more divided on the two statements referring to environmental and cleanliness benefits of the industry. Indeed, they showed uncertainty regarding *the presence of shellfish aquaculture is an indicator of a healthy marine environment* (33.4% responding "Not Sure") and *shellfish aquaculture demonstrates "clean" resource harvesting techniques* (44% responding "Not Sure"). Since the list of potential benefits of the industry is not exhaustive, respondents were provided the opportunity to note any other benefits they knew of. A categorized summary of the comments about the benefits or concerns associated with shellfish aquaculture (Q.13) is presented below in Table 4.11.

Table 4.11 Analysis of Comments Regarding Shellfish Aquaculture (Q.13)

Type of Comments:	Number of Comments:
Negative Comments (n = 76):	
Environmental Impacts (pollution, exotic species, diseases)	25
Impacts associated with visual / sound / garbage (unnatural)	23
Interferes with other uses / hazard to navigation	12
Similar impacts as finfish (Salmon) aquaculture	10
Lack of consultation / information from industry	9
Health concerns of human consumption	7
Neutral / Uncertain Comments (n = 27):	
Lacking knowledge / uninformed	17
Effects on other ecosystems?	5
Carrying capacity?	3
Other	2
Positive Comments (n = 23)	
Positive if in right location / proportion	11
Safe source of seafood	7
Employment / economic activity	3
Improvement to water quality / provide artificial reef	2
Total Comments	136

Of a total of 136 open-ended comments (Q.13), the majority were of a negative nature towards aquaculture (n = 76), but there were 27 neutral and 23 positive comments. One respondent provided a comment reflective of the requirement of good water quality, while others had to do with the perception that commercially farmed products are of better food quality and consistency than wild products. Examples of positive comments include:

“In our area, shellfish aquaculture improved water quality in Boot Cove because sewage discharge on lots adjoining the cove had to be upgraded”.

“I think it may provide a safer source of shellfish for consumers than would wild harvest and less destructive to the natural shellfish environment”.

“Dug clams & oysters from the beach are often unsafe after inappropriate transportation. They find their way to restaurants. It would be better if restaurants use shellfish aquaculture sources to ensure quality and safety”.

In addition to the four benefits presented in Q.10, four potential concerns towards the shellfish aquaculture industry were presented. Results of the sample's perceptions towards these potential concerns are presented below in Figure 4.5.

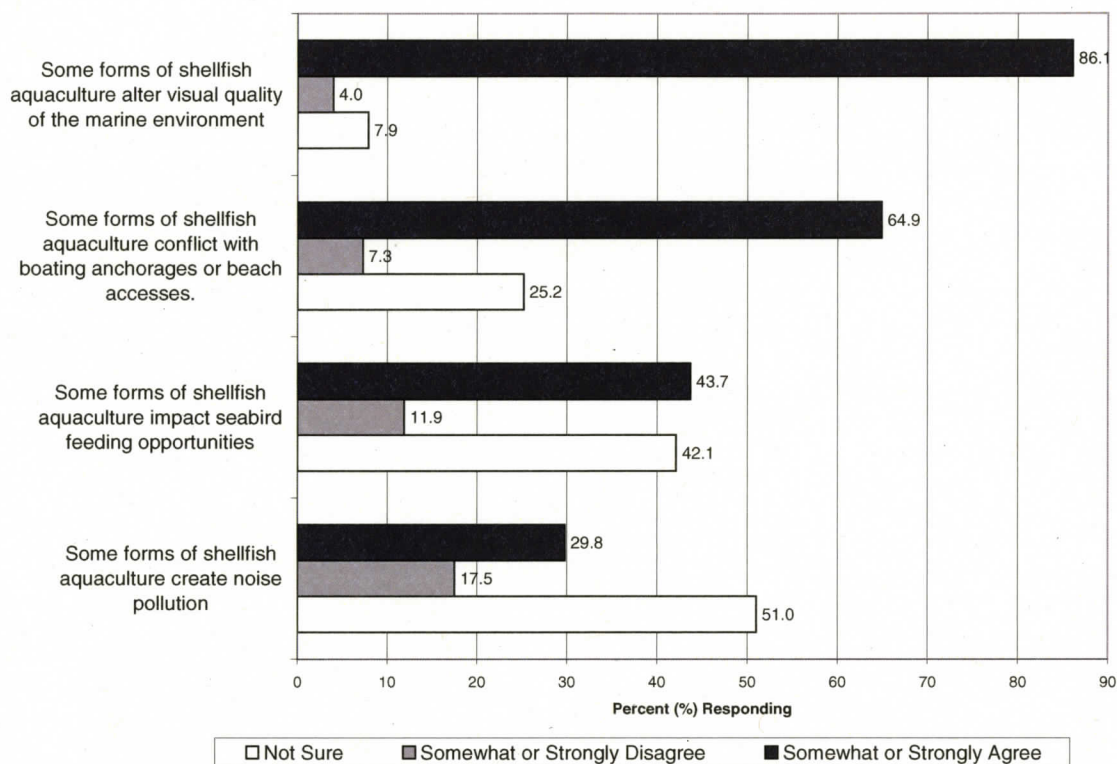


Figure 4.5 Perception of Concerns towards Shellfish Aquaculture (Q.10)

Respondents showed strong agreement with the concern related to visual impact of shellfish aquaculture, and to a lesser degree the statement that shellfish aquaculture conflicts with boating anchorages. Overall, only a few respondents disagreed with any of the concern statements, but again, uncertainty was present. For instance, 11.9% disagreed with, and 42.1% were "Not Sure" about the statement, *some forms of shellfish aquaculture impact seabird feeding opportunities*, and 17.5% disagreed with and 51% were "Not Sure" about the statement, *some forms of shellfish aquaculture create noise pollution*. This question was placed following the sequence of photos depicting shellfish aquaculture in the survey, which may explain the high agreeability and low uncertainty with the statement, *some forms of shellfish aquaculture alter visual quality of the marine*

environment. In addition to these concerns listed here, the qualitative responses (Q.13) produced other concerns, including:

“Adjoining residents should be properly consulted and compensated for any loss of amenity”

“That unused ones can be left *in situ* is shocking and unacceptable.”

“Poorly kept aquaculture could spread disease to other ‘free’ shellfish / sea creatures.”

Results of the benefit and concerns statements were analyzed for differences between the two cluster groups, and results, along with mean response for each statement by cluster group, are displayed in Table 4.12 below. The mean responses of the *Environmentally Oriented* cluster group are consistently lower for the benefit statements (meaning they more strongly disagree with the benefits) and consistently higher for the concern statements (meaning they more strongly agree with the concern statements). Significant differences are present in two of the benefit statements and two of the concerns statements.

Table 4.12 Differences in Perceptions of Shellfish Aquaculture (Q.10) by Cluster Group

Perceptions of Shellfish Aquaculture	Mean		t-test	df	Sig. 1-tail
	Human Use Cluster	Enviro-Oriented Cluster			
<u>Benefits:</u>					
Shellfish aquaculture demonstrates "clean" resource harvesting techniques	0.16	-0.01	-1.385	292	0.084
The presence of shellfish aquaculture is a good indicator of a healthy marine environment	0.09	-0.10	-1.389	292	0.083
Shellfish aquaculture provides employment in coastal communities	1.08	0.80	-2.641	291	0.005 *
Shellfish aquaculture diversifies the economy of a coastal region	0.87	0.63	-2.051	292	0.021 *
<u>Concerns:</u>					
Some forms of shellfish aquaculture alter visual quality of the marine environment	1.23	1.49	2.785	288.4	0.003 *
Some forms of shellfish aquaculture conflict with desired boating anchorages or beach accesses	0.78	1.01	2.003	289	0.023 *
Some forms of shellfish aquaculture impact seabird feeding opportunities	0.53	0.57	0.344	290	0.366
Some forms of shellfish aquaculture create noise pollution	0.16	0.27	0.95	292	0.172

* **Bold - Significant at $p < 0.05$ (1-tailed test)**

** Calculation of mean considers that Strongly Agree = +2 Somewhat Agree = +1, Not Sure = 0, Somewhat Disagree = -1, and Strongly Disagree = -2.

Finally, respondents were asked to summarize their overall perception of the shellfish aquaculture industry and to indicate whether the benefits outweigh the concerns or the concerns outweigh the benefits of the industry. Responses to this query of overall perception of the shellfish aquaculture industry (Q.11) are shown below in Figure 4.6.

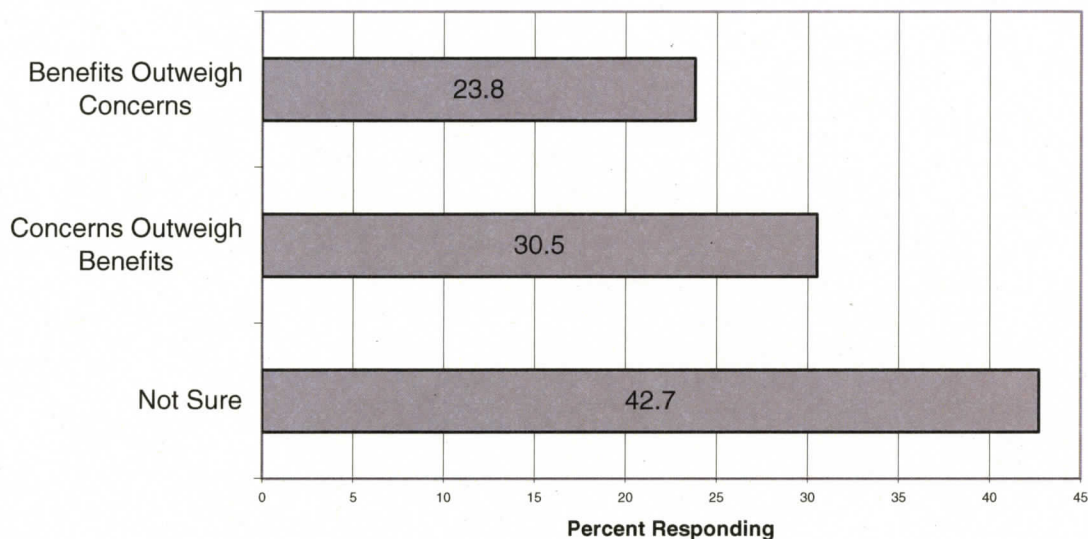


Figure 4.6 Overall Perception of Shellfish Aquaculture (Q.5)

While 23.8% of respondents perceive that the benefits of the industry outweigh the concerns, a higher percentage (30.5%) believes the contrary. However, of particular interest is the high “Not Sure” response. Almost half the respondents, 42.7%, responded “Not Sure” when asked for their overall opinion of the industry, which may indicate an opportunity for interested parties to provide more information to the public with intentions of educating them towards issues associated with the industry. Some of the qualitative comments provided in Q.13 help to explain the uncertainty towards the industry:

“I am not well informed, thus very concerned”

“Our knowledge of shellfish aquaculture is very limited – hence our ‘not sure’ answers.”

“Don’t know much about it, really.”

The other qualitative responses associated with shellfish aquaculture (Q.13) revealed that for some respondents, the perception of aquaculture is ingrained no matter what type (i.e. either finfish or shellfish aquaculture). For instance, even though the questionnaire did not at all focus on finfish aquaculture, many respondents commented negatively towards that industry. It is apparent that to some, perceptions of the shellfish

aquaculture industry (as presented in Figure 4.6) are highly influenced by their strong negative perception of the finfish aquaculture industry. For instance:

“Farm salmon aquaculture is still highly controversial, and I cannot support shellfish aquaculture without 110% proven data that it has zero impact on the marine environment.”

“If this means fish farming i.e. salmon, NO!”

“Based upon the disastrous impact of fish farms on the BC coast, I am concerned about where shellfish aquaculture will end up.”

One respondent, while commenting negatively on finfish aquaculture, did at least show an understanding of the difference between the two industries and that this research does not specifically address finfish aquaculture:

“I am not informed on this issue, so can’t answer. However, (not that you asked) I am totally opposed to salmon culture.”

Analysis was conducted to examine those respondents who perceive that the *concerns outweigh the benefits* of shellfish aquaculture, by cluster group. As is shown by Figure 4.7 below, 38.1% of the *Environmentally Oriented* cluster group responded “Concerns outweigh Benefits”, while 25.6% of the *Human-Use Oriented* cluster group responded “Concerns outweigh Benefits”. This result is significant (chi-square = 6.313; df = 2; 2-tailed sig. = 0.043) and expected, since the *Human-Use Oriented* cluster may be considered to be more accepting of different types of uses of the marine environment, including industry such as shellfish aquaculture.

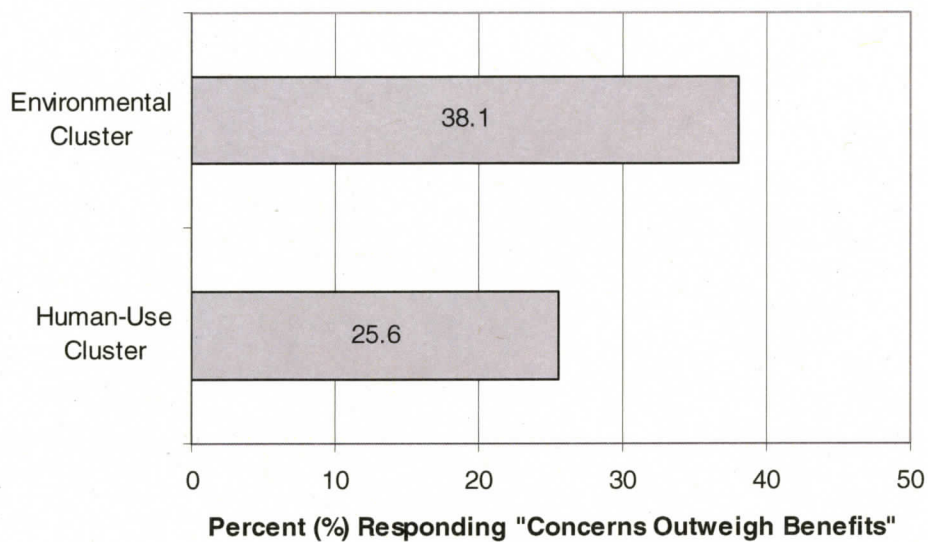


Figure 4.7 Percent Responding "Concerns Outweigh Benefits" by Cluster Group

This section of the results chapter presented descriptive results and a factor and cluster analysis of results associated with impacts to the marine environment and issues associated with shellfish aquaculture. The focus of the discussion now turns to results of questions associated with the visual impacts of recreational boating and shellfish aquaculture.

4.4 Visual Impacts

One type of human impact on the marine environment is the visual impact of certain activities. In terms of visual impact, this study focussed on two specific, unique, and potentially conflicting uses of the marine environment: recreational boating and shellfish aquaculture. In order to examine attitudes towards visual acceptability of both of these activities, sequences of six digitally altered photos were presented to respondents for their acceptability assessment. This section of the results chapter presents the results and interpretation of data analysis for residents' attitudes towards visual acceptability of both activities.

4.4.1 Visual Impact of Recreational Boating

Recreational boating is already a popular activity during the summer months in the Gulf Islands. There is a well-established network of 'marine parks' in the area that, with the help of the Council of BC Yacht Clubs and the BC Marine Parks Forever Society, are managed by either the provincial or federal governments (BC Parks or Parks Canada). Depending on the time of year and local conditions such as access, exposure, or location, these 'marine parks' and other anchorages may be either very crowded, or not at all. In order to establish a standard for recreational boats, the questionnaire presented respondents with a series of six photos showing different densities of recreational boats. Two unique surveys were implemented; the original sample (n = 221) presented common recreational boats (both power and sail) in an anchorage (see Figure 4.8) and the alternate sample (n = 81) presented a depiction of whale-watching boats of uniform design (see Figure 4.10). The alternate set of photos was borrowed from a similar study, conducted in 2001 with a sample of kayakers in the Broken Group Islands, Pacific Rim National Park (Randall, 2003). Results of these two questions are presented in the sequence of tables and charts below.

4.4.1.1 Regarding the Visual Impact of Recreational Boats

Table 4.13 shows the descriptive results for the original recreational boats photo sequence. Mean acceptability of each photo is calculated considering the response category range from "Very Acceptable" = +2, "Somewhat Acceptable" = +1, "Not Sure" = 0, "Somewhat Unacceptable" = -1, and "Very Unacceptable" = -2.

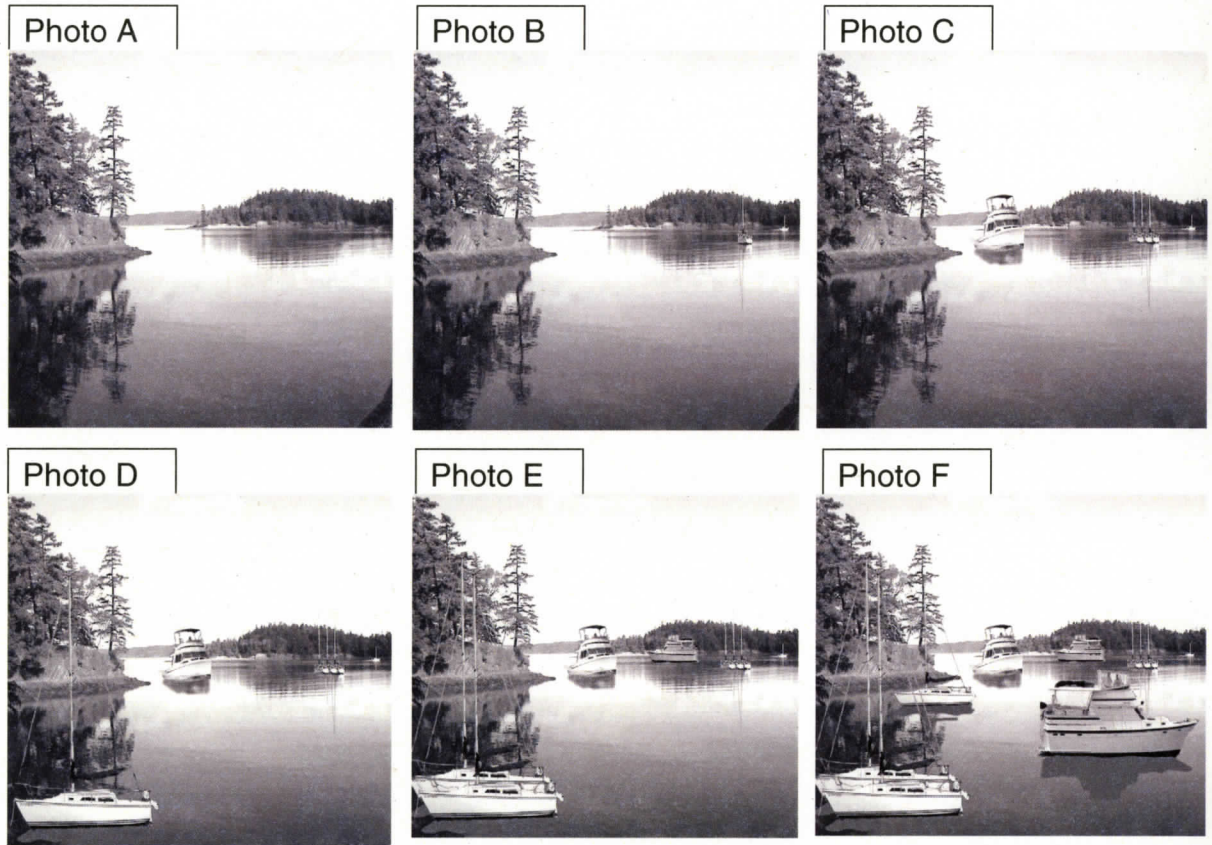


Figure 4.8 Recreational Boat Photo Sequence (n = 221)

Table 4.13 Acceptability of the Recreational Boat Photo Sequence (Q.6)

Photo:	Response (%)						Mean **	SD
	Very Acceptable	Somewhat Acceptable	Not Sure	Somewhat Unacceptable	Very Unacceptable	No Response		
	+2	+1	0	-1	-2			
Photo A	98.6	0.0	0.0	0.0	0.5	0.9	1.98	0.27
Photo B	87.8	10.0	0.0	1.4	0.0	0.9	1.86	0.45
Photo C	44.8	40.7	1.8	10.0	0.9	1.8	1.21	0.96
Photo D	28.1	32.1	8.1	24.4	5.4	1.8	0.54	1.29
Photo E	11.8	19.9	7.7	33.5	25.3	1.8	-0.41	1.38
Photo F	7.2	9.0	3.6	23.5	55.7	0.9	-1.12	1.27

n = 221

++ Calculation of mean considers that "no response" is missing data. Mean computed from Likert scale ranging from "Very Unacceptable" = -2, "Somewhat Unacceptable" = -1, "Not Sure" = 0, "Somewhat Acceptable" = +1, "Very Acceptable" = +2

The social norm curve (Figure 4.9 below) is a useful visual figure to display these same results. Where the acceptability rating is depicted on the horizontal axis, the mean result is plotted along the vertical axis. Figure 4.9 shows that the social norm, or the mean minimally acceptable condition (the point at which the mean crosses the neutral

line from positive to negative), is between Photo D and Photo E (about 7 boats). Another useful aspect of this figure is that it shows the 'Crystallization', or the extent of one standard deviation away from the mean (variability), as indicated by the bold lines above and below the norm curve. This is useful to visualize the variation of responses and their distribution away from the mean.

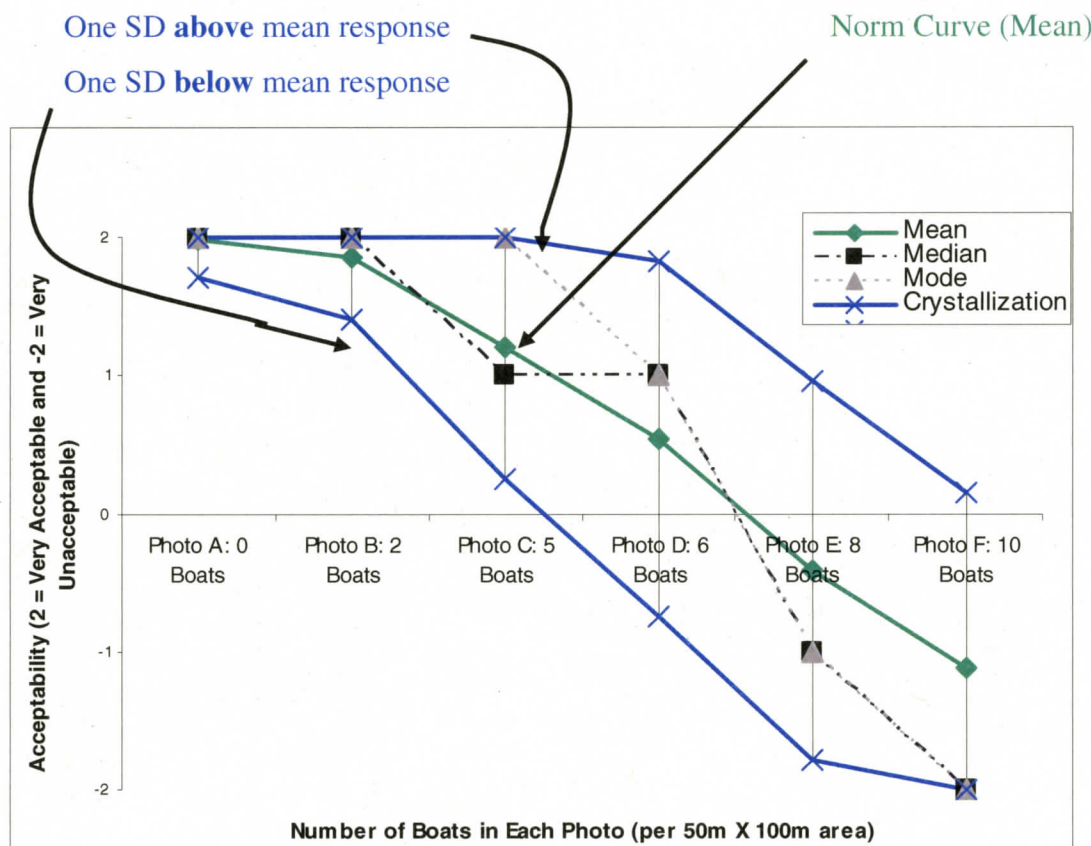


Figure 4.9 Social Norm Curve for the Recreational Boat Photo Sequence (Q.6)

Figure 4.9 above shows that for the first photo (depicting an empty bay with zero boats), there is high acceptability and very little variability in responses; in other words, high crystallization. However, the mean shows decreasing acceptability, along with increasing variability in responses, with increasing densities of boats. As expected, acceptability declines with increasing densities; however, in the case of recreational boats, general acceptability is apparent considering that the mean acceptability is positive for four of the six photos. The lack of consensus however (shown by the low

crystallization in the higher density photos) suggest people vary in their attitudes, which leads to the next analysis.

The descriptive results presented above were analyzed for significant differences between the two cluster groups (*Human Use* and *Environmentally Oriented*). Table 4.14 below shows the results of this analysis.

Table 4.14 Significance of Differences to Recreational Boat Photos (n = 221) by Cluster Group

Photo:	Mean Acceptability **		Standard Deviation		T=Test	DF	1-Tailed Sig.
	Human Use Cluster (n=123)	Enviro Cluster (n=95)	Human Use Cluster (n=123)	Enviro Cluster (n=95)			
Photo A	1.97	1.96	0.361	0.289	0.212	216	0.416
Photo B	1.85	1.82	0.523	0.437	0.490	216	0.313
Photo C	1.30	1.08	0.914	0.986	1.677	216	0.043 *
Photo D	0.65	0.41	1.293	1.250	1.378	216	0.085
Photo E	-0.20	-0.64	1.420	1.263	2.410	211.695	0.009 *
Photo F	-0.94	-1.32	1.369	1.113	2.216	215.399	0.014 *

* **Bold** - Significant at $p < 0.05$ (1-tailed t-test)

** Mean computed from Likert scale ranging from "Very Unacceptable" = -2, "Somewhat Unacceptable" = -1, "Not Sure" = 0, "Somewhat Acceptable" = +1, "Very Acceptable" = +2

Photos C, E, and F showed significant differences between the mean responses of the two clusters. The mean responses from the *Human Use* cluster for photos C, E, and F are 1.30, -0.20, and -0.9 respectively, and from the *Environmentally Oriented* cluster are 1.08, -0.64, and -1.32 respectively. This shows that the *Environmentally Oriented* cluster group consistently responded with a lower mean (less acceptability) than the *Human Use* cluster, and those differences were significant for the three photos C, E, and F (bolded in Table 4.14). This is logical as the *Environmentally Oriented* cluster is hypothesized to be less accepting of human uses and impacts in the Gulf Islands marine environment.

4.4.1.2 Regarding the Visual Impact of Whale Watching Boats

As discussed above, an alternate photo sequence was presented to a sample of 81 respondents, illustrating varying densities of whale watching boats. The alternate photo sequence (Figure 4.10) results are presented below in the same format as above for the original photo sequence, including descriptive results (Table 4.15), a norm curve (Figure 4.11), and comparison by cluster groups (Table 4.16).

