Incorporating stakeholder preferences, attitudes, and use patterns into marine protected area planning: a case study of recreational boating in the southern Gulf Islands, British Columbia

By

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B.Sc., University of Victoria, 2002

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ABSTRACT

Marine protected areas (MPAs) may be implemented as a means of managing human impacts on the marine environment; however, MPAs commonly have both biological *and* social goals, which are often addressed through the use of multiple use marine zoning. In British Columbia, 900 km^2 of the waters surrounding the southern Gulf Islands are under consideration for a National Marine Conservation Area (NMCA). Should the NMCA be created, a marine zoning plan will be developed for the region. Research has shown that MPAs and associated zoning schemes are unlikely to be successful at meeting their conservation objectives if they are not accepted by, and responsive to the needs of, stakeholders.

This study examines recreational boating in the southern Gulf Islands, within the context of the proposed NMCA. Specific areas of focus include: (1) activities, setting preferences, and sources of perceived conflict amongst boaters, (2) dimensions of support for and opposition to the concept of marine zoning amongst boaters, and (3) spatial patterns of recreational boating in the region. Methods included a focus group and a face-to face questionnaire, delivered to boaters in the southern Gulf Islands from June – September, 2007 (n=543, response rate=92%).

Results show that there is variability in the environmental, social, and managerial setting preferences of recreational boaters, and that boat type has an influence across all three categories. Furthermore, several activities emerged as sources of perceived conflict for recreational boaters. Reasons provided as to the nature of these conflicts indicate that

while some may be potentially addressed through marine zoning, others may be better mitigated through education and communication strategies.

While a majority of boaters are supportive of the general concept of marine zoning, there are some issues and concerns that will need to be addressed as MPA implementation proceeds. Support for marine zoning was found to be strongly related to perceived benefits, particularly environmental benefits. Major dimensions of opposition included perceptions of over-regulation, fears of losing access for boating, and mistrust of government involvement in managing the marine environment.

Spatial data was collected by asking respondents to indicate on a map the route of their current boating trip, resulting in a rich spatial dataset for recreational boating in the region. Mapping and display of this data indicates both hotspot destinations and heavily traveled corridors for recreational boating; furthermore, because spatial data can be linked to questionnaire variables, this dataset can provide the basis for a great deal of customized mapping and analysis related to spatial patterns of boating.

Given that little information on recreational boating in the region existed prior to this study, results from all three areas of focus together make a significant contribution to understanding recreational boating in the southern Gulf Islands, and provides valuable information for MPA planners and managers. In addition, this study also contributes to MPA research, recreation and leisure research, and research examining methods of spatially characterizing boating activity.

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Chapter 1:
Introduction: Rationale, Objectives, and Methods

1.0 Introduction

This study examines activities, preferences, attitudes, and patterns of use of recreational boaters in British Columbia's southern Gulf Islands, within the context of a proposed marine protected area (MPA). Such information is critical to gaining an increased understanding of this important user group, and can provide guidance to both researchers and MPA planners. The goals of this introductory chapter are to (1) provide a literature review outlining the background and rationale for the research, (2) outline the research questions of this study, (3) provide an overview of the methods employed, and (4) discuss limitations of the research. In addition, this chapter provides information for the reader regarding the overall structure of the thesis and its relationship to the discipline of geography.

1.1 Marine Protected Areas and Multiple Use Zoning

The oceans were once thought to be inexhaustible reservoirs for human use and consumption, areas so vast that they could never be affected by anthropogenic activity. However, it has become clear that this is not the case, and that human use, overexploitation, and mismanagement have put the health of the marine environment at risk (Worm *et al.*, 2006). Many fisheries are considered to be overexploited or depleted (Dayton *et al.*, 2000), affecting not only the target species, but also the ecosystem in which they are embedded (Dayton *et al.*, 1995; Pauly *et al.*, 1998). In addition to overexploitation, habitat destruction, pollution, eutrophication, and alteration of marine processes are but some of the impacts resulting from human activity (Huber *et al.*, 2003).

The root of many of these problems lies in the way that the human relationship to the sea has traditionally been defined. While relatively recent international agreements such as the United Nations Convention on the Law of the Sea have done much to delineate ownership of and responsibility for ocean resources, Hugo Grotius's 1608

notion of "*mare liberum"* or "freedom of the seas" is still a dominant ethos in many respects (Russ & Zeller, 2003). This open access nature of the marine environment has, in many cases, led to the tragedy of the commons phenomenon famously described by Hardin (1968). Hardin argued that unregulated access to a finite resource ultimately leads to overexploitation, because while the benefits of exploitation accrue to individuals, the costs are borne by the group; thus, there is very little incentive to conserve (Hardin, 1968).

The use of marine protected areas (MPAs) has emerged as a relatively recent strategy to address some the problems outlined above. Globally, 125 MPAs were recognized by 1974, a number that increased to over 1,300 by 1994 (Kelleher *et al.*, 1995), and stands at over 6,400 today (Wood, 2007). Although the term "marine protected area" can have a variety of meanings (Agardy *et al.*, 2003), the commonly cited definition is "any area of intertidal or subtidal terrain, together with its overlying flora, fauna, cultural, and historical features, which has been reserved by law or some other means to protect some or all of the enclosed environment" (Kelleher & Kenchington, 1992, p. 7). Thus, while there is often variation amongst MPAs with respect to the level of protection offered, all have in common some form of regulation, representing a fundamental shift away from the traditional open access nature of the ocean.

MPAs typically have both biological and social goals, which may include protecting biodiversity, contributing to fisheries management, separating conflicting uses, providing a forum for tourism and recreation, and promoting sustainable local economies (Jones, 2002). Considering the biological effects of MPAs, there is increasing scientific evidence that designating a marine area as "no take" (where no extraction is permitted) can have beneficial impacts on exploited species (e.g., Alcala & Russ, 1990; Wallace, 1999; Kelly *et al.*, 2000; Evans & Russ, 2004; Shears *et al.*, 2006). However, despite these potential benefits, efforts to designate MPAs are often met with resistance from user groups who fear loss of access to their social, recreational, cultural, or economic livelihoods (e.g., Fiske, 1992; Suman *et al.*, 1999; Lien, 1999; Davis, 2005). As a result, it has become apparent that the ultimate success of a MPA is intimately connected to the acceptance of it by local stakeholders. The trend has thus been away from designating an

entire area as “no take” and towards incorporating a multiple use model into MPA design that takes into account the varied biological, economic, and social needs of an area.

The use of marine zoning has become a common strategy for accommodating multiple uses within a MPA (Alder, 1996; Masica, 1999; Day, 2002). While zoning has a long history in terrestrial protected areas, it application to the marine environment is relatively new. Nevertheless, most marine zoning schemes are analogous to the UNESCO biosphere reserve concept, with highly protected core “no take” zones surrounded by zones allowing for an increasing range of use intensities (Day, 2002). MPA zoning schemes range from relatively simple two to three zone schemes (e.g. White, 2002) through to more complex schemes such as that applied to the Great Barrier Reef Marine Park (Great Barrier Reef Marine Park Authority, 2004). Common goals of a MPA zoning scheme are to protect marine resources and ecosystems, separate incompatible activities, and reduce conflicts (both between users and between users and the environment) (Bohnsack, 1996).

Given these multiple goals, it is clear that such a strategy has both a biological component and a social component. In this context, the challenge becomes how to sufficiently protect the marine environment while at the same time creating a zoning plan that is responsive to, and is supported by, the major stakeholders of a region. Consequently, developing a zoning plan requires a synthesis of a variety of information, including:

- the physical and biological characteristics of an area;
- user activities and resource use;
- stakeholder values, attitudes, and perceptions;
- conflict between different user groups; and,
- conflict between users and the environment (Laffoley, 1995).

1.2 Marine Protected Areas in Canada

With the passage of the *Oceans Act* in 1997 and the subsequent *Oceans Strategy* (2002) and *Oceans Action Plan* (2005), Canada has committed to achieving sustainable use of the coastal and marine environment. One of the ways in which this is to be

achieved is through the creation of a national system of marine protected areas. In Canada, there are three federal agencies, as well as numerous provincial agencies, with a mandate to enact some form of MPA (Dearden, 2002). Despite this, progress has been slow – a recent review by Guenette and Alder (2007) concluded that only 0.5% of Canada's exclusive economic zone was afforded any kind of protection. Reasons for the slow progress in designating Canadian MPAs include inadequate funding, the complex multi-jurisdictional nature of marine resources in Canada, the time and effort required to consult with a diverse array of stakeholders, and conflicts between conservation and commercial interests (Dearden, 2002; Guenette & Alder, 2007).

One of the federal agencies with a MPA mandate is Parks Canada, authorized to enact National Marine Conservation Areas (NMCAs) under the *National Marine Conservation Areas Act* of 2002. NMCAs are intended to be large marine areas managed for both conservation and sustainable use, and the enabling legislation specifically requires the development of a multiple use zoning plan. While the number and type of zones may vary from case to case, all NMCAs must include at least one "fully protected" zone and one zone that "fosters and encourages sustainable use" (Government of Canada, 2002). A recently released draft framework for zone types to be considered in NMCAs can be seen in Table 1.1.

The goal of Parks Canada's program is to establish a NMCA in each of Canada's 29 marine regions. While previous attempts to designate NMCAs in Canada were hampered by inadequate resources and opposition from user groups (Lien, 1999; Guenette & Alder, 2007), in October 2007, following a lengthy consultation and planning process, the federal government announced the creation of the Lake Superior NMCA – the first to be designated under the *NMCA Act* (Parks Canada, 2008a). In addition, Parks Canada is currently conducting studies to assess the feasibility of creating additional NMCAs in British Columbia's Gwaii Haanas and southern Strait of Georgia regions. It is within the context of the proposed Southern Strait of Georgia NCMA that the present research has been conducted.

Table 1.1: Draft national framework for zoning in NMCAs (after Parks Canada, 2007a)

	Zone Type				
	Access and Services	**Multiple Use**	**Conservation**	**Sanctuary**	**Special Preservation**
Level of use	A range of uses and facilities.	A range of uses including resource extraction.	A range of uses including some resource extraction. Protection of habitat is maintained.	No resource extraction. Protection of representative features is maintained.	Limited research and monitoring only.

1.3 MPAs and Stakeholder Support

The importance of Public Participation

Research in Canada and elsewhere has concluded that MPAs and associated zoning plans are unlikely to be successful at meeting conservation objectives if stakeholders do not support the initiative (e.g. Lien, 1999; White *et al.*, 2002; Clifton, 2003; Himes, 2007a). Indeed, a number of case studies have emerged documenting proposed MPAs that failed to become established due to lack of stakeholder support (Fiske, 1992; Lien, 1999; Salmanoa & Verardi, 2001), as well as established MPAs that are proving to be ineffective due to stakeholders either being unaware or unaccepting of the regulations (Elliott *et al.*, 2001; Lunn & Dearden, 2006a; Faasen & Watts, 2007). As in other areas of resource management, such examples have led to recognition of the importance of public participation in MPA planning and design. Meaningful stakeholder participation has a number of benefits, including enhanced local stewardship and support, increased understanding of diverse stakeholder perspectives, and improved overall management (Gregory & Wellman, 2001; Dalton, 2005). Furthermore, stakeholders are more likely to support decisions in which they were directly involved, thereby reducing the need for costly enforcement measures (Gillman, 2002). Ideally, participation involves a two way exchange of information between stakeholders and governing bodies (Arnstein, 1969).

The nature and extent of public participation in MPA planning varies from case to case, and is often dependent upon the size and complexity of the MPA. Small

community-based MPAs may intimately involve the local community in all aspects of MPA conception and design (e.g., Chuenpagdee *et al.*, 2002; White *et al.*, 2002; Beger *et al.*, 2005), while MPAs that deal with larger populations and more complex resource use typically have need for a central authority to coordinate planning efforts (Gillman, 2002). In cases such as these, the managing authority often relies on consultation with stakeholders through formal and informal meetings in order to ascertain the attitudes, perceptions, and issues that stakeholders may have. An example of such an approach can be seen in the current feasibility study for the Southern Strait of Georgia NMCA, where Parks Canada has been undertaking a series of public consultations over a period of several years.

While there are obvious benefits to public participation in MPA planning, there remain significant challenges to meaningful stakeholder participation. Even when a full consultative process is followed, some stakeholders may feel alienated if the final decisions do not reflect their particular values or concerns (Wolfenden *et al.*, 1994; Suman *et al.*, 1999; Stump & Kriwoken, 2006). It is also noted that stakeholder vision may, at times, directly conflict with conservation goals (McClosky, 1999; Dearden, 2002). Furthermore, there remain challenges in ensuring fair and even representation for groups that have traditionally been marginalized (Cocklin *et al.*, 1998). Finally, groups that are active in formal public participation processes may not be representative of society as a whole (Cocklin *et al.*, 1998; Wolfenden *et al.*, 1994). To counter this, it has been recommended that social science be given a more prominent role in MPA planning (Tisdell & Broadhaus, 1989; Christie *et al.*, 2003; Lundquist & Granek, 2005), and that additional research be conducted to examine those elements of society that do not necessarily take part in public participation forums (Wolfenden *et al.*, 1994; Salz & Loomis, 2004).

Studies assessing stakeholder preferences, attitudes, and use patterns

Given the above, a particular contribution for social science is research assessing the attitudes, preferences, and overall patterns of use of stakeholder groups. Such information can contribute to improved communication between MPA planners and stakeholders, aid in the design and management of an MPA that is responsive to both

biological and social needs, and facilitate successful implementation of a MPA (McClannahan *et al.*, 2005). Furthermore, tracking attitudinal data over time can also provide valuable indicators from which to measure the social acceptance of a MPA (Cocklin *et al.*, 1998; Himes, 2007b).

A number of case studies have been conducted examining the attitudes, perceptions, and preferences of a variety of stakeholders with respect to MPAs. Many of these studies have focused primarily on nearby residents or the fishing community, the latter group often being the most vocally opposed to MPA initiatives (Helvey, 2004). An example of such research includes Stump and Kriwoken (2006), who investigated the attitudes of fishers in Tasmania with respect to an overall MPA strategy and found that while many fishers object to MPAs, many would support further MPAs if the benefits of such measures became apparent. Salz and Loomis (2004), meanwhile, surveyed anglers in the United States regarding their perceptions of MPAs and various management options, providing valuable information for future planning efforts. Other research has compared the perceptions of the fishing community with other stakeholder groups. McClannahan *et al.* (2005) compared the perceptions and attitudes of fishers and park managers in Kenya, while Suman *et al.* (1999) found that fishers were more opposed to the zoning process for the Florida Keys National Marine Sanctuary than were divers or environmental groups, despite the fact that they successfully lobbied to have the amount of "no take" zone significantly reduced. In terms of studies examining residents living near MPAs, Cocklin *et al.* (1998) tracked resident perceptions over time and found that support for MPAs in New Zealand increased as time progressed. Chuenpagdee (2002) considered the attitudes of residents towards a community-initiated MPA in Mexico, while McCallum (2006) examined the attitudes of Gulf Island residents with respect to the proposed Southern Strait of Georgia NMCA. More recently, Broad and Sanchirico (2008) investigated factors influencing local resident support for marine reserve creation in the Bahamas, In all cases, the researchers stressed the utility of such information in contributing to better planning for or management of the MPA.

Another area of research has been studies examining the patterns of use of an area by stakeholders, in order to incorporate this information into informed decision making in MPA planning and design. Examples include Lunn and Dearden (2006b), who

conducted an assessment of local fishery use in Thailand's Koh Chang Marine Park in order to contribute to a future zoning plan, and Lynch *et al.* (2004), who utilized use information of divers and anglers in order to develop a zoning strategy for Australia's Jervis Bay Marine Park. In addition, Lynch (2006) focused on incorporating recreational fishery information into MPA design in Australia, while Haas *et al.* (2008) investigated spatial modeling of recreational boat fishing in Hawaii as an input into marine reserve planning and design.

1.4 MPAs and recreational boating

While attitudinal and use information for fishers and residents is important for MPA planning, there remains a need to expand this research to include a broader range of stakeholders. One often dominant user group that has received only limited attention is recreational boating. Recreational boating can be defined as boating for pleasure purposes (Widmer & Underwood, 2004), and consists of a variety of human, sail, and motor powered watercraft. Along with a general growth in marine tourism (Orams, 1999; Hall, 2001; Collins, 2008), recreational boating is an activity that is gaining in popularity in coastal and marine environments (Widmer & Underwood, 2004; Sidman & Fik, 2005). It is a particularly popular activity in Canada, as evidenced by the 2.9 million recreational vessels owned, an average of approximately one boat per eleven residents (Genesis Public Opinion Research, 2007).

Marine recreational boating has both potential compatibilities and conflicts with MPA goals. For example, an important role of many MPAs is the provision of opportunities for sustainable ecotourism (Agardy, 1993), and recreational boating can be a significant form of such tourism (Sutton, 2005). Indeed, most marine-based tourist activities require the use of a boat, either as the primary activity or as a means of transport for the activity. Furthermore, recreational boating can make a significant contribution to local economies through boater trip spending (e.g., Lee, 2003). In Canada, it has been estimated that recreational boating in all its forms contributed approximately $12.6 billion to the national economy in 2006 (Genesis Public Opinion Research, 2007).

Despite the positive social and economic impacts associated with recreational boating, research has documented a number of environmental impacts associated with the activity, particularly where it occurs in high concentrations. These include:

- impacts of anchoring on benthic communities (Creed & Filho, 1999; Brackhurst & Cole, 2000a; Leatherbarrow, 2006; Lloret *et al.*, 2008a);
- impacts of wake, both on shorelines and marine organisms (Bishop, 2008);
- impacts associated with pollution from sewage discharge (Guillon-Cottard *et al.*, 1998; Shafer & Yoon, 2005; Leon & Warnken, 2008), antifouling paints (Albanis *et al.*, 2002; Valkirs *et al.*, 2003), and litter (Brackhurst and Cole, 2000b; Bauer *et al.*, 2008);
- impacts of boating infrastructure, such as marinas and docks (Burdick & Short, 1999; Paoli *et al.*, 2008); and,
- impacts on a variety of marine fauna, including (but not limited to) seabirds, shellfish, dolphins, and whales (Burger, 1998; Janik & Thompson, 1996; Foote *et al.*, 2004; Wall *et al.*, 2005; Bain *et al.*, 2006).

Given the above issues, recreational boating is an activity that has the potential to be impacted by any MPA designation, and one which must be considered in the development of a marine zoning plan. Furthermore, it is also an activity that has traditionally enjoyed free and open access to coastal and marine areas. Despite this, there have been very few studies investigating the relationship between boating and MPAs. However, one study (Sutton, 2005) examined factors influencing boater satisfaction in the Great Barrier Reef Marine Park, and demonstrated that boater satisfaction with a MPA experience is multi-dimensional, and that differences exist in satisfactions depending on the overall activity that a boater is engaged in. Salmanoa and Verardi (2001), meanwhile, describe the ongoing conflict between a proposed MPA near Portfino, Italy, and the recreational boating community over a zoning scheme that would prohibit boater access to a portion of the coast. In this case, recreational boaters proved to be a powerful lobby group that effectively stalled the MPA from proceeding

(Salmanoa & Verardi, 2001). Such an example demonstrates the importance of considering the boating community in any MPA planning process.

1.5 Study Goals and Objectives

Given the context outlined above, this study partially addresses the existing research gap by focusing on a subset of the recreational boating population in the southern Gulf Islands, British Columbia. Specifically, this research aims to achieve a greater understanding of boater preferences, attitudes, sources of conflict, and use patterns, particularly as they relate to the proposed Southern Strait of Georgia NMCA. While the term "recreational boating" can refer to a broad range of boat types, the primary population of interest in this study was motor or sail powered recreational cruisers accessing southern Gulf Island anchorages during the peak summer season. Specific objectives and questions that this study addresses include:

(1) Examining boater activities, preferences, and sources of perceived conflict
   (a) What is the demographic profile of recreational boaters in the region?
   (b) What are typical activities pursued by boaters when engaged in boating?
   (c) What setting characteristics (environmental, social, and managerial) are particularly important to recreational boaters?
   (d) What perceived conflicts exist between recreational boaters and other marine activities in the region?

(2) Assessing the level of support amongst recreational boaters for marine zoning strategies
   (a) What is the level of support amongst boaters for (i) the general concept of marine zoning, and (ii) specific management strategies that may form the basis of a zoning plan?
   (b) What are the factors influencing boater support for or opposition to marine zoning?

(3) Examining the distribution, density, and intensity of use of boating in the region
   (a) What are the characteristics of boating trips in the region (vessel type and size, trip duration, number of passengers)?
   (b) What is the spatial distribution and intensity of use of boating in the region, both in terms of travel corridors and hotspot destinations?

As there presently exists very little information in this regard, this study will contribute to a baseline understanding of this important user group in the southern Strait of Georgia. Furthermore, it is anticipated that by examining these issues in advance of the NMCA being established, this study will contribute to enhanced communication between boaters and MPA planners, and, ultimately, contribute to developing a NMCA zoning plan that not only protects the marine environment, but is also responsive to boater needs. Finally, this study will contribute to the MPA literature by focusing on the reaction of an important and understudied stakeholder group to an MPA proposal, as well as to recreation and leisure literature by drawing upon several theories and concepts from the canon.[1]

1.6 Structure of the thesis

The purpose of this thesis is to explore three related but discrete aspects of recreational boating in the southern Gulf Islands, within the context of the proposed NMCA. As a result, chapters two through four have been written as stand-alone manuscripts, complete with their own abstracts, introductions, literature reviews, methods, results, and conclusions. Given this structure, there is a certain unavoidable level of repetition throughout the thesis.