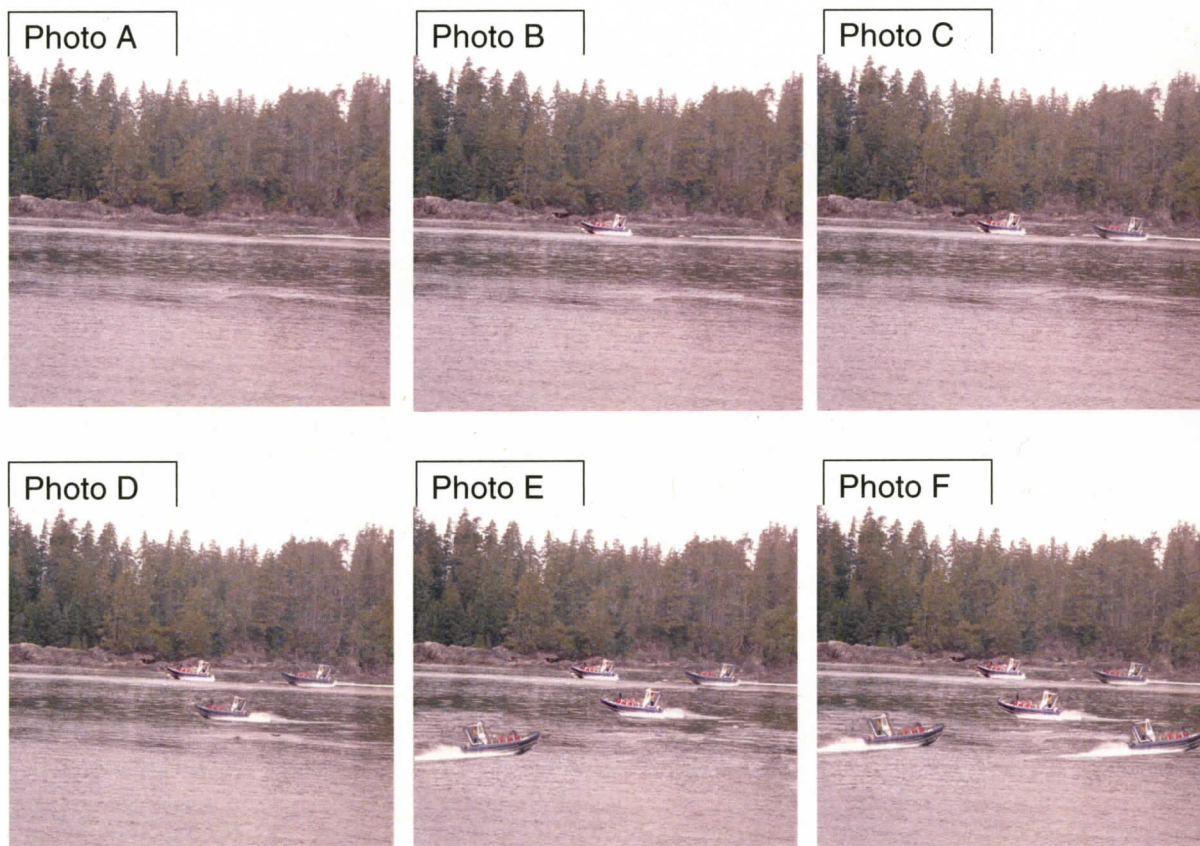


Figure 4.10 Whale Watching Boats Photo Sequence (n = 81)

Table 4.15 Acceptability of the Whale Watching Boat Photo Sequence (Q.6)

Photo:	Response (%)					No Response	Mean **	SD
	Very Acceptable	Somewhat Acceptable	Not Sure	Somewhat Unacceptable	Very Unacceptable			
	+2	+1	0	-1	-2			
Photo A	92.6	2.5	0.0	0.0	0.0	4.9	1.97	0.16
Photo B	75.3	18.5	0.0	0.0	0.0	6.2	1.80	0.40
Photo C	43.2	33.3	4.9	11.1	2.5	4.9	1.09	1.10
Photo D	16.0	22.2	7.4	30.9	18.5	4.9	-0.14	1.42
Photo E	8.6	6.2	0.0	12.3	66.7	6.2	-1.30	1.32
Photo F	8.6	2.5	1.2	9.9	74.1	3.7	-1.44	1.23

n = 81

++ Calculation of mean considers that "no response" is missing data. Mean computed from Likert scale ranging from "Very Unacceptable" = -2, "Somewhat Unacceptable" = -1, "Not Sure" = 0, "Somewhat Acceptable" = +1, "Very Acceptable" = +2

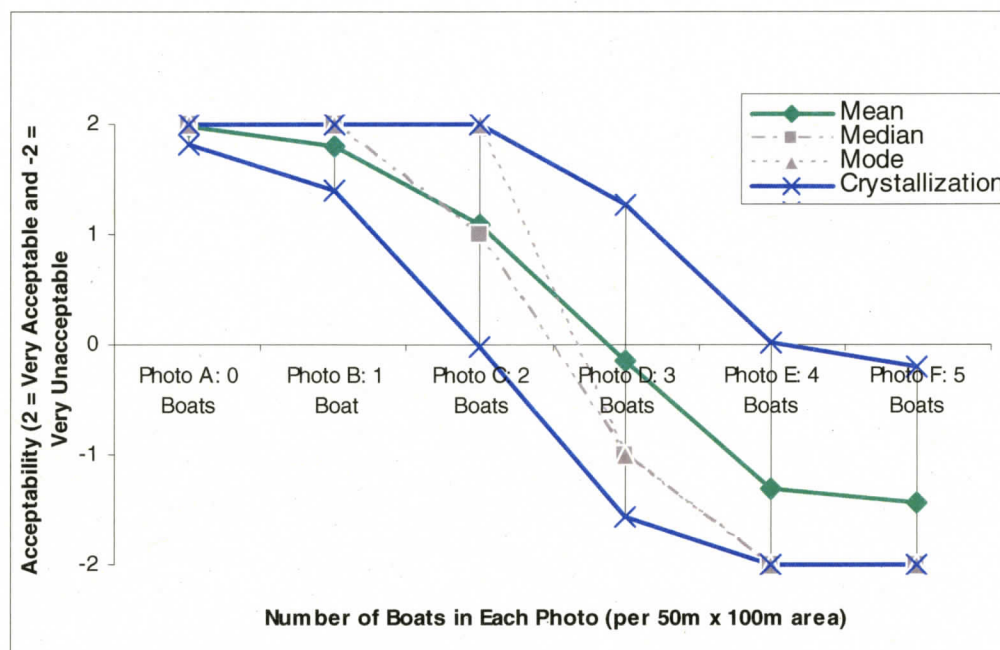


Figure 4.11 Social Norm Curve for Whale Watching Boat Photo Sequence (Q.6)

The above norm curve, Figure 4.11 for acceptability of the series of photos depicting whale-watching boats is shaped a little differently than Figure 4.9 (depicting common recreational boats); notably, there is a greater crystallization, or less variability in responses. Though whale watching boats are a type of recreational boat, these data are not necessarily easily compared to the original photo sequence, given that opinions of the two types of recreational boats may be affected by unique variables. For instance, someone who enjoys the social component of recreational cruising, and is therefore accepting of a bay densely packed full of cruising boats, may feel that the impact of whale watching boats on the whales themselves is not acceptable, thereby influencing their opinion of the activity's visual impact. Also, although the mean minimally acceptable condition is lower for the alternate photo sequence (whale watching boats) than it is for the original photo sequence, these cannot well be compared since the densities of boats are different between photo sequences. For instance, Photo D of the original photo sequence depicts six boats while Photo D of the alternate photo sequence depicts three boats.

As above, the results of acceptability to the alternate photo sequence were compared by cluster group. In this instance, responses to Photos A, D, E, and F are significantly different. Interestingly, the *Human Use* cluster group responded less acceptable to Photo A and B, though this difference is not significant. However, as expected, the *Environmentally Oriented* cluster group's mean response was significantly less acceptable than the *Human Use* cluster's mean response to photos D, E, and F (below in Table 4.16).

Table 4.16 Significance of Differences to Whale Watching Boat Photos (n = 81) by Cluster Group

Photo:	Mean Acceptability **		Standard Deviation		T=Test	DF	1-Tailed Sig.
	<i>Human Use</i> Cluster (n=123)	<i>Enviro</i> Cluster (n=95)	<i>Human Use</i> Cluster (n=123)	<i>Enviro</i> Cluster (n=95)			
Photo A	1.79	1.95	0.577	0.305	-1.569	54.599	0.061
Photo B	1.68	1.70	0.620	0.558	-0.103	79	0.459
Photo C	1.11	0.98	1.110	1.102	0.522	79	0.302
Photo D	0.26	-0.49	1.329	1.352	2.517	79	0.007 *
Photo E	-0.84	-1.56	1.498	1.031	2.474	64.479	0.008 *
Photo F	-1.08	-1.65	1.421	0.997	2.072	65.302	0.021 *

* **Bold** - Significant at $p < 0.05$ (1-tailed t-test)

** Mean computed from Likert scale ranging from "Very Unacceptable" = -2, "Somewhat Unacceptable" = -1, "Not Sure" = 0, "Somewhat Acceptable" = +1, "Very Acceptable" = +2

A test was also conducted to determine if there were significant differences in attitudes towards the photos of recreational boats (Q.6 both sequences) using boat ownership (Q.22) as an independent variable. The only significant difference (t-test = -2.146, df = 32, 2-tailed significance = 0.040) was present in alternate recreational boat Photo A (see Figure 4.10). In this case, boat owners responded with higher acceptability than non-boat owners.

4.4.1.3 Perceptions of Number and Types of Boats Seen

This study employed a secondary approach to understanding resident perceptions of acceptable levels of recreational boats. The first, as presented above, asked respondents to indicate their acceptability rating for each photo in a series of six photos of increasing densities. The second method, as presented below in Table 4.17, asked respondents to indicate whether their encounters with different types of boats from a list, were "Too Few", "About Right", or "Too Many".

Table 4.17 Attitudes towards Encounters with Different Types of Boats (Q.8)

Type of Boat:	Response (%)				
	Too Few	About Right	Too Many	Not Sure	No-Response
PWC or Jet-Skis	2.0	25.8	48.3	21.2	2.6
Motor cruisers	1.7	47.4	41.7	7.0	2.3
Whale watching boats	2.6	28.5	32.8	33.1	3.0
Sport fishing boats	5.6	59.3	16.6	15.6	3.0
Commercial fishing boats	8.3	52.0	14.9	22.5	2.3
Tugs or other cargo ships	2.3	67.5	7.9	20.5	1.7
Other	0.7	1.0	6.0	0.0	92.4
Sailboats	7.3	80.1	5.6	4.6	2.3
Kayaks or canoes	17.2	70.9	5.6	4.6	1.7
Ferries	4.6	82.1	5.6	5.6	2.0

n = 302

The descriptive results for Q.8, ranked in order from most to least responses under the category “Too Many”, weight heavily on motorized recreational boats. The number of *PWC or jet skis* seen is considered by the highest number of respondents to be “Too Many”, followed by *motor cruisers* and *whale watching boats*. 17.2% of respondents thought there were “Too Few” *kayaks or canoes*, while 7.3% of respondents thought there were “Too Few” *sailboats*. Respondents felt that the number of many of the types of boats was “About Right”. At least 50% of respondents thought the number of *sport fishing boats* (59.3%), *commercial fishing boats* (52%), *tugs or other cargo ships* (67.5%), *sailboats* (80.1%), *kayaks or canoes* (70.9%), and *ferries* (82.1%) was “About Right”. However, at least 20% of respondents were “Not Sure” about the number of *PWCs* (21.2%), *whale watching boats* (33.1%), *commercial fishing boats* (22.5%), and *tugs or other cargo ships* (20.5%). Of those (7.6% of all respondents) that noted an *other* type of boat, 6% noted that the amount of that *other* boat was “Too Many”. Based on the qualitative response to this category (Q.8.J), many of those responding “Too Many” were directing their comment at float planes. Though float planes are not technically considered boats, they operate and are regulated as boats when not airborne. They necessarily transit the water from berth to take-off; indeed many Gulf Islands residents (especially respondents from Salt Spring) feel there are too many.

The results to Q.8 were compared for significant differences by cluster group, as shown below in Table 4.18. Mean responses of each cluster group were compared for

each boat type using a 1-tailed t-test analysis, since it is expected that the *Human Use* cluster will have a more positive attitude towards numbers of boats seen. The *Human Use* cluster has a significantly lower mean response for both the *kayaks or canoes*, and *PWCs*.

Table 4.18 Attitudes towards Encounters with Different Types of Boats (Q.8) by Cluster Group

Type of Boat:	Mean**		SD		T-Test	DF	1 Tailed Sig.
	Human Use Cluster	Enviro Cluster	Human Use Cluster	Enviro Cluster			
Kayaks or canoes	-0.17	-0.06	0.500	0.446	-1.930	278	0.028 *
Sailboats	-0.02	-0.02	0.413	0.328	-0.155	272.42	0.454
Ferries	0.03	-0.01	0.351	0.317	0.872	273.94	0.192
Tugs or cargo ships	0.06	0.07	0.377	0.327	-0.207	229.99	0.418
Commercial fish boats	0.10	0.07	0.511	0.590	0.470	209.10	0.320
Sport fishing boats	0.10	0.17	0.476	0.541	-1.000	241	0.159
Motor cruisers	0.39	0.50	0.543	0.518	-1.636	265.86	0.052
Whale watching boats	0.41	0.54	0.588	0.564	-1.541	188.46	0.063
PWC (Jet-Skis)	0.53	0.69	0.594	0.463	-2.318	225	0.011 *
Other	0.67	0.71	0.707	0.611	-0.166	15.35	0.435

* **Bold** - Significant at $p < 0.05$ (1-tailed t-test)

** Mean is calculated where "Too Few" = -1, "About Right" = 0, and "Too Many" = +1

4.4.2 Regarding the Visual Impact of Shellfish Aquaculture

While much of the literature on the visual approach to normative theory has focussed on crowding or natural resource indicators in recreational settings, none has addressed an industrial indicator such as the existence of shellfish aquaculture. The same normative theory visual approach to establishing standards (as applied to recreational boats above) was used to determine a standard of acceptability for a sequence of photos depicting an industrial activity, shellfish aquaculture. Similarly, two sequences were examined, the original sequence showing a 'pristine' background with increasing densities of shellfish aquaculture in the foreground (Figure 4.12), and the 'developed' sequence showing the same densities of aquaculture facilities, but with developments (cottages and a marina) placed in the background (see Figure 4.14). The 'developed' sequence was included to address concerns from stakeholders (shellfish growers) with regards to the original photo sequence (see discussion section 3.3.4 of the Methods Chapter). Based on their input, an

alternate photo sequence was developed to allow the researcher to test for differences in responses between the two photo sequences.

4.4.2.1 'Pristine' Background Photo Sequence

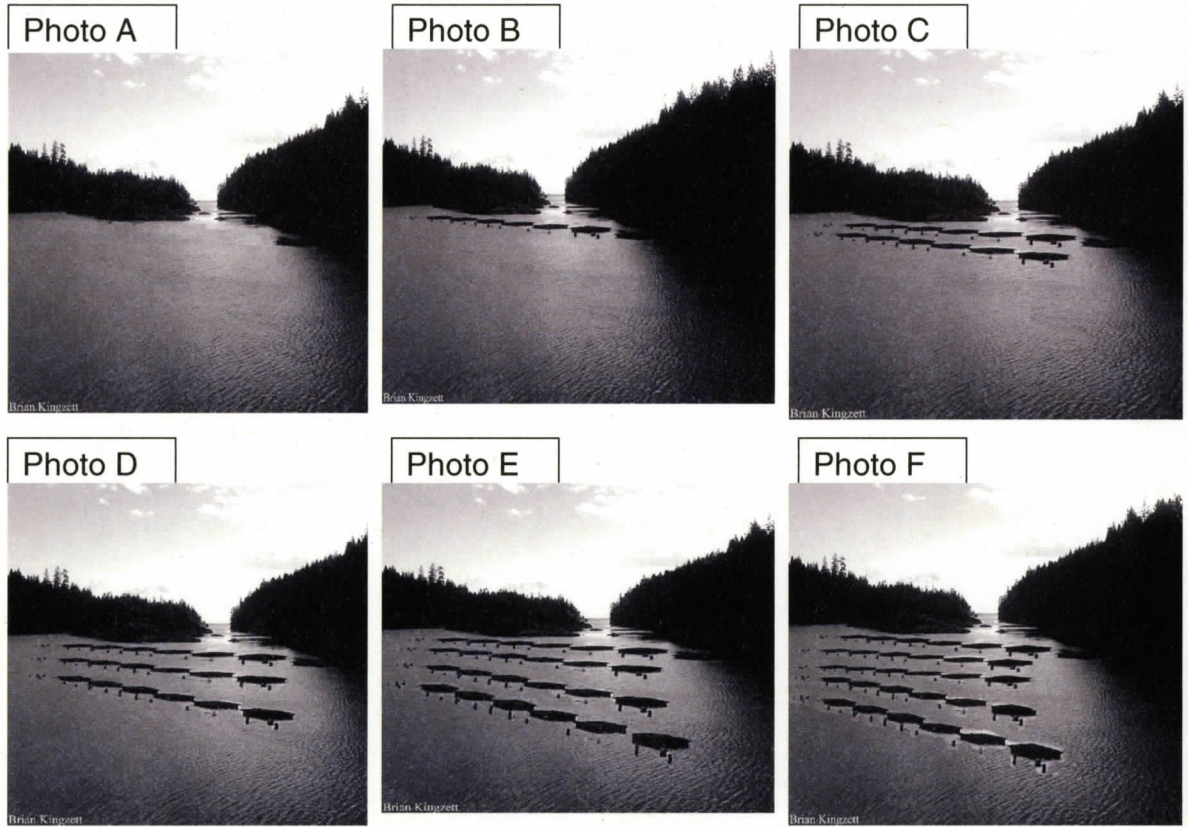


Figure 4.12 Pristine Background Shellfish Aquaculture Photos Sequence (n = 221)

Table 4.19 Acceptability of the Pristine Shellfish Aquaculture Photo Sequence (Q.9)

Photo:	Response (%)						Mean **	SD
	Very Acceptable +2	Somewhat Acceptable +1	Not Sure 0	Somewhat Unacceptable -1	Very Unacceptable -2	No Response		
Photo A	94.6	2.3	1.4	0.5	0.0	1.4	1.94	0.34
Photo B	30.3	43.0	1.8	8.1	15.4	1.4	0.66	1.40
Photo C	14.0	35.3	5.4	18.6	24.9	1.8	-0.05	1.46
Photo D	4.1	14.9	5.9	27.6	45.7	1.8	-0.98	1.23
Photo E	2.3	5.4	3.2	18.1	69.7	1.4	-1.50	0.96
Photo F	2.3	5.0	2.3	12.7	76.5	1.4	-1.58	0.93

n = 221

++ Calculation of mean considers that "no response" is missing data. Mean computed from Likert scale ranging from "Very Unacceptable" = -2, "Somewhat Unacceptable" = -1, "Not Sure" = 0, "Somewhat Acceptable" = +1, "Very Acceptable" = +2

Table 4.19 above presents the descriptive results for the original photo sequence of shellfish aquaculture ($n = 221$). The table is structured the same as the recreational boat photo results tables, where “Very Acceptable” = +2, “Somewhat Acceptable” = +1, “Not Sure” = 0, “Somewhat Unacceptable” = -1, and “Very Unacceptable” = -2 are used to calculate the mean response for each photo. The mean response is more readily visualized in the social norm curve, shown below in Figure 4.13.

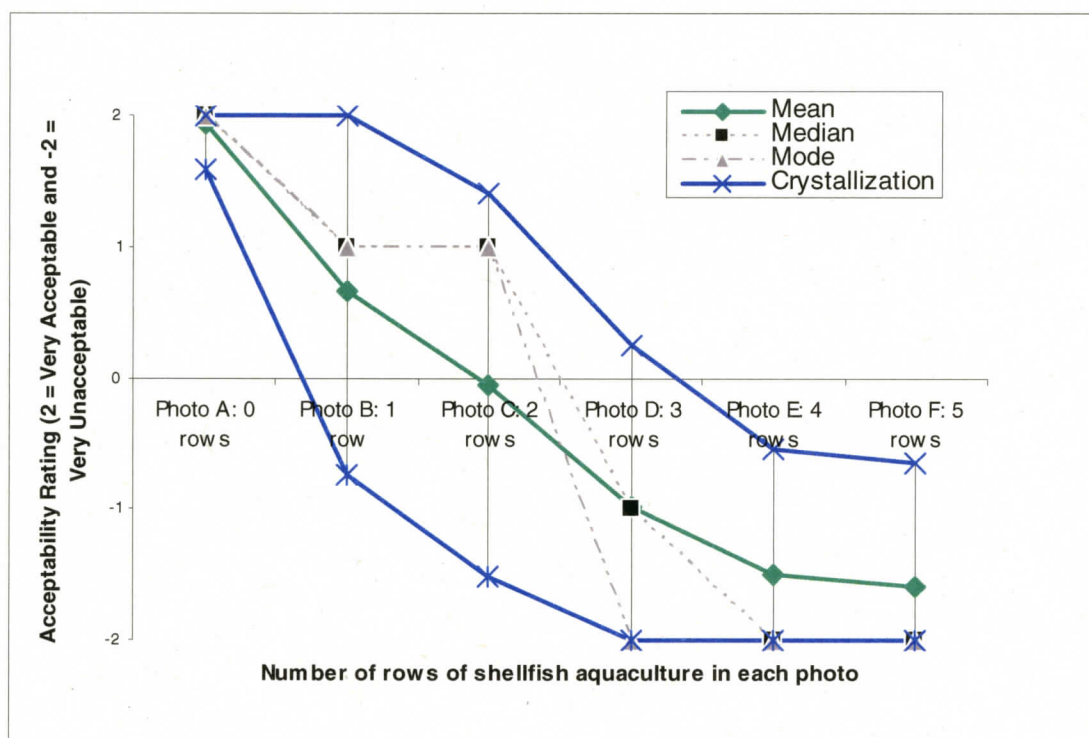


Figure 4.13 Social Norm Curve for Pristine Photo Sequence (Q.9)

The norm curve shown above (Figure 4.13) shows that the mean minimally acceptable condition for the pristine background sequence of shellfish aquaculture photos is approximately two rows of aquaculture. Where the norm curve (mean) crosses the horizontal axis is an indicator of the ‘norm of acceptability’. Figure 4.13 also shows that the crystallization is greatest at the first photo (low variability near consensus), low in the middle group of photos indicating high variability in responses, and medium at the last two photos.

These results are compared across the two cluster groups, shown below in Table 4.20. This analysis shows that the differences of the mean response of the *Human Use* cluster and the *Environmentally Oriented* cluster are significantly different for Photos B, C, D, E, and F. The mean response from the *Environmentally Oriented* cluster is consistently less acceptable, meaning that cluster group is less tolerant of the visual impact of shellfish aquaculture than the *Human Use* cluster group.

Table 4.20 Significance of Differences to Pristine Background Photos (n = 221) by Cluster Group

Photo:	Mean Acceptability **		Standard Deviation		T-Test	DF	1 Tailed Sig.
	Human Use Cluster (n=123)	Enviro Cluster (n=95)	Human Use Cluster (n=123)	Enviro Cluster (n=95)			
Photo A	1.94	1.89	0.332	0.449	0.760	216	0.22
Photo B	0.82	0.41	1.379	1.395	2.169	216	0.02 *
Photo C	0.17	-0.34	1.453	1.404	2.596	216	0.01 *
Photo D	-0.80	-1.15	1.329	1.072	2.106	216	0.02 *
Photo E	-1.37	-1.60	1.059	0.843	1.754	216	0.05 *
Photo F	-1.46	-1.68	1.065	0.762	1.849	215	0.04 *

* **Bold** - Significant at $p < 0.05$ (1-tailed t-test)

** Mean computed from Likert scale ranging from very unacceptable (-2), somewhat unacceptable (-1), not sure (0), somewhat acceptable (+1), very acceptable (+2)

As discussed in the Methods Chapter, there were concerns about this method and image used to assess the visual impact of shellfish aquaculture. The visual approach method received much negative feedback from shellfish growers themselves. Examples of their criticism included:

- ÷ The facility in the photo is not representative of all forms of shellfish aquaculture;
- ÷ The photo is taken from an aerial perspective, not a water-level perspective from which most boaters would view the facilities;
- ÷ Photos are not representative of other sensory issues such as noise or smell;
- ÷ The background in the photo is pristine – what would the responses be if there were a developed background?

This final item was tested in this research and results are described in the following section.

4.4.2.2 'Developed' Background Photo Sequence

Based on the input from the shellfish growers, a test was implemented where the background of the original shellfish aquaculture photo sequence was altered. A marina and two waterfront houses were digitally added, to create a developed background with the same shellfish aquaculture industrial facility in the foreground. The alternate photo sequence is shown in Figure 4.14; descriptive results are presented in Table 4.21, along with the associated norm curve in Figure 4.15. Comparison by cluster group is presented in Table 4.22.

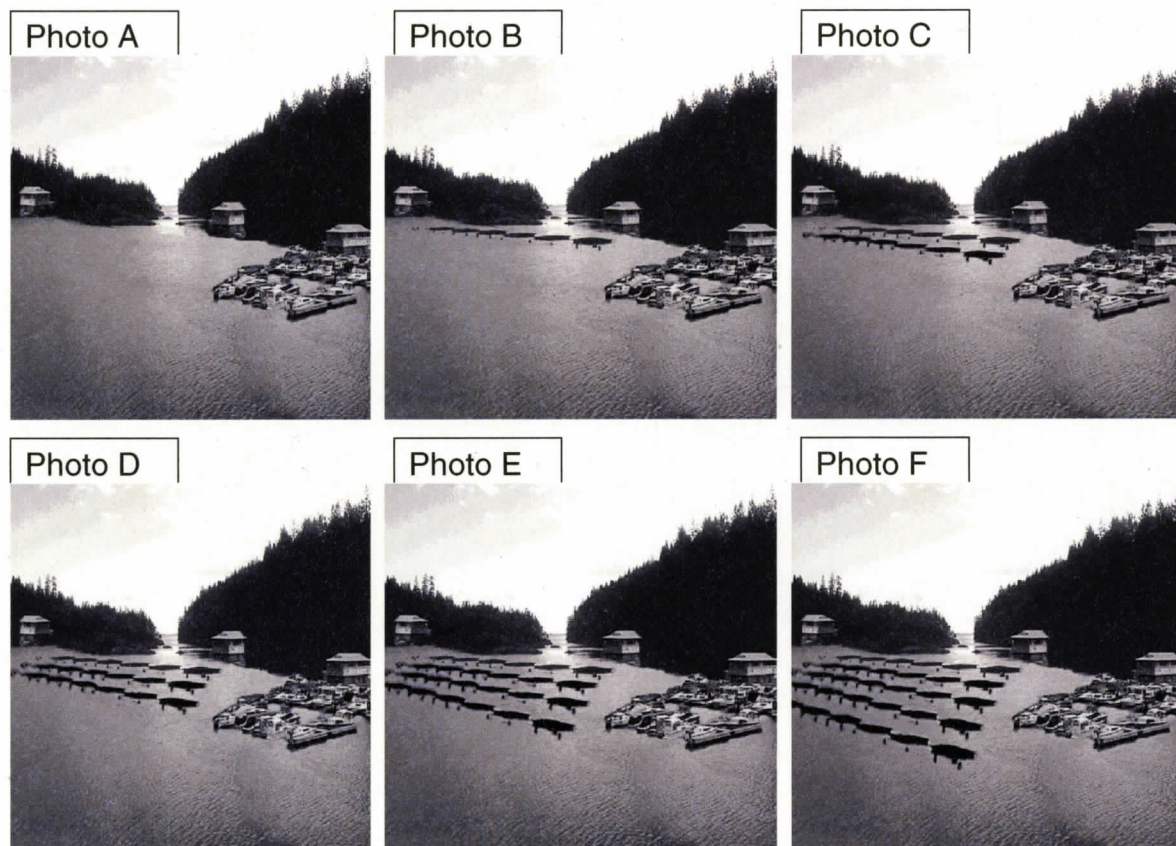


Figure 4.14 Developed Background Shellfish Aquaculture Photo Sequence (n = 81)

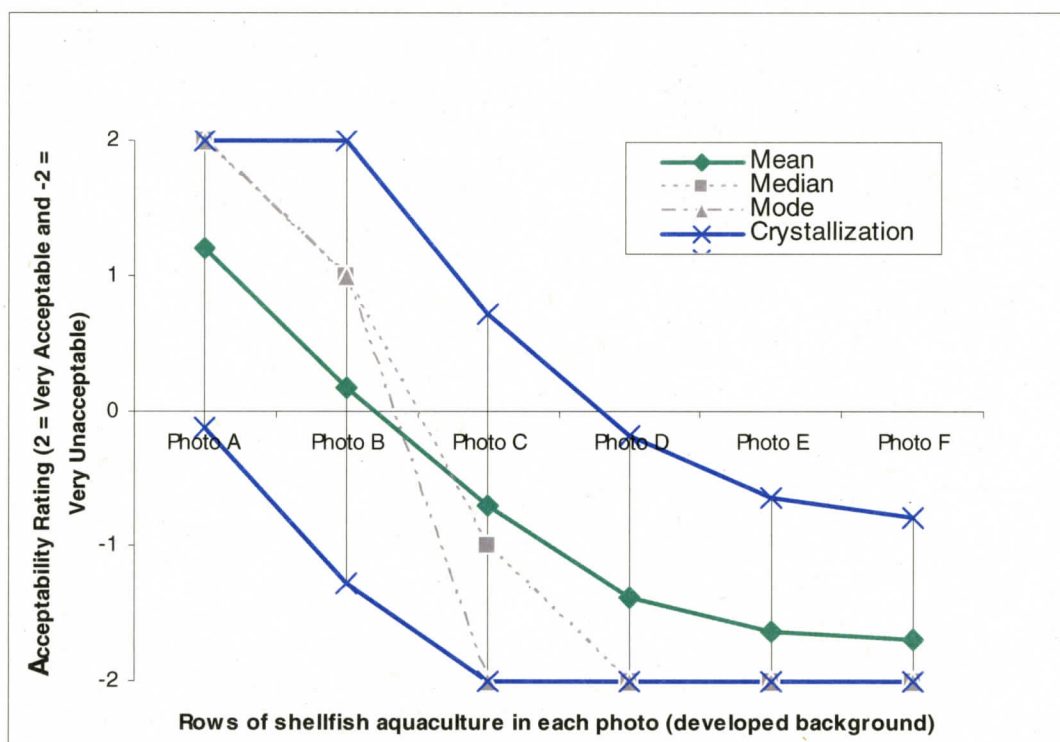
Table 4.21 Acceptability of the Developed Background Photo Sequence (Q.9)

Photo:	Response (%)						Mean **	SD
	Very Acceptable	Somewhat Acceptable	Not Sure	Somewhat Unacceptable	Very Unacceptable	No Response		
	+2	+1	0	-1	-2			
Photo A	60.5	21.0	2.5	2.5	11.1	2.5	1.20	1.32
Photo B	18.5	38.3	3.7	18.5	19.8	1.2	0.18	1.46
Photo C	9.9	16.0	8.6	22.2	40.7	2.5	-0.70	1.42
Photo D	4.9	8.6	2.5	9.9	71.6	2.5	-1.38	1.20
Photo E	3.7	3.7	2.5	4.9	82.7	2.5	-1.63	0.99
Photo F	3.7	1.2	3.7	3.7	85.2	2.5	-1.70	0.91

n = 81

++ Calculation of mean considers that "no response" is missing data. Mean computed from Likert scale ranging from "Very Unacceptable" = -2, "Somewhat Unacceptable" = -1, "Not Sure" = 0, "Somewhat Acceptable" = +1, "Very Acceptable" = +2

These results show that this alternate photo sequence (with a developed background) is less acceptable than the original photo sequence (with a pristine background). Of the four photo sequences presented (including the recreational boat photos), this is the least acceptable.