The thesis has been divided into five chapters:

- Chapter 1 has, thus far, outlined the broad background and rationale for this research, including a review of literature pertinent to this rationale. Furthermore, the following material of this chapter describes the study area and methodology in greater detail

[1] See Chapter 2 for a literature review in this area.

than is afforded by the constraints of the manuscript format of Chapters 2-4. However, because each of these chapters also discusses the methods as they relate specifically to a single area of focus of this study, in some cases the reader is referred to chapters 2, 3, and 4 for more issue-specific discussion of the methods.

- Chapter 2 examines the demographics, activities, setting preferences, and sources of perceived conflict amongst recreational boaters. As this chapter draws upon concepts and theories from recreation and leisure research, it also includes a literature review of these concepts, including the behavioural approach, the recreation opportunity spectrum, and models of recreation conflict.

- Chapter 3 examines dimensions of support for or opposition to the concept of marine zoning amongst boaters, and includes results and analysis from both quantitative and qualitative portions of this study.

- Chapter 4 discusses the spatial characterization of boating activity in the southern Strait of Georgia, and assesses the use of a face to face questionnaire at obtaining such information. Included in this chapter is a literature review of different methods for spatially characterizing recreational boating.

- Chapter 5 summarizes the major findings from all three portions of this study, and makes recommendations for both management and future research.

1.7 Study Area

The southern Strait of Georgia (SSG) is located on the southwest coast of British Columbia, between Vancouver Island and the B.C. mainland (see Figure 1.1). It is connected to the Pacific Ocean via Haro and Juan De Fuca Straits, and adjoins Puget Sound in Washington State to the south. With the warmest and most humid climate in Canada, the region is unique in the country in terms of both wildlife and vegetation (Davenne & Masson, 2001); as a result, it is home to some of Canada's most endangered

ecosystems – both terrestrial and marine. Situated in the heart of the SSG are the southern Gulf Islands (SGI), an archipelago of inhabited and uninhabited islands and islets that provide seasonal and year-round residence for many, and represent extremely popular tourist destinations, particularly during the summer months.

Given its location adjacent to major population centres of both British Columbia and Washington State, the southern Strait of Georgia is one of the most heavily used marine waterways in Canada, and accommodates a large number of commercial, transport, and recreational activities. B.C. Ferries operates regular passenger ferry service between the mainland, Vancouver Island, and several of the Gulf Islands. Commercial activities include fishing and crabbing, which occur in the region throughout the year. Shipping activities, including freighters and tugs, are also common in the region; in addition, major U.S. shipping lanes exist just outside of the boundaries of the SSG. Commercial shellfish aquaculture occurs in the SSG in several locations. Commercial whale watching vessels also operate in the area, particularly during the summer months. Finally, the SSG/SGI region is also extremely popular for a variety of marine-based recreation activities, including recreational fishing, scuba diving, kayaking, sailing, and power cruising.

With its geographical location, sheltered waters, and mild climate, the SSG is extremely accessible to a large population of recreational boaters. The SGI in particular are a major focal point for boating in the region; indeed, together with the San Juan Islands of Washington State, they comprise one of the most desirable cruising grounds in western North America. The region contains a number of provincial marine parks, created in the 1980s and 1990s with significant contribution from the B.C. Council of Yacht Clubs. These marine parks, together with a system of marinas, docks, undeveloped anchorages, and a national park, provide varied and extensive opportunities for recreational cruising in the region (Vassilopolous, 2006). While recreational boating occurs in the SSG throughout the year, the peak cruising season occurs in the summer months. Research has shown the boating population during this time consists of a combination of residents and tourists, including a significant population from the United States (Parks Canada, 2007b). While the number of recreational vessels utilizing the region is known to be high, the precise number is currently unknown. However, given

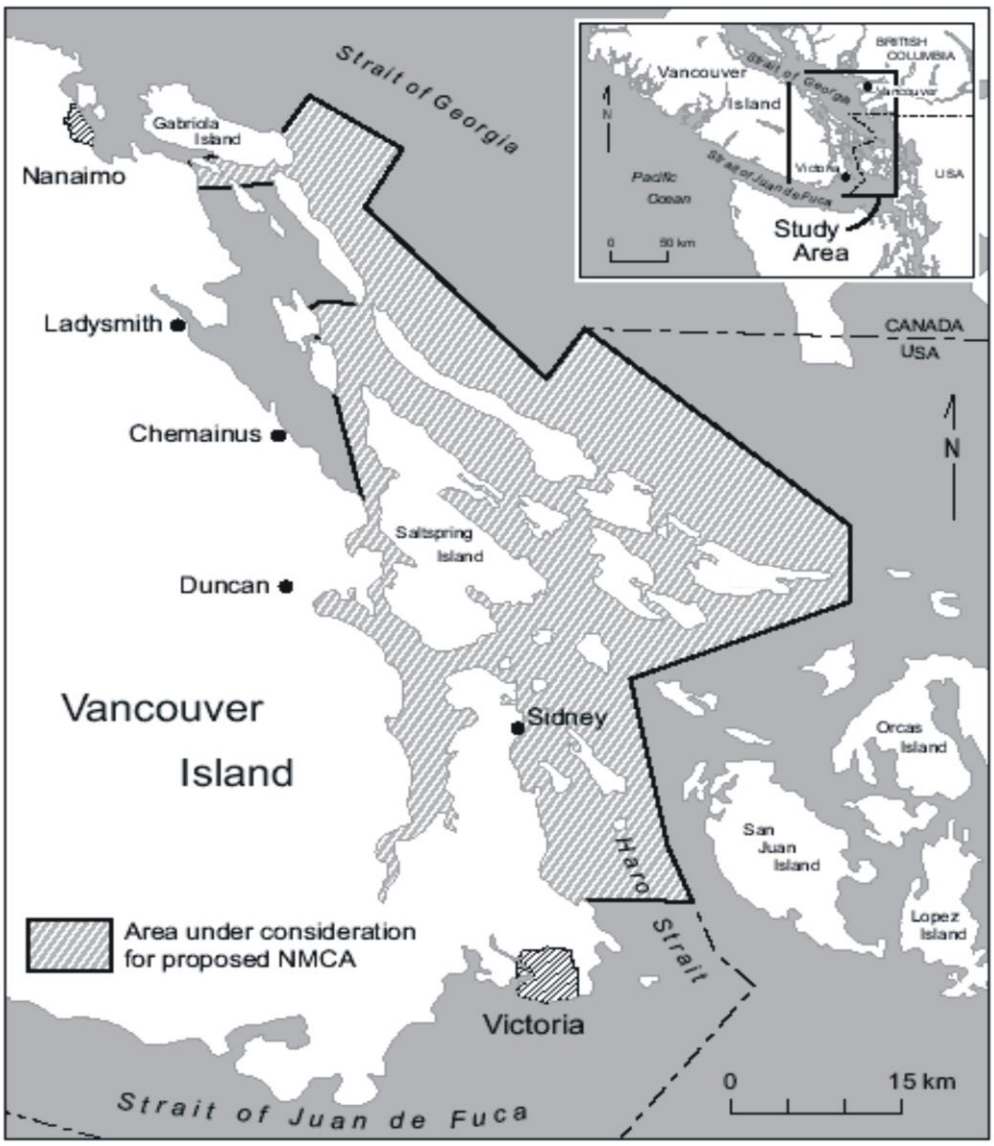
that the climate of the area allows for year-round boating, user days per boat in the region is estimated to be up to five times higher than in other Canadian coastal areas (Fisheries and Oceans Canada, 2003).

In addition to a range of human activity, the protected waters and tidal channels of the SSG/SGI also support a large amount and diversity of marine life, including several species of marine mammals, over 200 species of fish, in excess of 1,500 species of invertebrates, hundreds of species of seabirds, and approximately 500 species of plant life (Georgia Strait Alliance, 2008). A species of particular focus in the region is a threatened population of southern resident orcas (*Orcinus orca*), which have experienced an approximate 20% decline over the past twenty years. In recognition of the ecological and social importance of the SSG region, approximately 900 km^2 of the waters surrounding the southern Gulf Islands are currently under consideration for the Southern Strait of Georgia National Marine Conservation Area. The governments of Canada and British Columbia are jointly undertaking a study to assess the feasibility of creating the NMCA; as part of this study, biological and socioeconomic data are being compiled for the region. Furthermore, Parks Canada has held a series of public consultations and open houses over a period of several years. Should the current study conclude that the NMCA is feasible, a draft zoning plan will be developed for the area. While the precise boundaries of the proposed NMCA have yet to be determined, the most recent draft boundary of the study area is depicted in Figure 1.1.

In addition to the proposed NMCA, there currently exists some additional limited marine protection in the region. The Gulf Islands National Park Reserve (GINPR), created in 2003, protects approximately 35 km^2 of terrestrial land, as well as 26 km^2 of near-shore marine area, spread throughout a number of sites in the region. As with all of Canada's terrestrial national parks, the protection of ecological integrity is the foremost management goal of the GINPR. A zoning strategy for both terrestrial and marine areas has been included in the park's interim management guidelines, which are expected to be finalized with the completion of the GINPR management plan (Parks Canada, 2008c). In addition to the GINPR, the region's provincial marine parks provide some limited protection for the marine environment, although they are often managed primarily for recreation (Jamieson & Levings, 2001). Finally, portions of the marine environment are

also provided some protection through land use zoning policies at the regional and municipal level, such as those of the Islands Trust.

Figure 1.1: Study Area: The Southern Strait of Georgia, British Columbia



1.8 Methodology

1.8.1 Overall Approach

This study, examining issues relevant to recreational boating and MPA planning in the southern Gulf Islands, represents an exploratory case study approach. As noted by Yin (1992), a case study involves focusing on a contemporary phenomenon in its real life context, often using multiple sources of evidence. This study employs multiple sources of evidence through the use of a "mixed methods" strategy, utilizing both quantitative and qualitative data sources. While the blending of qualitative and quantitative techniques is an emerging practice (Creswell, 2005), a particular strength of the approach is that it allows for triangulation, which involves the use of multiple methods "in a converging fashion, so that the data should triangulate over the facts of a case" (Yin, 1992, p.131). Although a potential shortcoming of the case study is its lack of generalizable results beyond the study area (Yin, 1992), a body of knowledge related to stakeholders and MPAs can only be built through a compendium of such case studies.

In using qualitative and quantitative techniques, it is recognized that each have their own particular strengths (Mitra & Lankford, 1999). Quantitative methods, which stem from the positivist tradition, may be best suited to questions involving breadth, and questions asking "how much, how many, or how often" (Henderson & Bedini, 1995, p. 126). Qualitative methods, rooted in the interpretive tradition, are well suited for questions involving depth, such as understanding meaning or capturing rich descriptions (Denizen & Lincoln, 1994; Henderson & Bedini, 1995). While some researchers have claimed that the two types of data are so fundamentally different that linking them becomes impossible, others claim that the strengths of both qualitative and quantitative data can be combined by linking them in a single study (see review in Henderson & Bendini, 1995).

The primary research instrument used in this study was a structured, quantitative questionnaire; however, this study also made use of qualitative data in the form of a focus group meeting and several unstructured, open-ended questions in the questionnaire. Thus, while both qualitative and quantitative methods were employed, the approach used can perhaps best be described as an encapsulated or nested approach (Henderson &

Bedini, 1995), in which qualitative methods have been embedded in a primarily quantitative study for the purposes of verifying and clarifying findings pertinent to certain research questions.

The following sections outline the methods used in this study. However, in some cases, the reader is referred to the methods sections of chapters 2-4 for more detailed discussion of some aspects of the methods as they relate to specific research questions.

1.8.2 Focus Group

Rationale

A focus group is "a one-off meeting of between four and eight individuals who are brought together to discuss a particular topic chosen by the researcher, who moderates or structures the discussion" (Bedford & Burgess, 2001, p. 126). A researcher will typically select focus group respondents because they have certain characteristics in common that are of interest to the study (Krueger, 1988). Because focus groups emphasize conversation amongst a group of individuals, they have a number of benefits. Krueger (1988) and Bedford and Burgess (2001) outline the main benefits of a focus group as follows:

- it places the individual in a group setting, where conversations can develop more than in an interview setting;
- it is a socially oriented research procedure that captures the dynamics of a group;
- it allows for probing and further exploration of issues;
- it can provide researchers with multiple understandings of an issue; and,
- it is a method that has high face validity.

Despite these potential benefits, focus groups also have challenges associated with them, including the fact that they are dependent on often difficult to predict group dynamics, the risk of one participant dominating the discussion, and issues associated with inexperienced or unskilled moderators (Krueger, 1988). However, this last issue in particular has been questioned by some authors, who note that inexperienced facilitators may still elicit valuable data from a focus group, as long as they possess the ability and

willingness to listen and an interest in the subject matter (Goss, 1996; Bedford and Burgess, 2001).

While focus groups have often been employed in the services of market research, they also have significant utility to social scientists. In particular, they allow for a deeper exploration of a the way in which people regard an idea, concept, or reality (Krueger, 1988); for example, a researcher conducting a focus group can explore not only attitudes, but some of the underlying reasons for these attitudes. Furthermore, it is noted that one of the common uses of focus groups is in informing and guiding the design of questionnaires (Krueger, 1988; Bedford & Burgess, 2001).

Design, Conduct, and Analysis

In this study, a focus group consisting of representatives from six local boating organizations was held on May 31, 2007. The primary goal was to explore in greater detail the attitudes that boaters hold towards the proposed NMCA and the concept of marine zoning; however, a secondary goal was to provide feedback on, and inform the design of, a draft questionnaire. The sampling strategy for this session was purposive, as invitations were sent to the heads of local boating organizations. In utilizing such a sampling strategy, the intent was to deliberately recruit information-rich cases in the form of individuals who are deeply involved in the recreational boating community; however, it must be recognized that such individuals are not necessarily representative of the boating community at large.

While eight representatives expressed interest in attending the focus group meeting, six members were actually able to attend on the selected date. Although some of the participants did know each other from previous experience, this was considered unavoidable due to the overlapping nature of local boating organizations. There exists debate amongst authors as to whether previous acquaintance affects the outcome of focus group sessions. Some authors have stressed that focus groups should be comprised of strangers (Krueger, 1988), while others have noted that a previously existing social relationship can promote more free and easy discussion amongst participants (Bedford and Burgess, 2001). From this author's observation, the pre-existing relationships did not affect the flow or tone of the discussion, and in fact contributed to a collegial and open

atmosphere during the session. While the session was for the most part unstructured, a series of five general questions related to the NMCA, management of the marine environment, and concept of zoning were used to guide and direct the discussion of the group. At the end of the session, participants reviewed a draft version of the questionnaire, providing comments and feedback.

With the permission of the participants, the focus group was audio recorded, and was transcribed following the session. Analysis of the transcribed data involved isolating dominant and recurring beliefs and perceptions, particularly those related to the NMCA and zoning. These were categorized according to major themes, which were used in two ways. First, they contributed to refining some of the items in the questionnaire, particularly belief scales related to perceived benefits and constraints of zoning (see Chapter 3). Second, analysis of the focus group discussion was used as its own form of qualitative data, which contributed to adding depth and verification to questionnaire results regarding attitudes towards the NMCA and zoning, as is discussed in Chapter 3.

As noted by Baxter and Eyles (1997), one way to establish rigor in qualitative analysis is to return to research participants near the end of the study, to present the findings and interpretations of the researcher. Consequently, on October 27, 2008, the focus group members were re-convened and presented with an overview of the results, conclusions, and interpretations of the data produced through this study. Focus group participants were generally in agreement with the conclusions reached, which contributes to establishing the validity of the research findings.

1.8.3 Structured Questionnaire

Rationale

A quantitative questionnaire was chosen as the primary research instrument in this study for several reasons. First, while it is recognized that questionnaires are limited in terms of depth of exploration of a topic, the research questions that this study set out to address are varied and broad, and thus are well suited to the breadth that a questionnaire affords. Furthermore, given sufficient sample size, the use of a questionnaire has the distinct advantage of being able to identify the attributes of a larger population based on

results from a smaller subset of that population (Babbie, 1990; Salant & Dillman, 1994). Third, the use of a structured questionnaire allows for statistical analysis to be applied to the data in order to examine relationships between variables under study (Rea & Parker, 1992). Several areas of interest to this study, including the influence of boat type on setting preferences and perceived conflict, as well as factors influencing support or opposition to marine zoning, lend themselves well to this type of analysis. Finally, the nature of the questions themselves is well suited to a quantitative questionnaire. Assessing demographics, preferences, and attitudes is a common area of study for recreation research, and this is often accomplished through the use of questionnaires (Manning, 1999).[2]

Design & Testing

The questionnaire was designed as a booklet (Appendix D), guided by methods outlined by Salant and Dillman (1994). A total of 33 questions were developed to address the research objectives, including sections soliciting information on boater demographics, setting preferences, perceptions of other marine activities, attitudes towards marine zoning, and vessel and trip information. Most questions involved closed-ended or Likert-scale response categories, although for four questions respondents were afforded the opportunity to express themselves in an unstructured, open-ended format (see Chapters 2 and 3). In addition, boaters were provided with an 8.5" x 11" 1:450,000 scale map of the region, on which they were asked to plot the route of their current trip, including start point and locations of stops while en route. In order to minimize repetition in this thesis, specific, detailed descriptions of the questionnaire design as it relates to individual research objectives can be found in the methods sections of chapters 2, 3, and 4.

The initial draft questionnaire was developed based on a review of other boating-related studies, discussions with Parks Canada, and feedback from my supervisory committee. It was then reviewed by the focus group participants, and several changes to

[2] Further rationale for the use of a questionnaire as it relates to specific research questions can be found in the methods sections of Chapters 2, 3, and 4. In particular, the use of a questionnaire to collect spatial information for recreational boating is a topic that is afforded a great deal of discussion in Chapter 4.

content, terminology and phrasing of questions were made based on this feedback. Finally, the questionnaire was pilot tested with 15 recreational boaters at Sidney Spit on June 16, 2007. Following this pilot study, several other minor revisions were made to the questionnaire.

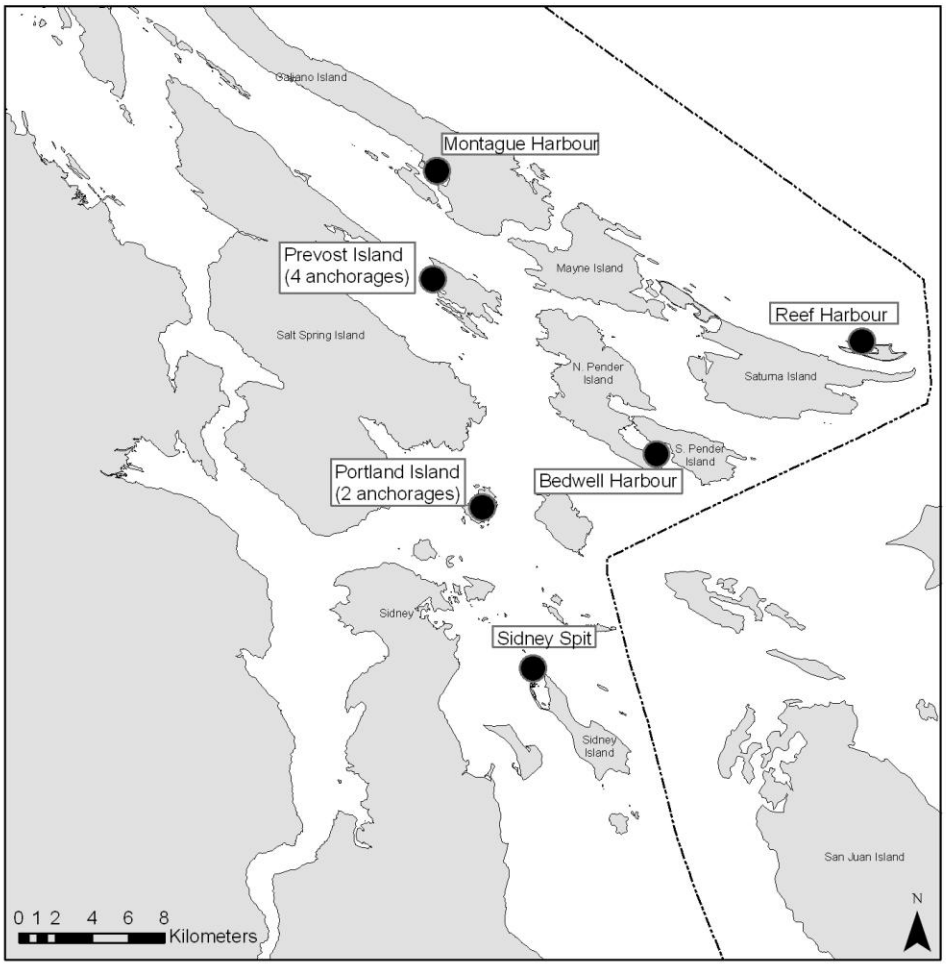
Administration and Sampling

A number of survey types are available to researchers, most notably mail surveys, telephone surveys, and face to face surveys (Salant & Dillman, 1994). Other research into recreational boating has often employed mail or telephone surveys based on local vessel registry databases (e.g., Heatwole & West, 1982; Lee, 2003; Sidman & Fik, 2005), and a particular strength of this method is that it enables the most random sample of boat owners. However, despite the fact that a registry of vessel owners in Canada exists, a mail or telephone survey based on this information was not considered to be a viable option for this study. The primary population of interest in this study was recreational cruisers visiting the southern Gulf Islands, and given that past research has indicated that up to 20% of registered vessels in the region are not used in saltwater (Mos & Harrison, 1974), any sampling strategy based on the vessel registry would capture a large amount of boaters that would be excluded from this research. More importantly, such a method would fail to capture out of province boaters and U.S. vessels, which can comprise 30% of the boating population in the region during the summer months (Parks Canada, 2007b). Given the above issues, a face to face approach was deemed to be the only feasible method of capturing a range of the recreational cruising population that visits the study area. As noted by Salant and Dillman (1994), such an approach is best used when a population list from which to derive a sampling frame is not available.