**Figure 4.15 Social Norm Curve for Developed Background Photo Sequence (Q.9)**

The norm curve above in Figure 4.15 shows a low mean minimally acceptable condition and high variability in responses. The norm curve (representing the mean) crosses the horizontal line between photos B and C; however, the crystallization is low, indicating a high degree of variability for this standard. This photo sequence depicts residential, recreational and industrial development all in one location, so the results may reflect the notion that some residents feel different types of uses in one location is not acceptable while others may feel that multiple activities should take place in the same location.

In an attempt to understand the variability of responses, Table 4.22 below compares the mean response to the alternate photo sequence by cluster group. However, it shows that there are no significant differences by cluster group for any of the photos in the alternate shellfish aquaculture sequence.

Table 4.22 Significance of Differences to Developed Background Photos (n = 81) by Cluster Group

Photo:	Mean Acceptability **		Standard Deviation		T-Test	DF	1 Tailed Sig.
	Human Use Cluster (n=38)	Enviro Cluster (n=43)	Human Use Cluster (n=38)	Enviro Cluster (n=43)			
Photo A	1.16	1.19	1.366	1.296	-0.095	79	0.46
Photo B	0.32	0.05	1.435	1.463	0.834	79	0.20
Photo C	-0.53	-0.81	1.520	1.296	0.919	79	0.18
Photo D	-1.32	-1.37	1.210	1.215	0.208	79	0.42
Photo E	-1.58	-1.60	1.004	1.027	0.114	79	0.46
Photo F	-1.63	-1.67	0.943	0.944	0.204	79	0.42

* Significant at $p < 0.05$ (1-tailed t-test)

** Mean computed from Likert scale ranging from very unacceptable (-2), somewhat unacceptable (-1), not sure (0), somewhat acceptable (+1), very acceptable +2

Table 4.23 below compares the mean acceptability of each photo compared between the pristine background and the developed background photos using a t-test. These results show that there is a lower mean acceptability for shellfish aquaculture amid existing development than in the pristine environment (significant differences between photos A, B, C, and D). This can be interpreted in a number of ways. First, the sample may prefer to see industry locate in areas where there is no other development (pristine areas), or second, they may feel opposed to any new development at all.

Table 4.23 Significance of Differences Between Pristine and Developed Photos (Q.9)

Photo:	Mean Acceptability **		Standard Deviation		T-Test	DF	2 Tailed Sig.
	Pristine (n=221)	Developed (n=81)	Pristine (n=221)	Developed (n=81)			
Photo A	1.94	1.20	0.340	1.324	4.94	85.59	0.000 *
Photo B	0.66	0.18	1.397	1.456	2.60	300	0.010 *
Photo C	-0.05	-0.70	1.463	1.417	3.37	300	0.001 *
Photo D	-0.98	-1.38	1.230	1.202	2.44	300	0.015 *
Photo E	-1.50	-1.63	0.961	0.989	0.92	300	0.357
Photo F	-1.58	-1.70	0.933	0.911	0.76	300	0.447

* **Bold** - Significant at $p < 0.05$ (2-tailed t-test)

** Mean computed from Likert scale ranging from very unacceptable (-2), somewhat unacceptable (-1), not sure (0), somewhat acceptable (+1), very acceptable +2

Another test was conducted to compare “Serious Impact” and low impact (“Not Sure”, “Not at all Impacted”, “Moderately Impacted”) responses to Q.4D (perception of the *visual impact of shellfish aquaculture*) by responses to Q.9 (both shellfish aquaculture photo sequences). It was speculated that those who responded “Serious Impact” to Q.4D would have a less acceptable attitude towards the photo sequences in Q.9. Results of this comparison are presented below in Table 4.24.

Table 4.24 Perception of Visual Impact of Shellfish Aquaculture (Q.4D) by Visual Acceptability of Shellfish Aquaculture (Q.9)

	Mean (Q.4D)		Standard Deviation		t-test	DF	1-tailed Sig.
	Low Impact	Seriously Impacted	Low Impact	Seriously Impacted			
<u>Pristine Background (Original Photos) n = 221</u>							
	n = 179	n = 42	n = 179	n = 42			
Photo A	1.91	1.90	0.401	0.431	0.084	219	0.467
Photo B	0.96	-0.67	1.194	1.408	6.904	56	0.000 *
Photo C	0.22	-1.21	1.384	1.116	7.156	74	0.000 *
Photo D	-0.79	-1.67	1.253	0.786	5.700	97	0.000 *
Photo E	-1.40	-1.81	1.025	0.594	3.456	106	0.001 *
Photo F	-1.50	-1.83	1.002	0.581	2.878	106	0.003 *
<u>Developed Background (Alternate Photos) n = 81</u>							
	n = 64	n = 17	n = 64	n = 17			
Photo A	1.31	0.65	1.220	1.579	1.875	79	0.032 *
Photo B	0.36	-0.53	1.418	1.375	2.311	79	0.012 *
Photo C	-0.53	-1.24	1.447	1.091	2.196	33	0.018 *
Photo D	-1.19	-1.94	1.308	0.243	4.338	75	0.000 *
Photo E	-1.48	-2.00	1.113	0.000	3.708	63	0.000 *
Photo F	-1.56	-2.00	1.037	0.000	3.375	63	0.001 *

* **Bold** – Significant at $p < 0.05$ (1-tailed t-test)

** Mean computed from Likert scale ranging from very unacceptable (-2), somewhat unacceptable (-1), not sure (0), somewhat acceptable (+1), very acceptable +2

Table 4.24 above shows that responses to all but one of the photos (original Photo A) differed significantly by those who responded “Seriously Impacted”, and those who responded low impact to Q.4D. The mean acceptability of the alternate photo sequence is consistently less than the original photo sequences. The standard deviation varies, but it is notable that all 17 respondents who feel that overall the marine environment is “Seriously Impacted” also responded “Very Unacceptable” to alternate Photos E and F.

The final analysis used boat ownership (Q.22) as an independent variable. The only significant difference (t-test = -2.042, df = 50, 2-tailed significance = 0.046) was present in the developed background shellfish aquaculture Photo A (see Figure 4.14), where (like the response to whale watching boats), boat owners responded with more acceptability than non-boat owners.

4.5 Management of the Marine Environment

4.5.1 Sewage from Recreational Boats

Although recreational boating is a popular activity in the Gulf Islands, it is an activity with potential for a negative impact on the marine environment through the disposal of untreated sewage. In this study, five potential solutions to the problem of sewage from recreational boats were proposed and respondents were asked to indicate their level of support for each solution on a Likert scale from “Strongly Support” = +2, “Somewhat Support” = +1, “Not Sure” = 0, “Somewhat Oppose” = -1, to “Strongly Oppose” = -2. Descriptive results of this question, along with the mean and standard deviation are presented in Table 4.25 below.

Table 4.25 Attitudes towards Solutions for Sewage from Recreational Boats (Q.7)

Do you support or oppose:	Response (%)						Mean **	SD
	Strongly Support +2	Somewhat Support +1	Not Sure 0	Somewhat Oppose -1	Strongly Oppose -2	No Response		
Introduction of voluntary "no discharge" restrictions in some areas	49.7	21.5	5.3	7.9	11.9	3.6	0.92	1.42
Introduction of compulsory "no discharge" regulations in some areas	79.1	11.3	4.6	1.0	2.0	2.0	1.68	0.79
Subsidised (no fee charged) holding-tank pump out stations	48.7	23.2	9.3	7.3	8.9	2.6	0.98	1.31
Private (fee charged) holding-tank pump out stations	48.0	30.1	9.3	4.6	5.0	3.0	1.15	1.11
Designation of specific "no go" areas that apply to recreational boats and other vessels	42.4	23.3	10.9	8.9	12.6	2.0	0.75	1.42

n = 302

++ Calculation of mean considers that "no response" is missing data. Mean is calculated using "Strongly Support" = +2, "Somewhat Support" = +1, "Not Sure" = 0, "Somewhat Oppose" = -1, and "Strongly Oppose" = -2.

Results indicate that the highest mean response (mean = 1.68) was for *introduction of compulsory "no discharge" regulations in some areas*. In the US, federal law prohibits the discharge of untreated human waste within three nautical miles of the shoreline, and there is periodic media and political comment over the fact that similar regulation does not exist in Canada. One challenge in Canadian waters is that the infrastructure for pumping out holding tanks is not as well established, nor are there adequate resources for enforcement. These attitudinal results show support for both *subsidized* and *private holding tank pump-out stations* (mean = 0.98 and 1.15 respectively). The mean response indicates that there is the least support (mean = 0.75) for *designation of specific "no go" areas that apply to recreational boats and other vessels*; however, the mean is positive meaning that there is more support than opposition to this potential solution. Qualitative responses (Q.16) provide significant input on the perceptions of limiting access to certain areas, as discussed later in this section.

Responses to Q.7 were also compared for differences between the two cluster groups. Significant differences were produced for two of the five proposed potential solutions as shown in Table 4.26 below.

Table 4.26 Support for Solutions to Sewage from Recreational Boats (Q.7) by Cluster Group

Proposed Solutions:	Mean **		Std. Deviation		t-test	DF	1 Tailed Sig.
	<i>Human Use Cluster</i>	<i>Environ mental Cluster</i>	<i>Human Use Cluster</i>	<i>Environ mental Cluster</i>			
Introduction of voluntary "no discharge" restrictions in some areas	0.97	0.86	1.40	1.46	0.677	287	0.250
Introduction of compulsory "no discharge" regulations in some areas	1.65	1.71	0.84	0.73	-0.584	292	0.280
Subsidised (no fee charged) holding-tank pump out stations	1.12	0.81	1.22	1.41	1.976	269	0.025*
Private (fee charged) holding-tank pump out stations	1.25	1.02	0.98	1.23	1.785	289	0.038*
Designation of specific "no go" areas that apply to recreational boats and other vessels	0.76	0.72	1.43	1.41	0.224	291	0.412

* **Bold** – Significant at $p < 0.05$ (1-tailed t-test)

** Mean computed from Likert scale ranging from "Strongly Support" = +2, "Somewhat Support" = +1, "Not Sure" = 0, "Somewhat Oppose" = -1, to "Strongly Oppose" = -2.

Table 4.26 shows the mean and standard deviation compared by both cluster groups and, based on a 1-tailed t-test, indicates two variables with significant differences between cluster groups. The cluster groups show different levels of support for both *subsidized* and *private holding tank pump-out stations*, with the *Human-Use* cluster group indicating a higher level of support for both.

4.5.2 Zoning Strategies

As a potential solution to the issue of conflicting activities such as recreational boating and shellfish aquaculture, some countries and jurisdictions are implementing MPAs that are zoned to accommodate different types of uses. The *Canada National Marine Conservation Areas Act* (2002) states that each NMCA must include at least one zone

that accommodates ecologically sustainable use (including ecologically sustainable industrial and recreational uses) and at least one zone designated to full protection of features or ecosystems, and may also include other types of zones. This research proposed five different types of management areas to the respondents and asked them to indicate their level of support or opposition to each of these areas. Descriptive results of this question (Q.14) are provided in Table 4.27 below.

Table 4.27 Attitudes towards Zoning Strategies for the Marine Environment (Q.14)

Proposed Management Areas:	Response (%)						Mean **	SD
	Strongly Support +2	Somewhat Support +1	Not Sure 0	Somewhat Oppose -1	Strongly Oppose -2	No Response		
<u>Zone A</u> – Areas to allow for strict protection with no access unless with a permit	33.1	23.2	9.6	17.5	14.6	2.0	0.44	1.48
<u>Zone B</u> – Areas to allow for only appreciation, education, or learning purposes	52.3	30.5	2.0	6.3	7.0	2.0	1.17	1.19
<u>Zone C</u> – Areas to allow for only low-impact, non-motorized recreational use	57.6	25.2	3.6	5.0	6.0	2.6	1.27	1.15
<u>Zone D</u> – Areas to allow for only low-impact forms of shellfish aquaculture or other low-impact commercial activity	27.8	38.4	11.3	9.6	10.6	2.3	0.65	1.29
<u>Zone E</u> – A mix of low impact recreation and commercial use	27.8	38.4	13.9	9.3	7.3	3.3	0.73	1.19

n = 302

++ Calculation of mean considers that “no response” is missing data. Mean computed from Likert scale ranging from “Strongly Support” = +2, “Somewhat Support” = +1, “Not Sure” = 0, “Somewhat Oppose” = -1, to “Strongly Oppose” = -2.

The mean response indicates that there is general support for each of the five zones, and highest support for *Zone C - areas to allow for only low-impact, non-motorized recreational use* (mean = 1.27). *Zone A - areas to allow for strict protection with no access unless with a permit* resulted with the lowest level of support (mean = 0.44). Additionally, this result is consistent with Q.7 of the survey which proposed five potential solutions to the issue of sewage from recreational boats. A similar response variable in (Q.7.E – designation of specific “no go” areas that apply to recreational boats and other vessels) showed similar results; there was the least amount of support for this variable from the five options in Q.7 as well.

Considering that Gulf Islands residents generally value their unique natural terrestrial and marine environments (see Table 4.5 and a recent opinion poll (Essig, 2005) by Ipsos Reid), it may be viewed as contradictory in that there is the least support (though there is more support than opposition) for areas of *strict protection* or “no go” areas. This contradiction may be explained by text provided in response to the open-ended questions in the questionnaire (Q.16). For instance, one respondent noted:

“I am opposed to the Government buying land with taxpayers’ money and then not allowing the taxpayer to use it. Ditto for the marine environment. Residents of Gulf Islands should have complete access to all parts of their traditional Gulf Islands. Our family has been here for three generations. Fishing, shellfish harvesting and hunting are our family’s traditional ways of life. Are we to be denied access?”

Also, there were comments suggesting scepticism of government bureaucracies and over-management. This is a reflection of the necessity for a ‘bottom-up’ approach to planning, as discussed in the Literature Review. Although there is a desire for preservation of existing environmental values in the Islands, residents are sceptical of future changes to their traditional use patterns. Respondents’ attitudes and perceptions regarding this scepticism are highlighted in these selected quotes:

“There is only one Gulf Island marine environment and yet there are many competing jurisdictions & strategies. The risk isn’t too much regulation. It is overlap, inconsistency, and a conflict of priorities. Some things will be overly regulated and others will fall into the cracks.”

“I do not want to see our recreational and sport fishing in the area become over-managed, controlled, and limited by a bureaucratic system that reflects the agenda and policies of a cruciferous minority.”

“Yes, we need to preserve the natural beauty and provide year round employment for residents. However, we must be careful not to start establishing rules where they really are not required.”

“The Gulf Islands have been logged, mined, quarried, industrialized and settled using common sense. I have watched as planning by idiots has destroyed far more than it has created. Turning the Gulf Islands into one big planned sterile prison to please the current purveyors of planning dogma is a sick prospect.”

However, not all comments were as negative as the above. Indeed, some were supportive of zoning strategies (in association with the quantitative data) as indicated by the following comments:

“Significant protection of Gulf Islands marine environment could be a pilot to assess marine recovery impacts in support of broadening marine protection.”

“I feel strongly that large and small areas should be set aside, but it is vital that these not be used as a bargaining chip to then allow further development and greater population density.”

“Specific areas in Gulf Islands should be set-up as totally protected marine areas including the sea & sea bottom, foreshore, and offshore islets to allow recovery of a natural environment: no-one allowed in, no fishing, boating, fish farming, etc, etc.”

“I really do like A (strict protection) and B (only appreciation, education purposes) and would like to see more very protected space. But I also realise that people need to do different things.”

“There is a need to protect, yet provide access to the beautiful resources we have. The right balance is important.”

Zone D – Areas to allow for only low-impact forms of shellfish aquaculture or other low-impact commercial activity resulted with the second lowest level of support (mean = 0.65). However, with a positive mean (where support is positive and opposition is negative), this is an indication that the sample is somewhat supportive of having this type of zone (including industrial activity) in the Gulf Islands marine environment. It is noted that the standard deviation for each of these variables is relatively high (between 1.15 and 1.48), indicating a degree of variability in responses. Analysis of attitudes towards different zone types (Q.14) did not result in significant differences by cluster group

In the design phase of the questionnaire, it was seen as important to put the attitudes towards proposed management zones into a spatial context. Since a respondent may strongly support a certain type of zone, but feel that that zone is only appropriate for a small portion of the whole marine environment, an effort was made to understand these

types of perceptions. Respondents were asked to apply the five management zones to the whole (100%) Gulf Islands marine environment, by allocating a percentage of the total area to each zone. Results from this question (Q.15) are presented below using two different illustrations. Table 4.28 shows the mean area allocated per zone and Figure 4.16 graphically shows percentage of each zone allocated to six area categories.

Table 4.28 Management Area Mean and Standard Deviation Response (Q.15)

Zone Type:		Mean	SD
<u>Zone A</u>	Areas to allow for strict protection with no access unless with a permit	12.3%	14.04
<u>Zone B</u>	Areas to allow for only appreciation, education, or learning purposes	20.6%	17.82
<u>Zone C</u>	Areas to allow for only low-impact, non-motorized recreational use	24.8%	20.46
<u>Zone D</u>	Areas to allow for only low-impact forms of shellfish aquaculture or other low-impact commercial activity	13.9%	14.57
<u>Zone E</u>	A mix of low impact recreation and commercial use	27.3%	24.83

n = 242 (60 non-response)

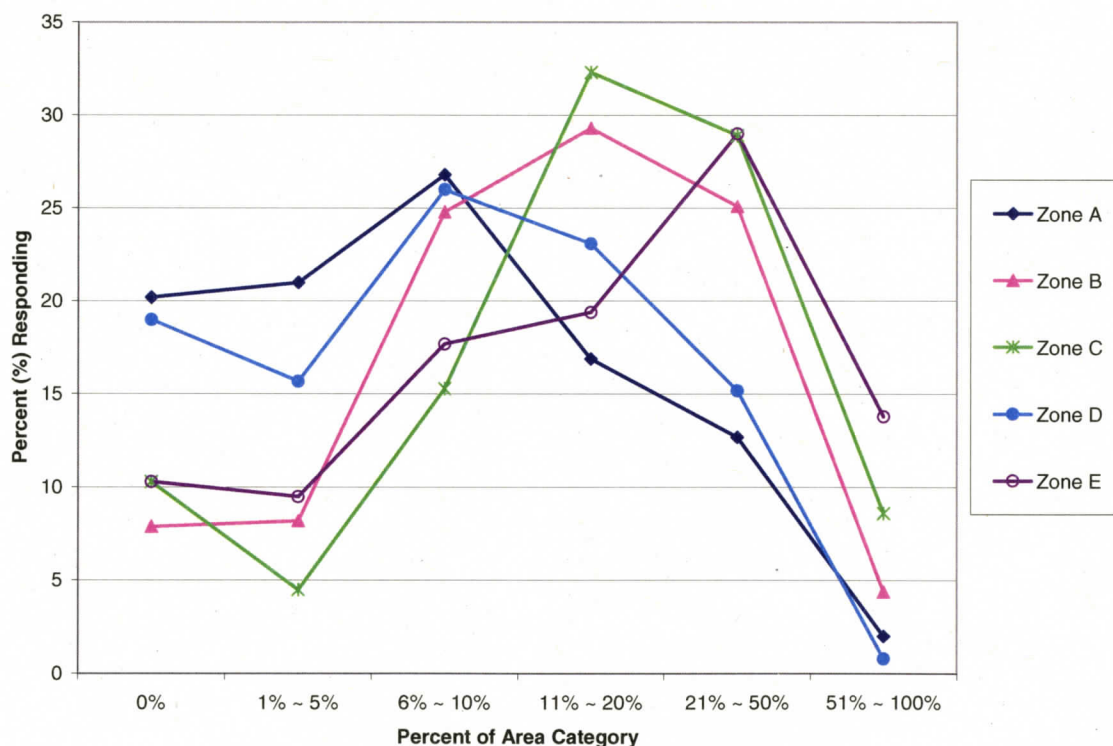


Figure 4.16 Zone Allocations by Area (Q.15)

The data in Table 4.28 show that the highest overall mean area allocation was for *Zone E – a mix of low-impact recreation and commercial use (mean – 27.3%)*, followed closely by *Zone C – only appreciation, education, or learning purposes (mean – 24.8%)*. The lowest mean percentage allocation was for *Zone A – strict protection with no access unless with a permit* (which is consistent with results presented in Table 4.27). However, the mean for *Zone A* (12.3%) indicates that the sample would accept a small amount of this type of zone, though it should be noted that there is a substantial standard deviation for each of these variables. With regard to distribution across the area of the Gulf Islands marine environment (Figure 4.16), *Zone C* and *Zone E* tended to be allocated to larger areas, while *Zone A* and *Zone D* tended to be allocated to smaller areas and they were more often (around 20% for both) allocated to 0% of the area than any of the other zones. These results may be interpreted in that the sample will accept multiple-use and recreational uses in larger areas. Zones of strict protection (*Zone A*) and zones that allow for low-impact commercial activity (*Zone D*), while certainly supported, are only supported in smaller-scale areas. These results were tested for differences of responses between the two cluster groups and no significant differences are reported.

It must be noted that 14% of responses to Q.15 did not add up to 100%. This was influenced by two factors. First, some respondents made errors in dividing the options up to add up to 100%. Second, some respondents felt there were other zone options missing, and therefore they intentionally left room for other types of areas. Of all the questions in the questionnaire, this had the highest non-response (19.9%) – due in part to the complexity in conceptualizing the task without more information, and because of the perception that this question was “foolish” as indicated by these respondent comments:

“This is a foolish approach – must be case specific. We are drowned in red tape and idiotic regulations in Canada.”

“Cannot answer this question (Q.15) without more information about the specific areas and activities.”

“It is not this simple. Any answer on my part would have no meaning.”

It was speculated that perception of the visual impact of shellfish aquaculture might influence attitudes towards accommodating the industry within management zones within the Gulf Islands. A test was conducted to determine if there were significant differences between perception of Q.4.D (*visual impact of shellfish aquaculture*) and attitudes towards Q.14.D (*Zone D - Areas to allow for only low-impact forms of shellfish aquaculture or other low-impact commercial activity*). Descriptive data for this comparison are presented in Figure 4.17 below and a discussion and analysis of the result follows.

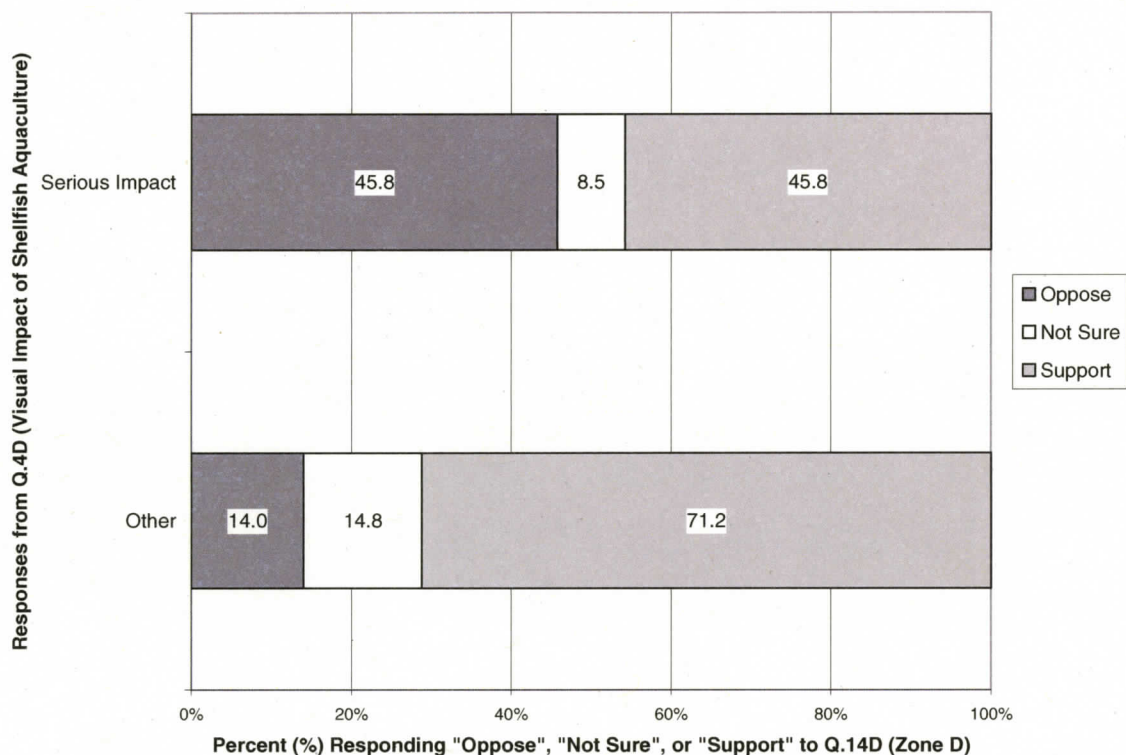


Figure 4.17 Comparison of Responses to Q.4D (perception of the *visual impact of shellfish aquaculture*) by Q.14D (attitude towards *areas to allow for only low-impact forms of shellfish aquaculture or other low impact commercial activity*).

Figure 4.17 above shows that there are differences between those who responded “Serious Concern” and those who responded other (“Not Sure”, “No Impact”, or “Moderate Impact”) by support for Zone D (Q.14.D). Those who perceive a “Serious Impact” from the *visual impact of shellfish aquaculture* are less likely to support *areas to allow for only low-impact forms of shellfish aquaculture or other low-impact forms of*

commercial activity. Results of a *chi-squared* analysis showed significant differences (value = 29.8, df = 2, 2-tailed significance = 0.000).

It was hypothesised (in section 3.3.2 of methods Chapter) that if there is a perceived impact from human activity on the marine environment, then there should also be a supportive attitude towards protection strategies to mitigate such a threat. A *chi-squared* test was conducted to compare differences between those who responded “Seriously Impacted” and those who responded other (“Not Sure”, “No Impact”, and “Moderate Impact”) to the perception of the *overall impact from human activity* (Q.5) by “Support” for the five proposed management zones (Q.14). Results of this analysis are presented below in Figure 4.18.