Given the large number of entry and exit points for boating in the region, developing a sampling strategy for a face to face survey was a considerable challenge for this study. Because it was not possible for the researcher to spend time at all potential anchorages or entry points within the southern Gulf Islands, a stratified random sampling strategy was employed. Such an approach has been successfully used in other recreation-based studies for which a large number of potential destinations exist within a study area

(e.g., Needham, 2004). Because this research was interested in obtaining information from a wide range of the recreational cruising population, and given that past research in the region has indicated that different sites attract different intensities of use and types of boats (Leatherbarrow, 2006), sample sites were selected to represent a range in terms of spatial distribution, facilities offered, and estimated intensity of use. However, in the absence of data on use levels in the various Gulf Islands anchorages, sample sites were chosen based on discussions with my supervisory committee, feedback from focus group participants, and input from management agencies. Six primary sampling sites were subsequently chosen, comprising ten distinct anchorages (see Figure 1.2). The general characteristics of each site, along with number of questionnaires completed per site, can be seen in Table 1.2.

Figure 1.2: Survey locations in the southern Gulf Islands



The survey was delivered from June 25 to September 3, 2007. Eight sampling days were conducted at each site, covering every day of the week and representing days in the early, mid, and late summer season.[3] The sampling schedule consisted of an eight day cycle of three days at one site, three days at another site, and two days to re-provision. Given the high daily turnover rate of vessels at each location, this proved to be an effective strategy. However, it should be noted that due to some required boat repairs in mid July, there was a five day period in which no sampling occurred (July 20-24). Data collection typically occurred between approximately 12:00 p.m. and 8:00 p.m.

For some sampling days and sites, the number of vessels was low enough (approximately 10 or less) that a census of vessels was undertaken when the researcher was on site. However, often a large number of vessels required the use of a spatial random sampling strategy to ensure that boats within each destination were sampled at random. Using Garmin Mapsource software (Garmin, 2007), a $100m^2$ grid was applied to each anchorage area, and GPS waypoints were generated for intersections of the grid lines. While on site, a waypoint would be selected at random, and the vessel that was closest to that waypoint would be selected. Sampled vessels were approached while moored, anchored, or docked and, after being given a brief introduction to the research, the boat owner was invited to participate in the study. If they agreed, they were provided with a copy of the questionnaire, as well as a consent form outlining in greater detail the purpose of the study (Appendix C). Questionnaires were typically left with the boat owner to be completed, and were collected later in the day, at which time the researcher would answer any questions or discuss any issues that the respondent had. A large majority of questionnaires (93%) were collected later in the same day; however, for those boaters who did not have time to complete the questionnaire on site, a mail-back option was provided. The number of questionnaires completed per day proved to be variable, and was dependent upon the number of boats on site (affected by sample location, weather, and date), the spatial distribution of boats (vessels that were more spread out took longer to access), and the extent to which respondents wished to discuss the research

[3] Results from the pilot study of the questionnaire were also utilized in this study, resulting in nine sample days at Sidney Spit.

topic before of after completion of the questionnaire (many boaters did wish to discuss the study).

Overall, boaters were open to the research topic, and the strategy outlined above resulted in 543 completed questionnaires out of 591 invited to participate, for a response rate of 92%. 38 (7%) of the 543 completed questionnaires were returned by mail. Of those who chose not to complete the questionnaire, the most common reasons provided were a lack of time or interest. Non-responses were tracked based on boat type and country of origin, and no significant patterns were observed. While the total number of vessels accessing the region during the summer months is unknown, a sample of 543 is considered to have a sampling error of ±5% for a population of 1,000,000 or more at the 95% confidence level (Salant & Dillman, 1994). Towards the end of the research season, there were indications that saturation was being approached, as it became extremely common to enter an anchorage and find one or more vessels that had been intercepted earlier in the summer.

Analysis

As outlined in the results sections of Chapters 2 and 3, a number of statistical analysis techniques were applied to examine the relationships between variables in the questionnaire, including the chi-square test, the t-test, factor analysis, and multiple regression analysis. Furthermore, Chapter 4 outlines the manipulation and analysis applied to the spatial data obtained from the route maps. Qualitative responses to open ended survey questions regarding perceived conflict and attitudes towards marine zoning were content-analyzed, categorized, and reported on in Chapters 2 and 3. While the reader is referred to these chapters for further information on the analysis of the data, one issue that warrants discussion here is the use of Likert scale data.

In this study, Likert scale data has been treated as interval scale data, in order to perform more powerful statistical analyses throughout the study. However, it is recognized that this is a subject of long standing debate in the social sciences. Some researchers claim that Likert scale data unequivocally falls within the ordinal scale of measurement, and thus is not appropriate for any parametric statistical test (e.g. Jamieson, 2004). Others, however, contend that because Likert questions occur on a scale,

responses can be converted to a numerical format and thus treated as interval (e.g., Pell, 2005). Another perspective claims that rather than level of measurement, sample size and distribution of data should be the criterion when determining whether to use parametric or nonparametric tests (Knapp, 1990). While a resolution of this debate is far beyond the scope of this thesis, this author subscribes to Pell's contention that "it is acceptable, in many cases, to apply parametric techniques to non-parametric data such as that generated from Likert scales, provided that the assumptions are clearly stated" (2005, p. 970). This thesis has in many cases treated Likert data as interval, making the assumption that the scaled nature of the questions makes this a valid approach. In doing so, this research is consistent with a large body of research in recreation and tourism research that commonly does likewise (see Manning, 1999).

Table 1.2: Survey location characteristics, and number of surveys completed

Anchorage	Location	Jurisdiction	Facilities offered	# surveys	% total surveys
Sidney Spit	Sidney Island	Parks Canada	Mooring buoys, dock, terrestrial park space	121	22%
Bedwell Harbour	Pender Islands	Parks Canada	Mooring buoys, marina nearby, terrestrial park space	120	22%
Montague Harbour	Galiano Island	BC Parks	Mooring buoys, dock, marina nearby, terrestrial park space	90	17%
Princess Bay	Portland Island	Parks Canada	Dinghy dock, terrestrial park space	57	10%
Reef Harbour	Tumbo/Cabbage Islands	Parks Canada	Mooring buoys, terrestrial park space	39	7%
Annette Inlet	Prevost Island	Private	None – anchorage surrounded by private land	39	7%
Royal Cove	Portland Island	Parks Canada	Dinghy dock, terrestrial park space	26	5%
Glenthorne Passage	Prevost Island	Private	None – anchorage surrounded by private land	25	5%
James Bay	Prevost Island	Parks Canada	Terrestrial park space	17	3%
Selby Cove	Prevost Island	Private / Parks Canada	None – anchorage surrounded by private land and some park land (no access from Selby Cove)	9	2%

Limitations

While the study was designed to address the research questions as best as possible, it is important to recognize the limitations of the research design. One limitation is that this study only focuses on a portion of the boating population in the southern Gulf Islands. While the term "recreational boating" is often used in this thesis in describing the results, it must be recognized that this research focused on primarily overnight and day cruisers who moor, dock, or anchor in one of the selected anchorages. Other members of the recreational boating population, including human powered watercraft (e.g. rowboats, ocean kayaks), personal watercraft (jet skis), and small motor powered craft that typically do not anchor or moor were excluded from this research.

It is also important to recognize potential sources of error in any questionnaire-based study. While efforts were made to randomize respondent selection as much as possible, the sampling strategy was not completely random, as it focused on only ten anchorages and on predetermined dates. Furthermore, a related limitation is a certain amount of coverage error, which occurs when a portion of the population of interest is excluded from the sampling design (Salant & Dillman, 1994). While care was taken to select the sample sites in this study to represent a range of destinations, any recreational boater in the study area that does not visit any of the sampled anchorages had no chance of being intercepted. For example, because marinas were not sampled as part of this study, any boater who visits marinas exclusively would be subject to coverage error.[4] While some amount of coverage error is thus unavoidable in this study, it is thought to be minimized by the fact that a large majority of boaters intercepted were on multi-destination cruises in the region (see Chapter 4), as well as by the fact that this study had both a large sample size (543) and a high response rate (92%).

[4] Although it should be noted that both Montague Harbour and Bedwell Harbour have marinas very nearby, and vessels that were anchored just outside of the marinas were sampled.

1.9 The geographic focus of this thesis

This thesis has been written in partial fulfillment of the requirements for a Master of Arts degree in the field of geography; as such, it is important to recognize the relationship between this thesis and the discipline. While geography can be literally defined as writing about the earth, it is an area of study that is characterized by a great deal of diversity, and is thus difficult to concisely define. Although the two major divisions in the study of geography are often described as human and physical (Norton, 2007), many areas of geographical inquiry are not so easily categorized. Indeed, geographical study often lies at the nexus of both the physical and social sciences (Small & Witherick, 1989). However, three areas that are often seen to be common to geographical research include the relationship between people and the environment, spatial relationships and patterns, and regional or place-based analysis (Mitchell, 1989; Small & Witherick, 1989). This study incorporates elements of all three aspects of geographical inquiry. First, it is a place-based study in that it is focusing on the southern Gulf Islands region of British Columbia, Canada. Second, by examining the attitudes and preferences of boaters, as well as ways in which boaters use the marine environment of the southern Gulf Islands, this research is clearly concerned with the relationship between people and the natural environment. Finally, this study is also concerned with spatial patterns – in this case, the spatial patterns of use of recreational boaters within the southern Strait of Georgia.

As this research is social-science based and primarily focused on human use, attitudes, and perceptions, it clearly draws upon aspects of human geography, which can be defined as "the spatial differentiation and organization of human activity and its interrelationships with the physical environment" (Johnston *et al.*, 2000, p. 353). However, as it is also concerned with how such information can inform the management and allocation of marine resources in the southern Gulf Islands, this study is also falls under the mantle of resource management. Mitchell (1989) defines resource management as "the actual decisions concerning policy or practice regarding how resources are allocated and under what conditions or arrangements resources may be developed" (p. 3). It has been recognized that social science has an important role to play in resource

management decisions in general (Haider & Morford, 2004), as well as parks and protected area management in particular (Rollins & Robinson, 2002). Consequently, this study makes a contribution to resource management through its application of social science information to potential management decisions in the southern Strait of Georgia.

1.10 Summary

This study addresses an existing research gap by examining the relationship between recreational boating and marine protected areas, with focus on attitudes, perceptions, and patterns of use of recreational boaters in the southern Gulf Islands, British Columbia. This chapter has focused on providing a broad description of the rationale and background for the research, as well as an overview of the methods employed. However, because chapters two, three, and four have been written as "stand-alone" manuscripts, the reader is referred to each of these chapters for additional issue-specific discussion of these areas.

Chapter 2

Activities, setting preferences and conflict among recreational boaters in a proposed marine protected area: implications for research and management

Abstract. Marine protected areas (MPAs) and associated zoning plans must be accepted by and responsive to stakeholders if they are to be successful at meeting their conservation objectives. Such strategies thus require an understanding major stakeholder groups. Using the recreation opportunity spectrum (ROS) and models of recreation conflict as a basis for investigation, this paper examines the influence of boat type on activities, setting preferences, and perceived conflict amongst recreational boaters in a proposed MPA in British Columbia, Canada. A survey of recreational boaters (n=543) was conducted during the peak summer season, 2007. Results show variability amongst boaters with respect to activities and setting preferences, and that boat type has a varying degree of influence on both. This supports the potential application of an ROS-based approach to MPA zoning for boating. Results also indicate that there are several marine activities that are perceived as conflicting with recreational boating; reasons provided as to the nature of these conflicts indicate that some may be addressed through zoning, while others may be more suited to education and communication. Recommendations for both research and management are made.

2.1 Introduction

Marine protected areas (MPAs) are commonly employed in an effort to manage anthropogenic impacts on marine ecosystems. While MPAs may serve a variety of roles, much of the literature has focused on their contribution to protecting biodiversity and managing fisheries. Indeed, there is increasing evidence that "no take" areas (where no extraction is permitted) can have beneficial impacts on a variety of marine species (e.g. Alcala & Russ, 1990; Wallace, 1999; Kelly *et al.*, 2000; Evans & Russ, 2004; Shears *et al.*, 2006). However, despite these potential benefits, efforts to designate MPAs are often met with resistance from user groups who fear loss of access to their social, recreational, or economic livelihoods (e.g., Fiske, 1992; Suman *et al.*, 1999; Lien, 1999; Davis, 2005). It has thus become apparent that the ultimate success of an MPA is intimately connected to the acceptance of it by local stakeholders (Elliott *et al.*, 2001; Salmanoa & Verardi, 2001; Lunn & Dearden, 2006a). The trend in many MPAs has thus been away from designating the entire area as "no take" and towards incorporating a multiple use zoning model into MPA design (Alder, 1996; Masica, 1999; Day, 2002; Agardy *et al.*, 2003).

While the number and type of zones may vary, most MPA zoning schemes include core "no take" zones surrounded by zones allowing for a range of use intensities

(e.g., Day, 2002). Typical goals of marine zoning are to separate incompatible activities, reduce conflicts, and protect marine resources and ecosystems (Bohnsack, 1996). As a result, zoning has both a biological component (protecting critical and sensitive areas) and a social component (providing for a range of uses, separating conflicting activities). Given this, and coupled with the importance of stakeholder support for MPAs, there have been calls for increased application of social science to MPA planning and management (e.g., Christie *et al.*, 2003; Lundquist & Granek, 2005).

While a number of published studies have focused on social aspects of MPAs, many have focused primarily on the attitudes and perceptions of either the fishing community or nearby residents (e.g., Wolfenden *et al.*, 1995; Cocklin *et al.*, 1998; Suman *et al.*, 1999; McClannahan *et al.*, 2005; Salz & Loomis, 2004; Stump & Kriwoken, 2006; Broad & Sanchirico, 2008). While these stakeholders are certainly important, there is a need to expand research to consider additional stakeholder groups. One such group that has received only limited attention is recreational boating, although one study (Sutton, 2005) examined factors influencing boater satisfaction in Australia's Great Barrier Reef Marine Park and found that boater satisfaction with a MPA experience is multidimensional, and that differences exist in satisfactions depending on the overall activity a boater is engaged in.

Given the increasing prevalence of recreational boating in marine environments (Widmer & Underwood, 2004), understanding this user group is critical for MPA planning. This study addresses the existing research gap by drawing upon recreation and leisure theory in a study of sail- and motorboat users in a proposed MPA in British Columbia, Canada. The goals of this study were to examine (1) the typical activities pursued by boaters, (2) the importance of various setting elements to boaters, (3) perceived conflicts between recreational boaters and other marine activities, and (4) the influence of activity (boat) type on each of the above.

2.2 Literature Review

2.2.1 The Behavioral Approach

The behavioral approach underlies much of the research conducted in the field of recreation and leisure (Manning, 1999). This approach has its roots in expectancy value

theory (Ajzen & Fishbein, 1980), which views recreation behavior as being motivated by the expected achievement of certain goals or satisfaction of needs (Manning, 1999). This approach defines a four level hierarchy of recreation experience (Diver & Brown, 1978; Manning, 1999). The first level focuses on recreation *activities*, including recreationist demographics and characteristics. The second level focuses on the *settings* in which these activities take place, recognizing that different types of settings provide different opportunities to meet recreation needs. The third level focuses on the *motivations* for recreation, arguing that people participate in specific activities in specific settings in order to achieve certain outcomes. Finally, the fourth level focuses on the *benefits* and *satisfactions* that accrue from recreation (Manning, 1999). The behavioral approach has formed the basis for a number of concepts and models found in the literature. Two such concepts that are pertinent to this study include the recreation opportunity spectrum and models of recreation conflict.

2.2.2 The Recreation Opportunity Spectrum

Many of the social aspects of marine zoning can be conceptually linked to the recreation opportunity spectrum (ROS). The ROS emerged as a planning tool in terrestrial land management (Driver and Brown, 1978; Clark & Stankey, 1979), and is based on the notion that recreation experiences are directly related to the settings in which they occur. These settings can be classified into environmental, social, and managerial factors (Manning, 1999). The ROS focuses on providing for diversity in recreation experiences by planning for a continuum of settings (often termed "setting-based management"), ranging from primitive wilderness areas characterized by a lack of facilities and a minimum of social contact, through to more developed areas characterized by more infrastructure and a greater intensity of use (Clark & Stankey, 1979, Pierskalla *et al.*, 2004). While the ROS was developed for terrestrial land use planning, Orams (1999) introduced a variation of the concept tailored for marine applications, which was termed the Spectrum of Marine Resource Opportunities (SMRO). Similar to ROS, SMRO focuses on providing for a range of marine settings, focusing on aspects such as distance from shore, accessibility, amount of contact with others, and level of infrastructure (Orams, 1999).

A number of studies have specifically examined various aspects of ROS relationships in terrestrial settings (e.g., Virden & Knopf, 1989; Yuan & McEwen, 1989; Heywood *et al.*, 1991), while others have used the ROS concept as a theoretical background for other recreation-based research (e.g., Kalternborn & Emmelin, 1993; Needham *et al.*, 2004; Hunt *et al.*, 2005; Pierskalla *et al.*, 2007; Cahill *et al.*, 2008). Despite these studies, a review of the concept by Driver *et al.* (1987) noted a need for further research examining the relationship among activities, settings, and experiences across a variety of recreationists and geographical areas, a conclusion that was reiterated by Pierskalla *et al.* (2004).

Despite the research that has been conducted in terrestrial settings, there have been but a handful of studies that have examined the SMRO or the ROS in a marine environment. In one study, Shafer and Inglis (2000) examined visitors utilizing tour operators in the Great Barrier Reef Marine Park and found that different reef settings provided for different types of tourist experiences. A study by Sorice *et al.* (2007), meanwhile, examined variability in managerial setting preferences amongst scuba divers and found that divers preferred a certain level of management intervention in order to maintain a quality experience. In another study, Roman *et al.* (2007) found that both social and environmental setting factors had an influence on snorkeler satisfaction within Thailand's Koh Chang Marine Park. These studies notwithstanding, there remains a lack of research on the relationships between ROS components in a marine setting. The present research will expand upon ROS research by focusing on the relationship between activity type and setting preference amongst a heretofore understudied stakeholder group in a complex, multiple-use marine setting.

2.2.3 Recreation Conflict

As one of the potential goals of MPA zoning is to separate conflicting uses (Bohnsack, 1996; Lynch *et al.*, 2004), it is important, in the planning stages of a MPA, to identify areas of perceived conflict between users and to determine whether or not these conflicts can potentially be mitigated through zoning. Recreation researchers have built a considerable body of knowledge regarding conflict (see Watson, 1995; Graefe & Thapa, 2004, for reviews). While early research focused on different aspects of conflict,

particularly between motorized and non-motorized activities (e.g. Lucas, 1964), it was not until 1980 that a dominant theoretical model emerged. Jacob and Shreyer's (1980) goal interference model of recreation conflict has provided the basis for much of the research found within the literature. This model defines conflict as "goal interference attributed to another's behavior" (Jacob & Shreyer, 1980, p. 369). Within this context, a goal can be defined as "any preferred social, psychological, or physical outcome of a behavior that provides incentive for that behavior" (Gramman & Burdge, 1981, p. 17). In order for conflict to occur, the goal interference model requires that there be contact between activities (either direct of indirect), and that one individual attributes their lack of goal attainment to another's behavior (Jacob & Shreyer, 1980). Much research has explored various aspects of the goal interference model across a variety of recreation activities, lending it considerable support (e.g. Gramman & Burdge, 1981; Jackson & Wong, 1982; Ivy *et al.*, 1992; Watson *et al.*, 1994; Blahna *et al.*, 1995; Wang & Dawson, 2005).

More recently, the concept of social values conflict has emerged. Vaske *et al.* (1995) studied conflict between hunters and non-hunters in Colorado and found that despite the fact that the topography of the area limited contact between the two groups, perceived conflict still existed. This was termed social values conflict, because it is rooted in differences in values, and can thus occur independent of direct contact (Vaske *et al.*, 1995). Social values conflict has since been investigated in studies of hikers and mountain bikers (Carrothers *et al.*, 2001) and skiers and snowboarders (Vaske *et al.*, 2007). Researchers have stressed the importance of distinguishing between goal interference and social values conflict because while goal interference conflict may be addressed through strategies such as zoning, social values conflict often cannot be mitigated through spatial separation, and instead must be addressed through strategies such as targeted education or communication (Vaske *et al.*, 2007).

While recreational boating has been the focus of a number of conflict studies (e.g., Lucas, 1964; Devall & Harry, 1981; Gramann & Burdge, 1981; Adelman *et al.*, 1982; Ivy *et al.*, 1992), research has typically occurred in freshwater systems, with little research focusing on open marine settings. Furthermore, the majority has focused on perceived conflict between two activities, although a study by Wang & Dawson (2005)

used goal interference theory to examine conflict among motorboaters, personal watercraft users, and residential homeowners in New York. The present study expands upon conflict research by exploring perceived conflict between recreational boaters and a variety of activities in a complex marine setting.