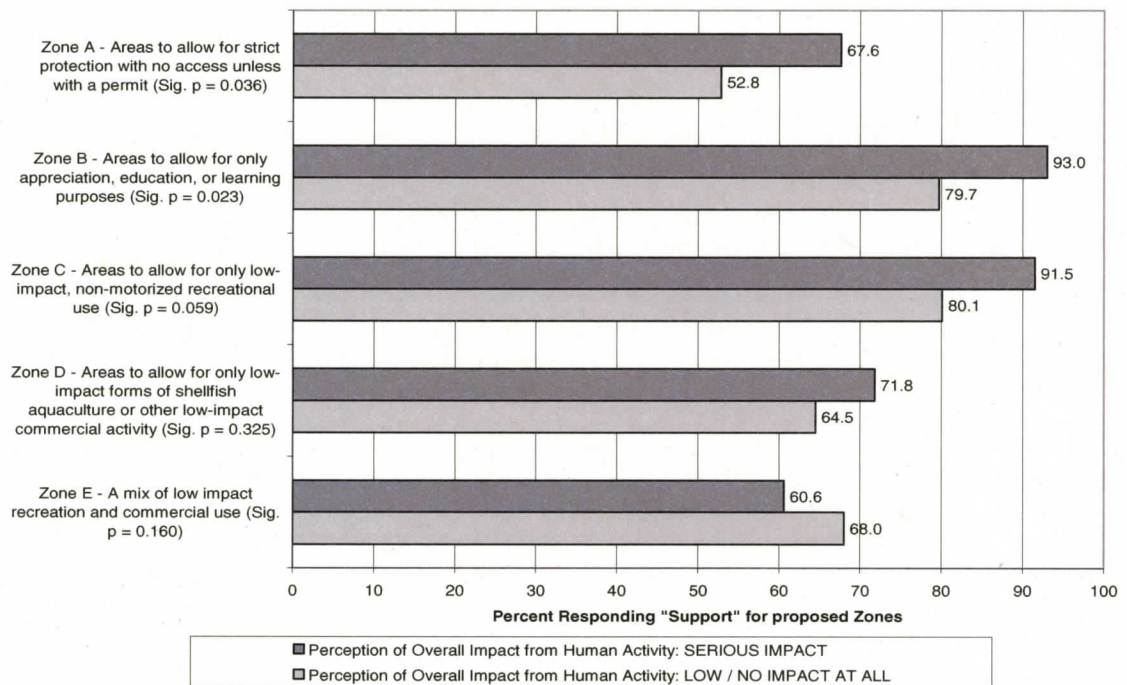


Figure 4.18 Perception of Overall Impact (Q.5) by Support for Management Zones (Q.14)

Figure 4.18 above shows that there is more support for the first four zones (*Zones A, B, C, and D*) by those who perceived an overall “Serious Impact” than those who perceived an overall “Low” or “No Impact at All” on the marine environment from Q.5. These differences are significant for Q.14.A (*chi-square*

value = 6.65, df = 2, 2-tailed significance = 0.036) and Q.14.B (chi-square value = 7.55, df = 2, 2-tailed significance = 0.023). Results for both of these questions on zoning the marine environment (Q.14 and Q.15) were also tested for differences between cluster groups. However, no significant differences between cluster groups were produced, so this analysis did not prove useful in describing variation in attitudes to the different types of zones.

4.6 Results Summary

This chapter presented the descriptive results and a series of analyses that help paint a picture of the attitudes, perceptions and values of Gulf Islands residents towards their marine environment. Gulf Islands residents are active users of their marine environment; indeed many (55.6%) own their own boat(s). They place high *Aesthetic*, *Conservation*, and *Life Sustaining* (environmentally oriented) values therein and interestingly, low importance towards *Economic* values.

They do perceive threats to the marine environment; the highest perceived threats include over-development, over fishing, and pollution. Overall, residents perceive the Gulf islands marine environment to be moderately (56.3%) or seriously (23.5%) impacted by human activity. With regard to one specific activity, shellfish aquaculture, residents perceive this industry variably with some feeling positive and others negative towards it. Also, there is a high degree of uncertainty towards the industry. This visual approach indicated a high degree of variability. Among these photo sequences, excluding the most developed (alternate shellfish aquaculture) photos, there were many significant differences in responses between the two cluster groups.

Residents are generally supportive of different types of proposed management 'zones' including those that allow for multiple use and those that allow for strict protection. However, based on their open-ended comments, they approach new regulations with caution and many fear being denied access to certain areas.

This study found that based on their values towards the marine environment, residents may be clustered into two groups: *Human Use Oriented* and *Environmentally*

Oriented. However, as stated earlier in this chapter, a word of caution is necessary in interpreting the results of the factor-cluster analysis, since the treatment of ordinal data as interval data is a breach of a fundamental statistical law. A summary of the differences between the two clusters is provided in Table 4.29 below.

Table 4.29 Summary of Significant Findings by Cluster Group

Human Use Oriented Cluster Group (n=161)	Environmentally Oriented Cluster Group (n=138)
Negative mean factor score on <i>Environmental</i> factor.	Positive mean factor score on <i>Environmental</i> factor.
Positive mean factor score on <i>Feel Good</i> and <i>Human Use</i> factors.	Negative Mean factor score on <i>Feel Good</i> and <i>Human Use</i> factors.
More accepting towards the visual impacts of both recreational boating and shellfish aquaculture.	Less accepting towards the visual impacts of both recreational boating and shellfish aquaculture
More supportive of sewage pump out stations for use by recreational boats.	Less supportive of sewage pump-out stations for use by recreational boats
Agree more with the benefits of shellfish aquaculture.	Agree more with the concerns of shellfish aquaculture. Overall, more concerned about the shellfish aquaculture industry.
More likely to live on Salt Spring Island .	More likely to live on Thetis or Saturna Islands.
More likely employed in tourism .	More likely to own their residence .
More likely to have resided longer in the Gulf Islands.	

Discussion and further interpretation of these results is provided in the conclusions chapter following.

5.0 Conclusions and Discussion

5.1 Introduction and Brief Synopsis of This Study

This study examines resident stakeholder attitudes, perceptions and values towards use and protection of the Gulf Islands marine environment. The research is unique in a number of aspects, not the least of which is its relevance to coastal planners and those responsible for the management of MPAs. At a time when pressure from human use on marine environments is increasing, natural resource managers are recognizing the need for increased marine conservation initiatives. In order for recreational and industrial uses to be incorporated into marine conservation initiatives, managers need to gain an understanding of the attitudes, perceptions and values of various stakeholder groups, whose goals may sometimes be competing. Attitudinal research such as this creates knowledge that can lead to more effective management plans and increased compliance to policies and regulations.

This research is guided by the Limits of Acceptable Change (LAC) visitor management planning framework. LAC was first conceptualized as a wilderness management framework after it became apparent that traditional park management concepts (such as the numerical carrying capacity) were not providing managers with sound practical direction. It was realized that the carrying capacity framework was ineffective, since both ecological and social impacts are not simple functions of use level, but are often influenced by variables such as visitor behaviour (Borrie *et al.*, 1998). In the application of the carrying capacity concept, managers ask, "How much use or impact is too much?", whereas in the application of an LAC framework, managers now ask "What are the desired ecological and social conditions?" LAC is a more sophisticated framework whereby protected area managers determine acceptable social and resource conditions and then prescribe management actions to achieve and maintain these conditions. LAC incorporates the concept of zoning, where zones are allocated based on (1) the most appropriate opportunities that they provide to the users, and (2) the resiliency of the resource to different types of use. To produce a sound management and zoning plan, an LAC process must incorporate multi-stakeholder consultation and involvement.

Therefore, the purpose of this study is to gather input from one stakeholder group (Gulf Islands residents), building on similar research with other stakeholder groups (shellfish growers, visitors to the area, and protected areas scientists).

In particular, this thesis measured Gulf Islands residents' (1) preferred marine activities; (2) values towards the marine environment; (3) perceptions of impacts towards the marine environment; (4) attitudes towards the visual impacts of recreational boats (5) attitudes concerning potential solutions to sewage from recreational boating; (6) attitudes towards the impact of the shellfish aquaculture industry; (7) attitudes towards different types of management zones for protection of the marine environment, and finally; (8) selected demographic information. The results of this research are discussed in depth in chapter four. The current chapter will review the results and discuss how they may be applied by various management agencies. Then, the discussion will describe how this research adds to the existing body of literature. Finally, study limitations and future research needs will be discussed.

5.2 Review and Discussion of Results

Gulf Islanders live close to the ocean, so it may be expected that they have a close association to the marine environment, either through active usage for transportation or recreation, or simply intrinsic appreciation (or both). The *most popular activities* are beachcombing, bird watching and other nature appreciation, suggesting that many Gulf Islanders are appreciative and respectful of their natural surroundings. The majority of the sample participated in at least four (of the 15) proposed activities. Only 1.1% of the sample indicated that they did not participate in any of the activities listed in the questionnaire. Results also show that the majority of residents are at least somewhat involved in marine use and protection, through media sources such as newspapers, TV, or radio, while just over 10% have written a letter about the topic, and about 6% are employed by an agency involved in marine use and protection. A key finding from this information is that they vary in their demographics and activities of interest. These findings are important because they are a good indication of the way residents use and value their local marine environment. It is apparent that there is a high level of usage of the marine environment, and therefore it is valued and appreciated. However, this

question was mainly intended as introductory to the questionnaire topic (as argued in the methods chapter) and was not sufficient in gaining a full understanding of how Gulf Islanders value their marine environment. This more thorough measure of how they value the marine environment is described below.

A key component of this thesis is the emphasis on *values towards the marine environment*. This is a cornerstone of the thesis, as much of the MPA and natural resource management literature emphasizes the importance of understanding stakeholder values (Orbach, 2000; Mascia, 2003; Haider & Morford, 2004; NOAA, 2005), yet few studies have applied values as an independent variable to help explain variation in attitudes and perceptions towards other marine activities. In this research, respondents were asked to indicate the importance of 13 potential values. Descriptive results indicate that Gulf Islanders place a large importance on aesthetic, conservation, and life-sustaining values of the Gulf Islands marine environment. These values appear to be favourable towards a protection paradigm, which is useful information to MPA and NMCA planners, should they choose to apply this knowledge within their programs.

None of the values presented in this research resulted with a mean response of less than 2.11 (where low importance = 1, medium importance = 2, and high importance = 3). In other words, none resulted in a mean of less than medium importance; indeed eight of 13 values from the list had a mean importance of 2.5 or higher. However, the least important values to Gulf Islanders turned out to be economic, historic, cultural, and spiritual. The economic value (employment opportunities such as fisheries, tourism, and transportation) resulting near the low end of the scale was interesting, given the diversity of human uses and activity in the Gulf Islands area. Indeed with such strong demand for residential and commercial development, and the diversity of tourism, resource harvesting, shipping, and other industries, it might be expected that the economic values would be given more importance. However, it may also be that within the sample, the high percentage of retirees and people working in fields unrelated to marine tourism or resource harvesting (combined – 66.9%) value the marine environment for uses other than economic activity.

The way that stakeholders value the marine environment and the variation within these values is important for managers to understand. Gaining this knowledge, managers will have a better sense of how to proceed with either conservation or development plans at a time when demand for usage of the marine environment is high. For instance, understanding that there is high importance placed on aesthetic and conservation oriented values may allow Parks Canada planners (or other conservation oriented agencies) a higher degree of confidence in their NMCA proposal. Conversely, this knowledge, combined with lack of consensus over the economic value importance, potentially may make it challenging for developers (such as the shellfish aquaculture industry, for instance) to further penetrate the area. Of course further market analysis research is necessary to make these conclusions with confidence, but these results are very suggestive.

The values component of this thesis was a key part of the research, both for the descriptive results it produced and the utility of conducting a factor-cluster analysis with the data. The intention of the factor-cluster analysis was to segment the population into two unique groups which were then applied to further analyses to gain a better understanding of the variability in responses. The primary characteristics that separate the two cluster groups are their factor scores resulting from a factor analysis of the importance of values towards the marine environment. The *Human Use* cluster group had a negative mean factor score on the *Environmental* factor and positive mean factor scores on the *Feel Good* and *Human Use* factors. Conversely, the *Environmental* cluster group had a positive mean factor score on the *Environmental* factor and negative mean factor scores on the *Feel Good* and *Human Use* factors. It is these results that justify the choice of labels for the cluster group. Recognizing that these labels are subjective, they were appointed based on the groups of values that made up each factor and the factor scores for each cluster group.

Perceptions of threats were examined in order to gauge how residents perceive the level of impact on the marine environment from human activity. It was hypothesized that if there is a perception of negative impact from certain uses, then there should be

support for protection from that threat. Also, it may be assumed that an understanding of stakeholder perceptions, “will contribute to better predictions of the public’s reactions to policies or other interventions before they are implemented” (Haider & Morford, 2004: 3). A list of 21 potential impacts to the marine environment was presented to respondents, to determine their perception of how much impact each threat has on the marine environment. Results of this query showed a high degree of variability, with some items perceived as a serious impact, and others as moderate or no impact at all. The most serious impacts based on mean response are over-fishing due to commercial fishing, followed by pollution from pulp mills, threat to wild salmon from finfish aquaculture, and loss of habitat due to residential development.

Since perceptions are a subjective, intuitive impression of a truth, variability in responses is expected, especially given that many of the issues presented are either not visible (i.e. damage to ocean floor from anchors) or newsworthy (i.e. noise from recreational vessels). Indeed, something of interest to note in these descriptive results is the high uncertainty about the impact of some of the variables. For instance, for 14 of the 21 threats, at least 10% of respondents were uncertain, and four of the variables had uncertain responses at around 20%. This knowledge of public uncertainty around certain issues facing the marine environment begs the question: should resource managers make attempts to inform stakeholders about the real (i.e. scientifically established) impact of certain activities? Before addressing this question, it must be noted that there is always a level of uncertainty and bias associated with any science; indeed sometimes scientists remain in disagreement over important issues, such as the cause of sea lice on juvenile pink salmon (e.g. Morton *et al.*, 2004; Beamish *et al.*, 2005). The answer to the above query however is yes, especially in potentially controversial situations (such as the issue of sewage discharge and its effects on marine ecosystems) or in situations where polarization of opinion could become so ingrained that industrial development potential is reduced (such as occurred with the finfish aquaculture industry).

These results also show that there is concern surrounding the health of the Gulf Islands marine environment overall, and the majority of residents believe the

environment is either moderately or seriously impacted by human activity. Knowing this (and perceptions of specific threats), MPA managers may be able to better predict the way stakeholders will respond to a MPA proposal and establish outreach initiatives that capitalize on these perceptions. In terms of differences in perception of threat between the cluster groups, of the 21 proposed threats, there were only two that showed significant differences. These were the threat to wild salmon from finfish aquaculture (*Human Use* cluster perceived less impact) and runoff from agriculture (*Environmental* cluster perceived less impact).

The concept for this research originated from a series of other studies whose overall objective was to examine the compatibility of shellfish aquaculture within MPAs. Since Parks Canada's proposed Southern Strait of Georgia NMCA may be zoned to accommodate certain sustainable industries, and since shellfish aquaculture is reported to be a benefit to water quality and marine habitats (Costa-Pierce & Bridger, 2002; Lindahl *et al.*, 2005), potential exists (at least ecologically) for the two developments to coincide, as argued in the introductory chapter. However, it may be that local stakeholders do not perceive it as a compatible activity within an MPA. Therefore, one of the foci of this research was on *perceptions of shellfish aquaculture* within the Gulf Islands. Specifically, perceptions of a list of benefits and concerns towards shellfish aquaculture were tested, along with overall perception of the industry. Results indicate that there is general agreement with the economic benefits of shellfish aquaculture, but responses varied (including uncertainty) with regard to its environmental impact and water quality benefits. Likewise, there was a degree of agreement with the concerns of visual impact and spatial conflicts with recreational boating and high uncertainty about the activity's noise pollution and impact on seabird feeding practices. Significant differences between the two cluster groups existed in two of the four benefits (...employment in coastal communities and ...diversifies the economy of a coastal region). The *Human Use* cluster group responded with a higher mean level of agreement to both of these (economically focussed) benefits. Significant differences also were present for two of the four concerns (...alters visual quality and ...conflicts with desired boating anchorages or beach accesses). The *Human Use* cluster group responded with a lower mean level of

agreement to these concern statements. These results are intuitive since the *Human Use* cluster group may place higher importance on human use values such as economic activity, so it is logical that they would more highly agree with the benefits and disagree with the concerns of industrial activity.

Overall, more respondents felt the concerns outweigh the benefits of the industry than otherwise, indicating more opposition than support towards further shellfish aquaculture industrial development. However, descriptive results show that 42.7% responded with uncertainty about their overall perception of the industry. This result indicates that there may be potential (if deemed necessary by industry or planning agencies) to inform and educate the public about shellfish aquaculture so that they can make more informed assessments before perceptions become as negatively engrained as they have with the finfish aquaculture industry. More of the *Environmentally Oriented* cluster group feel that the concerns outweigh the benefits of shellfish aquaculture than the *Human-Use* cluster group, which is again an intuitive result. These are important findings because agencies (such as shellfish aquaculture operations, or the BC Ministry of Agriculture and Lands) whose mandates are influenced by these perceptions may be better informed about predicting public reactions to future proposals or developments. Indeed these findings may also provide an indication as to why the public has reacted the way they have to existing developments, such as the highly controversial sablefish hatchery at Walker Hook on Salt Spring Island (Shilling, 2004).

This thesis applies components of the LAC visitor management framework – specifically the measurement of indicators to reveal standards of acceptability. While much research in this regard has been terrestrially based (i.e. having to do with crowding in National Parks, trail conditions, or campfire ring size, etc (Vaske & Whittaker, 2004)), this study applies similar concepts to the marine environment, specifically with regard to examining standards for (1) *common recreational boats at anchor in a bay*, (2) *whale watching boats under way*, and (3) *shellfish aquaculture development*. Standards were established in this research using a visual approach to normative theory (Manning & Freidmund, 2004), details of which are described in the methods chapter. While the

standards established in this research only represent the images presented, the results give a good indication of the acceptability of each of the activities – more so than by simply asking how many recreational boats (for example) are acceptable. Results indicate that the mean minimally acceptable condition for recreational boats is located between the fourth and fifth photos (around seven boats per 50m by 100m area). This standard is high (relative to the photos presented), indicating that residents are generally accepting of common recreational boats, though there was considerable variability. The alternate photo sequence depicting whale watching boats under way resulted with low variability in responses and a minimally acceptable condition of just under three boats per 50m by 100m area. Visual acceptability of the photos depicting whale watching boats appears to be relatively low, perhaps influenced by perceptions that the whale watching industry has become invasive to the whales themselves. The majority of the qualitative comments regarding whale watching indicated a negative perception of the industry in general.

Using a similar method as above, attitudes towards the visual acceptability of shellfish aquaculture were also tested. Additionally, a test was conducted where the photos were altered to include a developed background (two oceanfront homes and a marina). This developed background photo sequence was less acceptable than the sequence with a pristine background. Also, there was little variability in responses to the high density photos between the two cluster groups. These results that show more acceptability for the photos of shellfish aquaculture with a pristine background are contrary to what one might expect, especially in the Gulf Islands where there is high importance placed on the natural aesthetic values. This result may indicate a perception that industry should not be located in front of residential or recreational properties, or that industrial development should locate in areas where there are no other activities occurring at all.

Descriptive results of these visual acceptability questions were plotted on social norm curves to illustrate the mean acceptability of each photo and the standard revealed where the mean crosses from positive to negative (the mean minimally acceptable condition). When these two shellfish aquaculture photo sequences were compared for

significant differences by cluster group, five of the six original ('pristine') photos showed significant differences (with the *Human Use* cluster group consistently responding with more acceptability), while none of the alternate 'developed' photos showed significant differences between the cluster groups.

Study findings also reveal that there is general support for all five of the proposed potential solutions to the problem of sewage from recreational boats (Q.7), but the lowest mean response (least support) was for the designation of specific "no go" areas that apply to recreational boats and other vessels. This result indicates that there is awareness of the issue of the impacts of sewage on the marine environment. The overall empirical impact of sewage from recreational boats is not well documented or understood, relative to the impacts of sewage from other sources. Nevertheless, these results indicate support for solutions to the problem. Similarly, there is generally support for each of the five proposed management zones in Q.14, but there is the least support for areas to allow for strict protection with no access unless with a permit. Based on these results, it is apparent that, though there is support for protection strategies, Gulf Islanders do not want to be denied access to any areas in the marine environment. However, presently there are such managed places already established. For instance, at least two properties (Brackman Island and Georgeson Island) in the Gulf Islands National Park Reserve are designated ecological reserve (Zone 1: special preservation) where access is not permitted. While this study provides a hint about residents attitudes to "no go" areas, to date, the existing areas of special preservation are not explicitly controversial. Therefore, it is possible that certain (terrestrial and marine) areas, chosen through effective public consultation, may be supported by stakeholders for special preservation, even though these results do not indicate so.

The ultimate goal of research such as this is to contribute not just to the research literature, but to the decisions of management agencies as well. For instance, knowledge of stakeholder support for solutions to the problem of sewage from recreational boats may assist government agencies in generating policy directed towards solutions to the problem. At present, Canada has not established blanket legislation restricting sewage

discharge in coastal waters, mainly because of a lack of sewage treatment facilities in many Canadian ports. Perhaps gaining an understanding of the level of local support for both private and subsidized pump-out facilities would influence development of such policy. Another example of how the knowledge gained from this thesis could be applied to policy is through the formulation of a zoning plan for the proposed Southern Strait of Georgia NMCA. While the drafting of a zoning plan in reality would require much more research in both the natural and social sciences to determine the most ecologically and socially effective and acceptable designation of zones, these results do give an indication of support for various types of zones and for zoning the marine environment in general. An agency such as Parks Canada may start with this recognition of support and move towards further methods of public consultation to determine public attitudes towards the creation of an NMCA. However, it must also be recognized that variability of opinions exists and not all stakeholders will be supportive of any proposed zoning plan. Therefore, Parks Canada will need to conduct very thorough consultations and attempt to create a plan that satisfies the greatest amount of the population.

5.3 Contributions to the Literature

This thesis provides a number of contributions to the research literature. Its primary contributions are bulleted briefly here and discussed in more detail below.

1. The research samples attitudinal data in advance of MPA creation;
2. Values towards the marine environment are used as an independent variable in analysis;
3. Components of the LAC planning framework are applied to a marine environment;
4. The normative approach is advanced by:
 - a. including both recreational and industrial indicators, and
 - b. testing the visual approach to normative theory with photo sequences that alter the background as well as foreground images;
5. This study is one of few marine conservation social science studies that examine acceptability of uses such as recreational boating and shellfish aquaculture, and attitudes and perceptions of marine conservation initiatives.

First, this thesis samples stakeholder attitudes, perceptions and values towards the marine environment of a proposed MPA *in advance of establishment*, whereas most reports in the literature are either (1) attitudinal studies sampled post-MPA establishment (i.e. Wolfenden *et al.*, 1994; Cocklin *et al.*, 1998; Suman *et al.*, 1999; Salz & Loomis, 2004; McClanahan *et al.*, 2005), (2) reports on socio-economic variables that influenced success or failure of conservation initiatives (Lien, 1999; Fiske, 1992), or (3) reviews of stakeholder involvement in MPA planning processes (White *et al.*, 2002; Delaney, 2003; Helvey, 2004). Many authors state the importance of incorporating stakeholder input through consultations and other means that inform the design of an MPA (Wells & White, 1995; Kelleher & Recchia, 1998). Indeed the concept of public involvement in natural resource management is not new, given Arnstein's (1969) proposed 'ladder of citizen participation'. This research is not directly related to Parks Canada's NMCA proposal (i.e. there was no reference made to it on the questionnaire), since the NMCA is still in very early stages of planning, yet the data it collected are directly relevant to the needs of the NMCA management plan. Therefore, as an attitudinal study and a form of public involvement in coastal planning, its implementation well in advance of MPA creation is unique. By this, the information gained through this thesis can promote the development of more comprehensive managerial initiatives (Widmer *et al.*, 2002) if Parks Canada's proposal comes to fruition.

Second, and perhaps its most unique contribution, this thesis uses respondent values towards the marine environment as an independent variable in analysis. Based on the importance that respondents placed on certain values towards the marine environment, the study clustered respondents into two groups, which helped explain variability in responses to other questions. To help explain the variation in respondent attitudes and behaviour, previous studies (Needham, 2002; Randall, 2003) have applied the concept of recreation specialization (Bryan, 1977), as an independent variable. However, this thesis advances the literature by instead using respondent values towards the marine environment (via a factor-cluster analysis) as an independent variable to help explain attitudes and perceptions.

Third, this study applies the LAC framework to a marine environment. The only other reported application of LAC in a marine environment is Shafer & Inglis' (2000) study of snorkelers at reef sites in the Great Barrier Reef World Heritage Area. Even their study, like this thesis, only applies the LAC framework on a conceptual basis. While there are reports on the complete application of LAC in terrestrial environments such as in the Bob Marshall Wilderness Complex (Stokes, 1990) and other wilderness areas in the US, there are no known reported complete applications of LAC in a marine environment. Indeed, it is difficult to find examples of true LAC processes in practice, and there are few critiques on its effectiveness (Sidaway, 1994). Like others (Needham, 2002), this study does not attempt to fulfill all nine stages of the LAC process (see Figure 2.2). It does however (along with its accompanying studies with other stakeholder groups) establish baseline information that could be applied by a managing agency should they choose to establish an LAC process in the future. Indeed, Shafer & Inglis conclude their report with support for, "the potential usefulness of ... applying the LAC concept to a marine environment where tourism and recreational uses are rapidly changing" (2000: 73).

The fourth contribution of this thesis lies in its advancement of the normative approach by including both recreational and industrial indicators in one study. To date, the majority of normative research has focussed on encounters, crowding, behaviours or other conditions having to do with recreational activity or settings (Vaske & Donnelly, 2002; Vaske & Whittaker, 2004). There are no other known applications of normative research examining an industrial (i.e. the presence of shellfish aquaculture) indicator. In addition, this study advances the visual approach to normative theory by testing differences in responses to two photo sequences with the same activity in the foreground (shellfish aquaculture), and different levels of development (i.e. none or some) in the background. Manning & Freidmund (2004) conducted a similar test, but theirs was of the same foreground subjects (hikers), using two different aspects of the same background (i.e. a perspective looking down the slope of a trail and another perspective looking up the slope of the same trail). While they report that their study data indicated virtually no differences in the crowding-related standards (Manning & Freidmund, 2004), this thesis

does report significant differences in the visual acceptability norms between the two separate shellfish aquaculture photo sequences.

The fifth major contribution of this thesis to the literature includes its input to the social sciences literature surrounding natural resource management and marine conservation. While both social and biophysical sciences contribute to natural resource management, the role of the former is not as well established, nor as understood as the latter. It has been stated that social science is of comparable importance to natural and biological sciences in ensuring the success of marine conservation initiatives (Tisdell & Broadus, 1989; Fiske, 1992; Kelleher & Recchia, 1998; Bunce *et al.*, 1999; Agardy *et al.*, 2003). However, social science studies are scarcer than natural science studies in this body of literature. Haider & Morford (2004) and others predict that the role of social sciences in natural resource management will become increasingly important in the future. This study then, contributes social science research to natural resource management and marine conservation decisions, and can provide the following recommendations:

1. The literature states that it is important to understand how local stakeholders value their marine environment. This thesis has shown that values can be usefully applied as an independent variable in analysis, which may help managers understand variation in responses and why people hold certain attitudes or perceptions.
2. Measuring perceptions of threats is important so that managers can understand how stakeholders perceive the issues facing their local environment. Since perceptions are an interpretation of truth based on one's understanding of something (not necessarily truth as defined by experts), it is important for managers of MPAs to have sound understanding of both scientifically defined impacts from threats (established through natural sciences), and perceived impacts (established through social sciences). Additionally, perceptions may influence support or opposition to certain management actions.

3. In multiple use MPAs, it is important to measure views on all the different uses of the environment. Managers need to understand views on industrial use and recreational uses. For instance, this study found some types and levels of recreational and industrial activity are visually acceptable. Also, it found that sewage from recreational boats is an important concern and there is strong support for various management solutions to the problem.
4. When assessing visual impacts, the normative approach used here, with photo sequences showing different levels of activity and development, is more effective at establishing a standard than a worded statement. For instance, using the visual approach, a minimally acceptable condition (standard) may be established at the point where mean response turns from positive to negative, which is impossible to establish without a benchmark visual. The visual cue establishes a consistency in responses with regard to the level of activity and background landscape.

5.4 Reflections on Study Limitations

There are both methodological and conceptual limitations of this study. The following discussion will highlight the main limitations of this study and suggest further research that might compensate for what this study was not able to accomplish.

One of the objectives of this study was to gain an understanding of the views of Gulf Islands residents, so that coastal and MPA managers would be better informed and thus, more effective in achieving their mandates. Has this research been successful in doing so? Certain aspects of this thesis will be highly valuable to coastal and MPA managers, while other components will be less useful. As stated throughout this thesis, with data such as these, managers are more effective in determining public relations needs, identifying potential conflict areas that demand management attention, and justifying management decisions. For example, Parks Canada is presently in the feasibility study phase of planning for the proposed Southern Strait of Georgia NMCA. These results show support for certain types of management zones, including those that are intended for marine conservation purposes. The language and terminology used in survey research have the potential to affect the way the research is perceived. In this

research, terms that may portray preconceived notions such as 'marine parks' were avoided and more general terminology was used, such as 'areas to allow or disallow certain activities'. This type of approach to ensure that the public understands the multiple-use nature of the NMCA may allow Parks Canada to gain further support for their proposal.

Conversely, certain aspects of this thesis may not be as useful in application. For instance, while the questions on zoning indicate a general level of support for all five different types of proposed zones, the specific zone categories were not as well thought out as they might have been. For instance, the five proposed zones were not comprehensive enough to represent all different types of activities that may occur in the marine environment. This flaw was realized only after the researcher was in the field, and was noted by some of the respondents with comments such as:

Re Q.15: "Not all options are covered, so how can these few tally to 100%?" or

"Where is fishing?"

For future research that attempts to measure public opinion about zoning the marine environment, two suggestions should be considered, based on this learning experience. First, it would be more effective to examine attitudes towards a more comprehensive and explicit list of zone types such as those already established in the Great Barrier Reef Marine Park (see Table 2.1). Future research should propose a series of zones with a well defined continuum of options from multiple-use through to high levels of protection with explicit definitions of which activities are, or are not allowed in each zone. Second, future research may consider zoning from a spatial perspective, perhaps having respondents indicate preferred locations for zones on a map. Various methods are available to accomplish this task and advancements have been reported in recent papers (for example O'Connell & Keller, 2002; Brown, 2005) though this is a much more complex methodology.

Values and the Factor-Cluster Analysis

Values are the foundation for how people form attitudes (Manfredo *et al.*, 2004) which subsequently assist in predicting human behaviour (Ajzen & Fishbein, 1980). The values component of the thesis is the key aspect of this research, since the literature emphasizes the importance of understanding local values and their contribution to informing management decisions. However, as discussed earlier in this thesis, the analysis of the values (and other data) stretched a few of the assumptions of statistical testing. Specifically, statistical laws do not justify calculating a mean from ordinal data since there is not possibly an equal, numerical distance between “low” and “high” importance, for example. In these analyses, ordinal data were treated as interval data and doing so may inhibit the validity of the results. However, by waving some of the assumptions, more powerful statistical processes such as the factor-cluster analysis and t-tests were possible. Certainly, many researchers conduct similar analyses and the occurrence is not uncommon in academic literature. Future studies might devise a measurement scale that is more conducive to parametric statistical tests. Also, a more effective factor analysis of the values data may have occurred with a greater selection of variables (values) with more specificity of focus. For instance, the economic value might have been sub-divided into (1) natural resource harvesting economic value, (2) marine tourism economic value, or (3) residential development economic value, for example. Likewise, the cultural value might have been sub-divided into (1) First Nations cultural value, or (2) contemporary cultural value. Additionally, other types of analyses should be considered for future studies. It may be effective to segment the sample based on their participation in marine based activities as queried in Q.1. For instance, the data presented in Figure 4.1 shows the number of activities participated in over the past year (interval data). Analysis could then be conducted to examine differences between sub-groups depending on the amount of marine activities they participate in.

As described in the literature review of this thesis, Brown (2005) has tested a methodology, using a similar list of values as this study, to spatially orient the values in areas such as the Chugach National Forest and Prince William Sound in Alaska. While this thesis did not attempt to spatially orient the values, that type of information would be

particularly interesting and useful. For instance, locating areas associated with certain values could add to research on community mapping, both terrestrial and marine zoning plans, and potentially on a larger scale, integrated coastal zone management plans. Parks Canada could use this approach to gain an understanding of the spatial orientation of stakeholder values within the Gulf Islands marine environment, to enhance the feasibility study for the proposed NMCA. This knowledge could lead to a better informed and more creative management plan.

Transactive Planning and Stakeholder Involvement

LAC is a comprehensive framework and in its full application is a transactive process, incorporating all affected stakeholders in all phases of a process which ultimately leads to consensus in the design of management guidelines. This thesis, of course, was not able to accomplish the inclusion of multiple stakeholders and the long-term involvement necessary through all phases. It is a snapshot of a specific stakeholder group (Gulf Islands residents) at one point in time (summer of 2004) regarding their attitudes, perceptions and values towards specific uses of the marine environment (recreational boating, shellfish aquaculture, and the notion of zoning as a management concept). This project was however part of a group of four research projects which each focussed on issues around the question of compatibility of shellfish aquaculture within MPAs. The four stakeholder groups that were sampled in this group of related studies included (1) marine tourists in the Gulf Islands via face-to-face survey, (2) shellfish growers via focus groups, (3) protected areas scientists via an online email survey, and (4) this study of Gulf Islands residents via face-to-face survey. While it is unique for a series of academic studies to address similar research questions with multiple studies and respondents, not all stakeholder groups have included so far. For instance, other stakeholders might include non-governmental organisations with a focus on the area, such as the Georgia Strait Alliance or interest groups such as the Council of BC Yacht Clubs or the local sports fishing association.

Selection and Measurement of Indicators

In addition, while a full application of an LAC framework would establish standards for a host of meaningful indicators, this thesis was limited by design to focus on only three indicators (the presence of common recreational boats, whale watching boats, and shellfish aquaculture). As argued in the introductory chapter, these indicators were selected based on potential compatibilities and conflicts associated with their occurrence alongside a proposed NMCA in the Gulf Islands. Are there other indicators that may have been more useful in this research? Indeed there are countless potential socio-economic, biophysical, and governance indicators that could be used to in the management of the Gulf Islands marine environment. Also, since effective indicators must be relevant, cost effective, feasible to be measured repetitively, and reliable enough to provide consistency, more research is necessary to determine the most effective indicators for the Gulf Islands marine environment. Also, more research is necessary to determine the best ways to establish standards, and subsequent management actions should those standards be exceeded. Therein lays the reason why a true LAC process is so daunting for managers.

Even though this thesis tested differences between two different photo sequences of shellfish aquaculture, this test only responded to one of the critiques of the visual method. Additional tests to reduce the method's limitations might have (1) used a photo of an actual shellfish aquaculture facility in the Gulf Islands (i.e. the Booth Canal hanging oyster culture lease); (2) used a different perspective or angle of view such as closer to the waterline (as viewed from a kayak for instance) instead of the aerial viewpoint used; (3) incorporated other technologies such as audio or video; or (4) showed different methods of shellfish culture such as hanging or beach culture, instead of raft culture as depicted in the photos. The visual approach to establishing normative standards, while having been frequently applied in academic research, is not without methodological challenges. For instance, these visuals represent snapshots of one moment in time and space. Future studies may work towards finding ways to establish standards that reflect different locations and time variables such as seasonality. Additionally, each of the visual photo sequences is located in unidentifiable generic backgrounds. Perhaps

focussing the photos in specific, identifiable locations such as Ganges Harbour or Sydney Spit anchorage (and subsequently sampling to identify unique standards for each location) would provide a more meaningful and accurate standard. However, this option presents new methodological challenges. Other methods of identifying standards might involve the use of higher technology such as video, or 'virtual reality' applications which may better represent different scenarios by incorporating other sensory information such as movement (i.e. speed of boats), sound effects, or even smell effects. Clearly, more research attention is warranted.

5.5 Conclusion

New paradigms for management of marine resources and activities are needed because without sound management, declines are likely to occur in biodiversity, industrial use, and tourism or recreational activity. Within the broad ICM paradigm, planning for conservation and sustainability has become increasingly important. Multiple-use MPAs are one type of conservation initiative that has the potential to allow certain sustainable uses to continue, alongside various levels of protection, by way of comprehensive zoning plans. However, they are a challenge to establish because managers are faced with competing interests and varying opinions of what types of activities are acceptable within their boundaries. Solutions for creating, maintaining and expanding MPAs are complex and require dedicated efforts over long time periods.

Here, three imperatives for successful management of MPAs are apparent. First, it is vital to establish political support (and to do so the public must be supportive), since the establishment and maintenance of an MPA is ultimately a political decision. Second, MPA managers must be clever and astute in their management of local communities and stakeholders in terms of understanding and responding to their needs and views. To do so, managers need to be informed by (the Third imperative) sound and rigorous science. Good science (both natural and social) is essential, since without good science, it is hard to make a good argument in support of protection, or for the way in which measures of protection should be implemented.

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7.0 Appendices

7.1 Appendix A: Human Research Ethics Committee Approval



University
of Victoria

Human Research Ethics Committee

Office of the Vice-President, Research
University of Victoria
Room 425 Business and Economics Building
Tel (250) 472-4545 Fax (250) 721-8960
Email ovprhe@uvic.ca Web www.research.uvic.ca

Human Research Ethics Committee Certificate of Approval

<u>Principal Investigator</u> David McCallum Graduate Student <u>Co-Investigator(s):</u>	<u>Department/School</u> GEOG	<u>Supervisor</u> Dr. Peter Keller Dr. Rick Rollins
<u>Project Title:</u> Perceptions of Environmental Conditions and Use Within the Proposed Southern Strait of Georgia National Marine Conservation Area		
<u>Protocol No.</u> 130-04	<u>Approval Date</u> 12-May-04	<u>Start Date</u> 12-May-04
		<u>End Date</u> 11-May-05

Certification

This certifies that the UVic Human Research Ethics Committee has examined this research protocol and concludes that, in all respects, the proposed research meets appropriate standards of ethics as outlined by the University of Victoria Research Regulations Involving Human Subjects.

Dr. J. Howard Brunt
Associate Vice-President, Research

This Certificate of Approval is valid for the above term provided there is no change in the procedures. Extensions or minor amendments may be granted upon receipt of "Request for Continuing Review or Amendment of an Approved Project" form.

130-04
McCallum, David

7.2 Appendix B: Covering Letter to Prospective Respondents

David McCallum
Master of Arts Candidate
Department of Geography, University of Victoria
Phone: (250) 538 7173 (Salt Spring Island)
Email: davidmcc@uvic.ca

June 10, 2004

Dear Gulf Islands Resident:

As a graduate (Master of Arts) student in the Department of Geography at the University of Victoria (UVic), I wish to invite you to participate in a study entitled **Strategies for Use and Protection of the Gulf Islands Marine Environment**. I am interested in sustainable planning of our marine environment and for my research, I wish to gain an understanding of stakeholder attitudes towards various uses, and protection, of the marine environment. Since a portion of this research has been funded by *AquaNet – Centre of Excellence in Research in Aquaculture*, some of the questions in the survey focus on the compatibility of shellfish aquaculture within the Gulf Islands marine environment. This research will provide planning agencies (e.g. Department of Fisheries and Oceans, Parks Canada, Islands Trust, etc) with insights and concerns of stakeholders towards policies concerning the marine environment.

To effectively manage the marine environment, stakeholder input is essential and as a resident of the Gulf Islands, your opinions are very important. I have selected your household (one of 350 in the sample) randomly from the Gulf Islands telephone directory. If you agree to voluntarily participate in this research, your participation will include the completion of a 15-minute questionnaire. After you have had a chance to view this letter, I will phone you to ask if you are interested in participating in the research. If you agree to participate, we may then set-up a time to conduct the questionnaire that is convenient for you. So that you know, I assure you that your participation will be both voluntary and confidential. I will not record your name, and your address will in no way be associated with the results of this survey.

In addition to being able to contact me at the above address, email or telephone number regarding questions you may have about the study, you may also contact my direct supervisor, Dr Rick Rollins at his office in Nanaimo at (250) 753 7345 (ext 2413). You may verify the ethical approval of this study, or raise any concerns you might have by contacting the Associate Vice President of Research at UVic by calling (250) 472 4545. Thanks for your time and I'm looking forward to your input in this timely and important project.

Sincerely,

David McCallum

7.3 Appendix C: Participant Consent Form

You are being invited to participate in a study entitled **Strategies for Use and Protection of the Gulf Islands Marine Environment** that is being conducted by me, David McCallum. I am a Graduate Student in the Department of Geography at the University of Victoria and you may contact me if you have further questions by emailing davidmcc@uvic.ca or phoning (250) 538 7173.

As a Graduate student, I am required to conduct research as part of the requirements for a Masters in Geography (MA). It is being conducted under the supervision of Dr Rick Rollins who may be contacted at rollins@mala.bc.ca or (250) 753 7345 (ext 2413). Since a portion of this research is being funded by *AquaNet, Centre of Excellence in Research in Aquaculture*, some of the questions focus on your attitude towards shellfish aquaculture development within the Gulf Islands. This research will provide planning agencies with insights and concerns of stakeholders towards both use and protection in the marine environment.

You are being asked to participate in this study because as a resident of the Gulf Islands, your opinion is important to marine planning processes. If you agree to voluntarily participate in this research, your participation will include the completion of a 10 page / 15-minute questionnaire. There are no known or anticipated risks to you by participating in this research. Your participation in this research must be completely voluntary. If you do decide to participate, you may withdraw at any time without any consequences or any explanation. If you do withdraw from the study, your data will not be used in the analysis and you may keep the incomplete survey form.

In terms of protecting your anonymity I will at no time associate any identifying information with your responses. Questionnaires will be coded only for sequence number, time of interview, and location of interview for organizational and data entry purposes. My storing the completed data in a locked storage box will protect your confidentiality and the confidentiality of the data. Shredding the hard-copy documents and erasing electronic files will dispose of data from this study. It is anticipated that the results of this study will be shared with others in the form of written thesis and oral dissertation to a committee of academics. It may also be published in academic journals such as *Tourism Management, Marine Tourism, or Ocean & Coastal Management, Society and Natural Resources*, or less formally in media such as *Pacific Yachting Magazine*, or local newspapers such as the *Times Colonist, Island Tides, or the Driftwood*. I may also present my research at academic and professional conferences such as *AquaNet or Science and the Management of Protected Areas Association (SAMPAA)*, or others.

In addition to being able to contact me and my supervisor at the above phone numbers, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Associate Vice-President, Research at the University of Victoria at (250) 472 4545.

Your signature below indicates that you understand the above conditions of participation in this study and that you have had the opportunity to have your questions answered by the researcher.

Name of Participant

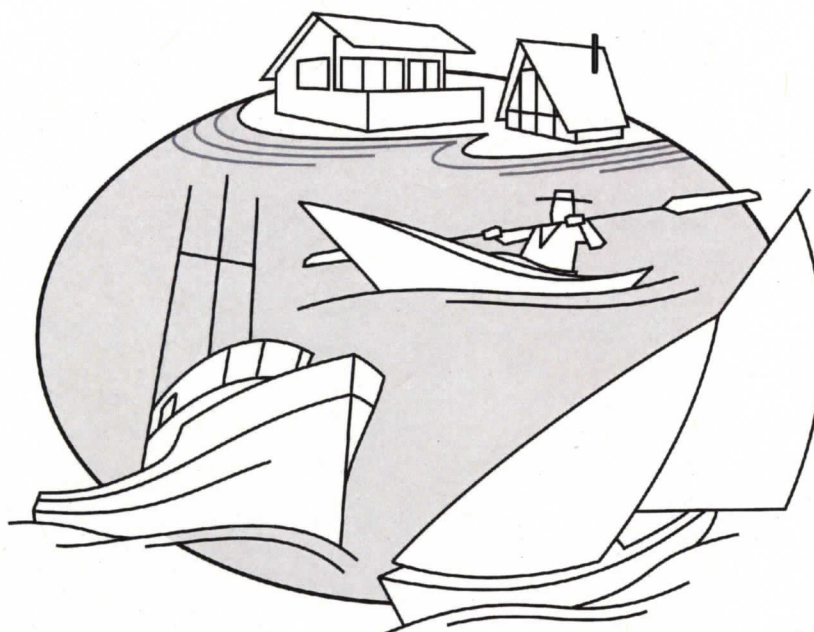
Signature

Date

A copy of this consent will be left with you, and a copy will be taken by the researcher.

7.4 Appendix D: The Survey Instrument

Strategies for Use and Protection of the Gulf Islands Marine Environment



A Survey of Residents of the Gulf Islands - Summer, 2004

Research Conducted By:
David E. McCallum
Department of Geography, University of Victoria
davidmcc@uvic.ca / (250) 727 7173



MAP OF THE GULF ISLANDS



A SURVEY FOR THE RESIDENTS OF THE GULF ISLANDS

The purpose of this research is to gain an understanding of the opinions of Gulf Islands residents regarding both use and protection of the marine environment. Thank you for sharing your views.

Q.1 Thinking about the marine environment of the Gulf Islands (see map on facing page), what types of activities did you participate in, over the past 12 months? (Please circle all that apply).

- 1 BEACHCOMBING
 - 2 KAYAKING OR CANOEING
 - 3 MARINE MAMMAL VIEWING (E.G. WHALE WATCHING)
 - 4 BIRD WATCHING
 - 5 OTHER NATURE APPRECIATION
 - 6 SCUBA DIVING OR SNORKELING
 - 7 SWIMMING
 - 8 WINDSURFING
 - 9 MOTORBOAT CRUISING
 - 10 SAILBOAT CRUISING OR RACING
 - 11 PERSONAL WATERCRAFT OR JET-SKIING
 - 12 USING BOATS FOR TRANSPORTATION (EXCLUDING THE FERRY)
 - 13 CRABBING
 - 14 SPORT OR RECREATIONAL FISHING
 - 15 SHELLFISH GATHERING
 - 16 OTHER: (Please state)
-

VALUES TOWARDS THE MARINE ENVIRONMENT

Q.2 The Gulf Islands marine environment holds different values to different people. Below is a list of possible values for the Gulf Islands marine environment. Please indicate how important each of the values are to you. (Please circle the number beside each statement below).

VALUES:	IMPORTANCE:			
	LOW	MEDIUM	HIGH	NOT SURE
A AESTHETIC – It has wonderful scenery	1	2	3	N/S
B ECONOMIC – It provides employment opportunities such as fisheries, tourism, and transportation	1	2	3	N/S
C RECREATION – It provides a place for outdoor recreation activities	1	2	3	N/S
D LIFE SUSTAINING – It is a place that helps preserve clean air, soil and water	1	2	3	N/S
E LEARNING – It provides opportunities to learn about the marine environment	1	2	3	N/S
F CONSERVATION – It provides a variety of marine life, plants, waterfowl, and places for them to live	1	2	3	N/S
G SPIRITUAL – It is a sacred, religious or spiritually special place to me	1	2	3	N/S
H INTRINSIC – It is valuable in and of itself, no matter what others or I think about it	1	2	3	N/S
I HISTORIC – It has places and things of human history that matter to me	1	2	3	N/S
J FUTURE – It allows for future generations to enjoy it as it is now	1	2	3	N/S
K SUBSISTENCE – It provides necessary food and supplies to sustain people's lives	1	2	3	N/S
L THERAPEUTIC – It makes me feel better, physically and/or mentally	1	2	3	N/S
M CULTURAL – It is a place of important traditions, wisdom, and way of life	1	2	3	N/S
N OTHER (Please state) _____	1	2	3	N/S

Q.3 Please indicate your TWO most important values from the list above (use the letter at the side).

1 _____ and

2 _____

ABOUT THE HEALTH OF THE MARINE ENVIRONMENT

Q.4 A healthy marine environment is needed for a variety of benefits to Gulf Islands residents. At the present time, how would you rate the current impact on the marine environment in the Gulf Islands, resulting from the following? (Please circle the number of your response).

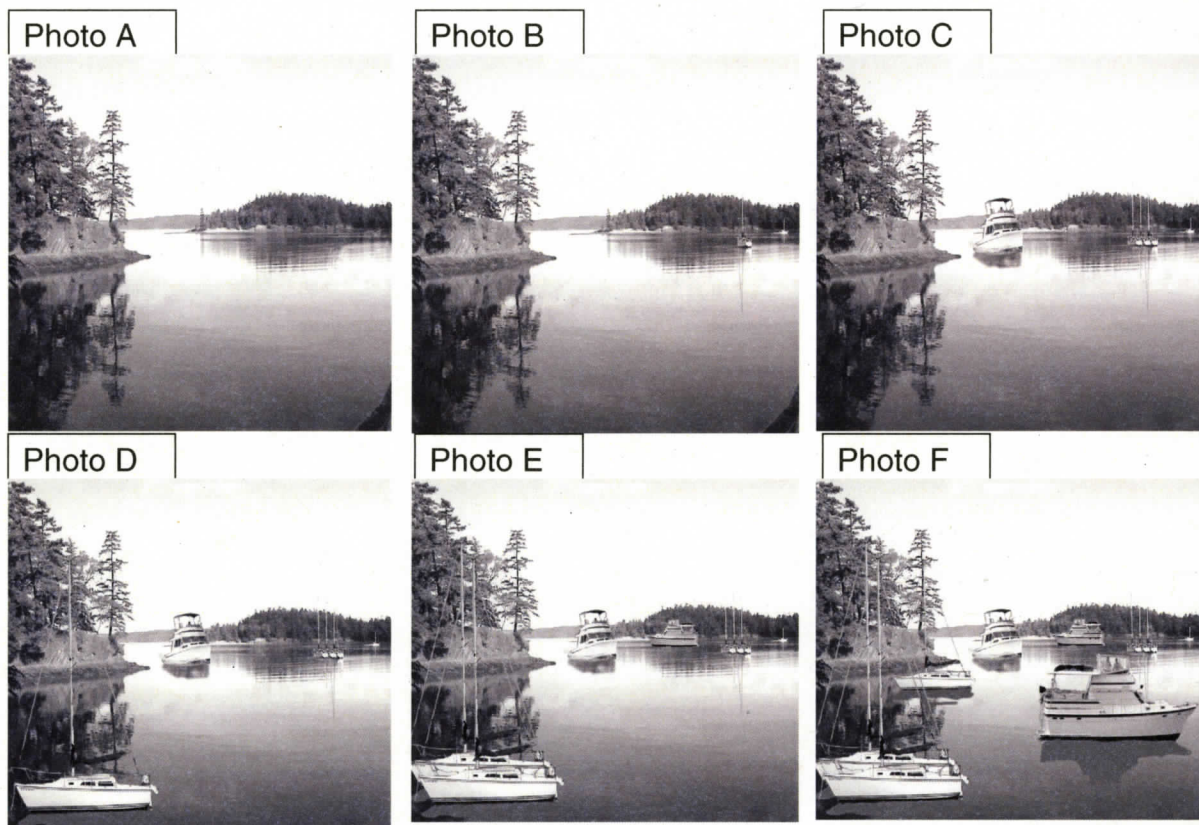
POSSIBLE IMPACTS ON THE MARINE ENVIRONMENT:		NO IMPACT AT ALL	MODERATE IMPACT	SERIOUS IMPACT	NOT SURE
A	Noise from commercial vessels (e.g. freighters, tugs)	1	2	3	N/S
B	Noise from recreational vessels (e.g. yachts)	1	2	3	N/S
C	Threat to wild salmon from fin-fish aquaculture	1	2	3	N/S
D	Visual impact of shellfish aquaculture	1	2	3	N/S
E	Visual impact of logging	1	2	3	N/S
F	Loss of habitat due to residential development	1	2	3	N/S
G	Loss of habitat due to other shoreline development (e.g. marinas)	1	2	3	N/S
H	Chemical spills from commercial cargo vessels	1	2	3	N/S
I	Over fishing due to commercial fishing	1	2	3	N/S
J	Over fishing due to sport fishery	1	2	3	N/S
K	Pollution from pulp mills	1	2	3	N/S
L	Runoff from agriculture	1	2	3	N/S
M	Sewage from Vancouver Island communities	1	2	3	N/S
N	Sewage from Gulf Islands communities	1	2	3	N/S
O	Sewage from commercial vessels	1	2	3	N/S
P	Sewage from recreational vessels	1	2	3	N/S
Q	Damage to the ocean floor from anchors	1	2	3	N/S
R	Disturbance of whales from whale watching	1	2	3	N/S
S	Disturbance of shorebirds from boating	1	2	3	N/S
T	Petroleum spillage from overfills or bilges	1	2	3	N/S
U	Impact of garbage on beaches	1	2	3	N/S

Q.5 *At the present time*, how impacted by human activity is the marine environment of the Gulf Islands, overall?

NOT AT ALL IMPACTED
 MODERATELY IMPACTED
 SERIOUSLY IMPACTED
 NOT SURE

YOUR OPINIONS ABOUT RECREATIONAL BOATING

Q.6 When you look out over the water near your residence, you may see any number of recreational boats. Please indicate how acceptable or unacceptable you feel about each of the settings illustrated below using the scale provided at the bottom of the page.



Your Rating:		VERY ACCEPTABLE	SOMEWHAT ACCEPTABLE	NOT SURE	SOMEWHAT UNACCEPTABLE	VERY UNACCEPTABLE
A	Photograph A	1	2	3	4	5
B	Photograph B	1	2	3	4	5
C	Photograph C	1	2	3	4	5
D	Photograph D	1	2	3	4	5
E	Photograph E	1	2	3	4	5
F	Photograph F	1	2	3	4	5

Q.7 Although there are a number of possible benefits of recreational boating, some people are concerned about the amount of sewage associated with recreational boating in the Gulf Islands. Please indicate your level of support or opposition to the following potential solutions for dealing with sewage from recreational boats:

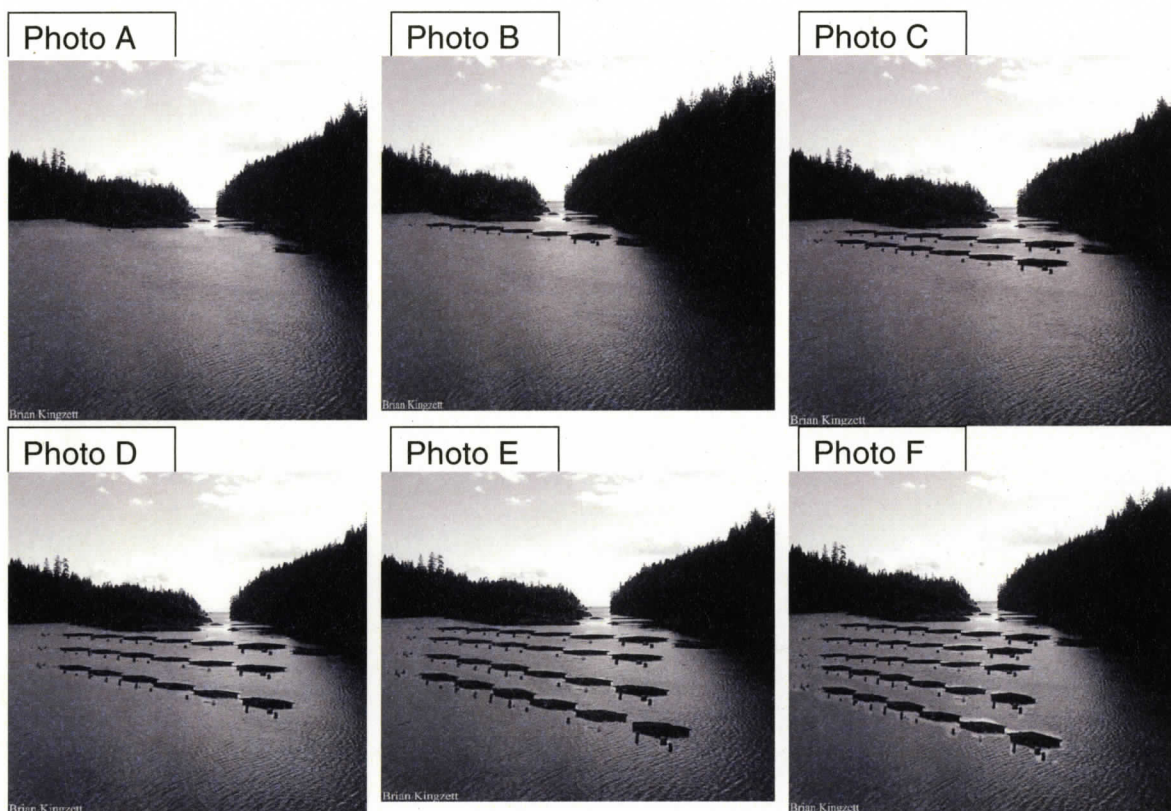
DO YOU SUPPORT OR OPPOSE:		STRONGLY SUPPORT	SOMEWHAT SUPPORT	NOT SURE	SOMEWHAT OPPOSE	STRONGLY OPPOSE
A	Introduction of <i>voluntary</i> "no discharge" restrictions in some areas	1	2	3	4	5
B	Introduction of <i>compulsory</i> "no discharge" regulations in some areas	1	2	3	4	5
C	Subsidized (no fee charged) holding-tank pump-out stations	1	2	3	4	5
D	Private (fee charged) holding-tank pump out stations	1	2	3	4	5
E	Designation of specific "no go" areas that apply to recreational boats and other vessels	1	2	3	4	5

Q.8 Over the past 12 months, how do you feel about the number of the following types of boats that you may have seen in the Gulf Islands marine environment?