2.3 Methods

2.3.1 Study Area

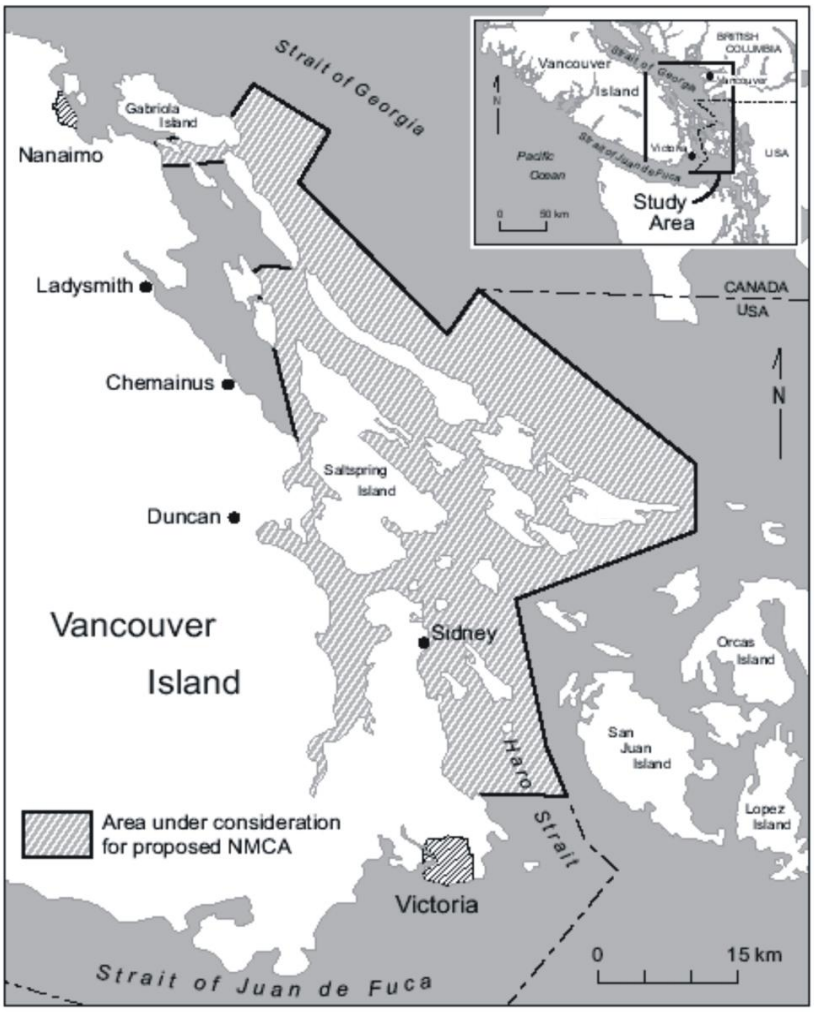
This study was conducted in the Southern Strait of Georgia (SSG), located in southwest British Columbia (B.C.), between southern Vancouver Island and the B.C. mainland (Figure 2.1). Given its location adjacent to major population centers of both B.C. and Washington State (U.S.A.), the SSG is one of the busiest waterways in Canada; consequently, it is host to a number of recreational, commercial, and transportation activities. The region also contains the southern Gulf Islands, an archipelago of inhabited and uninhabited islands and islets that provide year-round and seasonal residence for many, and attract thousands of tourists every year.

With a mild climate and sheltered waters, the SSG is extremely popular for recreational boating (Dearden, 1990), both for residents and tourists alike (Parks Canada, 2007b). The region is host to a number of marinas, marine parks, and undeveloped anchorages, providing varied and extensive opportunities for recreational cruising (Vassilopolous, 2006). While the precise number of boats visiting the region is unknown, it has been estimated that the number of vessels accessing the southern Gulf Islands in the peak summer months is in the range of 14,700 ±25% (Parks Canada, 2007b).

With the warmest and most humid climate in the country, the SSG is unique in Canada in terms of both wildlife and vegetation (Davenne & Masson, 2001); furthermore, the waters support a large amount and diversity of marine life, including an endangered population of resident orcas *(Orcinus orca*). Approximately 900 km^2 of the region is currently under consideration for a National Marine Conservation Area (NMCA), which is a MPA managed by Parks Canada for both conservation and sustainable use (Parks Canada, 2008b). Should the proposed NMCA be created, a zoning plan will be developed for the waters. Such a plan may consist of up to five zone types, including

both fully protected zones and zones for a variety of sustainable uses (Parks Canada, 2007a).

Figure 2.1: Study Area: The Southern Strait of Georgia, British Columbia



2.3.2 Research Design

Data for this study were obtained from a face-to-face questionnaire, delivered to boaters visiting the southern Gulf Islands from June to September 2007. Although the term "recreational boating" encompasses a range of sail, motor, and human powered watercraft, the focus of this research was solely on sail and motorboat cruisers accessing the region in the summer season. While other research into boating has often employed telephone or mail surveys based on boater registries (e.g. Heatwole & West, 1982; Lee, 2003; Sidman & Fik, 2005), a face-to-face approach was deemed to be the only suitable

method of accessing the portion of the boating population that visits the region; such an approach is appropriate in situations where a list from which to derive a sampling frame does not exist (Salant & Dillman, 1994).

The questionnaire consisted of 33 questions addressing various aspects of boating in the region (Appendix D). These were developed through a literature review, conversations with boaters, and meetings with regulatory agencies. Questions were refined through feedback from a focus group of boaters in May 2007 and through a pilot study conducted in June 2007. Portions of the questionnaire pertinent to this paper are briefly described below.

2.3.3 Questionnaire Design

To assess boater activities, respondents were presented with a list of twelve activities that they might engage in while boating, and were asked to indicate which of these they usually participate in. Examination of boater setting preferences involved presenting respondents with a 20-item list comprising various environmental, social, and managerial/facility settings. Due to a lack of ROS-based boating research from which to draw upon, the items on this list were developed to reflect the three setting types found in the literature (Manning, 1999), and were constructed based on local conditions, discussions with boaters and management agencies, and a review of other (non-ROS) boating studies (e.g., Sidman *et al.*, 2004; Parks Canada, 2007b). Boaters were asked to indicate the importance of each setting item to their overall experience of boating on a five point scale (1=not at all important, 2=slightly important, 3=somewhat important, 4=very important, 5=extremely important).

While there is no consensus in the literature on how to best measure conflict (Graefe & Thapa, 2004), for this study respondents were presented with a list of twelve marine activity/vessel types and asked to indicate how encountering each affected their enjoyment of boating trips. Responses were measured on a five point Likert scale (1=significantly detracts, 2=somewhat detracts, 3=no effect, 4=somewhat enhances, 5=significantly enhances). To obtain additional information about the nature and type of perceived conflict, an open-ended question was used, asking respondents to provide a brief explanation as to how or why any activities detracted from their boating experience.

Finally, the questionnaire collected descriptive and demographic information, including respondent age, residence, boating experience, years living in the region, vessel type, and vessel size. This information was used to contextualize results and to examine variability in responses.

2.3.4 Administration and Sampling

As previous research in the region has indicated that different sites attract different intensities of use and boat types (Leatherbarrow, 2006), a modified stratified random sampling strategy was used. Six sampling sites were chosen, which ranged from highly developed (docks, mooring buoys, nearby marinas, and terrestrial park space) to no development (anchorage completely surrounded by private/undeveloped land). Eight sampling days were conducted at each site, covering every day of the week, and including days in the early, mid, and late summer season.

For three sites, the number of boats was usually low enough that a census of vessels was undertaken when the researcher was on site. The other three sites were extremely busy anchorages, requiring the use of a spatial random sampling strategy. Using Garmin Mapsource software (Garmin, 2007), a 100 m^2 grid was applied to each anchorage area, and global positioning system (GPS) waypoints were generated for intersections of grid lines. While on site, a waypoint would be randomly selected, and the vessel closest to that waypoint was sampled.

Data collection took place from approximately 12:00 p.m. to 8:00 p.m. Boaters were approached while moored, anchored, or docked and invited to participate in the study. Most questionnaires were collected later on the same day, though a mail back option was provided for boaters who did not have time to complete the questionnaire on site. 543 questionnaires were completed out of 591 boaters invited to participate, for a response rate of 92%. Ninety-three percent of the questionnaires were collected on the day they were administered, and 7% were returned by mail. Although the number of vessels accessing the region during the summer months is unknown, a sample of 543 is considered to have a sampling error of ± 5% for a population of 1,000,000 or more at the 95% confidence level (Salant & Dillman, 1994).

2.4 Results

2.4.1 Visitor Characteristics

The majority of respondents were Canadian (72%), most of whom (68%) were from nearby areas in British Columbia. 27% of respondents were from the United States, most notably from Washington State (20%). Seventy three percent of all respondents indicated they had lived in the Pacific Northwest region for more than 20 years. Fifty nine percent of respondents were over 55 years of age, with a further 29% between 46 and 55 years of age.

Overall, respondents were experienced mariners. Seventy two percent had more than twenty years of boating experience, and a further 15% had between eleven and twenty years of experience. When asked to rate their boating skill, 78% rated themselves as either "advanced" or "expert"; furthermore, 52% of respondents belong to at least one boating club or organization. Considering boat type, 52% of respondents were sailboat operators, and 48% were motorboat operators. Vessel size ranged from 13 to 78 feet, with a median vessel length of 35 feet.

The demographic information outlined above was used to examine variability in boater activities, setting preferences and perceptions of conflict. Responses were compared by country of origin, respondent age, level of boating experience, boat club membership, vessel size, and vessel type (See Appendix F). Although some statistically significant differences emerged in many of these comparisons, the variable that exhibited the greatest number and extent of differences across all three areas of inquiry was vessel type (sail vs. motor). Consequently, boat type has been used as the primary means of segmenting the boating population and examining variability in this paper.

2.4.2 Typical boating activities

Response to the question regarding typical activities is outlined in Table 2.1. Five activities emerged as ones that are usually practiced by a majority of respondents. These comprised trail walking/hiking (81%), accessing beaches (77%), marine wildlife viewing (71%), photography (61%), and accessing amenities on shore (61%). Considering

extractive activities, crabbing emerged as the most frequent for respondents (48%), followed by sport fishing (28%) and shellfish harvesting (16%). The activities with the lowest frequency of participation for boaters included scuba diving/snorkeling (7%) and camping (5%); these results are likely due to the highly specialized nature of scuba diving and because most boaters intercepted prefer to sleep on their boats rather than utilize camping facilities.

Table 2.1
Boating activities: percentage of boaters who usually participate

Activity	All vessels %	By boat type		x^2	p	df
		Motorboats %	Sailboats %			
Trail walking/hiking[a]	81	77	85	4.63	0.03	1
Walking/relaxing on beaches	77	77	78	3.72	0.78	1
Marine wildlife viewing	71	69	72	0.36	0.55	1
Photography	61	61	62	0.14	0.75	1
Accessing shops/restaurants	61	66	58	3.72	0.05	1
Birdwatching	48	45	51	2.03	0.16	1
Crabbing[a]	48	57	40	14.83	0.00	1
Recreational fishing[a]	28	36	21	13.90	0.00	1
Gathering shellfish	16	17	15	0.65	0.42	1
Diving/snorkeling	7	7	7	0.02	0.90	1
Camping	5	6	4	2.08	0.15	1

[a] $p<0.05$

To examine the influence of boat type on activity participation, Pearson's chi-square was used to test for differences between sailboat and motorboat operators (Table 2.1). For most activities, boat type had little influence on frequency of participation; however, there are several notable exceptions. The greatest differences in participation can be seen in the extractive activities of crabbing and fishing, where motorboat operators are significantly more likely to participate ($p<0.00$). The one other significant difference was found with respect to trail walking/hiking, where sailboat operators were found to be significantly more likely to participate.

2.4.3 Boater setting preferences

The importance that boaters placed on each of the twenty environmental, social, and managerial setting elements is outlined in Table 2.2. For each item, a mean importance score was calculated; these results, along with the relatively high standard deviations for certain items, show that there exists variety in terms of the importance that boaters place on various setting elements in the region. However, the items with the highest rated importance across all respondents were safe anchorages, natural scenery, clean/unpolluted water, and being in a peaceful, quiet place.

To reduce the 20-item list to a smaller number of categories for further analysis, a factor analysis with a varimax rotation was conducted (Table 2.2). Using a minimum eigenvalue of 1.0, all items loaded at 0.52 or higher. One item ("being around other boaters") loaded most strongly in a negative direction; this item was subsequently reverse-coded and the factor analysis was repeated. Five factors were identified, which have been labeled "built facility", "nature/environment", "quiet and solitude", "extractive activity", and "natural facility".[5] Cronbach's alpha was used to determine the reliability of each resulting factor. Although one factor ('quiet and solitude') had a relatively low alpha score (0.57), this is not uncommon in cases where there are few items (Cortina, 1993). For each of the five factors, a mean importance score was calculated by dividing the sum of the responses for each item by the number of items in each factor.

The results, displayed in Table 2.2, show that recreational boaters overall place the highest level of importance on the "environment/nature" setting factor (mean=4.3), including items such as clean water, natural scenery, undeveloped shoreline, and marine wildlife. The "quiet and solitude" factor, comprised of items such as being in a peaceful, quiet place and being away from other boaters, was also rated as being of high importance (mean=3.9). Mid level importance was attributed to both the "built facility" and "natural facility" factors (both means=3.2). The "extractive activity" factor, meanwhile, was rated as being of the lowest importance to boaters (mean=2.3). However, the relatively high standard deviations for the items within this factor indicate

[5] It is important to note that these labels are subjective interpretations of the researcher, and are used solely for descriptive purposes in an attempt to characterize the groupings of items in each factor.

that there is a portion of the boating population that places a high importance on settings which facilitate extractive activities.

Table 2.2. *Factor analysis of setting factors important to boaters*

	Item Mean[a]	Item SD	Factor loading	Factor mean[b]	α	Variance explained
Built facility				**3.17**	**0.74**	**17.5**
Marinas	2.86	1.12	0.78			
Access to supplies	3.49	0.99	0.71			
Dinghy docks	3.37	1.18	0.70			
Mooring buoys	2.87	1.34	0.61			
Safe anchorages	4.56	0.62	0.55			
Social/entertainment opportunities	1.98	0.99	0.52			
Pumpout facilities	3.06	1.35	0.48			
Extractive Activity				**2.30**	**0.79**	**14.9**
Crabbing	2.68	1.26	0.86			
Catching fish	2.20	1.18	0.83			
Gathering shellfish	2.02	1.17	0.78			
Nature/Environment				**4.29**	**0.68**	**10.8**
Viewing natural scenery	4.56	0.57	0.80			
Clean/unpolluted water	4.49	0.63	0.77			
Viewing marine wildlife	4.09	0.83	0.61			
Seeing undeveloped shoreline	4.01	0.95	0.59			
Quiet and Solitude				**3.87**	**0.57**	**6.9**
Being away from other boaters	3.14	1.10	0.71			
Being in a peaceful, quiet place	4.44	0.74	0.68			
Being around other boaters (reverse coded)	4.02	1.02	0.57			
Natural Facility				**3.20**	**0.65**	**6.2**
Access to walking/hiking trails	4.02	0.92	0.83			
Access to beaches	3.84	1.01	0.82			
Access to camping facilities	1.72	1.06	0.56			

[a] Based on a five point scale where 1=not at all important, 2=slightly important, 3=somewhat important, 4=very important, 5=extremely important

[b] Calculated by dividing the sum of the mean importance scores for each individual item by the number of items in the factor.

2.4.4 The influence of activity type on setting preferences

To examine the influence of boating activity type on setting preferences, the mean importance score for each setting factor for both motorboat and sailboat operators was

compared using the student's t-test. The results, outlined in Table 2.3, indicate that boating activity type does have an influence on setting preferences, as significant differences between sailboats and motorboats were observed in four of the five setting factors.

Sailboat operators placed a statistically greater importance on both the "environment/nature" and "quiet and solitude" factors ($p<0.05$), suggesting that operators of this boat type are more likely to seek settings characterized by natural settings and a peaceful, quiet atmosphere. Motorboat operators, meanwhile, placed a significantly greater importance on the "extractive activity" and "built facility" factors. Thus, operators of this boat type are more likely than sailboat operators to seek settings in which they can partake in extractive activities and can access a certain level of boating infrastructure.

Table 2.3. Test for differences in setting preferences between sailboats and motorboats

	Mean score[a]		t-test results		
	Motorboat (n=279)	Sailboat (n=255)	T	df	Sig.
Built facility [b]	3.32	3.03	4.87	522	0.00
Extraction [b]	2.47	2.15	3.59	517	0.00
Nature/environment [b]	4.24	4.34	2.04	515	0.04
Solitude [b]	3.76	3.95	2.89	528	0.00
Natural facility	3.25	3.13	1.91	530	0.06

[a]Mean based on a five point scale where 1=not at all important, 2=slightly important, 3=somewhat important, 4=very important, 5=extremely important
[b] $p<0.05$

While these results do show clear differences in setting preferences based on boating activity type, it is important to note that the ranking of importance for each of the five setting factors is similar for both activity types. Thus, while motorboat operators placed a comparatively lower level of importance on "nature/environment" settings, this factor is still rated as being more important to motorboat operators than any of the other

factors. Thus, the differences based on activity type can perhaps best be characterized as differences in the intensity of importance rather than the relative ranking.

2.4.5 Perceived conflict amongst boaters and other marine activities

Responses to the question regarding perceived conflict with other marine activities are outlined in Table 2.4. As this table indicates, the activity that is clearly viewed negatively by the largest portion of respondents is personal watercraft (PWC). 84% of boaters rated encounters with PWC as detracting from their experience, compared to only 1% who felt positively towards this activity. Other activities that were seen as sources of perceived conflict included commercial whale watching boats (46% of respondents felt negatively) and shellfish aquaculture (39% of respondents felt negatively). In both cases, very few respondents rated these activities positively, although many felt that neither activity affected their enjoyment of boating. In contrast, three activities are clearly not a source of conflict for most boaters. Less than 5% of respondents felt that encountering scuba divers, human-powered watercraft, or sailboats had a negative effect on their boating experience; in fact, the latter two activities were rated positively by 68% and 74% of respondents, respectively.

Other activities appear to be more divisive for recreational boaters. While between 20% and 30% of respondents felt negatively towards encountering cruise ships, commercial shipping vessels, float planes, passenger ferries, commercial fishing vessels, and motorboats, all of these activities were also rated positively by between 16% and 30% of respondents. Thus, there is clearly some variability amongst boaters with respect to perceptions of these activities; some boaters find such activities as detracting from their desired boating experience, while others seem to feel that encountering a diverse array of marine activities enhances their experience.

Table 2.4.
Recreational boater views about encountering other marine activities

Activity	% of respondents			Mean[a]
	Detracts	No effect	Enhances	
Personal watercraft/jet skis	84	15	1	1.54
Commercial whale watching boats	46	45	9	2.48
Commercial shellfish farms	39	56	5	2.52
Cruise ships	27	55	18	2.80
Float planes	27	45	28	2.97
Motorboats	27	44	29	3.05
Commercial shipping (freighters/tugs)	21	62	16	2.94
Ferries	21	60	19	2.97
Commercial fishing boats	20	60	20	3.00
SCUBA divers	4	73	23	3.22
Kayaks/rowboats/canoes	3	29	68	3.93
Sailboats	2	24	74	4.13

[a]Based on a five point response scale where 1=significantly detracts, 2=detracts, 3=no effect, 4=enhances, 5=significantly enhances

2.4.6 The influence of activity type on perceived conflict

To test for differences in perceived conflict based on activity type, Pearson's chi square was used to compare the percentage of sailboat and motorboat operators who felt negatively towards each activity. These results, which are outlined in Table 2.5, show significant differences ($p<0.05$) for six of the twelve activities. In five of six cases, a greater percentage of sailboat operators felt that the activity detracted from their boating experience.

The most significant difference was seen with respect to motorboats; in this case, 46% of sailboats felt that these vessels detracted, compared to only 7% of motorboats. However, when asked to rate encounters with sailboats, very few motorboats or sailboats felt that they detracted. This indicates that where perceived conflict exists between motorboats and sailboats, it appears to be an asymmetrical conflict. This finding is consistent with a large body of research that has examined motorized versus non-motorized recreation activities (see Thapa & Graefe, 2004), although it should be noted

that nearly all sailboats encountered were also fitted with an auxiliary motor. Other activities that were rated negatively by a significantly larger percentage of sailboats include PWC, whale watching boats, cruise ships, and float planes. In all cases, these tend to be louder, motorized activities. Given that sailboat operators placed a greater importance on the "quiet and solitude" and "environment/nature" setting factors, it follows that these same respondents would react more negatively to activities that would potentially detract from these settings.

Table 2.5.
Recreational boater views about encountering other activities: response by boat type

	% respondents who felt negatively				
Activity	Motorboats (n=279)	Sailboats (n=255)	x^2	Sig.	df
Personal watercraft/jet skis[a]	80	90	10.08	0.00	1
Commercial whale watching boats[a]	39	52	8.32	0.00	1
Commercial shellfish farms	36	41	1.43	0.23	1
Cruise ships[a]	22	33	7.53	0.01	1
Float planes[a]	21	32	8.80	0.00	1
Motorboats[a]	7	46	103.2	0.00	1
Commercial shipping (freighters/tugs)	19	21	0.28	0.60	1
Ferries	20	23	0.78	0.38	1
Commercial fishing boats	19	20	0.03	0.87	1
SCUBA divers	4	4	0.01	0.93	1
Kayaks/rowboats/canoes	4	1	3.61	0.06	1
Sailboats[a]	4	1	6.10	0.01	1

[a] $p<0.05$

2.4.7 Determining Sources of Perceived Conflict

While other studies have used a series of structured, closed-ended questions to discern conflict type (Vaske *et al.*, 1995; Carrothers *et al.*, 2001; Vaske *et al.*, 2007), this study explored the use of an open-ended question asking respondents to characterize why or how any activities detracted from their boating experience. Given the exploratory nature of the study and the fact that perceived conflict between boaters and multiple

activities was being investigated, closed-ended questions about reasons for perceived conflict were not considered practical. Furthermore, the use of open-ended questions has a number of advantages – in particular, respondents are able to elaborate in their own words without the use of rigid categories; as result, open-ended questions tend to provide more rich and detailed information (Mitra & Langford, 1999).

For the six activities for which 25% or more of respondents felt negatively, respondent comments have been categorized into major reasons for perceived conflict. Each of these reasons was then classified as most likely being based on either direct contact (goal interference), value differences (social values), or a potential combination of both. Table 2.6 shows the results of this analysis.

Perceived conflict between recreational boaters and PWC was primarily found to be related to direct contact. The dominant reason given for why PWC detract from boaters' experience was noise (75% of those who felt negatively gave this as a reason), followed by dangerous behaviour (19%), and wake (13%). These reasons can be viewed as stemming from direct contact with PWC, and have therefore been classified as goal interference. Two of the reasons provided, including the perception that PWC lack respect for other boaters (11%) and that they lack safety training (6%), have been classified as both goal interference and social values, as such perceptions may reflect actual experiences or general assumptions made about PWC operators.

Perceived conflicts with commercial whale watching boats elicited a more varied range of responses. The primary reason given was environmental concern, including pollution and perceived impacts on whale populations (30%). This is an example of value differences, as it is not necessarily a result of direct contact between boaters and whale watching vessels. However, other reasons given are clearly a result of direct contact, including noise (20%), wake (17%), and speed (9%). Consequently, it appears that perceived conflicts with whale watching boats are rooted in a combination of goal interference and social values conflict.

Commercial shellfish farms are perceived to be detracting from boaters' experience for three main reasons. Two of these reasons – that these sites limit boater access to anchorages and beaches (33%) and are aesthetically displeasing (16%) – are a result of direct contact. The third reason, pollution and environmental concern (14%), is

a result of value differences. Thus, while conflict with this activity is apparently based on a combination of goal interference and social values, the majority of it can be attributed to goal interference.

Table 2.6.: *Primary reasons for perceived conflict between boaters and other marine activities*

Activity	**Number of responses**		**Nature of Conflict**	
(number of respondents who felt negatively towards activity in parentheses)	% of those who felt negatively[a]		Goal interference	Value differences
Personal watercraft / PWC *(454)*				
Noise	342	75%	X	
Dangerous/reckless behaviour	87	19%	X	
Wake	59	13%	X	
Lack of respect/consideration for others	52	11%	X	X
Speed	39	9%	X	
Inexperienced/lack boating training	25	6%	X	X
Commercial Whale Watching Boats *(246)*				
Environmental concerns/effects on whales	72	30%		X
Noise	49	20%	X	
Wake	42	17%	X	
Too many boats / people	25	10%	X	X
Speed	23	9%	X	
Lack boating etiquette / knowledge	21	9%	X	X
Commercial shellfish farms *(206)*				
Limit harbour/bay/beach access	68	33%	X	
Aesthetic concerns	33	16%	X	
Pollution/environmental concerns	28	14%		X
Cruise Ships *(147)*				
Pollution/environmental concerns	24	16%		X
Too many people/contributes to crowding	19	13%	X	X
Wake	19	13%	X	
Noise	16	11%	X	
Not appropriate for the region	8	5%		X
Powerboats *(146)*				
Wake	65	45%	X	
Noise	53	36%	X	
Generator use	19	13%	X	
Lack of respect/consideration for others	15	10%	X	X
Speed	15	10%	X	
Pollution/environmental concerns	10	7%		X
Smell (exhaust/fumes)	9	6%	X	
Lack boating etiquette/knowledge	8	5%	X	X
Float Planes *(144)*				
Noise	70	49%	X	

[a] The percentages do not add to 100% because (a) boaters may have given more than one reason why the activity detracts, and (b) some boaters did not provide any reasons why an activity detracts.

As noted earlier, motorboats are primarily a concern of sailboats. While value differences were evident in some of the responses, the majority of reasons given for why motorboats detract from the experience of other boaters are related to goal interference. Indeed, reasons such as wake (45%), noise (36%), generator use (13%), speed (10%) and smell (6%) all stem from direct contact with this vessel type. Two other reasons, lack of respect for others (10%) and lack of boating knowledge (5%) may be a result of either direct contact or value differences. Finally, pollution and environmental concerns (7%) are a result of value differences.

The other two activities examined included cruise ships and float planes. Perceived conflict between recreational boaters and cruise ships appears to be based on a combination of direct contact and value differences. Reasons related to value differences include pollution and environmental concerns (16%) and a feeling that cruise ships are not appropriate for the region (5%). Reasons related to direct contact include crowding (13%), wake (13%), and noise (11%). In contrast, the only major reason given for why float planes detract from boaters' experience was noise (49%), suggesting that this is a rather straightforward conflict that is clearly based on goal interference.

2.5 Discussion

MPAs are often enacted to serve both environmental and social goals, and marine zoning is a strategy by which these varied goals may be achieved. Developing a zoning plan thus requires a variety of both biological and social information. This study examines the activities, setting preferences, and perceived conflicts of recreational boaters, an often dominant but understudied stakeholder group. As this research was conducted within the context of a proposed MPA and draws upon theories and concepts of recreation and leisure, the findings have implications for both researchers and managers.

2.5.1 Implications for Researchers

Setting Preferences and Activity Type

ROS researchers have stressed the need for studies to examine the relationships between activities, settings, and experiences across different recreation activities and

geographical areas (Driver *et al.*, 1987; Pierskalla *et al.*, 2004). However, there has thus far been little examination of how these relationships apply to a marine setting. This study has extended this research by focusing on the relationship between activity type and setting preference amongst boaters in a marine environment.

Findings show that there is diversity among recreational boaters in terms of setting preferences, and that boating activity type has an influence across all three ROS setting categories (environmental, social, and managerial). Settings characterized by a natural environment were more important to sailboat operators compared to motorboat operators, while motorboat operators placed a comparatively greater importance on settings which facilitate extractive activities. Considering managerial settings, motorboat operators placed a greater importance on settings that provide a greater degree of management influence, as determined by the presence of built facilities. Social settings also exhibited differences, as sailboat operators placed a higher importance on settings characterized by quiet and solitude. While this was also important to motorboat operators, the fact that this group placed a greater importance on built facilities (which lead to an increased density of boats at a site) suggests that motorboat operators overall are more amenable to a greater degree of social contact. By establishing the diversity of setting preferences amongst boaters and the clear influence of activity type on setting preferences, this study supports the underlying concepts of the ROS as applied to a marine environment, and supports the subsequent need to preserve a range of settings in order to provide for diverse recreation experiences for boaters.

Despite the fact that the results exhibited considerable diversity in terms of setting preferences, where differences based on boat type (or any of the other variables examined in Appendix F) existed, they tended to be in terms of intensity of importance rather than the relative ranking of setting factors. Boaters as a group (both sailboats and motorboats) placed the greatest level of importance on "environment/nature" and "quiet and solitude" elements. This high level of importance was observed at all survey locations, including the "primitive" settings (no development, low density of boaters) and the "modern" settings (many facilities, high density of boaters). Research into recreational motivations has shown that experiencing nature is often the strongest motivating factor (e.g. Manning, 1999; Shafer & Inglis, 2000), and this likely has an influence on the importance boaters

place on "natural" settings. However, given that the high level of importance was expressed across a variety of setting types, this suggests that boaters may have differing definitions as to what constitutes a "natural" setting. To some, an anchorage with a number of facilities and services may very well meet their criteria for a "natural" setting; for others, criteria for a "natural" setting may only be met in a completely undeveloped anchorage. Similar questions are raised with respect to "quiet and solitude" in a boating setting. For some, "quiet and solitude" may be met in high density boating areas, while for others it may require an anchorage with very few other boaters. Alternately, these results indicate that an individual can have different preferences at different times during a trip.

These findings suggest the need for additional research into how recreational boaters define both natural and quiet/solitary settings. A useful approach for future research may be to apply a limits of acceptable change model (Stankey *et al.*, 1985), looking at the natural and social settings for recreational boating in the marine environment. Such an approach has been used in other marine applications (Shafer & Inglis, 2000; McCallum, 2006; Roman *et al.*, 2007), and can help to characterize how boaters define natural, quiet, and solitary settings, as well as at what point the amount of development or the number of other boaters begins to detract from these settings.

Recreational Conflict

While much research has been conducted on recreational conflict, there has been very little applied to the marine environment. Moreover, recent research has stressed the need to distinguish between goal interference and social values conflict among various activities. This study took an exploratory approach to examining perceived conflict amongst recreational boaters in a marine setting; consequently, several findings are relevant to researchers.

First, results indicate that both activity type and setting preference have an influence on perceived conflict amongst recreational boaters, lending support to aspects of the goal interference model and highlighting the need to consider these differences in conflict research. Sailboat operators tended to rate loud, motorized activities as being more detracting than did motorboat operators. This can likely be attributed to the fact

that sailboat operators have stronger setting preferences with respect to "nature/environment" and "quiet and solitude", and are thus more likely to react negatively to activities that disturb these settings.

Second, this study is consistent with a large body of research in terrestrial and freshwater settings that has shown conflict between motorized and non-motorized activities is persistent, and is often asymmetrical in nature (Graefe & Thapa, 2004). Results show that sailboat operators tended to react more negatively to motorboats, as well as a variety of other motorized craft, than did motorboat operators. It is interesting to note that the large majority of sailboats encountered do have a motor on their vessel; however, the results indicate that despite this, this user group clearly views themselves as being very different from motorboats.

Finally, this study explored the utility of using an open-ended question to differentiate between goal interference and social values conflict. Asking respondents to characterize, in their own words, why or how certain activities detracted from their experience elicited a fairly small list of underlying reasons for perceived conflict for each activity, which could then be categorized according to the type of conflict. This proved to be a useful exploratory approach, particularly in light of the fact that this study was examining perceived conflict between boaters and a variety of activities. Despite this, it is recognized that future research is warranted to explore in greater detail some of the areas of conflict that emerged in this study. In particular, research into perceived conflict between recreational boaters and PWC, whale watching boats, and shellfish aquaculture would benefit from the more structured approach developed by Vaske *et al.* (2007), looking not only at perceptions of other activities, but also at how often they are encountered and (in the case of PWC and whale watching boats) whether or not problematic behavior was observed. Findings from this research can greatly assist in developing such questions in future studies.

2.5.2 Implications for managers

Boating Activities and Setting Preferences

Results from this study also have considerable utility to MPA planners and managers. In terms of boating activities, results indicate that boaters frequently

participate in a varied list of activities – both passive and active, on the water as well as on shore. Such information is useful for understanding, planning for, and managing this user group. For example, the number of boaters who frequently partake in trail walking and hiking, accessing beaches, and visiting land-based services and attractions indicates the importance of providing access to these types of facilities if boater satisfaction is to be maintained; consequently, managers making marine zoning decisions should take this into consideration.

Furthermore, given that the SSG region is currently under consideration for a MPA that will include fully protected "no take" zones, of particular note is the frequency of boater participation in extractive activities. Research has shown that even small scale recreational fisheries can have an impact on species abundance and biomass (e.g., Polunin & Roberts, 1993; Jennings e*t al.*, 1995). While none of the three extractive activities (crabbing, fishing, and selfish gathering) was a frequent activity of a majority of recreational boaters, the number of respondents who usually practice crabbing, and to a lesser extent sport fishing, are of note to managers. Indeed, given the thousands of boaters who visit the region during the peak season, the fact that 48% of these usually practice crabbing indicates that a significant amount of crab are being removed from the waters by recreational boaters, particularly in the vicinity of the most heavily used anchorages; the effects of this extraction may require further research and monitoring as MPA planning proceeds.

Results also indicate that vessel type has an influence on both the frequency of participation in and the importance placed on extractive activities; in both cases, motorboat operators ranked significantly higher than sailboat operators. This suggests that in the creation of "no take" zones, managers may be faced with more opposition from motorboat operators in the region. Researchers have suggested that one way to mitigate stakeholder opposition to MPAs and zoning is to include them in MPA planning at the earliest possible stages (Suman *et al.*, 1999; Davis, 2005; Dalton, 2005). Consequently, it would be valuable for managers to establish open lines of communication with this user group during the planning stages of the MPA in order to mitigate potential conflict (discussed in more detail in Chapter 3).

The results from this study also show that there is variety amongst recreational boaters with respect to the types of settings preferred. Because different setting types provide different recreation experiences and thus opportunities for satisfaction, managers tasked with creating an MPA zoning plan should strive to preserve a variety of setting types for boaters, if boater support for any such plan is to be achieved. To this end, there may be considerable utility in applying an ROS or SMRO classification to boating destinations in the region, in order for managers to ensure that variety in settings is preserved as a zoning plan is developed.

Finally, it is important to note that settings characterized by a natural environment, quiet, and solitude were important to a large proportion of boaters, independent of activity type. While, as noted earlier, further research is needed to determine how boaters define these characteristics, managers should bear this high level of importance in mind when making zoning decisions. Secluded bays and harbours that exhibit a low intensity of use may be the most attractive areas for fully protected zones due to a relatively undisturbed environment and a decreased potential for public opposition; however, these types of areas may also be most likely to provide the types of settings (and thus experiences) that are most important to many boaters. Thus, if managers are concerned with maintaining boater satisfaction and thus obtaining support of the boating community for an MPA zoning plan, a balance may need to be reached between protection and access to these types of areas.

Perceived Conflict and Marine Zoning

If managers intend to utilize zoning as a means of reducing conflict in a MPA, it is critical to understand the major sources of conflict amongst users, as well as the underlying reasons for this conflict. Results indicate there are three particularly notable activities in the region that are perceived as being in conflict with recreational boating. While, as noted earlier, further research may be needed to examine the nature of these conflicts in more detail, several conclusions from this study are relevant to managers tasked with creating a MPA zoning plan.

Of the perceived conflicts, those related to PWC are likely the ones with the greatest potential to be mitigated through zoning. The large majority of reasons as to

why PWC detract from boaters' experience were related to issues of direct contact. As a result, much of this conflict could likely be addressed through spatial separation via zoning; indeed, such a strategy has been recommended for mitigating conflict related to PWC in other studies (Roe & Benson, 2001; Wang & Dawson, 2005). By designating specific areas where PWC may or may not operate, boaters (and other users) would know where they are most likely to encounter PWC, and could choose their destinations accordingly. However, it is noted that developing such zoning arrangements would require extensive consultation with both the recreational boating and PWC communities.

Perceived conflict between recreational boaters and commercial whale watching vessels is less likely to be addressed simply through spatial separation of these two activities. While approximately half of the reasons given for this perceived conflict were due to issues of direct contact with whale watching vessels, the primary concern expressed was perceived impacts on whale populations. In this case, spatially separating recreational and whale watching vessels is unlikely to mitigate this conflict. However, zoning may still prove useful in potentially reducing this perceived conflict. One way this may be achieved is through designating areas as "marine mammal refuge" (e.g., areas off limits to commercial *and* recreational vessels when whales are present). Such a strategy, by providing spatial areas for whales free from vessels, may have utility in reducing boaters' perceptions that commercial whale watching vessels are continually 'harassing' whales, thereby causing them harm. Other non-zoning strategies that could be employed to address this perceived conflict would be targeted communication and education regarding existing whale watching guidelines.

Considering shellfish aquaculture, the majority of boaters' concerns were a result of direct contact, particularly due to aquaculture sites limiting anchoring space and beach access; however, it is unclear whether zoning can mitigate this. Essentially, these two activities compete with each other for a finite amount of marine space. Even with spatial separation through zoning, aquaculture sites will still limit anchoring space for boaters, as both activities require relatively sheltered bays or harbours. However, one way that a zoning scheme may be able to partially address the issue is to designate shellfish aquaculture zones that would concentrate tenures for such facilities into certain areas. Such a scheme would limit the spatial distribution of these sites, and would potentially

reduce the instances of boaters unexpectedly entering a bay to find the anchorage space obstructed. However, it is recognized that this type of strategy may not be practicable in the southern Strait of Georgia region; furthermore, it is likely to only partially address the goal interference aspects of this conflict, and will not address the perceived environmental impacts of shellfish aquaculture.

2.6 Summary and Conclusions

It has become clear that if MPAs and associated zoning plans are to meet their conservation objectives, they must be accepted by, and responsive to the needs of, major user groups. From the perspective of recreation and tourism, if support for an MPA is to be achieved, managers must be able to provide for a diverse range of satisfactions (Shafer & Inglis, 2000; Roman *et al.*, 2007). Recreational boating is an often dominant activity in the marine environment, and can provide an important means of tourism and revenue generation within an MPA. However, there has been thus far little research into recreational boater preferences and MPA planning. As this study has demonstrated, in considering this stakeholder group, application of theories and concepts from recreation and leisure research has considerable utility.

Application of an ROS-based planning framework can help identify, classify, and preserve a variety of setting types for recreational boating as a zoning plan is developed. Indeed, given the results of this research showing variety in terms of setting preferences of boaters and how this is influenced by activity type, such an approach may be warranted in MPA planning and design. Furthermore, by understanding not only the sources of perceived conflict among recreational boaters but also the underlying reasons for this conflict, managers can better address these issues, whether through zoning or other means.

It is recognized that developing a zoning plan requires a synthesis of information, and that this study addresses but one component. However, by elucidating the activities, setting preferences, and sources of conflict among a heretofore understudied stakeholder group, this study has addressed an existing research gap and contributed to both recreation theory and MPA planning needs.

Chapter 3

Dimensions of Support for and Opposition to Marine Zoning Amongst Recreational Boaters in a Proposed Marine Protected Area

Abstract. Research has shown the success of marine protected areas (MPAs) to be dependent upon stakeholder acceptance and support. The goal of this study was to assess attitudes of recreational boaters towards a proposed MPA in British Columbia, Canada. Specific objectives were to examine the level of support for the concept of marine zoning and to identify factors influencing support for or opposition to marine zoning amongst boaters. The study employed both a focus group and a quantitative questionnaire (n=543). Results indicate that while a majority of recreational boaters are supportive of the concept of marine zoning, there are several key areas of concern that may need to be addressed as implementation proceeds. Support was found to be strongly related to perceived benefits of zoning, particularly environmental benefits. Those in support of zoning also had significantly different setting preferences than those opposed. Major dimensions of opposition included perceptions of over-regulation, fears of losing access for boating, and mistrust of the government. Such concerns may be potentially mitigated through focused communication and meaningful involvement of boaters in the zoning process. Recommendations for research and management are made.

3.1 Introduction and Literature Review

3.1.1 Marine Protected Areas

Anthropogenic impacts on marine environments have become a concern worldwide (e.g., Worm *et al.*, 2006; Ban & Alder, 2008). Such impacts include those associated with overexploitation, habitat destruction, pollution, and alteration of marine processes (Dayton *et al.*, 1995; Pauly *et al.*, 1998; Huber *et al.*, 2003). Given the ecological, economic, and social importance of the oceans (Costanza, 1999), many governments are looking for solutions. Marine protected areas (MPAs) have emerged as potential tools for mitigating some of these impacts (Allison *et al.*, 1998; Masica, 1999; Agardy *et al.*, 2003). While there is variation amongst MPAs with respect to the level of protection offered (Jamieson & Levings, 2001), all have in common some form of regulation; as a result, they represent a fundamental shift away from the traditional open access nature of the ocean (Russ & Zeller, 2003).

It is recognized that MPAs typically have both biological and social goals, which may include protecting biodiversity, managing fisheries, separating conflicting uses, providing a forum for tourism and recreation, and promoting sustainable economies (Jones, 2002). These varied goals are often addressed through multiple use marine

zoning (Alder, 1996; Day, 2002; Agardy *et al.*, 2003). Marine zoning is a spatial management tool in which areas are designated which allow or disallow certain activities. While the number and type of zones used in an MPA may vary, most zoning schemes include highly protected core highly protected zones surrounded by zones allowing for a range of use intensities (Day, 2002).

3.1.2 MPAs and Stakeholder Support

Many authors have noted that the success of a MPA and associated zoning scheme is linked to the acceptance of it by local stakeholders (e.g. White *et al.*, 2002; Clifton, 2003; Himes, 2007a). Indeed, a number of case studies have emerged documenting proposed MPAs that failed to become established due to lack of stakeholder support (Fiske, 1992; Lien, 1999; Salmanoa & Verardi, 2001), as well as established MPAs that are proving to be ineffective due to stakeholders either being unaware or unaccepting of the regulations (Elliott *et al.*, 2001; Lunn & Dearden, 2006a; Faasen & Watts, 2007). Consequently, it has been recommended that stakeholders be considered in any MPA initiative at the earliest possible stages (Suman *et al.*, 1999; Dalton, 2005), and that social science be given a more prominent role in MPA planning (Christie *et al.*, 2003; Lundquist & Granek, 2005).

One of the ways in which stakeholders may be considered is through studies assessing attitudes and perceptions towards a MPA. Knowing the range of attitudes and opinions amongst stakeholders can help facilitate implementation of a proposed MPA, or can contribute to better management of an existing MPA (McClannahan *et al.*, 2005). Furthermore, by canvassing stakeholders about attitudes, researchers are often able to capture a broader range of opinions than might be evident through a more formal consultative process (Salz & Loomis, 2004). Tracking attitudinal data over time can also provide valuable social indicators from which to measure changes in acceptance of an MPA (Cocklin *et al.*, 1998; Himes, 2007b). Finally, assessing stakeholder attitudes and opinions early in the planning process can help elucidate issues and concerns before they become significant obstacles to MPA implementation (Davis, 2005).

While a number of published studies have considered the attitudes of stakeholders towards MPAs and marine zoning, many have focused primarily on the fishing

community or nearby residents (e.g., Wolfenden *et al.*, 1995; Cocklin *et al.*, 1998; Suman *et al.*, 1999; Salz & Loomis, 2004; Davis, 2005; Stump & Kriwoken, 2006; Broad & Sanchirico, 2008). However, an often dominant stakeholder group that has not been sufficiently studied is the recreational boating community.