TYPE OF BOAT:		TOO FEW	ABOUT RIGHT	TOO MANY	NOT SURE
A	Sailboats	1	2	3	N/S
B	Kayaks or canoes	1	2	3	N/S
C	Motor cruisers	1	2	3	N/S
D	Sport fishing boats	1	2	3	N/S
E	Commercial fishing boats	1	2	3	N/S
F	Personal watercraft or Jet Skis	1	2	3	N/S
G	Ferries	1	2	3	N/S
H	Whale watching boats	1	2	3	N/S
I	Tugs or other cargo ships	1	2	3	N/S
J	Other (Please state) _____	1	2	3	N/S

YOUR OPINIONS ABOUT SHELLFISH AQUACULTURE

Q.9 Shellfish aquaculture, involving the farming of species such as clams, mussels and oysters in the ocean, provides economic benefits to the Gulf Islands. However, shellfish farms may alter the appearance of some coastal areas. Please indicate how acceptable or unacceptable you feel about each of the settings illustrated below, using the rating scale at the bottom of the page.



Your Rating:		VERY ACCEPTABLE	SOMEWHAT ACCEPTABLE	NOT SURE	SOMEWHAT UNACCEPTABLE	VERY UNACCEPTABLE
A	Photograph A	1	2	3	4	5
B	Photograph B	1	2	3	4	5
C	Photograph C	1	2	3	4	5
D	Photograph D	1	2	3	4	5
E	Photograph E	1	2	3	4	5
F	Photograph F	1	2	3	4	5

Q.10 There are a number of possible benefits, as well as possible concerns associated with shellfish aquaculture in the Gulf Islands. Please provide your opinion towards these possible benefits and concerns by circling your response beside each statement below.

POSSIBLE BENEFITS:	STRONGLY AGREE	SOMEWHAT AGREE	NOT SURE	SOMEWHAT DISAGREE	STRONGLY DISAGREE
A. Shellfish aquaculture demonstrates "clean" resource harvesting techniques	1	2	3	4	5
B. The presence of shellfish aquaculture is a good indicator of a healthy marine environment	1	2	3	4	5
C. Shellfish aquaculture provides employment in coastal communities	1	2	3	4	5
D. Shellfish aquaculture diversifies the economy of a coastal region	1	2	3	4	5
POSSIBLE CONCERNS:	STRONGLY AGREE	SOMEWHAT AGREE	NOT SURE	SOMEWHAT DISAGREE	STRONGLY DISAGREE
E. Some forms of shellfish aquaculture alter visual quality of the marine environment	1	2	3	4	5
F. Some forms of shellfish aquaculture conflict with desired boating anchorages or beach accesses	1	2	3	4	5
G. Some forms of shellfish aquaculture impact seabird feeding opportunities	1	2	3	4	5
H. Some forms of shellfish aquaculture create noise pollution	1	2	3	4	5

Q.11 Overall, how do you feel about the possible benefits and possible concerns associated with shellfish aquaculture?

- BENEFITS OUTWEIGH CONCERNS
- CONCERNS OUTWEIGH BENEFITS
- NOT SURE

Q.12 Are you aware of any existing shellfish aquaculture facilities located in the Gulf Islands?

- NO
- IF YES, WHERE ARE THEY LOCATED?

Q.13 Are there any other benefits or concerns you would like to mention about shellfish aquaculture?

STRATEGIES FOR PROTECTION OF THE MARINE ENVIRONMENT

Q.14 One strategy for protecting the marine environment is through the creation of areas to allow or disallow specific activities. Please rate your level of support or opposition to the following types of areas in the Gulf Islands marine environment. (Please circle the number of your response).

DO YOU SUPPORT OR OPPOSE:		STRONGLY SUPPORT	SOMEWHAT SUPPORT	NOT SURE	SOMEWHAT OPPOSE	STRONGLY OPPOSE
A	Areas to allow for only strict protection with no access unless with a permit	1	2	3	4	5
B	Areas to allow for only appreciation, education or learning purposes	1	2	3	4	5
C	Areas to allow for only low-impact, non-motorized recreational use	1	2	3	4	5
D	Areas to allow for only low-impact forms of shellfish aquaculture or other low-impact commercial activity	1	2	3	4	5
E	Areas to allow for a mix of low impact recreation and commercial use	1	2	3	4	5

Q.15 Imagine that you could apply any or all of the above types of areas to the Gulf Islands marine environment. What percentage of the Gulf Islands marine environment would you allocate to each area?

- A. _____%
 - B. _____%
 - C. _____%
 - D. _____%
 - E. _____%
- TOTAL 100%

Q.16 Please provide any suggestions or comments you may have on allowing or disallowing specific activities in the Gulf Islands:

ABOUT RESIDENTS OF THE GULF ISLANDS

Q.17 How involved have you been in the topic of marine use and protection in the past year? (Please circle all that apply).

1. READ NEWSPAPER OR MAGAZINE ARTICLES ABOUT MARINE USE AND PROTECTION
2. SAW A TV PROGRAM ABOUT MARINE USE AND PROTECTION
3. LISTENED TO A RADIO PROGRAM ABOUT MARINE USE AND PROTECTION
4. ATTENDED A PUBLIC MEETING ABOUT MARINE USE AND PROTECTION
5. BELONG TO AN ORGANISATION RELATED TO MARINE USE AND PROTECTION
6. WROTE AT LEAST ONE LETTER / ARTICLE ABOUT MARINE USE AND PROTECTION
7. EMPLOYED BY AN AGENCY INVOLVED IN MARINE USE AND PROTECTION
8. NOT AT ALL INVOLVED / INTERESTED

Q.18 About how many years have you resided here in the Gulf Islands?
 _____ YEARS

Q.19 Which option best describes your residential status?

1. FULL-TIME RESIDENT (consider this to be your home year-round)
2. PART-TIME RESIDENT (consider your home to be here and in another place)
3. TEMPORARY RESIDENT (you are residing here temporarily for work or other reasons)
4. OTHER (Please state) _____

Q.20 Do you own or rent your residence here in the Gulf Islands?

1. OWN
2. RENT

Q.21 How would you describe your employment situation?

1. UNEMPLOYED
2. EMPLOYED IN TOURISM RELATED INDUSTRIES (e.g. marinas, hotels, B&Bs, etc.)
3. EMPLOYED IN MARINE RESOURCE HARVESTING INDUSTRIES (e.g. commercial fishing, aquaculture)
4. EMPLOYED IN A CAREER UNRELATED TO TOURISM OR MARINE RESOURCE HARVESTING
5. RETIRED
6. OTHER (Please state) _____

Q.22 Do you own a recreational boat?

1. NO
2. YES (Please state which type: _____)

Q.23 Is there anything else you would like to tell us about use or protection in the Gulf Islands marine environment? If so, please use the space below to express your views:



THANK YOU for completing this survey, as your views are important to my graduate research. If you are interested in further participation in this research, or are interested in receiving a summary of the results when complete, please provide your name and contact information in the space above.

7.5 Appendix E: Detailed Raw Open-Ended Text Data

Q.6 – When you look out over the water near your residence, you may see any number of recreational boats. Please indicate how acceptable or unacceptable you feel about each of the settings illustrated below...

Q.7 – Although there are a number of possible benefits associated with recreational boating, some people are concerned about the amount of sewage associated with recreational boating in the Gulf Islands...

Q.8 – Over the past 12 months, how do you feel about the number of the following types of boats that you may have seen in the Gulf Islands marine environment?

Q.6, 7, 8 Recreational Boating / Sewage / Types of Boats:

Wish there were more boats out there because it would mean we haven't made such a mess of it.

Q.6, 7, 8 Recreational Boating / Sewage / Types of Boats:

Very opposed to Jet Skis.

Q.6, 7, 8 Recreational Boating / Sewage / Types of Boats:

Re Q.6: A very clever way of presenting this question, & very clear.

Re Q.7: Were these choices supposed to be mutually exclusive? E.g: If you pick "A", then not "B"?
Confusing.

Q.6, 7, 8 Recreational Boating / Sewage / Types of Boats:

Large cargo ship unloading in Navy Channel – large amounts of dust.

Q.6, 7, 8 Recreational Boating / Sewage / Types of Boats:

Re Q.6: These look like whale watching boats and considering the existing stresses to the Orca population, I wouldn't want to see very many at all.

Re Q.7.F: Jet skis in residential areas should definitely be banned & habitat needs to be protected for marine life.

Q.6, 7, 8 Recreational Boating / Sewage / Types of Boats:

I see as acceptable a few densely, regulated areas for marinas. They must flush well with tidal action. Our OCP comments on specific areas for marinas. At BBQ time, we have an influx of boaters for the weekend only. In general (*the higher density photos*) reflect my belief that their presence is way too uneducated or disrespectful in too many cases.

Q.6, 7, 8 Recreational Boating / Sewage / Types of Boats:

Re Q.7: Ambiguous – some areas?

Q.6, 7, 8 Recreational Boating / Sewage / Types of Boats:

Not sure because it depends on the impacts these boats, their users, and their servicers, but generally speaking there is too much of everything as beaches are littered, fish gone, etc.

Q.6, 7, 8 Recreational Boating / Sewage / Types of Boats:

Re Q.6: Assume that the photo/image represents a frequency per unit of time rather than a single event.

Re Q.7.E: Completely impractical

Q.6, 7, 8 Recreational Boating / Sewage / Types of Boats:

"Something is required." (Regarding sewage from recreational boats).

Q.6, 7, 8 Recreational Boating / Sewage / Types of Boats:

I live in the country, not the water. Besides, this question is "loaded".

Q.6, 7, 8 Recreational Boating / Sewage / Types of Boats:

I think there should be a distinction between motorized and nonmotorized vessels ex: kayak/canoes/windsurf and motor anything. (*Strongly support*) "Non go" areas for motorized vessels.

Q.6, 7, 8 Recreational Boating / Sewage / Types of Boats:

There are periods/areas of concentration that are too many during summer times & acceptable in winter.

Q.6, 7, 8 Recreational Boating / Sewage / Types of Boats:

Re boat photos: Depends on how such a concentration may be benefiting other areas.

Q.6, 7, 8 Recreational Boating / Sewage / Types of Boats:

PWC should be banned.

Q.13 – Are there any other benefits or concerns you would like to mention about shellfish aquaculture?**Q.13:**

Negative impact on marine environment through environmental pollution – "unclean".

Q.13:

Adjoining residents should be properly consulted and compensated for any loss of amenity.

Q.13:

Problems for boats if not properly marked & signed. Must be totally removed by lessee if no longer required (E.G. Boot Cove).

Q.13:

For a long time, there was an oyster lease in Boot Cove & one over towards Winter Cove. As long as they were operating, they were no problem. When they became unviable, there was no "reserve" to dismantle them, and they became potential and real boating hazards.

Q.13:

Don't know about effects on the adjacent marine ecosystem – you do not mention this.

Q.13:

Our knowledge of shellfish aquaculture is very limited – hence our "not sure" answers.

Q.13:

I assume they have less food/medication than fish farms – I'm very concerned/opposed to open water fish-farms due to marine impacts of their intensive food/medication pollution.

Q.13:

I understand that we need to do this, but we need to find out how to do it carefully and sustainably.

Q.13:

1. Can introduce parasites to natural stocks.
2. It compromises the natural scenery.

Q.13:

That unused ones can be left *in situ* is shocking and unacceptable.

Q.13:

I think it may provide a safer source of shellfish for consumers than would wild harvest and less destructive to the natural shellfish environment.

Q.13:

Based upon the disastrous impact of fish farms on the BC coast, I am concerned about where shellfish aquaculture will end up.

Q.13:

They tie up crab fishing areas. Derelict farm entangles crab gear outside of their lease.

Q.13:

Employment of island residents is a benefit.

Q.13:

Effects of waste products on environment (*are a concern*).

Q.13:

No problem if situated in a reasonable and responsible manner.

Q.13:

Develop more!

Q.13:

There is room for some, but they should be small scale in proportion to their surroundings.

Q.13:

Commercial crabbers and prawn fishermen are depleting stocks.

Q.13:

It all depends on the form of aquaculture. Some forms are suitable for certain areas and others are not!

Q.13:

In our area, shellfish aquaculture improved water quality in Boot Cove because sewage discharge on lots adjoining the cove had to be upgraded.

Q.9:

Again, small scale. As much as what you show in your photos is the impact of the collecting, processing & mining of "product".

Q.13:

Could be good – depends on scale, size, state of respect that the entrepreneur has.

Size & scale are crucial – must be regulated. Must have community input & discussion. The licensing must be renewed & reviewed regularly. If it is leased to another operator it must be reviewed.

Q.13:

The need for aesthetically pleasing signage.

Q.13:

Oyster lease in front of our place has been used as a relay station for flushing out contaminated oysters. Sea life has diminished considerably over the last 40 years – the ocean does not seem very alive.

Q.13:

Fine if not overdone.

Q.13:

Re Q.12: I'm aware of shore leases where clams & oysters are seeded and harvested – 3 on Thetis shores – and that some clams are brought in for "cleansing", having grown in contaminated areas.

That, as in fish farming, there may be issues of species interference (i.e. wild & "Atlantic" salmon), as well as pollution and contamination issues. I wonder if in the case mentioned here (*cleansing oysters above*), "cleansing" areas will become contaminated from pollution left behind.

Q.13:

Over harvesting, large groups of non-locals & accompanying crime problems, lack of "no commercial picking" areas for local gathering.

Q.13:

Public needs to have more information on successful operations.

Q.13:

Please keep shellfish / finfish aquaculture out of Gulf Islands!

Q.13:

Concerns: How does the sewage in the water affect conditions of harvest (e.g. red tide)? Is the aquaculture safe?

Q.9:

Not sure because a business has to make money so has to be at least a certain size – the question is how many. What is their fair share based on their environmental impact and do we want many small or a few large to maybe lessen marine traffic. This is planning that needs to be done in context.

Q.13:

Re Q.11: Not sure because I know nothing about it except for the oyster leases here which have worked very well with little impact and did provide local part time work.

All in all if this is a clean industry, then I would strongly support it. How much is allowed is another matter and there needs to be lots of public (informed public) debate. We hear lots about fish farms but

nothing really about shellfish aquaculture.

Q.13:

Polluted shellfish, taking them from polluted areas & putting them in clean areas.

Q.13:

Provincial agencies should support environmental & residential concerns; they should not be an industry "cheer leader".

Q.13:

Bringing shellfish from contaminated areas to Gulf Islands for cleansing.

Q.13:

Gulf Islands are too populated with people & boats to add shellfish aquaculture.

Q.13:

Don't know much about it really.

Q.13:

The dumping of barge loads of oysters (wild) from polluted water areas to purge themselves in our clean seawater changes 2 beaches on Thetis Island with dead shell debris and contaminants. Not environmentally healthy.

Q.13:

Some problems for upland land owners. Some noise from spat spreading & harvesting.

Q.16:

Shellfish or finfish farms should not be permitted within the Gulf Islands marine environment. Shellfish and finfish farms should be in closed systems on land.

Q.13:

I am not informed on this issue, so can't answer. However, (not that you asked) I am totally opposed to salmon culture.

Q.13:

Interfering with swimming beaches in some areas.

Q.13:

If this means fish farming i.e. salmon, NO!

Q.13:

Presence of marketable biological specimens concentrated on holding lines / infrastructure (by-catch).

Q.13:

Possible for private stewardship to exceed capacity of public "stewardship".

You need to differentiate between bottom and off-bottom operations. Major concerns about "exclusivity" of foreshore leases – no linkage to stewardship responsibilities, consultation with public, or communities and no consequences for inappropriate management practices. Concern about float structures of any kind.

Q.13:

Ecological impacts of farming non-native species are HUGE! Nutrient alteration in ecosystems requires more research but could be a problem.

Q.13:

Dug clams & oysters from the beach are often unsafe after inappropriate transportation. They find their way to restaurants. It would be better if restaurants use shellfish aquaculture sources to ensure quality and safety.

Q.13:

Too few jobs for the destruction and poor setting that results – loss of anchorages etc.

Q.13:

Environmental studies are definitely a PLUS when dealing with this type of subject to keep public in the know.

Q.13:

Should be located in areas of low boat traffic and far enough off shore to allow beach access for recreation.

Q.13:

Over removal – need more limits.

Q.13:

I need more info.

Q.13:

No, but I do love oysters, mussels and clams, etc. Just keep it aesthetic & do keep the people informed.

Q.1.16 (Other):

Who dares? (*regarding shellfish gathering*)

Q.13:

Pollution. I would think the water would be less polluted further up the coast.

Q.13:

Yes – provision of food for a hungry world and local employment BUT they must be environmentally sustainable.

Q.13:

If we properly managed the waterways of our world with as much diligence as we spend on research away from taking care of the damage we cause, we would not require “artificial” food.

Q.13:

Should be far offshore – Federally regulated / Utility company – publicly owned.

Q.13:

Depends on the possible use of heavy-metal containing food used & possible the escape of certain troubling species here, analogous to the Zebra Mussel problem in the Great Lakes.

Q.13:

Abandoned sites in Desolation Sound should be cleaned up & restored to original condition. This applies anywhere, but DS is the only ones I have seen abandoned.

Q.13:

It would prevent the over-harvesting of ocean shellfish.

Q.13:

Only that poorly kept shellfish aquaculture could spread disease to other “free” shellfish / sea creatures.

Q.13:

They create a few low paying labour jobs highly subsidised by tax dollar. Money goes in only a few pockets.

Q.13:

Given a choice, I'd rather see a shellfish outfit than a fish farm.

Q.13:

Contamination of sea-life around them. What do they feed them? Food from the ocean? Disease?

Q.13:

- ÷ Bio-contamination concerns
- ÷ Visual pollution
- ÷ Reduction of recreational space

Q.13:

How effective is DFO in monitoring?

Q.13:

The issue is not what they look like, but how they are run and the density per given area.

Q.13:

Poorly marked – need radar reflectors.

Q.13:

I don't know if shellfish aquaculture is as “dirty” biologically as salmon farming has proven to be, but I would be against shellfish aquaculture if there were concerns about waste, pollution, or parasites. PS – I don't like most shellfish food.

Q.13:

From my point of view, it's the visual impact & reduction of recreational areas for boaters. Tourism is such an important part of our economy.

Q.13:

Commercial aspect conflicts with residential.

Q.13:

Could they be on same lines as fish farming?

Q.13:

The existing aquaculture farm at booth Canal causes enormous amounts of garbage on Booth bay shores: styrofoam, nets, trays, floats, more styrofoam, and the personal garbage from the workers. The boat they use has a very loud motor and even though we are a kilometre away from the aquafarm we can hear it

coming & going for miles. Generators.

Q.13:

Awareness of such is currently minimal.

Q.13:

Over concentration of species in one area *e.g. – the avian-bird concentration in the lower mainland

Q.13:

I don't feel like I can offer an informed enough opinion – need more info.

Q.13:

÷ We have noticed that crab pots near shellfish operations have much higher growth of same shellfish on traps & gear.

÷ Concerned about introduction of non-native species e.g. – PEI Blue Mussels or New Zealand Green Lips.

Q.16:

÷ Disallow introduction of species non-native to BC waters.

÷ Disallow intensive industrial type aquaculture;

÷ Disallow use of toxic chemicals for treatment of aquaculture products (e.g. pesticides like Emamectin).

÷ No finfish aquaculture unless contained & land-based.

÷ No siting of any aquaculture against the wishes of local communities.

Q.13:

Would be nice to see a report on the actual environmental damages.

Q.13:

The whole business of aquaculture is too secret, especially in remote areas.

Q.13:

How does this affect non-farmed shellfish?

Q.13:

Holding any kind of fish in a confined space whilst living & therefore needing to use manufactured food and medication (*bad*).

Q.13:

I do not think there is much to be concerned about the existing operations. A major concern if there is much of an increase in their numbers. They are mostly 1 or 2 man operations at present. They do take up quite a large water footprint. After storms, there are often a lot of the large plastic floats on the beaches.

Q.13:

Water pollution?

Q.13:

Like hunting, its existence encourages a certain degree of care over the environment in which the "resource" is found. For example, the presence of a mussel farm is likely to discourage the presence of large numbers of motor vessels.

Q.9:

Re Q.11 – Need more education on this subject to make an educated opinion.

Q.13:

I just don't know enough about what the practices are and how those practices impact the surrounding ecosystem.

Q.13:

Public needs more information on the matter.

Q.13:

Agree with Q.10 item C (*Shellfish aquaculture provides employment in coastal communities*).

Q.13:

Harmful to wild fish.

Q.13:

Regulations regarding visual impact of shellfish operations should be enacted.

Q.16:

We have to eat, so we must learn how to farm properly!

Q.13:

Filter feeder and habitation generally don't go together – especially if the shellfish are for human consumption.

Q.13:

Not sure how it impacts sealife in the immediate area.

Q.13:

Don't like the noise of constant motors running.

Q.13:

I don't know very much about it. Perhaps the smell.

Q.13:

I don't really know a lot about how it works – just see the visual “pollution”. Lots of related garbage – i.e. floats – giant styrofoam ones that break apart and big plastic ones – wash up on the beach. There doesn't seem to be any limit – the Booth Inlet one just grows and grows.

Q.13:

They destroy the natural cycles of local marine creatures.

Q.16:

Aquafarms (shellfish) I consider low-impact, but should be located sensibly with good tidal flush & not hamper beach accesses, also, I believe in size restrictions (keep them small) and possibly allow sailboat & kayak docking and / or restrict over usage in good anchorages.

Q.13:

Impacts on intertidal ecosystems unacceptable (select farming techniques).

Q.13:

Concern regarding cumulative impacts of most or all potential sites are occupied by commercial aquaculture – limits to “wild harvest” areas & recreational shellfish harvesting.

Q.13:

I don't believe in harvesting except possibly some clam species.

Q.13:

Farm salmon aquaculture is still highly controversial, and I cannot support shellfish aquaculture without 110% proven data that it has zero impact on the marine environment.

Q.13:

What are the threats to “wild” shellfish, from for example: PEI Mussels?

Q.13:

Concern about raising fish in coastal waters – should be land-based.

Q.13:

Increased availability of local seafood reduces the over-harvesting of native populations of oysters, mussels.

Q.13:

I don't understand why, if the bay is closed to shellfish gathering, an oyster farm is viable.

Q.13:

Increasing our technology helps with food availability, and our part in the world market. Aquaculture research also adds to our knowledge and awareness of the natural environment so we can learn how to treat & manage it better.

Q.13:

I am concerned about the harvesting of wild shellfish on the beaches – appears to be “over-harvested”.

Q.13:

Detracts from maintaining healthy natural marine environment.

Q.13:

The questions answered regarding shell aqua are answered in terms of hanging, not beach culture.

Beach aquaculture changes water transport & ecology of the beaches.

Q.13:

Not enough evidence yet to say they are not harming the delicate balance. Too soon to say. We once thought many things were safe (E.g. PCBs).

Q.13:

Quality – safeness of the product (eating, mineral accumulation, effect on natural / wild shellfish).

Q.13:

Main concern is visual – change the colours.

Q.13:

I guess I should learn more.

Q.13:

I do not think that they are as destructive as fin fish aquaculture, except completely self contained on shore systems like the eco system near Nanaimo.

Q.13:

I am not well informed, thus very concerned.

Q.13:

Concerns over the health of farmed shellfish – not sure I'd eat them.

Q.13:

I don't have enough knowledge; however, I am concerned about "stimulants" (i.e. antibiotics) & mass harvesting.

Q.13:

Less concerned about shellfish aquaculture than finfish aquaculture. Foreshore leases mean that kayaks / boaters are unable to land on some beaches.

Q.16 – Please provide any suggestions or comments you may have on allowing or disallowing specific activities in the Gulf Islands.

Q.16:

Re Q.14.E Areas to allow for a mix of low impact recreational and commercial use. – What does this mean?

Q.16:

I am against any activity that significantly harms the environment. I am against any commercial or recreational / commercial activity that disrupts the current enjoyment of the islands by residents and visitors.

Q.16:

Supervision of camping areas.

Q.16:

No fish farms.

Q.16:

Q.14/15 concerns:

÷ *It would depend on who was making these decisions (i.e. DFO is no good).*

÷ *BC Ferries – Private corporation- public no longer has a say in management decisions.*

Q.16:

Strict control by Fisheries and Oceans of allowable catch to prevent over-fishing of all types of fish / shellfish.

Q.16:

Re Q.14 / 15: Should also include:

F Other areas with no commercial use or other restrictions.

Q.16:

No trawling. Proper enforcement & management by DFO. No need for ling-cod to be closed in this area. Rock cod protected areas have been designated –Enforce them. No need to close shellfish in some areas but it is automatic.

Q.16:

Re Q.14.D, E: What is "low impact" – how do you define the term? I couldn't really answer your questions without a definition.

Q.16:

Ensuring decision-making based upon public input so that information & accurate research – most up-to-date results is shared in a meaningful way. Gulf Islands property owners & secondarily – visitors – would appreciate being part of any process.

Q.16:

Significant protection of Gulf Islands marine environment could be a pilot to assess marine recovery impacts in support of broadening marine protection.

Q.16:

Whale watching is becoming invasive and unacceptable. Radios used, fleets of boats surrounding them. It needs policing or should be illegal! They must stay further away as well. Noisy polluting activities kept to a minimum.

Q.16:

- ÷ Clean up Fraser River industrial pollution
- ÷ Stop bottom trawlers
- ÷ Limit whale watching vessels
- ÷ Fund federal fisheries enforcement

Q.16:

1. Anchored freighters (in Navy Channel and Plumper Sound) 7 gypsum barges (off loading) are a source of noise, light, and particulate pollution and could occur elsewhere.
2. Fin fish culture should not be allowed.

Q.16:

I believe standards should be set (noise, pollution, etc.) and violators should be prosecuted.

Q.16:

Personal watercraft (jet-skis) should be banned, except for low speed operation near shore, with designated offshore areas for high speed use.

Q.16:

Stricter sewage disposal.

Q.16:

- ÷ Stop all commercial fishing;
- ÷ Limit times for whale watching & monitor more closely;
- ÷ Ban jet-ski type craft.

Q.16:

We should not be looking to disallow; we should be working to establish reasonable use. Camping on shore may not be reasonable, but boating and walking are fine.

Q.16:

Given that there are a limited number of the prime sites for aquaculture, and these are perceived by some as "eye" pollution, education and acceptance are key issues to be resolved.

Q.16:

If there are going to be rules / regulations / zones, there must be enforcement or it is only a waste.

Q.16:

Development (& destruction) usually follows study and planning.

This is a sceptical comment (rightly so) regarding how and where the results of this research will be interpreted.

Q.16:

Recreational fishing & use – 100% usage. Commercial fishing by native, non-native & USA fishermen should be cut back.

Q.16:

Several of the activities listed can co-exist quite likely. Overall it is more important to reduce activities that increase the levels of noise and pollution.

Q.16:

Saturna could be a focal area for marine research & education. We are accessible to huge urban populations & are deeply needed for mental health. We are island communities and are unique.

The above 3 reasons support regulations and control and provide for economic stimulus – education opportunities for schools and individuals. The Gulf Islands are a tiny geographic area with a wealth of biotic systems

Q.16:

Believe in "no dumping areas" – however, it will be impossible for small marinas to have pump-out stations due to limited space for septic fields, etc. Will need a portable floating barge system such as in Nanaimo that is supported by fees.

Q.16:

Ban all "seadoo" use!

Q.16:

Most nooks & crannies in the Gulf Islands are used by recreational boaters. Any use by aquaculture would seriously disrupt boater use and therefore affect economies in tourism.

Q.16:

- ÷ Need to access water table for each island to find out population number that is sustainable;
- ÷ Limits need to be put on commercial & residential development.

Q.16:

Jet-ski is dangerous – for environment, participants, & bystanders & unacceptable noise.

Q.16:

Get the seal population adjusted to the finfish by ratio.

Q.16:

I would like to see engine noise controls so that PW / jet ski boats and other noisy, noisy craft are eliminated or severely curtailed. They are noise pollution.

Q.16:

Activities need to be planned with input from local Islanders.

Q.16:

Ban all salmon farms.

Q.16:

No access to Islands during nesting times.

Q.16:

No boundaries. Fisheries should be natural, and not arbitrarily determined – unless sensitive environmentally, for mating, hatching.

Q.16:

Our strong belief is that finfish aquaculture is a totally unacceptable activity for coastal BC.

Q.16:

No shore landings on Ragged Islet during marine bird & mammal breeding season (May thru August) and other islets, rocks, islands, etc., that are impacted negatively by uneducated tourists / picnickers, etc.

Q.16:

Should limit commercial growth as the Island can't sustain it.

Q.16:

Re: "A" – what would be the criteria for a permit? Animal & environmental protection? Or pay for the rights to fish?

Q.16:

Please keep aquaculture out of Gulf Islands region.

Q.16:

There appear to be many "Bayliner" type cruisers that guzzle fuel, spew waste, and throw a massive wake. Can this traffic be restricted in some way?

Q.23:

Further thoughts on Q.16: Could "Bayliners" etc be restricted to certain passages or moorages & only non-powered boats / craft be allowed into more sensitive zones?

Q.16:

Re Q.15: No really sure, would need scientific data as to impacts of these choices.

I feel strongly that large and small areas should be set aside, but it is vital that these not be used as a bargaining chip to then allow further development and greater population density.

Q.16:

Equal opportunity for harvesting for all residents (native & non-native).

Q.16:

Over population. There is a finite limit to development.

Q.16:

Jet ski and PWC rentals (*concern towards*).

Q.16:

Any additional for-profit activities should be disallowed from shore & water (e.g. marinas, aquaculture).

Q.16:

Respect for the environment is of the utmost importance.

Q.16:

No sea doos
No amplified sound

Q.16:

Limit over fishing and shellfish gathering.

Q.16:

We are very much opposed to any form of aquaculture.

Q.16:

Specific areas in Gulf Islands should be set-up as totally protected marine areas including the sea & sea bottom, foreshore, and offshore islets to allow recovery of a natural environment: no-one allowed in, no fishing, boating, fish farming, etc, etc.

Q.16:

Present marine parks are valuable.

Q.16:

Numbers of whale boats should be limited. Although regulations for whale protection have improved, whales must still suffer. It seems to be common knowledge that native whale-watch boats do not bother with regulations. I have seen this occur – everyone must obey the rules.

Q.16:

Some of the above (Q.15) could overlap.

Q.16:

Re Q.15: This is a foolish approach – must be case specific.

We are drowned in red tape and idiotic regulations in Canada.

Q.16:

Re Q.15: Not all options are covered, so how can these few tally to 100%?

Generally, such restrictions require a level of management that is not possible. Some activities can be zoned for specific purposes – e.g. preservation of ground fish, intertidal zones, etc.

Q.16:

Re Q.14.D: Assumes shellfish aquaculture can be low-impact. Not enough ecological data in my view.

All activities should be measured against the ecological integrity of the specific area and careful consideration should be given to the full time residents & official community plans and/or aboriginal titles.

Q.16:

Boats, planes (SEADOOS!!) should be low-noise!

Q.16:

Moderation.

Q.16:

“We need to be consciously involved in clear understanding of whether there are dangers / threats to all areas around here.”

Q.16:

“No fish farming!”

Q.16:

Continue to make the area ideal for tourism. That includes boats, kayaks, etc.

Q.16:

More INFO is needed i.e. local Chamber of Commerce with regard to local beach areas or marinas in the Saltspring Island region. At present any INFO seems to be via (word of mouth) local folk who may not have accurate information i.e. private areas etc

Q.16:

Limit the amount of sea plane activity. Restrict salmon farming.

Q.16:

- ÷ No commercial fishing including shellfish and crabs.
- ÷ Stream protection and enhancement
- ÷ No finfish farms in ocean pens
- ÷ No fish hatcheries in environmentally sensitive areas.

Q.16:

I feel that the issue of holding tanks in recreational vehicles is very important. Equally important is the provision of pump-out stations.

Q.16:

Educate acceptable use by the public and less rules will result.

Q.16:

Salt Spring needs more boat launches to access more areas.

Q.16:

Not enough info to answer properly (Q.15)

Regulations are useless without enforcement. Who will enforce them? The Coast Guard & Fisheries have been cut right back.

Q.16:

Dumping of sewage by cities (Victoria), BC Ferries & all manner of commercial & recreational boats must be brought under control.

Q.16:

Cannot answer this question (Q.15) without more information about the specific areas and activities.

Q.16:

Recreational use for everyone. No room for commercial use in the Gulf Islands.

Q.16:

Concern for the environment should have top priority in measuring the desirability of any activity, private or commercial.

Q.16:

If there is to be finfish aquaculture, it should be totally on land – but then too many chemicals are used & I would not eat this fish anyway.

Q.16:

Aside from pollution, fisheries mismanagement, the government's willingness to let fish farms do what they do, the most damage I've seen to the shoreline of the Gulf Islands is from Kayakers.

Q.16:

I really do like A (strict protection) and B (only appreciation, education purposes) and would like to see more very protected space. But I also realise that people need to do different things.

Q.16:

On all of the Gulf Islands there are small parks not accessible to the public. They need to have markers and trails and be used and appreciated especially by residents of these Islands.

Q.16:

Statutes / regulations to be properly set out and administered before further development on ANY level.

Q.16:

As human population (resident & visitor) grows, new restrictions should be established to protect our environment. Oil spills, increasing water use, risk of fire, chemical run-off & petro chemical exhausts all impact on plant and animal life. Logging is a major threat to the spawning creeks all along coastal BC, but more so on the highly populated Gulf Islands.

Q.16:

Absolutely no gas powered engines on any of the lakes, i.e. boats, jet skis, SEA PLANES!

Q.16:

Although not a problem yet, I believe Jet Skis and other noisy, fast PWC have NO place here. I would hate to see rental outfits or any other promotion of them for use in and around the Gulf Islands.

Salmon farming is another concern as I believe the risks to wild stock, they poop on the marine floor, and the unnatural pens are not good for our environment.

Q.16:

I am opposed to fish farming of any kind. Shellfish farming OK if not overdone. Water & shoreline should be open for all to enjoy, not just a tiny group of special interest. Marinas & docks serve everyone.

Q.16:

Motorized vessels should be limited / strict regulations re: sewage.

Q.16:

Fish farming seems to affect the marine life, as diseases are spread depleting the amount of fish (fish farming i.e. salmon farms should be disallowed). Fish farming is unnatural & negatively affects the marine ecology.

Q.16:

The Gulf Islands should not be exploited by ugly commercial use. It should be kept beautiful for its highest and best use – nature appreciation & eco-tourism.

Q.16:

Over dependence on tourism makes us vulnerable to the rape of the environment for the sake of money. Diversity is healthier.

Q.16:

There is a need to protect, yet provide access to the beautiful resources we have. The right balance is important.

Q.16:

Lets get rid of jet-skis, salmon farms in the water, and shellfish farms unless deemed safe. New by-laws are in order.

Q.16:

Thorough input from residents prior to approval with media coverage and public hearings.

Q.16:

Keep the island waters clean.

Q.16:

Would like to see some areas reserved for preservation (to allow fish to breed unmolested).

Q.16:

Jet skis only allowed in publicly authorised areas.

No garbage overboard.

Q.16:

I would encourage non-motorized boat usage. I would keep any shellfish areas relatively small and widely dispersed.

Q.16:

Cut down the number of whale watching staff. Ban US craft. Have CCGS & DFO do some proper enforcement.

Q.16:

I feel fairly uneducated at this time concerning these matters.

Q.16:

- ÷ NO jet skis = negative.
- ÷ Cap on number of commercial floatplanes allowed to land & take off.
- ÷ Restriction on size of yacht allowed into bays (40' max).
- ÷ Mandatory holding tanks on boats.
- ÷ Mandatory filters on storm sewers, residential run-off pipes and sewer systems (Victoria discharges raw sewage into the ocean for goodness sake!).

Q.16:

This spring there were workers raking clams for harvest at Booth Canal. They did not dig holes, and just disturbed the surface of the low-tide zone. This is acceptable for short periods of time.

Q.16:

Regulations and enforcement are very important to ensure a healthy industry.

Q.16:

No! fin fish aquaculture! Ever!

Q.16:

No jet or water craft near shoreline or residential areas. Encourage sailboats, kayaks, etc. Limit speed of boats along the shoreline.

Q.16:

- ÷ Disapprove of whale-watching
- ÷ Disapprove of jet-skis
- ÷ A fine given for failure to keep oil and gas out of the ocean.

Q.16:

The above Q.14 is hard to answer – C must include motors but not commercial use (as in E). The Gulf Islands are a unique recreation area which must be preserved. Keep aquaculture – all of it – to less frequented areas.

Q.16:

Older homes with non-functioning septic tanks & fields, draining into ocean & lakes.

Q.16:

Only non-motorized equipment use should be allowed on 100% of our freshwater lakes.

Q.16:

Possibly difficult to enforce.

Q.16:

- ÷ A cap on quantity of houses
- ÷ No cutting down trees
- ÷ Must be sustainable logging. Protection of old-growth & beaches
- ÷ More hiking trails
- ÷ No paid parking.

Q.16:

No seadoos.

Q.16:

No dumping of holding tanks and bilges.

Q.16:

No answer to Q.15: too many variables to consider.

Q.16:

I really support the idea of restricted access for the purpose of preservation. To live in the Gulf Islands, I depend on the tourist industry of private boat owners, so we need the tourists, but I really support the clean boat sewage ideas presented. Everyone should pay for their waste disposal. What about eventual wetland waste water management & composting humanure??

Q.16:

- ÷ Not many motorized boats
- ÷ Minimize fishing
- ÷ More awareness & preservation.

Q.16:

- ÷ Stop the disposal of offshore crown land for the purpose of building private docks.
- ÷ No open net fish farms.
- ÷ No commercial logging in the Gulf Islands.

Q.16:

Against “public access denial” of commercial activities.

Q.16:

Solicit significant public input to assess their opinions and establish political influence.

Q.16:

No jet-skis or PWC.

Q.16:

Re Q.15 – Ambiguous!

Cutting down trees to provide large areas to build houses, etc. – most of this is for a good “view” and creates run-off problems as well as loss of habitat. Also, there is a strong negative visual impact.

Q.16:

Re Q.15: Should be less than 100% - i.e. recreation with motor boats 95%.

Q.16:

It would have to be very individual areas for each of the A-E above done after research into sensitive areas. Hard to put a specific percentage on each type of activity.

Q.16:

I think all activities should be allowed. Just maybe between posted times or limited numbers per day.

Q.16:

Everyone uses common sense so that all people have access to shorelines with no disturbance to nature.

Q.16:

Estuaries should be no-go zones. Type A.

Q.16:

No more fin fish aquaculture.

Q.16:

1. If lakes are included, allow no motor boats on lakes supplying water for drinking.
2. No noisy, fast "bug boats" in Ganges, Montague, Browning, or Bedwell Harbours.

Q.16:

I don't agree with restricting access to any area. One type of activity that should be restricted is people living on the beach.

Q.16:

We especially need to protect Heron rookeries & Oystercatcher nesting areas.

Q.16:

"Allow" for an active First Nations environmental advisory counsel on the protection of marine & forest well-being.

Q.16:

Against salmon (Atlantic) aquaculture.

Q.16:

- ÷ No commercial salmon farming
- ÷ Limited commercial fishing
- ÷ No jet skis.

Q.16:

Re Q.15 – In the overall "marine planning" mix, there should also be allowance for "higher impact" activities (e.g. marinas, docks, harbours – i.e. 5-10% of total).

Prohibitions (Categories A & B) would be very difficult to enforce, enabling & encouraging community support for protection through education & stewardship initiatives & creating innovative (i.e. "non-government agency" oriented) approaches to protection & management. (e.g. citizen wardens, neighbourhood stewards / watch groups, school "adopt a shore / bay programs...")

Q.16:

I don't think boating negatively affects the environment unless sewage is dumped.

Q.16:

Telecable from Vancouver Island comes ashore in beach access near us –planned gas pipeline offshore – widening of rural roads. Telephone and hydro on different poles on both sides of road.

Q.16:

The Gulf Islands, more specifically Salt Spring Island, is already at risk in terms of its marine environment. I would totally ban all forms of aquaculture and would prohibit all tugs and cargo ships.

Q.16:

Sewage runoff and discharge is my biggest concern with the increase in population.

Q.16:

1. Marine protected areas are going to be nearly useless without some kind of seal control (as far as fish stocks are concerned).
2. We disagree with exclusivity.

Q.16:

Jet-ski or other noise polluters should be banned.

Q.16:

I am concerned about the harvesting of the wild shellfish in Booth Canal. Is it monitored? It appears to be over-harvested & is done in a noisy manner without consideration to residents who may be sleeping!

Q.16:

Any evidence of archaeological or cultural material on lands designated for marine development should negate any further development.

Q.16:

Comment re: Q.14: Where is fishing?

No-take areas (ie no fishing) are much easier to manage & get public buy-in than partial closures. They should total at least 30%.

Q.16:

God's country is free – people need to live. Don't systemise my beach.

Stop charging for camping – let the homeless live off the land. Stop the war on the poor. Its not my fault I was born into rent, or yours either. Stop picken on my people or I will fight you and we will win.

Q.16:

“Adequate local economy based with better than average ecology is essential”

...Brundtland

Q.16:

Omit all jet skis – noisy, disruptive, dangerous.

Q.16:

No personal watercraft anywhere. No fish farms anywhere. 10 knot speed limit within 150 m of low water mark everywhere.

Q.16:

No shipping of dangerous cargo. Small-scale commercial sustainable enforceable fishing & logging. Extremely regulated and enforced sport fishing.

Q.16:

I am totally opposed to fish farming and personal watercraft, jet-skis.

Q.16:

Low impact industries such as farming, vineyards, wineries, breweries, tourism, especially boat tourism, should be encouraged. Parking is already a problem. Open containment finfish aquaculture should not be permitted.

Q.16:

Re Q.15: It is not this simple. Any answer on my part would have no meaning.

The situation in each area will have to be considered at the time the proposal is brought forward to the public. Public hearings must be held in all cases.

Q.16:

Noisy (like jet-skis) is not appropriate anywhere. Protection of habitat used for breeding should be a priority. Identification & protection of habitat that will be used at environment warms up should also be a priority.

Q.16:

Re Q.15: Need more information to base choice on.

Q.16:

There can't be too many rules or regulations otherwise people just get mad & break the rules anyway. A BALANCE is needed. Also, a DIALOGUE among islanders. Even though I favour low-impact activities, there has to be space for healthy, respective recreation.

Q.16:

No jet skis – noise pollution, scares & disrupts wildlife.

Q.16:

Support the “no camping on islets” rule because islets too small to support large groups of kayakers camping.

Q.23 – Is there anything else you would like to tell us about use or protection in the Gulf Islands marine environment?

Q.23:

Limit number of cruise ships, due to their hazard to marine life resulting from numerous toxins / pollutants.

Q.23:

Read NEB final agreement for GSX marine coalition.

Q.23:

- ÷ Holding tanks on all sleep-aboard craft should be compulsory;
- ÷ Waste pump-out stations located at all major docks are needed.

- ÷ Recycling and garbage containers are needed at all major docks.
- ÷ Further educational promotional materials are needed to increase pride in our clean environment.
- ÷ Whale-watching and other sea-life observing tour operators need to be thoroughly trained and committed to preserving a safe and sustainable environment for all sea-life. Emphasis on the positive side is preferred to punishment for violations.
- ÷ All individuals are responsible to maintain a pristine environment with a social culture of pride in our accomplishments.

Q.23:

Mentioned the issue of the unused shellfish farm in the way of his recreational crab fishery.

Q.23:

We owned our mobile home until to-day when we sold it to the Federal Parks with license to live in the park for the rest of our lives.

We have a pod of killer whales that circumnavigate our island. I dislike seeing motor vessels pursuing them. A kinder way of seeing these wonderful creatures is by canoe or kayak.

Noise is stressful. We have peace & quiet plus a very supportive community. We have participated in the salmon enhancement on Lyle Creek that runs through this property. Otters come upstream.

Q.23:

From an attached document:

The Gulf Islands and the waters surrounding them constitute an area of particular interest, beauty and biological diversity. Due in part to poor communications and limited water resources, Saturna Island remains the least developed of these Islands and therein lies much of its charm. I strongly believe that it is the responsibility of all concerned to preserve the current status quo for the enjoyment and appreciation of future generations. The fact that three large conurbations are so close that they light up our night sky makes this task a very difficult one. If we continue to attract visitors and foster tourism, we will end up with a giant theme park which clearly would destroy the very environment which we have the responsibility to preserve. It would not be possible to "undevelop" the other islands, but it may not be too late to protect Saturna island and the surrounding waters from further erosion of their pristine beauty. There are several ways to reduce further development and "people pollution" in general. I believe that these should be explored and implemented as a high-priority. It would be necessary however to provide alternative occupations for those who would make their livelihood from the development and tourist trades. Aquaculture would appear to be a most viable option, and in conjunction with viticulture, herb farms, and a multitude of cottage industries, this Island could support a thriving economy which would have little serious impact on the environment.

Q.23:

I have sport fished and boated on the waters of Georgia Strait for over 50 years. I have lived on waterfront property on Saturna Isle for the past 25 years. Over the years I have seen excellent salmon & cod fishing and up until 10 years ago, the coho fishing off Saturna attracted many sport fishing boats from this area as well as Washington. On any given day (weather permitting) between July 15th and August 15th, I could count 50 to 75 boats fishing off this shore. The shellfishing & crab fishing was also excellent. In those days there were few seals & more whales. Cod were plentiful. Today there are few salmon, few rock cod, plenty of Lings, crabs & shellfish. The shortage of salmon can be blamed on El Nino, problems in the rivers, overfishing, and seals. The shortage of rock cod by ignorance of fishers and DFO. Shellfish are plentiful where I fish, in fact I have never seen more oysters. Ling cod are very plentiful in this area. There are 10 times more seals in this area than 20 years ago, which must have a bearing on the salmon and rock cod stocks. In my opinion, DFO must cull the seals even though it is not politically expedient.

Q.23:

There is only one Gulf Island marine environment and yet there are many competing jurisdictions & strategies. Fisheries & Oceans, Provincial, CRD, Islands Trust, local community. The risk isn't too much regulation. It is overlap, inconsistency, and a conflict of priorities. Some things will be overly regulated and others will fall into the cracks.

In many respects, there is a lot to be said for allowing the most "local" of jurisdictions set the priorities

for protection & then have those jurisdictions with the authority reflect those priorities in legislation & regulation. That way, "reality" and common sense prevail over often "broad brush" regulation which makes no sense.

Q.23:

There are several issues here – part of my answers were based upon my enjoyment of the marine environment. I know what I like (and don't like – for example, Jet-skis).

The second part is the health of the marine ecosystem, the shorelines, and the migratory creatures passing through – this is perhaps even more important to me than my own enjoyment – but I know less about it.

Hope this helps!

Q.23:

Our knowledge is mainly limited to Saturna Island. We feel that the residents of Saturna as well as visitors to the Island are generally very environmentally conscious and respect the beaches, water and sea-life.

We love Saturna and although our experiences on the other Gulf Islands are limited, we enjoy them all – the entire West Coast is a paradise for all the senses.

Q.23:

I do not want to see our recreational and sport fishing in the area become overmanaged, controlled, and limited by a bureaucratic system that reflects the agenda and policies of a crociferous minority.

Q.23:

1. An important issue in making decisions is
 1. Who makes the decisions
 2. On what basis are decisions made?
3. All decisions must be based on scientific & meaningful facts and information and NOT on the basis of interested partisan groups (i.e. Sierra Club).
4. Continued education of residents on use of property, shorelines, and dumping impacts. Perhaps too much emphasis is placed on recreation & commercial impacts without due consideration of resident issues.

Q.23:

- ÷ Old generations used the marine environment too much and I hope that society has changed its ideals.
- ÷ Environmental education should be part of young people's school curriculum.
- ÷ Seeing the Georgia Strait without fishing boats causes me worry because it means there are no fish left. I would rather see more boats out there fishing...
- ÷ In less than 50 years (short time in human history) the fish have disappeared.
- ÷ Important that the public learn that it is important to value the health of the environment over "stuff".

Q.23:

Idea: Combine DFO/Coast Guard/Parks Canada into one boat to patrol and act all 3 duties. Parks Canada is good, but they are spending too much money on management (boat).

Q.23:

Park laws need policing & protection. Concern re: fire protection. We were on Saturna long before the Oyster farm in Boot Cove was approved, and we officially objected to it long before its approval, yet it was still approved. Now we are stuck with the left-over mess.

Q.23:

Thank-you for considering my opinion on this issue. I have always hoped any development on and around Saturna would take a long-term sustainable and low impact direction. But if the year round population figure (which has not increased in the last 12 years) is any reflection, we are not developing at all but are only changing. The recent National Park designation will continue to skew the demographic to the part time user, retired residents, and single professionals. I would very much like to see many more ideas, like aquaculture, that provides an alternative employment to the service industry and harkens back to the Saturnas roots, that of a hard working, pioneering community. But these ideas must come with a commitment to the people of Saturna by including plans that will see access to

affordable housing, public education, basic medical services and conservation of freshwater supplies and the natural environment.

Q.23:

1. I believe the anchoring of freighters in Plumper Sound must have an adverse effect on the marine environment: A) off-loading of gypsum to barges – much blows into the water, noise carries on throughout day and night (!?). B) Freighters anchor here when Vancouver Port is jammed (this Spring 4 – 5 at a time). We noticed oil on our beach. Bilges must be being discharged into the sea.
2. Large, fast, noisy tour (whale watching) boats run close to shore – large wake – sometimes 10+ in an afternoon.
3. The way our BC Government fails to address the obvious and very serious problems in our salmon farms – business economics before environment gives me absolutely no confidence/assurance that shellfish aquaculture would not end up in the same sorry mess.

Q.23:

Having lived on Saturna for over 25 years, much of that on a house boat and as a commercial crab and prawn fisher, for many of those years, I have witnessed the depletion of various marine species – primarily sea birds, but also herring, salmon, and invertebrates. This can be explained by overfishing of herring in part, but my instincts tell me that water quality is the primary issue. No amount of protected areas will improve the water quality. The focus must be on industrial wastes primarily originating from the Fraser River.

Q.23:

I would like to see more DFO officers, and/or boats patrolling and checking for violations in catch of marine species, especially US boaters from Bellingham way. I would like whale watching boats to slow down in bays and passes – or to cruise areas where whales are most likely to be found.

The Fraser River has a great impact on the Gulf shores & pollution from upriver could affect all marine life.

Q.23:

I believe regulation should be based on science rather than public perception. Much of the regulation is based on “optics” rather than science. We have regulation without enforcement resulting in the “criminalization” of boaters. Enforcement becomes a selective.

Q.23:

Ensuring the environment is maintained at least at the current level is very important.

Q.23:

Yes, we need to preserve the natural beauty and provide year round employment for residents. However, we must be careful not to start establishing rules where they really are not required. Better observation and current administration may be an immediate reasonable tactic. For example, a large freighter currently unloads a cargo, which is very dusty in Navy Channel, approximately monthly. I can't believe this is reasonable management.

Q.23:

I have lived where you can't hear or see birds, but in the mornings here, I hear several. Trees, birds, vistas, peaceful spots. We need this to stay sane.

Q.23:

As a long-time resident, I have seen the Gulf Islands rebound very healthily from the massive logging of the '50's and the over-harvesting of shellfish etc, or the '60's and '70's. This is our family's home and I do not want to see an over legalistic situation with rules / laws governing our traditional way of life.

I am opposed to the Government buying land with taxpayers' money and then not allowing the taxpayer to use it. Ditto for the marine environment. Residents of Gulf Islands should have complete access to all parts of their traditional Gulf Islands. Our family has been here for three generations. Fishing, shellfish harvesting and hunting are our family's traditional ways of life. Are we to be denied access?

Q.23:

Docks should be limited. Our small cove has too many docks. Permits should be mandatory.

People should not be able to alter the beach areas in front of their property.

Large land-moving machines should not be allowed on beaches. These are the things I have observed

over the years in our area.

Q.23:

I am most disturbed by the proliferation of docks in many of the small bays in the Gulf Islands. Many of these docks have no permits & are built of creosote pilings (which should be outlawed) & pressure treated lumber. They are systematically destroying the marine environment (intertidal zone) by leaching dangerous chemicals & heavy metals on a continuous basis.

Q.23:

1. Regulations must be accompanied by education to gain cooperation – note success of anti-littering, seat belts. People need to “see” benefits to them. Education by all levels, groups: parks, school, recycling depot, Islands Trust, community club, conservancies, etc.
2. Regulations must be accompanied by a “buy-in” from those being regulated.
3. Values such as those in your list (spiritual, aesthetic, life sustaining, etc) need to be used a lot so people get used to them & have something to throw back at private enterprise and ownership and development backers.
4. You can't just study “use & protection”. Studying has no bite & I believe separates us from actual experience. Love a place & contribute to its protection because it feeds your heart – you choose. Be informed & act!
5. Dream big – what would it take to significantly protect the marine environment?
6. Demand universities give back – you study us, you give us knowledge & studies in useable terms for local conservation groups.
7. Protection issue – at some point consultation / conciliation / negotiation is all used up. For the collective good, for people now and in the future, you say this area is it. No more private gain from here – it is public in the highest sense of the word & you defend it with all your studies.

Q.23:

“All this conservation stuff, they tend to go overboard with that”.

Not in favour of protected areas.

Q.23:

Want all areas to be open to the public – with public access. Feel it is crucial to educate the public & perhaps initiate a voluntary donation program to support our provincial parks. Also, government funding or subsidy would be helpful to small marinas so we can continue to operate & perhaps implement more “green” strategies.

Q.23:

Over the last 15 years I have noticed significant changes in the marine environment:

- ÷ Decline in killer whale sightings;
- ÷ Decline in moonsnails on Kuper Island beaches;
- ÷ Less starfish;
- ÷ Proliferation of personal watercraft;
- ÷ Decline in BC marine parks personnel.

Q.23:

The Gulf Islands are so much used by recreational boaters, there is no room for any sort of commercial aquaculture. It appears that the ideal area for aquaculture is also prime recreational space and therefore the two are at odds with one another. Aquaculture should not take place in the Gulf Islands.

Q.23:

How can you protect against the influx of more people? It is the increasing population that is creating / causing problems and the need to “protect”. If you can figure this out, you deserve more than an MA.

Furthermore, if you can protect us from our governments (all levels), everything else may well fall into place. Cheers and good luck.

Q.23:

This summer we have noticed an increasing number of boats around the island. We strongly dislike jet-skis as they spoil the peace & tranquility of this place.

Our experience with an oyster lease owner in the bay has not been a positive one. We certainly do not own the bay, but would like to see it cleaned up from old shells. We feel that over the years it has been impacted by the oyster lease. As the sea life and ocean floor is dramatically different than many years

ago (for whatever reasons). Crabs, urchins, sea slugs, shells are in much less supply. Garbage floats in, in high tide on the surface – the water is not as clean or clear as in the past.

Q.23:

There should be more toilet facilities at public beaches & road to beach access areas where people come for a swim! Where do they go to the bathroom? Tent Island has no toilets?

Q.23:

I've been aware with growing concern of the issues surrounding fish farming (not shellfish) for sometime. In recent years, I've watched the growth of harvesting of prawns – wild ones, and the crisis a few years back when some ethnic groups combed our beaches of shellfish. Now I'm involved in trying to slow the exploiting of the Gulf Islands by the tourism industry – changing it into a different place altogether. I think this last is an issue related to Aquaculture because it also weighs economic benefits against the preservation and protection of not only the physical environment, but of communities and their way of life – which do have significant human and cultural value. In the case of aquaculture, the concern includes, of course, for marine life.

Q.23:

I would like to see less media coverage of activities that have not been researched by the media, but only reported to sell papers or TV sensationalism.

Q.23:

Re Q.2.B: Current fisheries (crabbing, prawning, salmon, herring) good use; not in favour of added aquaculture.

Q.23:

We are very fortunate in that the view from our waterfront property has not changed in the past 40 years.

Q.23:

- ÷ Shore lighting, used indiscriminately, causes problems for shore birds feeding – more education needed.
- ÷ Beach pollution by pleasure / commercial boater garbage must be addressed coastal-wide.
- ÷ Sea lice, possibly from finfish aquaculture is a problem on the rise. Also, antibiotics introduced to sea life through intensive fish farming.
- ÷ Sewage! Chemicals & drugs introduced into coastal waters – steroids, antibiotics, heavy metals etc by raw sewage (both boat & land sewage).
- ÷ Illegal shooting of marine mammals – perhaps there are not enough fisheries protection officers to alleviate this problem/
- ÷ I support the establishment of a public shellfish harvesting area for local residents / visitors which would exclude commercial harvesters.
- ÷ Wharfs & finger floats would seem to protect reefs and sensitive sea bottom areas, so more tie-up areas or provincial tie-up buoys should be made available in high marine traffic areas where boaters anchor out.

Q.23:

It would be unhealthy for Thetis to become another Salt Spring. Salt Spring ecosystem has been greatly affected by commercialism. It would be beneficial to do a paper on dramatic changes of a Gulf Island in the last 15 years and Salt Spring would be at the top.

Q.23:

We are concerned about the two different laws relating to natives & non-natives. E.g.: Natives can & do catch more fish than they can use... then sell it at a personal profit. They have little or no restrictions on the amount of wildlife / fish they catch (e.g. lingcod).