3.1.3 Recreational boating and MPAs

Recreational boating is an activity that is gaining in popularity in coastal and marine environments (Widmer & Underwood, 2004; Sidman & Fik, 2005). It is also an activity that can be seen to have both compatibilities and conflicts with MPA goals. For example, recreational boating can provide an important means of tourism in a MPA (Sutton, 2005), and boater spending can contribute to sustainable local economies (Lee, 2003; Lloret *et al.*, 2008b). However, research has also documented a variety of environmental impacts of boating, particularly where it occurs in high concentrations. These impacts include the effects of anchoring (Creed & Filho, 1999; Brackhurst & Cole, 2000a; Leatherbarrow, 2006; Lloret *et al.*, 2008a), wake (Bishop, 2008), sewage discharge (Guillon-Cottard *et al.*, 1998; Shafer & Yoon, 2005; Leon & Warnken, 2008), antifouling paint (Albanis *et al.*, 2002; Valkirs *et al.*, 2003), litter (Brackhurst and Cole, 2000b, Bauer *et al.*, 2008), and boating infrastructure (Burdick & Short, 1999; Paoli *et al.*, 2008); furthermore, boating can have a variety of impacts on a range of marine fauna (e.g., Burger, 1998; Buckingham *et al.*, 1999; Foote *et al.*, 2004; Wall *et al.*, 2005; Bain *et al.*, 2006; Morris *et al.*, 2007).

Recreational boating is thus an activity that has the potential to be impacted by any MPA zoning designation. Given the importance of stakeholder support for a MPA zoning plan, and coupled with the large number of boaters often utilizing the waters within MPA boundaries, this highlights the need to assess boater response to zoning strategies at the earliest possible stages. Indeed, the importance of considering recreational boaters in MPA planning is illustrated by Salmanoa and Verardi (2001), who describe how opposition from the boating community was able to effectively stall the implementation of a MPA near Portfino, Italy.

3.2 Study Objectives

The present study was designed to address this existing research gap and provide management recommendations by examining dimensions of support for and opposition to marine zoning amongst recreational boaters in a proposed MPA in British Columbia, Canada. Although the term "recreational boating" encompasses a range of sail, motor, and human powered watercraft, the focus of this research was solely on sail and motorboat operators accessing study area during the summer season. The specific objectives of the study were (1) to assess the level of support amongst boaters for the concept of marine zoning in the region, and (2) to examine the influence of (a) perceived benefits and constraints, (b) demographic variables, and (c) preferred setting characteristics on overall support for zoning. Such information can contribute to an increased understanding of this important user group's reaction to MPA proposals, and can help managers better respond to boater issues during MPA planning.

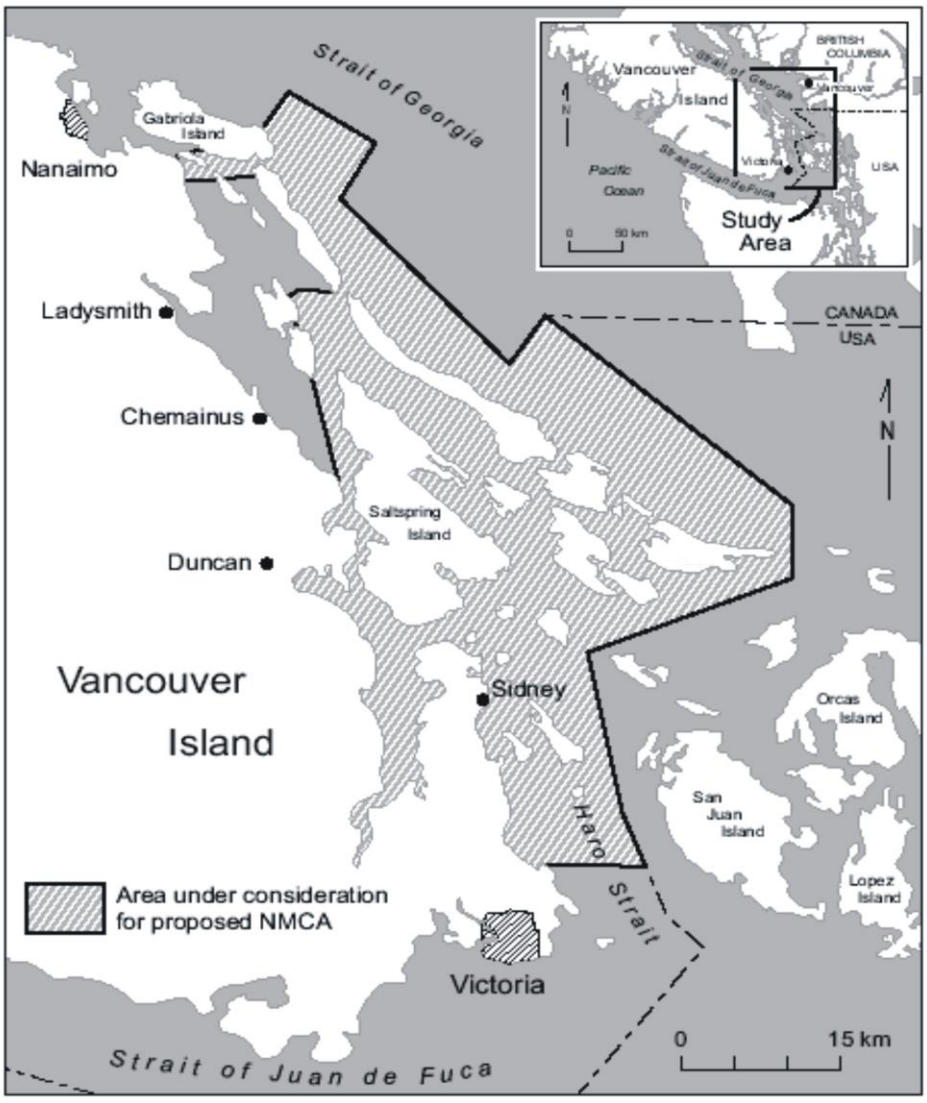
3.3 Methods

3.3.1 Study area

This research was conducted in the southern Strait of Georgia (SSG), which is situated on British Columbia's (B.C.) southwest coast, between southern Vancouver Island and the B.C. mainland (Figure 3.1). Given its location adjacent to major population centres of both B.C. and Washington State, the SSG is one of the busiest waterways in Canada; consequently, it is host to a number of recreational, commercial, and transportation activities. The region also contains the southern Gulf Islands, an archipelago of inhabited and uninhabited islands and islets that provide year-round and seasonal residence for many, and attract thousands of tourists every year. With the warmest and most humid climate in the country, the SSG is unique within Canada in terms of both wildlife and vegetation (Davenne & Masson, 2001); furthermore, the waters support a tremendous amount and diversity of marine life, including an endangered population of resident orcas (*Orcinus orca).*

With its mild climate and sheltered waters, the SSG is also an extremely popular destination for recreational boating (Dearden, 1990), both for residents and tourists alike (Parks Canada, 2007b). The region is host to a number of marinas, marine parks, and undeveloped anchorages, providing varied and extensive opportunities for recreational cruising (Vassilopoulis, 2006). While the precise number of boats utilizing the region is unknown, it has been estimated that the number of vessels accessing the southern Gulf Islands in the summer months is in the range of 14,700 ±25% (Parks Canada, 2007b).

Figure 3.1: Study Area: The Southern Strait of Georgia, British Columbia



Approximately 900 km^2 of the region is currently under consideration for a National Marine Conservation Area (NMCA), which is a MPA managed by Parks Canada for both conservation and sustainable use (Parks Canada, 2008b). Should the proposed NMCA be created, a draft zoning plan will be developed for the waters. Such a plan may consist of up to five zone types, including both fully protected zones and zones for a variety of sustainable uses (Parks Canada, 2007a). In addition to the proposed NMCA, there currently exists some limited protection of the marine environment in the SSG. The Gulf Islands National Park Reserve was created in 2003 to protect approximately 35 km^2 of terrestrial land, as well as 26 km^2 of near-shore marine area scattered throughout the region (Parks Canada, 2008b).

3.3.2 Research design

The methods employed in this study included both quantitative and qualitative techniques. The primary research instrument was a structured questionnaire, delivered face-to-face with boaters visiting the region from June to September 2007. While other research into boating has often employed telephone or mail surveys (e.g. Heatwole & West, 1982; Lee, 2003; Sidman & Fik, 2005), this approach was not deemed suitable for this study. The primary population of interest was recreational boaters visiting the region, and given that past research has indicated that up to 20% of registered vessels in the region are not used in saltwater (Mos & Harrison, 1974), any sampling strategy based on the vessel registry would capture a large amount of boaters that would be excluded from this research. More importantly, such a method would fail to capture out-of-province and American boaters, which can comprise up to 30% of the boating population in the region during the summer months. Given the above issues, a face-to-face approach was deemed to be the only suitable method of accessing the portion of the boating population that visits the region. Such an approach is appropriate in situations where a population list from which to derive a sampling frame does not exist (Salant & Dillman, 1994).

Prior to the questionnaire, a focus group was held with six representatives from local boating organizations, to explore in greater detail boater response to the NMCA

proposal and marine zoning, as well as to guide questionnaire development. Following collection and analysis of data, the focus group members were re-convened in October 2008 and presented with the findings for verification and further discussion.

3.3.3 Questionnaire design

The questionnaire consisted of 33 questions (Appendix D), developed through a review of boating and MPA literature, conversations with boaters, and meetings with regulatory agencies. Questions were further refined through focus group feedback and through a pilot study conducted in June 2007. The portions of the questionnaire pertinent to this paper are briefly described below.

To gauge boater support for the concept of marine zoning, three questions were used. Boaters were first asked to indicate their level of support for six potential environmental management strategies that have provided a basis for zoning decisions in other MPAs (e.g., Great Barrier Reef Marine Park Authority, 2004). Boaters were later specifically introduced to the concept of marine zoning, and asked to indicate their level of support for its application in the SSG. Support for all items was measured on a five point scale, where 1=strongly oppose, 3=not sure, and 5=strongly support. Boaters were also presented with an open-ended question asking them to indicate any additional thoughts or concerns they had about marine zoning in the region.

Two questions presented boaters with lists of statements regarding perceived benefits (8 items) and perceived constraints (8 items) of marine zoning in the region. Respondents were asked to indicate their level of agreement with each statement on a five point scale where 1=strongly disagree, 3=not sure, and 5=strongly agree. The items on this list were initially developed based on ways in which zoning might affect boaters (both positively and negatively), and through a review of other studies assessing stakeholder response to MPA initiatives. The benefit and constraint statements were then modified based on the results of the focus group discussion.

Boater setting preferences were measured with a 20-item list comprised of various environmental, social, and managerial elements. The items on this list were developed to reflect the three dimensions of setting characteristics found in recreation literature (Clark & Stankey, 1979; Manning, 1999), and were constructed based on local conditions,

discussions with boaters and management agencies, as well as a review of other marine boating studies (e.g. Sidman *et al.*, 2004; Parks Canada, 2007b). Respondents were asked to indicate the importance of each element to their overall experience of boating on a five point scale (1=not at all important, 2=slightly important, 3=somewhat important, 4=very important, 5=extremely important).

The questionnaire also collected a variety of descriptive and demographic information, including respondent age, residence, boating experience, years living in the region, vessel type, and vessel size. This information was used to contextualize results and examine variability in responses.

3.3.4 Sampling and Administration

As research in the area has indicated that different sites attract different intensities of use and types of boats (Leatherbarrow, 2006), a stratified random sampling strategy was used. Six sampling sites were selected within the southern Gulf Islands, covering a range in terms of spatial distribution, intensity of use, and level of development. Eight sampling days were conducted at each site, covering every day of the week, and including days in the early, mid, and late summer season.

For three sample sites, the number of boats was usually low enough that a census of vessels was undertaken when the researcher was on site. The other three sites were extremely busy anchorages, requiring the use of a spatial random sampling strategy. Using Garmin Mapsource software (Garmin, 2007), a 100 m^2 grid was applied to each anchorage area, and global positioning system (GPS) waypoints were generated for intersections of the grid lines. While on site, a waypoint would be selected at random, and the vessel that was closest to the waypoint would be selected.

Data collection took place from approximately 12:00 pm to 8:00 pm. Boaters were approached while anchored, moored, or docked and invited to participate in the study. Most questionnaires were collected later on the same day, though a mail back option was provided for boaters who did not have time to complete it on site. A total of 543 questionnaires were completed out of 591 boaters invited to participate, for a response rate of 92%. Of the 543 completed questionnaires, 93% were collected on-site, and 7% were returned by mail. A sample of 543 is considered to have a sampling error

of ± 5% for a population of 1,000,000 or more at the 95% confidence level (Salant & Dillman, 1994).

3.4 Quantitative Results

Although the focus group was held prior to the questionnaire being finalized and delivered to boaters, for the purposes of organization and flow of this paper, questionnaire results are discussed first, and focus group results second.

3.4.1 Boater support for marine zoning strategies

Boater response to questions regarding marine zoning strategies is displayed in Table 3.1. When asked to consider the general concept of zoning, 55% of respondents indicated they were supportive, 26% were opposed, and 19% were unsure (mean=3.3). This can be contrasted with the level of support for the six specific zoning strategies. The highest level of support was expressed for limiting commercial fishing in some areas (mean=3.6); this is likely due to the fact that this was the one strategy listed that would not directly impact recreational boating. Other strategies that received a relatively high level of support included seasonally closing certain sensitive areas (mean=3.5) and limiting anchoring in some sensitive areas (mean=3.4). Predictably, as the strategies became more restrictive towards boating, support tended to decline. The lowest level of support was expressed for limiting motorized access to some sensitive areas (mean=3.1), limiting all access to some sensitive areas (mean=3.0), and limiting recreational fishing in some areas (mean=3.0). The latter two strategies have a nearly equal number of respondents supporting and opposing the strategies.

It should also be noted that there were a number of respondents who indicated that they were not sure of their level of support for either the concept of zoning or the specific zoning strategies. The number of respondents who were not sure ranged from 16% to 22%, with the greatest amount of uncertainty pertaining to limiting recreational fishing, and the least amount of uncertainty pertaining to limiting anchoring and seasonally closing sensitive areas.

Table 3.1. *Recreational boater support for marine zoning strategies*

		Percentage of Respondents					
Activity	**n**	**Strongly Support**	**Somewhat Support**	**Not Sure**	**Somewhat Oppose**	**Strongly Oppose**	**Mean[a]**
General concept of marine zoning	**524**	**15%**	**40%**	**19%**	**15%**	**11%**	**3.35**
Limiting commercial fishing in some areas	537	26%	32%	20%	17%	4%	3.59
Seasonally closing certain environmentally sensitive areas	538	22%	39%	16%	14%	10%	3.48
Limiting anchoring in some environmentally sensitive areas	535	20%	37%	16%	16%	12%	3.37
Limiting motorized access in some areas	533	14%	32%	21%	18%	16%	3.10
Limiting all access to some environmentally sensitive areas	537	17%	26%	17%	23%	16%	3.04
Limiting recreational fishing in some areas	536	13%	27%	22%	23%	15%	3.00

[a]Based on a five point response scale where 1=strongly oppose, 2=somewhat oppose, 3=not sure, 4=somewhat support, 5=strongly support

3.4.2 Perceived benefits and constraints of zoning

Boater response to the questions measuring perceived benefits and constraints of zoning is outlined in Table 3.2. Cronbach's Alpha showed the reliability to be high for both the benefit (α=0.92) and constraint (α=0.83) scales. As Table 3.2 indicates, many respondents perceived both benefits and constraints with respect to a potential marine zoning scheme. A majority (>50%) of respondents agreed with seven of the eight benefit statements. Those most strongly perceived were that zoning would protect species and habitats (mean=4.1), provide clear ground rules (mean=4.0), allow fisheries to recover (mean=4.0), and enhance understanding of the marine environment (mean=3.8). In addition, 53% of boaters felt that a zoning plan would potentially

improve their boating experience. As with the benefits, a majority (>50%) of boaters agreed with many of the constraint statements. Those most strongly perceived were that a zoning plan would be difficult to enforce (mean=4.0), would curtail freedom of movement and access (mean=3.9), and would have a bias towards certain activities (mean=3.8). Furthermore, 42% of boaters felt that zoning would detract from their boating experience in the region. Once again, it should be noted that a number of boaters, ranging from 13% to 42% of respondents, indicated that they were not sure about a potential benefit or constraint of a marine zoning plan.

3.4.3 Influence of perceived benefits and constraints on support for zoning

To examine which of the individual benefit and constraint statements had the strongest influence on a respondent's position towards zoning, Pearsons's product moment coefficient was used to test the correlation between each statement and support for zoning; the results are outlined in Table 3.2. As anticipated, each benefit statement had a positive correlation with support for zoning, and each constraint statement had a negative correlation with support; furthermore, all correlations were found to be significant ($p<0.001$).

Cohen (1988) has suggested that a correlation of 0.5 or more can be considered strong in the social and behavioural sciences. Using this guideline, the benefit statements with a particularly strong correlation with support for zoning are that a zoning plan would protect species and habitats ($r=0.62$), would allow fisheries to recover ($r=0.54$), would provide clear ground rules ($r=0.53$), and would help promote a wilderness experience for boating ($r=0.52$). Constraint statements with a strong negative correlation with support for zoning were that it would detract from the respondent's boating experience ($r=-0.61$) and that it would represent over-regulation of the sea ($r=-0.54$). While the perception that zoning would be difficult to enforce ranked the highest in terms of agreement, it had a relatively low correlation with opposition to zoning ($r=-0.22$).

Table 3.2. *Perceived benefits and constraints of a marine zoning plan, and correlations with overall support for zoning*

		Percentage of Respondents				Correlation	
	n	**Agree**	**Not Sure**	**Disagree**	**Mean[a]**	**r**	**Sig.**
BENEFITS (α=0.92)							
Protect species and habitats	523	79	13	8	4.06	0.62	0.00
Provide clear ground rules for activities and areas	521	78	15	7	4.04	0.53	0.00
Allow fisheries to recover	523	75	16	9	4.01	0.54	0.00
Enhance understanding of the marine environment	522	67	20	13	3.77	0.46	0.00
Reduce conflict amongst users	525	50	32	18	3.50	0.50	0.00
Help promote a wilderness experience for boating	522	53	30	17	3.50	0.52	0.00
Improve my boating experience in the region	523	53	29	23	3.50	0.36	0.00
Provide economic certainty for some activities	520	41	42	17	3.32	0.38	0.00
CONSTRAINTS (α=0.83)							
Curtail freedom of movement / access	523	76	15	9	3.87	-0.30	0.00
Difficult to enforce	517	76	16	8	4.00	-0.22	0.00
Bias towards certain activities	523	71	23	6	3.83	-0.20	0.00
Low compliance rate	520	56	32	12	3.56	-0.27	0.00
Increase conflict amongst users	523	53	32	15	3.49	-0.37	0.00
Represent over regulation of the sea	525	51	25	24	3.39	-0.54	0.00
Create economic barriers to existing users	521	45	41	14	3.41	-0.37	0.00
Detract from my boating experience in the region	522	42	32	26	3.24	-0.61	0.00

[a]Based on a five point response scale where 1=strongly disagree, 2=somewhat disagree, 3=not sure, 4=somewhat agree, 5=strongly agree

While correlation analysis indicates the strength of association between each individual benefit and constraint statement and support for zoning, also of interest was the relative cumulative contributions of perceived benefits and constraints to overall support for zoning. To measure these contributions, a multiple regression approach was used. Each of the eight benefit statements were recoded on a scale from -2 (strongly disagree) to +2 (strongly agree). Perceived constraint statements were recoded on a scale from -2 (strongly agree) to +2 (strongly disagree), such that "disagreeing" with a constraint statement would constitute a "positive" response in the same way as "agreeing" with a benefit statement.

Sum scores for benefit and constraint scales were computed by adding scores for each individual statement, resulting in a benefits scale ranging from -16 (no benefits perceived) to +16 (benefits strongly perceived) and a constraints scale ranging from -16 (constraints strongly perceived) to +16 (no constraints perceived). The sum benefit and constraint scores were then input into a multiple regression model as predictor variables, using overall support for zoning as the criterion variable. Using the enter method, a significant model emerged, as outlined in Table 3.3 ($F=200.42_{2,465}$, $p<0.0005$, $R^2 = 0.46$).

Table 3.3: *Multiple regression analysis of the influence of benefits and constraints on support for zoning*

	b	SE *b*	*β*
Constant	3.21	0.079	
Benefits variable	0.084	0.007	0.48[a]
Constraints variable	0.069	0.009	0.31[a]

$R^2 = 0.46$; [a] =$p<0.001$

These results suggest several conclusions. First, the adjusted R^2 value of 0.46 indicates that perceived benefits and constraints together account for 46% of the variance in overall support for zoning. Furthermore, while both benefits and constraints were significant predictors of support for zoning, beta scores indicate that perceived benefits (0.48) had a stronger influence than did perceived constraints (0.31). This suggests that among recreational boaters, if benefits of a zoning plan are perceived, support is more likely, even if constraints are also perceived. As noted by Cohen (1988), an R^2 value greater than 0.25 is considered large in the social science fields, due in large part to the

inherent difficulties in measuring social phenomena. Thus, while an R^2 value of 0.46 can be considered relatively strong, it is also worth noting that 54% of the variance in overall support for zoning is unaccounted for in this model. Consequently, the next step in the analysis was to examine other factors influencing boater support for zoning, including demographics and setting preferences.

3.4.4 The influence of demographic variables on support for zoning

To examine the influence of demographic variables on boater support for zoning, respondents were divided into two categories based on whether they generally supported (n=291) or generally opposed (n=133) the concept of zoning. Using Pearsons' chi-square, these groups were compared across a variety of demographic variables, including respondent age, country of origin, years living in the region, boating experience, self-rated boating skill, boat club membership, and boat type. Demographically, the two groups were found to be very similar; indeed, only two significant ($p \leq 0.01$) differences emerged. First, those who were opposed to zoning tended to be older than those in support of zoning. Second, those who opposed zoning were more likely to own motorboats (56%), while those who supported zoning were more likely to own sailboats (57%). These results suggest that while demographics may not play a prominent role in explaining differences in support for zoning, older respondents (who may have become more accustomed to the status quo) and those who operate motorboats appear to be more threatened by the concept of marine zoning, while younger boaters are more open to the idea.