Q.23:

I grew up here and in that 53 years, the fish, shellfish have all but disappeared and anyway are too contaminated to eat. Now many days a year the air is smoggy. At night the glow from Vancouver lights impacts us now and a plane trip across the Gulf clearly shows the dirty water around that city drifting our way. Vancouver Island grows and grows. I strongly believe in land conservancy and if shellfish aquaculture could be used as a reason to enforce us all to be cleaner, then it is a good thing. I liked the way SPEC used to try and educate people with concrete formulas (e.g. 1 tree + so many rolls of toilet paper). People have to have concrete examples of what their lifestyle costs (environmentally). How much clean water does it take to produce a clean oyster? How much water is polluted running an average outboard? I am hopeful that shellfish aquaculture research could provide more of these

proportional type examples.

Q.23:

Department of Fisheries are extremely unfair. We who pay taxes are not allowed to keep over-catch while our taxes are going to those who not only can keep large amounts of fish but can now legally sell them. This is taxation without inclusion.

Q.23:

Treat everyone equally. Don't give natives or any other group preferred access to the resources in our area. Shellfish aquaculture has not appeared in our area, but over harvesting wild stocks by natives and commercial enterprises has decimated many beaches on Thetis.

Natives have rights to take large numbers of Ling Cod and other Canadians have no access to these fishes. Stocks of Ling Cod, we are told, have been depleted and need time to recover.

Q.23:

One of the major polluters of the marine environment is commercial vessels (i.e. ferries, warships, cruise ships). Some of these vessels have basically a strait through discharge of sewage carrying large numbers of crew & passenger. Those that have some kind of sewage treatment have problems with these systems often having to bypass them. Possibly grants could be applied to develop & install reliable sewage treatment systems. The companies, governments should be held responsible.

Also, ferries hose down their car decks directly overboard, washing diesel, gasoline & oil into the ocean – this should be addressed.

Q.23:

I think water (potable) protection is vital. And I believe our sources are in danger. On our own island, a vineyard (!!!) has been established as part of a business designed to attract large numbers of visitors here. There are many rental facilities that have visitors coming and going, using water with no regard for long-term community needs. The nature of our community is that anyone can do anything he/she wants. We need guidance and the Islands Trust must be able to provide this guidance. At the moment, they seem to have little interest and no teeth.

May I add my opinion about fish boats that do dragging: outrageous! Should be banned. May I also voice my horror at the enormous volume of prawns that come out of this small area during the season, which are loaded into containers at the Chemainus dock & driven directly to the airport for the Asian market. It's very difficult for locals to buy any small amount for our own consumption – shocking to see so many leaving the country. Aside from that small point, I feel that we are decimating the prawn population.

Q.23:

Our response is "tainted" by lack of knowledge (science); our emotional biases; NIMBY values to some extent – but overall if it meant saving our Island's character and environment, we would leave the Island for work, residency, business needs that would be more suitably met in urban areas. A lot of potential impacts have not developed here (Thetis) but we hear of conflicts on other Islands – Salt Spring in particular which is being lost.

Q.23:

The Gulf Islands have been logged, mined, quarried, industrialized and settled using common sense. I have watched as planning by idiots has destroyed far more than it has created. Turning the Gulf Islands into one big planned sterile prison to please the current purveyors of planning dogma is a sick prospect.

Yes! I was once a director on the Community Planners Council of Canada so I have seen the long-term results (so have the Russians).

Q.23:

I think a balanced approach is important. It's important to look to the future by putting a reasonable limit on fishing and shell fishing to ensure sustainability for commercial and sporting purposes and for human food needs.

However, I have a hard time with so much financial resources going into a specific cause such as Luna the Killer Whale situation (although I guess that is also providing economic benefit to a needy community).

I also think there should be reasonable limits on seal hunting – not a “no hunting” policy.

Q.23:

Holding tanks for all boats

Q.2.N (Other):

Note regarding Q.2.F: Even though Donovan has high conservation value, that does not mean he wants the NMCA. In fact opposite. Afraid his collection areas will be denied.

Q.23:

Absolute protection of everything is impossible. Absolute commercialization of everything is ridiculous.

A happy balance must be found so people can make a living and live on the islands.

Q.23:

Actually, opinion surveys of the general public count for very little in any field of public policy in BC or Canada. Government officials, political advisors, and professionals providing the former with expert advice / science are the alpha and the omega of public policy – not public opinion. However, that said, public opinion CAN be useful background re: perceptions of change or acceptable conditions. The pros know that uninformed opinions / perceptions may have no basis in fact.

I would hope you might probe the general perception of a decline in the quality of the marine environment over the past 40+ years – herring, salmon, bottom fish, pollution, etc. How widespread is the perception among people who have lived here over the past 2-4 decades? Is there quantifiable fact supporting this perception? What are the policy and legislative options for addressing the issue(s)? What are the governance implications and options?

Q.23:

Kayakers should be excluded from certain areas – no access areas needed! Kayakers have the potential to adversely impact remote locations that are not accessible to power / sail vessels.

No access areas for all – including kayakers!

Q.23:

What's missing is a consideration of aboriginal rights & title issues.

Q.23:

There are obviously many more pleasure craft using the water around the Gulf Islands. However, in my years of visiting and residing (65 & 30) I have not noticed and change in the condition of the beaches or water. Recent pollution regulations re: holding tanks have helped protect some fragile harbours. Very important though, is a general view that throwing garbage into the ocean is not acceptable. My father & neighbours would, 40 years ago, take their rowboats out to dump garbage and now boaters are warned not to throw refuse over the side. So it is clear that a program of teaching the public to dispose of their garbage responsibly is worthwhile.

Regarding shellfish aquaculture, the two I pass by frequently on my boat are of no consequence. If there were many, or they covered large areas, or if they were in my backyard, I would be concerned. Now they provide a safe source of shellfish with little adverse impact. Moderation in regulation & public education seem to be working.

Q.23:

Minimize development along the shoreline of the Gulf Islands.

Q.23:

At present in the Saltspring Island area I feel it is a total paradise which needs, needs, protection to keep in place for our future. And with regard to shellfish aquaculture development to date there still appears to be a “gray area” & more true information is needed. Thank you.

Q.23:

Some access limitation to seabird nesting areas should be instituted during nesting seasons.

Q.23:

One of my fears is commercial fishing to excess! When I see tons of fish coming on board even 1 boat, I imagine the same thing happening at the same time with 1,000 + other boats. By comparison recreational fishing is a minor concern. I do not fish anymore, but it still bothers me.

Q.23:

In 10 years as resident I have seen a big decline in population of birds. I live on an inlet where a variety of sea birds would find shelter during winter. During 10 years of observation I have seen populations & variety precipitously drop to present situation where only a few lonely Mergansers came into our inlet or bay.

Salmon enhancement in our small creek (Duck Creek) is not cost effective. Government fails to do proper screening for money invested and result is surely a "plentiful waste of time".

Q.23:

Many years ago, I was very involved in the fishing industry. Fishing halibut in the Bering Sea, Alaska Area. Fishing herring in the Gulf Islands and rest of BC waters. I was very concerned at times & complained to my MP and MLA re: foreign fishing re: our regulations & to pit lamping herring around the Gulf Islands 1950 – 1960 – which allowed the seiners to take all species and ruining the fishing for years to come.

Q.23:

I'm biased. I love boats. I love docks. I have no objection to anything to do with either, but for some reason I find commercial farm licenses objectionable. I started spending summers in the Gulf Islands from the time I was a baby. I lived in Vancouver. Nobody I went to school with knew where Pender Island or Saltspring Island were. Now the Gulf Islands are mentioned daily on CBC or mentioned in newspapers, etc. The Islands used to be heaven. I don't hold much hope for the future health of these Islands. Too popular. Too many people.

Q.23:

I feel there is a need for Marine Protected Areas (no-go-places) (even no Whale Watching).

But I believe in safe & environmentally sound mariculture and locally owned small scale low-impact aquaculture.

Q.23:

Please protect some space.

Q.23:

Not once is mention made of the Islands Trust and its mandate to "preserve and protect". Given support, the structure is in place to try and preserve what we have, conserve and reclaim some areas lost, and build for purchase of key lands to enhance parks and recreation and protect view corridors and scenery venues. The money to fund your project and others must be found!

Q.23:

It has gone long past the point when small issues can be dealt with on a one by one basis. Has to be a full out marine support approach at the highest level. It is a public issue, not a private one.

Q.23:

1. Should restrict population on the Gulf Islands because of the water problems & the many other polluting factors, notably the huge tourist population here in the summers (~250,000 per year).
2. Should stop 'catch-all' fishing techniques such as 'dragging', since they are responsible for a huge waste of the unwanted species, the effects of which will affect the Islands in time.
3. Should limit the size of houses built on the Gulf Islands, since they cover so much of the land & since they ultimately increase pollution to local creeks, while being responsible for wasting vast quantities of water. This latter problem is very serious on the Gulf Islands at this time. For example, St. Mary Lake is at a seriously low level now, causing loss of spawning habitat.

Q.23:

Sewage being expelled into the water in alarming quantities i.e. Victoria and many other coastal communities is a real concern. I would also love to see yearly (or more frequently) testing of shellfish for contaminants. We regularly consume shellfish from the waters around Salt Spring and other than rumours and speculation, have no idea if they contain heavy metals, PCBs, etc. Also, two-stroke motors should be phased out as soon as possible.

Q.23:

With the projected population growth over the next 10 to 20 years, the inevitable pollution and over harvesting of marine life that comes with that growth, now is the time to begin to preserve what we have, because in 20 years we'll be too late.

Everyone wants to lay blame on another user group, for pollution or depletion, but there are too many

self-interest parties that need to be educated. We're all part of the blame for the problems we create.

Q.23:

Cities such as Victoria should not dump their sewage untreated in the ocean. I don't care that Victoria claims they are not damaging the marine environment. That's what every mill & polluter claims, without exception – it is a disgrace.

Q.23:

1. Provide more mooring buoys in protected areas. This would a) protect the bottom from anchors, and b) generate revenue for marine parks.
2. Reduce the number of crab traps in navigable waters. They are a hazard.
3. Limit whale watching / enforce guidelines on distance from whales, etc. Revise guidelines, rules if necessary.

Q.23:

Another large pollutant is the Norske mill in Crofton. I'm sure it affects the marine ecology as much as it affects the atmosphere.

Q.23:

Booth Inlet has definitely changed in our years here. We saw ? swans every and all winter until '97. We saw far more buffle heads, widgeons and mallards then too. The inlet is silting up and the herons fishing are fewer. Fewer rock cod out there so we don't keep them and we catch a few prawns because we're leery about how "clean" they are in these waters so near the mill. Sport fishing should be more expensive. Commercial fishers put a lot back into the stocks. But sport fishing takes a huge toll and pays a pittance.

Q.23:

The priority needs to be on preservation of the marine environment within the Gulf Islands. In order to provide maximum protection however, there needs to be ways to improve the economy so restrictions, where appropriate, can be applied without creating negative impacts on an already fragile economy.

The area needs a more progressive local government concerned not only about growth, but how to create real jobs for people.

The lifestyle many enjoy here is in danger of disappearing as the islands shift to a retirement and vacation home community. Typically, part-timers have less interest or concern about preservation.

Q.23:

I was involved in a local group trying to prevent the construction of the wharf adjacent to this property, to no avail. It seemed commerce exceeded environmental concerns and despite intended rezoning changes, the Trust saw fit to allow the wharf despite the fact that it was not in the original site requested.

Q.23:

Repeat – would like to see some areas preserved – with no fishing allowed.

Q.23:

Totally reorganize DFO – Coast Guard. Make CCG crews police officers. Like BC Ferries, DFO & CCGS are overloaded with bureaucracy.

Ban all net salmon farms – only containment with Pacific species only.

Take away the enabling act which allows the Province to ignore local districts re:location of fish farms.

Enforce the collection of two million ? owed to the Province in fines and lease rentals.

Q.23:

I feel that salmon aquaculture and its associated risks are a large burden on the Gulf Islands marine environment. Salmon aquaculture must be halted until all the impacts are studied and known (words from my son!).

I believe that we should be doing everything to maintain the pristine value of our environment, at the same time as making that a prime tourist attraction. So Green Boating, marine parks, etc, all bring \$\$ into our economy whilst having less of an impact than "farming", whether it be finfish or shellfish.

Q.23:

Restrict the use of personal watercraft. These noisy machines please only the rider, and annoy everyone

else.

Q.23:

I am deeply concerned about the effects of obvious polluters: pulp mills (Crofton), residential septic systems not working well, farm run-off of sewage, chemicals of all kinds ending up into the ocean via storm sewers, boat discharges, etc.

I am totally against fish farms, including the on-land types, discharging sewage into the ocean (ex: proposed sablefin fishery at Walker's Hook).

Huge freighters seen at Crofton going through Porlier Pass scare me: can they spill chemicals? Sludge? Oil?

Q.23:

Who's there to protect it? There are quotas for shellfish harvesting but people just take what they want – there's no-one (no fisheries officers) patrolling the beaches – ever. Who will keep boaters away from seabird colonies, dogs away from nesting oystercatchers? Much more education is necessary, and some clear enforcement of any protective measures.

There should be areas that are completely closed to any sort of marine harvesting: eelgrass beds, and areas with exceptional, rare, or unusual flora & fauna.

As mentioned, we are extremely annoyed by the garbage generated by the shellfish aquaculture in Booth Bay. It makes us have a very negative view of such operations, but at least they are not polluting the area with bacteria, feces, chemicals, and potential disease as salmon farming does – we are completely opposed to salmon farming.

I see the marine environment as something to respect, care for, and honour, not as an artificial playground for those who are insensitive to other life forms. More protection is necessary and ways of cleaning up the toxins pumped into it must be found.

Q.23:

Big issue right now – on SSI.

1. Fish hatchery for Sable Fish
2. Hand fill-ins in Ganges Harbour for B&B Marina!

Help!!

Q.23:

Feel strongly about boats that upset the wildlife – especially high speed boats along the shoreline. A speed limit would help. I've seen wildlife take off during feeding times.

Q.23:

Can seaplanes have mufflers? They're awfully loud!

Q.23:

Sewage is not a major problem. Pump-out stations are impractical on this coast (too great an area to cover) but fee-charged ones at busy marinas are good.

Aesthetically, shellfish farms are ?. If we have to have them, let them be far from popular areas.

Q.23:

Use of Gulf Islands marine environment by recreational vessels varies according to seasons & events. While generally speaking, use could be acceptable, it could be very unacceptable at another time e.g. moorage during Saturna Lamb BBQ @ the marine park, or sailboats in Ganges Hbr during the 'Round Salt Spring Race.

I think it was totally unacceptable for the government to pass a bill allowing it to site aquaculture without respect/adhering to wishes of local communities. I believe that this has handicapped the abilities of bodies like the Islands Trust to protect the local marine environment.

- ÷ “Low impact” or “high”, “moderate” needs to be defined in explicit & consistent terms with standards for each.
- ÷ Aquaculture should not be left to be primarily self-monitoring (e.g. collecting own data &

submitting to Department of Fisheries & Oceans). Monitoring should be done by independent 3rd parties. I believe that DFO is unable to provide unbiased info due to its current mandate to promote aquaculture. Current researchers have disproved DFO claims with regard to the "safety" of salmon aquaculture in BC – this has undermined my faith in DFO's ability to act as a reasonable marine steward for us.

Q.23:

I think logging is very harmful as it causes erosion on slopes and causes run-off, which may affect the drinking water supply and marine environment and air quality.

Q.23:

Proper base studies need to be done on eel-grass beds – nursery to a lot of marine species.

Also on Sargasso weed, which was introduced to these waters along with Japanese Oysters many years ago. There seems to be an awful lot of it about. Is it crowding out the natural seaweeds? Does it provide shelter for marine organisms, or is it detrimental?

The type of shrimp fishing needs to be regulated – one is much more damaging than the other.

You show boating and shellfish farm viewsapes, but even more annoying to the view are personal docks and ramps.

There should be large areas of no-fishing, no anchoring, where fish stocks can replenish.

The floating shellfish farms are still preferable to the shore leases as at Pirates Cove & Baynes Sound.

Q.23:

Preserving & protecting within good reason would still be a good guideline.

Q.23:

Having travelled by sailboat through South-East Asia, I have seen the potential disaster the marine life can become. Sailing into BC after that made me realize how incredible where we live really is and how important it is to keep it this way.

I am basically opposed to anything that pollutes our waters and strongly supportive of anything that protects and preserves the natural beauty that we have maintained thus far!

Q.23:

I believe all marine environments should benefit the people whom live in the respective regions and are available for everyone to enjoy & benefit from them.

Q.23:

I would like to see a restriction on the number of private docks being built for waterfront homes. Where a concentration of waterfront homes exists, a common dock should accommodate all the homeowners.

Q.23:

Very important portion of environment.

Q.23:

Keep the pulp mills from polluting the area & require cities & towns to treat their sewage before dumping it into the ocean.

Q.23:

Q.4 – Visual impact of logging. Yes, but the runoff impact of logging is what does the damage to salmon streams, lakes, and then it's all related to the marine environment.

Also, residence & construction polluting ground water with chemicals hurts the marine environment.

Q.23:

People have been making a mess of the planet for too long. It should be respected.

Q.23:

We wouldn't need fish farms if we would care for our wild salmon. – especially the stream conservation for spawning. We wouldn't need shellfish aquaculture if our beaches were healthy, either. I say put the energy into healthy wild fish and shellfish, instead of "farms".

I watched the heron population around the McFadden Creek estuary drop from 60 every spring to 1

heron. Herons do relocate, but now they are facing a serious drop in population. They were constantly harassed by eagles, as the eagles have fewer fish to feed on.

Q.23:

Enforce the use of holding tanks in more areas than just Montague Harbour – e.g. Ganges, Pirates Cove, Bedwell, Browning.

Regulate the crab traps in busy harbours. There must be many on the bottom of the ocean.

Q.23:

I think it will be good when all recreational boats have to have holding tanks for sewage – also when there are frequent pump-out stations installed around the coast.

Q.23:

Please remember to contact: Tsawout First Nations Band to get their input / suggestions and valuable ideas on this topic / your survey. Band counsel # 250 652 9101.

As a non-native island 'resident', I believe it is crucial for the preservation / conservation / survival / protection of the environment to be in direct communication with local First Nations Band counsel. On Salt Spring Island, there is a local "Grassroots" organisation called "SSIJAR" (Salt Spring Islanders for Justice and Reconciliation). Contact Phil Vernon @ 250 653 9482. They coalesce with the band counsel regarding various land & water (historic & political) protection issues.

Q.23:

I am opposed to the farming of Atlantic Salmon unless done on land and away from natural spawning grounds. I don't believe any good will come of this in the long-run.

Considering that we have (humans) pretty much killed off ¾ of the world's fish stocks (or severely impacted various food chains) I think it is extremely important to maintain balance of sustainable fisheries. Cuts to DFO by Liberals, watershed logging (& clearcutting), possible oil wells in Hecate Strait (etc.) all very foolish and nearsighted. We should never lose sight of the big-picture or let greed guide us, too many examples of environmental devastation on this planet.

Q.23:

High impact industrial activity in or associated with the Gulf Island marine environment is excessive.

÷ I.e. pulp mill effluent

÷ I.e. log booms

Q.23:

Concerned about float plane noise & bald eagle nests.

I feel the sewer in Ganges has badly upset and messed up Ganges Harbour marine environment. I own an Island in the harbour and the smell is so bad now, it is barely habitable.

I also think boats must be restricted in what sewage they dump. Can't dump in US waters, why can you here? Other than dumping sewage, I don't think boating is bad.

Q.23:

The marine environment is being over harvested – salmon gone, rockfish barely hanging on. Too much crabbing. Shellfish harvesters seem to know no limits. Diversity has greatly declined since I first came here in 1970. Great Blue Herons going down. Oystercatchers always bothered. Moon snails just hanging on. Red Snappers gone, as is the Octopus.

Q.23:

Aquaculture, like cattle ranching and farming, tends to get larger and larger scale. It is the size that causes problems. Small operations (like a family farm) have much lower all-round impact. Why not do aquaculture away from recreational areas?

Q.23:

The pristine nature of our local marine environment is already being compromised by the level of development allowed. It needs every possible, conceivable protection – not more development. I am totally opposed to any form of aquaculture in the Gulf Islands, and I am opposed to encouraging increased boating (pleasure or commercial) around Salt Spring Island.

Q.23:

÷ Grants to marinas for pump-out stations before creating restricted dumping zones;

- ÷ Grants for the purchase of 4-stroke outboards (over 1/3 of 2-stroke fuel is discharged in the exhaust);
- ÷ Eliminate farmed salmon;
- ÷ Reduce the herring fishery;
- ÷ Eliminate EI for commercial fishers, but allow licenses to be diversified to include "less of more".

Q.23:

Protection and preservation of existing land parks (eg Ruckle Park) with NO commercial development to be allowed in parks – on land or as a commercial boat launch or marina. We must protect the parks we have!

Q.23:

One of my main concerns is the lax laws Canada has regarding ships dumping sewage in our coastal waters. The USA is very strict and monitors the ships in their waters with the consequence that cruise ships etc dump in our waters. I have always enjoyed swimming in these waters but last year as we cruised around the Islands, I found the waters very unappealing for swimming – around Saturna, Tumbo, Prevost. There seemed to be a lot of suspended "stuff" evenly dispersed through the water that I hadn't seen before. I was also amazed to learn that many large pleasure craft have no holding tanks! What percentage, I don't know, but the one travelling with us didn't have a holding tank. It seems to me that should be mandatory if you have a head! I believe education is the key – more TV programs which seems to be the medium that has the greatest impact.

Q.23:

I believe that our natural resources – marine and land-based – are at a critical point & that a major commitment of financial resources & political will – is required to keep what we presently have from being seriously decimated. We need to have legislation (with a bite) to protect marine & land natural resources and also money & person power designated to monitor & enforce much needed legislation. Also further designation of protected areas is needed. We need a Government with a vision of the future, commitment to the environment & the "intestinal fortitude" to take the necessary action. Unfortunately the elected "powers that be" can only see as far as the next election & what decisions will create the largest contributions to their election "war chest" as well as benefit their own pockets. Dismal reality for our precious environment!!

Q.23:

I think aquaculture must eventually feed us. But it must evolve as has agriculture. Prairie farm methods 50-70 years ago were very damaging to the land – much less so now.

Q.23:

Salt Spring acts like a peace loving community. People have been living along the water for centuries, move onto their beach and the worst really comes out. How come there's no protection for us? This summer, we had by-law officers kicking campers in the ribs in the middle of the night. Does the community know how its laws are enforced? I know it sounds great to put "rules" in place. What if instead of by-laws enforced with brutality, we started teaching others to live in harmony with all things by example?

Q.23:

Our islands are in crisis, pressure coming from many angles, the commercial pressure from marinas, the aquaculture pressure, more houses on our lakes, more people putting stress on our water supply, our sewage situation.

Q.23:

I have sailed the entire BC coast – lived and sailed from Prince Rupert for 5 years. Love the ferry commute for current exposure to water. Lost boat in settlement, not sailed in several years.

Q.23:

The schools of the Gulf Islands should do more field trips to show both visual & technical affects on the environment. My kids have been in the system for 8 years and I can count on one hand for both how many "marine" related field trips or essays they have had.

If you want people to be more aware, start with the schools – kids have a way of getting the point across to adults much easier than adults do to adults. Good luck.

Q.23:

I feel we must stop over-development of ocean front properties. I hate to see how residential areas are expanding so rapidly – so vast and worry about the water supply and quality (e.g. Channel Ridge). There are too many part-time residents here – they seem to care little of our environment and too much

about the size of their house, their new pier and how much property they can fence off.

The expanding marina is one indication of how many huge recreational yachts and boats are coming to this area. I am concerned about their fuel, noise, garbage, speed – seems little regard for marine life.

Q.23:

1. Noise is significant as it travels across water – as anchorages and marinas should have a quiet time (say summer 9pm thru 9 am).
2. Float planes are noisy & have a visual impact – there should be no low flying (or joy riding). Minimum height restrictions should apply: 1500 feet over water and 1000 feet above land forms.
3. Aquaculture can be ugly – different coloured floats. Why not muted and coordinated colours? Also suggest noise during working hours only (8 am thru 6pm)?

Q.23:

Development of sustainable energy sources (wind, solar, tidal, thermal). Enforcement of current regulations. Protection of private as well as public eco-sensitive areas. Education to think sustainable and plan ahead for a change.

Q.23:

My tolerance for presence of commercial & recreational vessels is determined by the fact that I live on Ganges Harbour. It is a working harbour with consequent activity – float planes, coast guard, water taxis, school boat transport and visiting recreational vessels, fishing boats.

Two things do concern me:

1. Occasionally a dreadful sludge accumulates on my beach. I am not a marine biologist so cannot tell whether this is a natural occurrence or caused by sewage discharge or oil spills from vessels. The problem with making pump-outs is who will police this?
2. My beach is a herring spawning area. Over the years, the spawn has diminished. In 1992 it was terrific with 50 seals, several heron, eagles, gulls circling for the kill. The water was alive with silver flashes from the jumping fish. Alas, this year, there were 4 seals, gulls & a few herring.

Q.23:

Finite supply of drinking water.

Q.23:

Let's avoid getting into a fight about our resources (of course, there are already fights & conflicts). But – dialogue, round table discussions, forums would be great, so people can discuss & express their views.

Q.23:

I am opposed to farmed fish & vote with my wallet – I don't buy farmed fish. Also, I have been visiting Salt Spring for over 30 years (16 prior to moving here) & remember frequent trips to the beach to dig clams and/or pick oysters. Now they are hard to find in any quantity and/or there is a red-tide warning.

Q.23:

More social research needed! Scientific research is important but the real issue is human use – how to balance recreational & commercial use. The maintenance of ecological integrity is supposed to be the main goal of Parks Canada, so hopefully the new MPA will not be developed as much as the mountain parks have been, and will stand by the Parks Canada mandate.

Other Survey Input

Other Survey Input:

Best wishes for tackling this difficult and most important subject.

Other Survey Input:

Good luck in your study of the Gulf Islands marine environment, and all the best for your future Masters in Geography.

Other Survey Input:

Good luck with your research. I look forward to the results.

Other Survey Input:

Your questionnaire is excellent! Good luck with your Masters!!

Good luck & best wishes of success with your MA☺

Other Survey Input:

Re: Q.15: Too difficult to assess without thorough research.

Other Survey Input:

As we discussed on the phone, Q.4 is ambiguous and could be read as: 1) whenever these events occur, they have no, medium, or high impact; or 2) do you know if they have occurred and did they have no, medium, or high impacts. We flip-flopped from one interpretation to the other.

We annotated the survey to reflect our confusion about the intent of some of the questions – hope that it helps in your write-up.

Other Survey Input:

Re Q.15: Percentage is the wrong way. Use should be based on sound but reasonable policy and plans dependent on the specific area.

Other Survey Input:

I would like to be included in future research.

Other Survey Input:

Good luck with your project!

Other Survey Input:

Good luck if you can help us to be wise in these developments!

Other Survey Input:

I would be interested in receiving a summary of your results when complete. Keep up the good work!

Other Survey Input:

Would like more info.

Q.23:

This is a thorough survey! Thanks and good luck!

Other Survey Input:

Good luck with your project, Dave!

Other Survey Input:

I am very interested in receiving a summary of the results of this when completed, as well, if there is anything else that I can help you with, don't hesitate to contact me.

Other Survey Input:

No – it's a good questionnaire.

Other Survey Input:

Concerned about photo method – it is a matter of where the facilities are located (not how dense they are or how many of them).

Other Survey Input:

Dave – enjoyed meeting you. “Illegitemus non carborunden est”. Layard family motto, “Don't let the bastards grind you down”!!

Other Survey Input:

Thank you for doing this research. Please add floatplanes as a great impact item. Last summer while kayaking in Ganges Harbour, I witnessed 18 planes landing / taking off in 1 hour!

Other Survey Input:

Appreciated the diverse and comprehensive list of values. Most research like this you see is missing so much and does not allow modification – did not feel like I needed to modify your list.

Other Survey Input:

Glad to see that there is a public opinion poll.

Other Survey Input:

The questionnaire is very well thought-out.

÷ Raised my awareness;

÷ These questions are essential for long term planning;

÷ I hope the results will be published outside of academic circles as well: yacht clubs, sailing clubs, power squadron, chamber of commerce, schools (environmental studies).

Other Survey Input:

This is great David, and somewhat overdue. I hope your survey will help to positively protect what is

left of this unique landscape.

Other Survey Input:

Thank-you for increasing awareness!

Other Survey Input:

This coast is a national treasure and I'm so glad someone like you is taking care to look into protecting it! Good work!

Other Survey Input:

Q.15: Question too broad – specific areas need to be protected – I don't care about percentages.

Other Survey Input:

It's about time! Best of luck to Parks Can.

Other Survey Input:

Good luck with your project!