3.4.5 The influence of setting preferences on support for zoning

The importance that boaters placed on the 20-item list of environmental, social, and managerial setting elements is displayed in Table 3.3. To reduce this list to a smaller number of categories for further investigation, factor analysis with a varimax rotation was conducted. Using a minimum eigenvalue of 1.0, all items loaded at 0.52 or higher, an acceptable level as suggested by other authors (e.g., Virden & Knopf, 1989; Shafer & Inglis, 2000). One item ("being around other boaters") loaded most strongly in a negative direction; consequently, this item was reverse coded and the factor analysis

repeated. Five factors were subsequently identified, which have been labeled "built facility", "extractive activity", "nature/environment", "quiet and solitude", and "natural facility". It is important to note that the factor labels are subjective interpretations of the researcher, and are used solely for descriptive purposes in an attempt to characterize the groupings of items in each factor. The items that comprise each factor can be seen in Table 3.4.

Table 3.4. *Factor analysis of setting factors important to boaters*

	Item Mean[a]	Item SD	Factor loading	Factor mean[b]	α	Variance explained
Built facility				**3.17**	**0.74**	**17.5**
Marinas	2.86	1.12	0.78			
Access to supplies	3.49	0.99	0.71			
Dinghy docks	3.37	1.18	0.70			
Mooring buoys	2.87	1.34	0.61			
Safe anchorages	4.56	0.62	0.55			
Social/entertainment opportunities	1.98	0.99	0.52			
Pumpout facilities	3.06	1.35	0.48			
Extractive Activity				**2.30**	**0.79**	**14.9**
Crabbing	2.68	1.26	0.86			
Catching fish	2.20	1.18	0.83			
Gathering shellfish	2.02	1.17	0.78			
Nature/Environment				**4.29**	**0.68**	**10.8**
Viewing natural scenery	4.56	0.57	0.80			
Clean/unpolluted water	4.49	0.63	0.77			
Viewing marine wildlife	4.09	0.83	0.61			
Seeing undeveloped shoreline	4.01	0.95	0.59			
Quiet and Solitude				**3.87**	**0.57**	**6.9**
Being away from other boaters	3.14	1.10	0.71			
Being in a peaceful, quiet place	4.44	0.74	0.68			
Being around other boaters (reverse coded)	4.02	1.02	0.57			
Natural Facility				**3.20**	**0.65**	**6.2**
Access to walking/hiking trails	4.02	0.92	0.83			
Access to beaches	3.84	1.01	0.82			
Access to camping facilities	1.72	1.06	0.56			

[a]Based on a five point scale where 1=not at all important, 2=slightly important, 3=somewhat important, 4=very important, 5=extremely important

[b]Means calculated based on the sum score for all items in each factor divided by the number of items.

Cronbach's alpha was used to determine the reliability of each resulting factor. Although one factor ('quiet and solitude') had a comparatively low alpha score (0.57), this is not uncommon in cases where there are few items (Cortina, 1993). For each of the five factors, a mean importance score was calculated by dividing the sum of the importance scores for each item by the number of items in each factor. The student's t-test was used to examine differences in the mean level of importance for each setting factor between those boaters who were supportive of zoning (n=291) and those who were opposed to zoning (n=133).[6] The results, which are outlined in Table 3.5, show statistically significant differences in three of the five factors. Both the "nature/environment" and "quiet and solitude" factors were of a greater importance to supporters of zoning compared to those opposed, while the "extractive activity" factor was more important to those opposed to zoning compared to those in support. Furthermore, though they were not statistically significant differences, those in support of zoning placed a higher importance on the "natural facility" factor, and those opposed to zoning placed a higher importance on the "built facility" factor. These results indicate that boater setting preferences do have an influence on support for zoning, and add further understanding to dimensions of support and opposition amongst recreational boaters.

Table 3.5. *Differences in setting preferences between boaters in support of and those opposed to zoning*

	Mean score[a]		t-test results		
	Oppose Zoning (n=133)	Support Zoning (n=291)	t	df	Sig.
Nature/environment [b]	4.09	4.39	5.25	406	0.00
Quiet and solitude [b]	3.76	3.94	2.41	412	0.02
Built facility	3.25	3.13	1.55	409	0.12
Natural facility	3.13	3.24	1.31	415	0.19
Extractive activity [b]	2.47	2.24	2.11	408	0.04

[a]Mean based on a five point scale where 1=not at all important, 2=slightly important, 3=somewhat important, 4=very important, 5=extremely important
[b] $p<0.05$.

[6] Although respondents who were 'not sure' (19%) were included as a third group in the analysis, they tended to fall between the group who supported zoning and the group who opposed zoning in virtually all categories. Consequently, they have been removed from the discussion in order to emphasize the main differences between those in support of and those opposed to zoning.

3.5 Qualitative Results

In addition to quantitative analysis, this study also employed qualitative methods to gain an increased understanding of dimensions of support for and opposition to marine zoning amongst boaters. By allowing respondents to express themselves in their own words without pre-constructed categories, qualitative methods can add greater depth and context to questionnaire results, and can also help to validate findings from quantitative analysis (Henderson & Bendini, 1995; Creswell, 2005). Two ways in which qualitative analysis was applied in this study were through the use of the open-ended survey question regarding zoning, and through the focus group discussion held with representatives from local boating organizations.

3.5.1 Open-ended question results

When asked in the open-ended question whether they had additional thoughts, suggestions, or comments about developing a zoning plan in the region, 266 respondents (50%) provided some form of comment. Of these, 9% expressed unqualified support for the concept of zoning, 46% expressed either opposition or qualified support (i.e. they recognized potential positive outcomes, but had some reservations or concerns), and 38% provided some form of suggestion for developing a zoning plan. Because such comments lend considerable insight to dimensions of support for and opposition to zoning amongst boaters, these comments have been categorized according to major themes (see Table 3.6).

As these results indicate, many of the comments provided by boaters confirm the perceived benefits and constraints as captured in the closed-ended questions of the study. For example, all comments voicing unqualified support for zoning expressed to some degree a desire to protect the environment from anthropogenic impacts. In addition, comments indicate that for some boaters, there is a recognized willingness to give up some freedom of access if it would benefit the environment. For example, one respondent noted that “to preserve the marine environment, some regulations do need to be established, especially as more people get out on the water”; another wrote that “there are more boats every year it seems … we need to protect the environment even if it limits

some access". The comments expressing unqualified support thus validate the notion that support for zoning is strongly tied to perceived environmental benefits.

Comments related to qualified support for, and opposition to, zoning reflected five main themes, four of which were captured in the closed-ended questions of the survey. The most common theme was fear of over-regulation (12% of comments). Comments confirm that many boaters are wary of the prospect of additional regulations being applied to a marine area that already contains a variety of regulations pertaining to harvesting, sewage and waste disposal, and navigation. Such concerns are voiced by one boater who noted that "if rules and regulations already existing were enforced, I don't see any problems arising that could be solved by a new bureaucracy".

A somewhat related concern, and one that was not directly captured in the closed-ended questions, is a level of mistrust that exists amongst the boating community of federal government involvement in managing the marine environment (11% of comments). Analysis of boater comments indicates that much of this mistrust stems from perceptions of a distant, centralized government with a perceived lack of understanding of local issues. As noted by one respondent, "in principle I agree with the concept of protecting the marine environment, but too often bureaucrats totally unfamiliar with this area enforce regulations that are impractical in the local environment". For other boaters, comments reflect perceptions of past government practice; for example, one boater noted that he would not support a zoning plan run by the federal government due to the feeling that "they have made a mess of our west coast fisheries and [have] shown total bias towards special interest groups". Comments such as these indicate that a certain amount of communication and trust building may be required between MPA planners and the recreational boating community as the MPA proposal proceeds.

A third theme found in the comments is the fear of loss of freedom and access for boating as a result of zoning (6% of comments). As noted by one boater, "I didn't invest in living and boating in the southern Gulf Islands to be prevented from enjoying parts or all of this area". Another indicated that "I am conflicted because I would like to see more marine and bird life but I don't want to sacrifice my access and freedom of movement". Other concerns expressed by boaters include perceptions that zoning would be difficult to enforce or manage (6% of comments), and the feeling that a zoning plan would have a

bias towards certain user groups (5% of comments). Such comments provide validation of several additional perceived constraints as captured in the quantitative analysis.

Finally, boaters expressed a number of specific suggestions related to developing a zoning plan in the region. The most dominant themes to emerge from these suggestions were the desire for consultation with boaters (and other stakeholders) in the zoning process, as well as education for stakeholders both before and after a zoning plan is implemented. Suggestions regarding consultation and involvement of boaters can be seen in the comments of one respondent, who noted that "as the majority of boaters in this area are concerned about the environment and represent major users, they need to have their concerns given weight in any decisions made, especially as they are not represented by a government ministry". Another noted that in addition to boaters, "all interested parties would need to be a part of the process in creating the zones". Such comments indicate a desire on the part of some boaters to be directly involved in the zoning process.

Table 3.6. Respondent comments regarding zoning: categorized according to major themes

Category of comment	**Number of responses**	**% of responses**
Unqualified support	24	9%
Qualified support / Concerns	123	46%
Over-regulation	33	12%
Federal government involvement	29	11%
Loss of access/freedom	17	6%
Difficult to enforce/regulate/manage	15	6%
Unbalanced interests/bias	13	5%
Others	16	6%
Suggestions	100	38%
Need for extensive consultation and education	37	14%
Decrease commercial fishing	17	6%
Specific facility/activity suggestions	17	6%
Phased/gradual implementation of zoning	8	3%
Others	24	9%

3.5.2 Focus group results

The focus group, comprising six representatives from local boating organizations, was conducted in May 2007, as a method of exploring in greater detail the attitudes of boaters towards the proposed NMCA and associated zoning concept. Analysis of the discussion showed several main concerns emerge, including the fear of loss of access for boating, mistrust of the federal government, and a perceived lack of focus with the NMCA proposal; however, there was also a general agreement that zoning could potentially have positive environmental effects. In presenting results from the focus group, direct quotes from boaters have been selected to illustrate these themes.

The first theme that emerged was a fear of losing access to boating locations as a result of MPA zoning. All focus group participants had extensive experience boating in the region, and there were a number of comments that expressed a fear of losing some of the traditional freedom associated with the activity. In the words of one participant, the proposed NMCA

> …*will* impact recreational boating. If I take my experiences in the terrestrial [national parks] program, there are areas of land set aside which limit human access. Now, if that starts happening in the much more confined marine environment in the Gulf Islands, it would have a serious impact on recreational boating … I want some place for my grandchildren to go just like I had to go when I got involved in boating.

Others expressed a concern that zoning decisions would favour conservation, with little consideration of how it would impact boating. In discussing this topic, one participant expressed the fear that the MPA would essentially mean "eelgrass versus anchoring", noting that

> …some boaters feel that they don't want to be restricted from anchoring, and there are fears that from this program there may be some restrictions on anchoring of pleasure craft. That's where I think some of the fear is starting to build up: who are these people, and what are they going to take away from us?

Much of the perception regarding a loss of access appears to be rooted in a fear of the unknown, or the feeling that the government would "arbitrarily" designate areas as "no access" zones for boating. As in the open-ended question, a certain level of mistrust of the federal government emerged. Much of this mistrust is linked to the perception that

the government does not have a clear mandate or vision for the NMCA, as well as the perception that planners have been vague throughout the process regarding what the eventual zoning concept might look like. Indeed, comments reflecting this perception were repeatedly offered by focus group participants throughout the session. In the words of one participant,

> I don't know if they're very focused on what they want to achieve. I mean, they started this [planning process] in 2002, and they are still sitting around asking people questions about how they feel about it.

To which another participant responded,

> …it's the not knowing, that's the part that makes me nervous. I can just see somebody from the federal government, where they spend all this time an energy on data gathering, coming along and saying "Rum Island and Isle De Lis are going to be a no-go zone" … it's the fact that we don't know. They've been at this since 2002 and we still don't know. We don't even know in a draft format.

As these comments indicate, feelings of unease and mistrust towards MPA planners seem to be amplified the longer that the MPA planning process goes on, due to the fact that a specific zoning concept has yet to be developed or presented to stakeholders. This is not so say that the MPA planners in this case have been purposively vague, but it is apparent that they are being *perceived* that way by some boaters. These findings confirm those of other studies emphasizing the importance of open and transparent two-way communication between planners and stakeholders.

Despite these perceptions and fears, most focus group participants were eventually able to come to agreement that some kind of management may be beneficial in the region due to an increasing level of use. Such a perspective is demonstrated by the following exchange between participants:

> The main reason that you need to implement these kinds of regulations is that there is enough use of [this area] that it is causing an impact….we're loving it to death. So zoning is fine. I don't see how we can get any better solution to having parks and using them both … without any regulation, the way I see it, you'd end up degrading the whole resource.
>
> I suppose you're right … with the increase in boating, it does need to be managed. Something needs to be done.

Furthermore, there was recognition amongst most participants that despite fears of losing access for boating, zoning could potentially have beneficial impacts. As was the case elsewhere in this study, the benefits most strongly identified were environmental benefits. For example, one participant pointed out that

> A lot of people go to parks because the natural resources are there … they might be going for bird watching, for example. If you don't keep people away from some of their nesting areas, then you won't have any birds to watch … so I think there are benefits [to zoning] and they are benefits to the greater good.

In thinking about possible zone types, another participant felt that

> If they have a designated area where whale watching boats cannot go and whales can go there to just be at peace and not have the motors … that sort of thing has got to be good if that's what comes out of this.

However, participants also stressed the importance of MPA planners communicating the reasoning behind any zoning decisions to stakeholders, noting that such a strategy would be critical to gaining support and compliance for any regulations. In the words of one participant,

> …if people knew that the reason why [they are] not supposed to go there was because of nesting birds, or the reason why you're not supposed to drop anchor here is because there is eelgrass and there are herring laying their eggs and there's crab reproducing … then I think that's the education the public need to have … that's going to make a difference.

In summary, the focus group discussion facilitated a deeper discussion of the feelings of boaters towards the proposed NMCA; many of the themes that emerged validated findings from the quantitative analysis with respect to dimensions of support for or opposition to zoning. The main concerns about zoning that emerged from this session were loss of access and mistrust of the federal government; meanwhile, dimensions of support for zoning were related to potential environmental benefits, and the need for education and communication was also stressed. It should also be noted that when the focus group was re-convened and presented with the results of this analysis, participants were generally in agreement with the conclusions reached, which contributes to establishing the validity of the findings.

3.6 Discussion and recommendations

3.6.1 Level of support for zoning

Results indicate a relatively strong base level of support amongst the boating community for the concept of marine zoning. Indeed, given that a majority of respondents expressed support for zoning, this provides a strong basis for engaging this stakeholder group in zoning discussions. Furthermore, as stakeholder support is one way of measuring the success of an MPA over time (Cocklin, 1998; Himes, 2007b), the level of support expressed in this study can provide valuable baseline information from which to measure any future changes in support for zoning as the NMCA is implemented.

Despite the relatively high level of support expressed by boaters, it is important to note that there remains considerable variability in responses. For example, 26% of boaters expressed opposition to the concept of zoning, while a further 19% were unsure. Furthermore, specific restrictions that will form the basis of an eventual zoning plan (limiting recreational fishing in some areas and limiting all access to some areas) were particularly divisive for boaters. This suggests that as the NMCA proposal proceeds, the location and size of any "no take" or "no access" zones may be a source of particular contention amongst a significant portion of the boating population. Given these results, it is critical for managers to understand the underlying reasons for boater support or opposition in order to recognize and respond to the issues and concerns of this important user group as a zoning plan is developed.

3.6.2 Dimensions of Support

Support for zoning amongst boaters was found to be tied to several influential factors, as summarized in Table 3.7. Results showed that even if boaters recognized constraints or had concerns about marine zoning, they were still likely to support the strategy if they also recognized potential benefits. In terms of specific benefits, those with the strongest influence on support for zoning were perceived environmental benefits; this finding was consistent throughout the quantitative and qualitative portions of the study.

These results have important implications for MPA planners and managers, particularly in terms of developing a strategic communication plan. In communicating with recreational boaters, MPA planners may benefit from focusing on the environmental benefits of establishing a zoning plan in the region. In particular, communicating how MPA zoning has resulted in positive environmental effects in other areas of the world may be a valuable means of gaining boater support. These results also highlight the importance of monitoring the environmental effects of any future zoning plan, and communicating these effects to stakeholder groups as a means of gaining support. As noted by Cocklin *et al.* (1998), such a strategy resulted in increased public support for MPAs in New Zealand as their environmental benefits became evident. However, it is important to note that this requires early planning, a strong baseline understanding of existing environmental conditions prior to zoning being implemented, and a plan in place to identify and monitor environmental indicators (Pomeroy *et al.*, 2004).

A second factor that had an influence on support amongst boaters was boater setting preferences. In particular, boaters who were supportive of zoning placed a greater importance on settings characterized by natural environment features, as well as peaceful and quiet surroundings. This suggests that in considering marine zoning, many boaters appear to view the strategy as being potentially compatible with these types of boating settings. Thus, if managers are concerned with obtaining support from recreational boaters for a zoning plan, consideration should be given to how zoning might preserve or enhance these setting types for boating in the region. Spatial zoning strategies such as those focusing on providing for a range of setting types and separating conflicting uses may have significant utility in this respect (see Chapter 2).

Table 3.7: Factors influencing support for or opposition to zoning amongst recreational boaters.

	Support for Zoning	Opposition to Zoning
Benefits / Constraints	Perceived environmental benefits	Perceptions of over-regulation, loss of access/freedom, negative impact on boating
Setting preferences	Greater importance on natural environment, quiet and solitude	Greater importance on setting which facilitate extractive activities
Demographics	Younger boaters, sailboat operators	Older boaters, motorboat operators
Other issues		Mistrust of the federal government, fear of the unknown

3.6.3 Dimensions of Opposition

Results of this study show several key dimensions of opposition to marine zoning amongst boaters (summarized in Table 3.7). Perceived concerns and constraints of a zoning plan, while not having as strong an influence as perceived benefits, were still found to be significant predictors of opposition to zoning. In particular, perceptions that zoning would represent over-regulation of the sea and that it would detract from respondents' boating experience were strongly correlated with opposition. In addition, qualitative analysis indicated several other prominent concerns of boaters, including the fear of losing access and freedom for boating, as well as a level of mistrust of the federal government amongst boaters. Results also show that older respondents (who may have become more accustomed to the status quo) and those owning motorboats were more likely to be opposed to zoning. Finally, boaters who were opposed to zoning placed a greater importance on settings which facilitate extractive activities, suggesting that for those boaters to whom such activities are important, the concept of zoning is viewed as a threat. These results have important implications for MPA planning. Indeed, if boater support for a zoning plan in the proposed NMCA is to be obtained, planners and managers must be able to recognize and respond to these issues and concerns.

Perceptions of over-regulation have been a concern of stakeholders in other MPA studies; for example, fishers in the Florida Keys National Marine Sanctuary were concerned about "creeping regulations" gradually imposed by zoning (Suman *et al.*, 1999). While such concerns among boaters may represent a fundamental opposition to the idea of regulating the oceans, any mitigation of such concerns amongst boaters will require targeted communication explaining how zoning regulations would complement or enhance existing regulations – particularly those related to fishing, sewage discharge, and waste disposal – rather than simply representing "another layer of bureaucracy". Such a message must be made clear in all MPA communications and consultations with boaters.

Much of the perception of loss of access, meanwhile, appears to be rooted in the fear that areas popular for boating will be suddenly designated as "no access" zones. Furthermore, focus group discussions expressed the concern that decisions regarding such zones would be made "arbitrarily" by MPA planners. To counter this, it is recommended that MPA planners engage recreational boaters in discussions regarding the development, sizing, and placement of zones (as was suggested by a number of boaters), and that the rationale for any such decisions be clearly documented and communicated. While specific designation of "no take" and "no access" zones will always be contentious for a portion of the boating community, involving these stakeholders in zoning design may greatly assuage the fears of boaters.

Finally, mistrust of the federal government is an issue with a number of boaters, a finding consistent with research examining other MPA stakeholders (e.g., Wolfenden *et al.*, 1994). While this mistrust may in many cases be deep-seeded and pervasive, it is only through open two-way communication between MPA planners and boaters, as well through meaningful involvement of boaters in the planning process, that these concerns are likely to be mitigated.

3.6.4 Engaging the boating community in zoning decisions

It is evident, particularly through the qualitative findings, that many of the concerns of boaters appear to be linked to an underlying fear of the unknown – a fear that may be amplified the longer an MPA planning and consultation process proceeds. In the case of the proposed NMCA, boaters expressed frustration and nervousness due to

several years of public consultation with no specific zoning concept being presented. In order to mitigate such reactions, many authors have noted the importance of meaningfully involving stakeholder groups in MPA planning (e.g., Dalton, 2005; Helvey, 2005).

As noted by Arnstein (1969), meaningful stakeholder involvement is ideally a two-way exchange of information and ideas between stakeholders and governing bodies. While such involvement in resource management is not without its challenges (e.g., McClosky, 1999), the potential benefits are numerous, and can include enhanced local stewardship and support, increased understanding of diverse stakeholder perspectives, and improved overall management (Gregory & Wellman, 2001). Furthermore, stakeholders are more likely to support decisions in which they were directly involved, thereby reducing the need for costly enforcement measures (Gillman, 2002).

In the case of the proposed NMCA, boaters have thus far been involved through general community consultation meetings and presentations to boating organizations (Parks Canada, personal comm.). However, one way in which boaters may be more meaningfully involved in marine zoning discussions is through the creation of some form of advisory council comprised of local recreational boaters. Such a method has been used on a large scale for involving the public in the U.S. National Marine Sanctuary Program (Dalton, 2005), as well as on a smaller scale for involving stakeholders in the designation of no take zones in the Channel Islands National Marine Sanctuary (Davis, 2005). Such a group could be directly involved or consulted in developing a specific zoning plan for the NMCA, thereby providing two-way communication between MPA planners and boaters, facilitating input of local boater knowledge, ensuring that boater perspectives are taken into account, diminishing boater fears and concerns, and helping to build trust between government representatives and this important user group. Indeed, when focus group participants were re-convened in October 2008, they generally agreed that this might be an effective approach. However, it is recognized that ensuring fair and even representation for the boating community on any such group, as well as balancing the needs of recreational boaters with those of other stakeholders, would be a considerable challenge.

3.7 Summary and Conclusions

Given the critical importance of stakeholder support for MPAs and marine zoning, studies assessing the response of marine user groups to such proposals are of significant utility. This research has contributed considerable insight into dimensions of support for and opposition to the concept of marine zoning amongst boaters. While the base level of support for the concept of zoning was found to be relatively high, this study identified several key concerns of boaters that will likely need to be addressed by MPA planners and managers.

A challenge of this research is that it is assessing response to a *concept* rather than a specific plan, and it is recognized that more specific issues and concerns are likely to emerge when a specific zoning plan is developed. However, a distinct strength of this approach is that it allows for the identification of issues early enough in the planning process that they may be addressed before they become significant obstacles to MPA implementation. As noted, it is possible that boater concerns identified through this study may be mitigated through concerted communication and meaningful involvement of boaters in any zoning process. Finally, while this research represents a case study of boaters in a proposed MPA in British Columbia, it is only through a compendium of case studies examining a variety of stakeholders across a range of geographical areas that an overall understanding of stakeholder response to MPA proposals will be developed.

Chapter 4

Spatial Characterization of Recreational Boating Using an On-the-Water Questionnaire: A Case Study from the Southern Strait of Georgia, British Columbia

Abstract. Effective management of marine activities for environmental and safety risk requires an understanding of their spatial distribution and intensity of use. Despite the popularity of recreational boating in Canada, there exists little information on the spatial patterns of boating in the country. This study, conducted in the southern Strait of Georgia, British Columbia, applied an on-the-water questionnaire to map recreational boating distribution and density, and assess the utility of a face-to-face questionnaire at capturing such information. Recreational boaters (n=543) visiting the region completed questionnaires asking them to plot the route of their current boating trip. Information was entered into ArcGIS for mapping and analysis. Results clearly indicate several hotspot destinations and corridors for recreational boating in the region. Strengths of the method include the ability to link spatial data to questionnaire variables, collection of data for entire vessel routes, a high response rate, and a reduction in recall error. Limitations include potential for bias towards sample sites, a trade off between the amount of area covered and the map detail, and issues of respondent accuracy when completing maps. Recommendations for both management and future research are made.

4.1 Introduction

Marine recreation and tourism is a growing use of coastal areas (Orams, 1999; Hall, 2001; Collins, 2008), and a dominant form of such tourism is often recreational boating (Sant, 1990; Widmer *et al.*, 2002; Sidman *et al.*, 2004). Recreational boating can be defined as boating for pleasure purposes, and consists of a variety of motor, sail, and human powered watercraft. With the longest coastline in the world, recreational boating is a particularly popular activity in Canada. Canadians own an estimated 2.9 million recreational vessels (Genesis Public Opinion Research, 2007), an approximate average of one boat per eleven residents; furthermore, many areas of the country experience a large number of boaters from outside Canada. This high rate of boating has positive impacts on national, provincial, and local economies – for example, it has been estimated that recreational boating in all its forms contributed approximately $12.6 billion to the Canadian economy in 2006 (Genesis Public Opinion Research, 2007).

Despite positive economic impacts, marine recreational boating can pose both safety and environmental risk. Data from the United States show that over 600 recreational boaters die and approximately 4,000 are injured in a typical year (McKnight *et al.*, 2007). In Canada, more than 50% of all Coast Guard search and rescue operations

involve recreational vessels (Fisheries and Oceans Canada, 2004; Pegler *et al.*, 2007). Research has also documented a variety of environmental impacts of marine recreational boating. These include impacts associated with anchoring (Creed & Filho, 1999; Brackhurst and Cole, 2000a; Leatherbarrow, 2006; Lloret *et al.*, 2008a), sewage discharge (Guillon-Cottard *et al.*, 1998; Shafer & Yoon, 2005; Leon & Warnken, 2008), antifouling paint (Albanis *et al.*, 2002; Valkirs *et al.*, 2003), wake (Bishop, 2008), and litter (Brackhurst and Cole, 200b; Bauer *et al.*, 2008). Furthermore, boating activity can pose disturbance to marine fauna, resulting in a variety of impacts (e.g., Burger, 1998; Buckingham *et al.*, 1999; Foote *et al.*, 2004; Wall *et al.*, 2005; Bain *et al.*, 2006; Morris *et al.*, 2007).

Assessment and management of the environmental and safety risk posed by recreational boating requires an understanding of the distribution and intensity of boating activity (Widmer & Underwood, 2004). However, there is very little information available on the spatial patterns of recreational boating in Canada. As an initial step towards addressing this information gap, a questionnaire-based study was conducted at six Canadian boat shows in 2004 (Pelot *et al.*, 2004; McCallum, 2004). Respondents were asked to indicate on a map the areas in which they boat most frequently. While this resulted in a general overview of marine areas frequented by boaters in Canada, the spatial data gathered was coarse, and was hampered by a focus solely on boat show attendees (Pelot *et al.*, 2004).

The present study was designed to capture more detailed spatial information for recreational boating in Canadian waters using a more direct on-the-water questionnaire. To capture such detail, this study employed a narrower focus, both in terms of geographic location and type of vessel. The study area was the southern Strait of Georgia, British Columbia, with particular focus on the southern Gulf Islands. The primary boating population of interest was motor- and sailboats engaged in overnight and day cruising during the peak boating season. This type of boating comprises a large portion of boating activity in the region during the summer months, and thus is a contributor to both safety and environmental risk.

The overall goal of this study was to produce a spatial dataset for recreational boating in the region, in order to increase understanding of boating patterns, inform

management decisions, and provide a basis for future analysis. Specific objectives were to (1) characterize recreational boating in terms of vessel type and size, trip duration, and number of passengers; (2) map boating activity in the region in terms of distribution, hotspot destinations, and density of routes; (3) examine boating patterns by vessel type and vessel size; and, (4) assess the utility of an on-the-water questionnaire at obtaining such information. Results of this study are relevant to managers tasked with making decisions regarding the marine environment, and to researchers interested in exploring methods of spatially characterizing boating activity.

4.2 Literature Review

Research has indicated that boating is not random in space (Box, 1996), but instead may be influenced by a number of variables, including boater activity preference (Lentnek *et al.*, 1969), attitudes towards potential destinations (Murphy, 1975), weather and seasonality (Leon & Warnken, 2008), location of boating facilities (Reed-Andersen *et al.*, 2000), geographic factors, or a combination of the above (Sidman & Fik, 2005). Any attempt to spatially characterize boating activity must consider the variety of data gathering methods available. A number of studies have examined spatial aspects of recreational boating, a review of which reveals three primary methods for capturing spatial data, including remote sensing (primarily aerial photography), direct observation, and questionnaires.

Aerial photography has been utilized to characterize boating in a number of studies. Ashton and Chubb (1972) used this method to map boat movements and use levels in a study of carrying capacity in Michigan Lakes, while Reed-Andersen *et al.* (2000) used it to determine boating distribution, density, and overall use of lakes in Wisconsin. Sidman and Flamm (2001), meanwhile, examined the utility of aerial photography to map boat type, density, and direction of movement in Florida. More recently, Leon and Warnken (2008) utilized aerial photography to document the number of small vessels in Queensland as an input into modeling recreational traffic and environmental risk. Through such research, aerial photography has proven useful at accurately portraying boat positions and direction of movement at a specific time; however, such a method is expensive (particularly when a large area is under

investigation), and requires numerous sets of photos throughout the study period in order to adequately and representatively characterize activity in an area (Sidman & Flamm, 2001). In addition to aerial photography, a study by Pegler *et al.* (2007) explored the use of high-resolution satellite imagery to identify small recreational vessels, as an input into marine risk assessment.

Direct observation, which includes techniques such as standing at or video recording from a particular vantage point and counting or mapping the location of observed vessels, has also been employed. Jaakson (1989) used this technique to map the density of boat activity at Mooney's Canal, Ottawa, while Widmer & Underwood (2004) used direct observation to characterize boat movements and anchoring patterns in Sydney Harbour, Australia. In both cases, the area under study was relatively confined, with limited entry and exit points. Although direct observation can be useful in such situations, it becomes more problematic in areas characterized by numerous possible entry and exit points for boating.

A third method that has been used is questionnaires with boaters. Heatwole and West (1982) utilized a mail questionnaire to registered boat owners in New York, providing respondents with a map asking them to indicate the areas that they boat most frequently. Hepner & Wales (1986) utilized a similar approach in a study of marina users in Mississippi. Falk *et al.* (1992) used a face-to-face approach with boaters in Delaware, asking boaters exiting an inland bay to plot on a map the route of the day's boating trip. A face-to-face approach was also utilized in the previously mentioned study of boat show attendees in Canada (Pelot *et al.*, 2004). Finally, a great deal of recent questionnaire-based research into boating patterns has been conducted in Florida. In a number of regional boating studies, Sidman and associates (Sidman & Flamm, 2001; Sidman *et al.*, 2004; Sidman & Fik, 2005; Sidman *et al.*, 2007) have utilized mail questionnaires to registered boat owners, waterfront property owners, boat ramp users, and marina slip occupiers, with the intent of capturing a representative sample of the boating population. Respondents were asked to indicate on a map the route of their last two boating trips, favourite destinations along those routes, and areas of perceived congestion. This information was incorporated into a geographic information system (GIS), allowing for extensive spatial display and analysis of boating patterns in Florida.

Through such studies, a questionnaire-based approach has been shown to have the distinct advantage of being able to link spatial patterns to a variety of other questionnaire variables (Sidman & Flamm, 2001; Sidman *et al.*, 2004), thereby providing for a rich and varied spatial dataset. Furthermore, it can obtain more detailed temporal information regarding boat movements than the "snapshot" data associated with aerial photography and direct observation. However, potential shortcomings of this approach are that the accuracy of the data obtained through a questionnaire will be constrained by the scale of the map, and is dependent upon respondent accuracy when completing the questionnaire (Canessa *et al.*, 2007). Furthermore, capturing a representative sample of recreational boaters using a questionnaire, particularly in an open marine setting, is a challenge (Lee, 2003).

In a review of potential methods available for capturing spatial data for boating, Sidman and Flamm note that "the appropriateness or usefulness of any one method, or combination of methods, would be determined by the kind of information needed for characterization" (2001, p. 31). This study has drawn upon methods developed by Heatwole and West (1982), Falk *et al*. (1992), and Sidman *et al.* (2004, 2007), adapting them for use in an on-the-water questionnaire with boaters. To this author's knowledge, this is the first attempt to spatially characterize marine recreational boating patterns based on an on-the-water questionnaire. The rationale for this research approach is outlined in the following section.

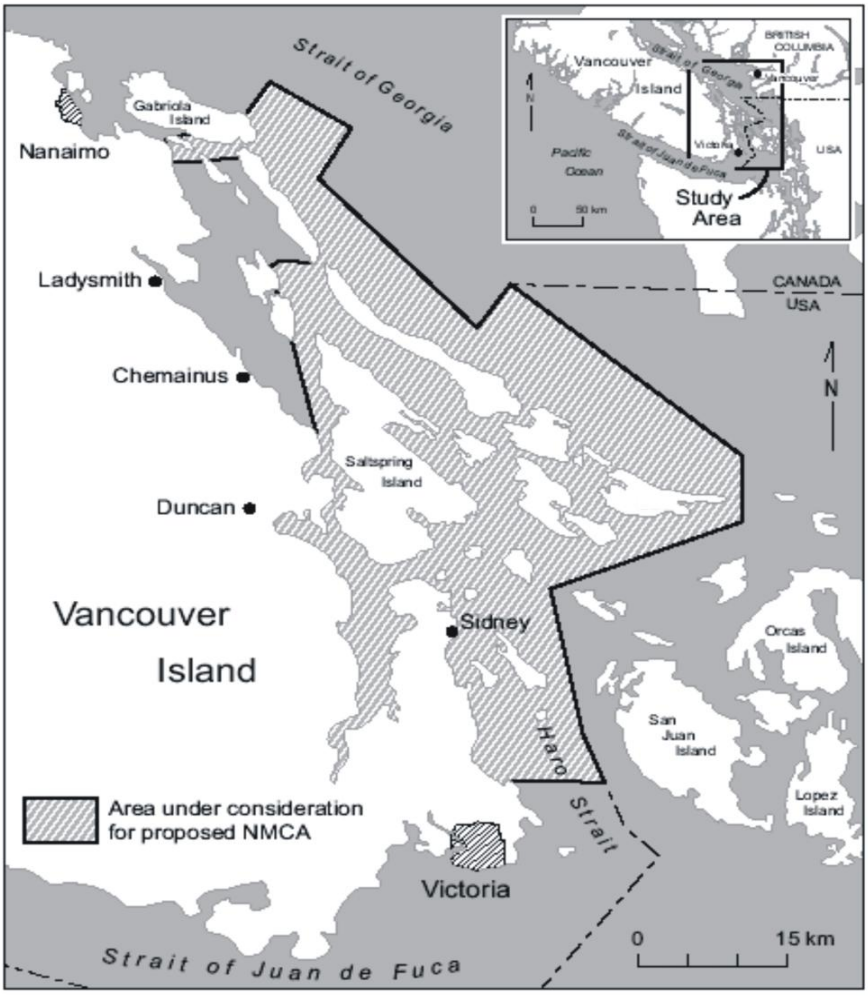
4.3 Methods

4.3.1 Study Area

The southern Strait of Georgia (SSG) is situated on the southwest coast of British Columbia (B.C.), between Vancouver Island and the B.C. mainland (Figure 4.1). A mild climate and sheltered waters, coupled with its location adjacent to major population centres of both B.C. and Washington State (U.S.A.), make the SSG one of the busiest areas in Canada for recreational boating. A major focal point for boating in the region is the southern Gulf Islands, an archipelago of inhabited and uninhabited islands and islets that, together with the San Juan Islands of Washington State, make up one of the most

desirable cruising grounds in western North America. While the total number of recreational vessels accessing the region is currently unknown, the summer boating population consists of a large number of both resident boaters and tourists (Parks Canada, 2007b). In addition to a high concentration of recreational vessels, the SSG is host to a number of other recreational and commercial marine activities (e.g. ferries, commercial shipping, commercial fishing, sea kayaking). The number of activities occurring in the same area as a large fleet of recreational vessels thus poses a potential for conflict, as well as a safety risk of unknown magnitude.

Figure 4.1: Study Area: The Southern Strait of Georgia, British Columbia



The waters of the SSG also support a large amount and diversity of marine life, including an endangered population of southern resident orcas (*Orcinus orca)*.

Recognizing the environmental value of the area, approximately 900 km^2 of the waters surrounding the southern Gulf Islands are currently under consideration for a National Marine Conservation Area (NMCA), which is a marine protected area managed by Parks Canada for conservation and sustainable use (Parks Canada, 2008b). Should the proposed NMCA be created, a multiple use zoning plan will be developed for the area, the intent of which is to designate marine zones that allow or disallow certain uses in order to reduce use conflicts and protect the marine environment. Of critical importance to developing any marine zoning plan is an understanding of the spatial use of the area by user groups (Laffoley, 1995; Haab *et al.*, 2008). Thus, the number and diversity of vessels in the SSG, the associated safety risks, a sensitive marine environment, and current management needs provide a strong impetus for this study.

4.3.2 Research Design

A face-to-face questionnaire was delivered to boaters visiting the southern Gulf Islands from June to September 2007. Prior to selecting this method, other methods were considered and rejected. Given the relatively large area under study and the numerous entry and exit points for boating, direct observation was not deemed to be a feasible method. Aerial photography was also considered; however, such an approach would require numerous flights over a large area, and would thus be prohibitively expensive. Furthermore, a comparison of preliminary data from this study with data from aerial photography (Canessa *et al.*, 2007), concluded that aerial photography would not be adequately representative of vessel routing in the region.

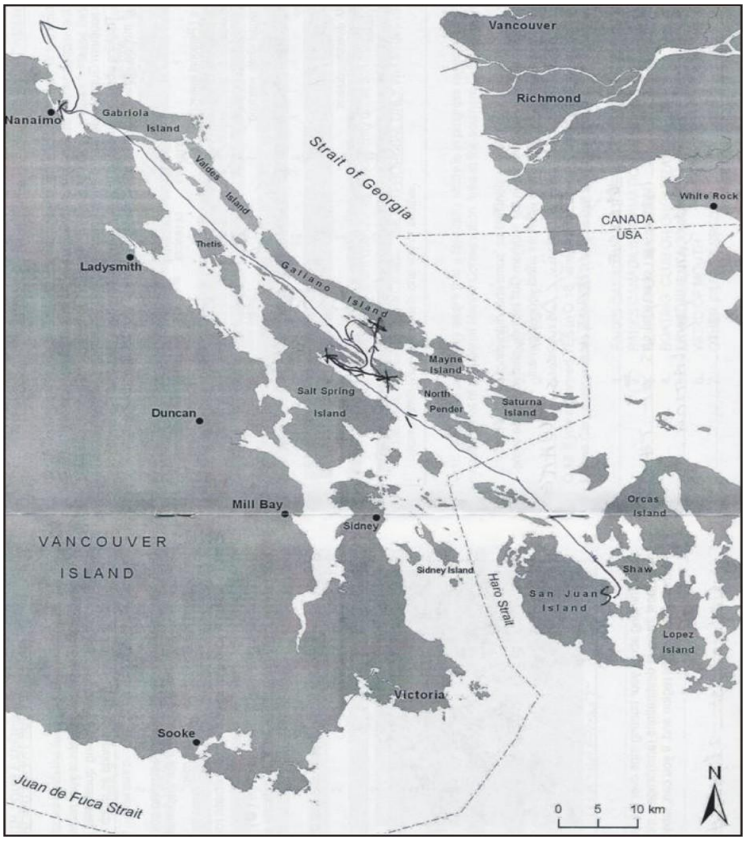
Many boating studies have employed mail or telephone questionnaires based on vessel registries in an attempt to achieve a representative sample of boaters (e.g., Heatwole & West, 1982; Lee, 2003; Sidman *et al.*, 2004); however, such a method was not considered appropriate for this study. The primary population of interest was recreational cruisers visiting the SSG, and given that past research indicates that up to 20% of registered vessels in the region are not used in saltwater (Mos & Harrison, 1974), any registry-based mailing would capture many boaters that would be excluded from this research. More importantly, such a method would fail to capture out of province and U.S. vessels, which can comprise up to 30% of the boating population in the region

(Parks Canada, 2007b). Furthermore, face-to-face questionnaires have consistently been shown to have a much higher response rate than mail questionnaires, thereby reducing the chance of both non-response error and coverage error (Salant & Dillman, 1994).

4.3.3 Questionnaire Design

The questionnaire contained a variety of questions about boating in the region (Appendix D), which were developed and refined through a review of other boating studies, conversations with boaters and management agencies, and a focus group of boaters. Following methods of previous studies (Falk *et al.*, 1992; Sidman *et al.*, 2004, 2007), boaters were presented with a map of the region (8.5"x 11" 1:450,000 scale), on which they were asked to plot trip information, including start point, travel route, and location of temporary and overnight stops. Research has shown that a traveler's ability to recall detailed information from a trip is reduced over time (Rylander *et al.*, 1995). Thus, rather than ask about past trips (Sidman *et al.*, 2004, 2007), it was felt that asking about a boater's current trip would result in more accurate routing information. Although the scale of the map precluded detailed labeling of all place names, several key islands and cities were labeled for reference. An example of a respondent-completed map can be seen in Figure 4.2.

Figure 4.2: Example of a respondent-completed map



To obtain additional information about boating patterns and activity, respondents were asked to estimate the number of days spent boating for each month over the past year, as well as to list their three most frequent destinations in the region over the same time period. Finally, the questionnaire also collected demographic, vessel, and trip information, as well as a variety of information on boater preferences and activities.

4.3.4 Sampling and Administration

Given the numerous entry and exit points for boating in the study area, a stratified random sampling strategy was employed. As previous research in the region indicates different sites attract different intensities of use and types of boats (Leatherbarrow, 2006), six sampling sites were selected in the southern Gulf Islands, representing a range in terms of spatial distribution, facilities provided, and estimated intensity of use. Eight sampling days were conducted at each site, covering every day of the week and including days in the early, mid, and late summer season. For three sampling sites, the number of boats was usually low enough that a census of vessels was undertaken when the researcher was on site. However, a large number of vessels at other sites required the use of a spatial random sampling strategy. Using Garmin mapsource software (Garmin, 2007), a 100 m^2 grid was applied to each anchorage area, and global positioning system (GPS) waypoints were generated for intersections of grid lines. While on site, a waypoint would be selected at random, and the vessel closest to the waypoint would be sampled. Boaters were approached while anchored, moored, or docked and invited to participate in the study. If they agreed, they were provided with a copy of the questionnaire to complete.

Most questionnaires (93%) were collected on the same day they were administered, though a mail back option was provided for those who were unable to complete it on site. A total of 543 questionnaires were completed out of 591 boaters invited to participate, for a response rate of 92%. Of these 543 responses, 519 usable maps were produced. Twenty four maps were rejected, either due to illegible information, routes that were clearly incorrectly drawn, or the respondent failing to complete that section of the questionnaire. Thus, considering solely the spatial aspects of this study, the adjusted response rate was 88%.

In designing the study, it was recognized that this strategy would result in some sampling bias towards the selected locations. However, this was still deemed to be the best approach to capture detailed movements of the boating population that visits the region in the peak season. Furthermore, because most boaters under investigation were on multi-destination cruises, it was reasoned that spatial information for boaters visiting a variety of sites would be captured. Further discussion of potential bias towards sample locations is included in the results section of this paper.

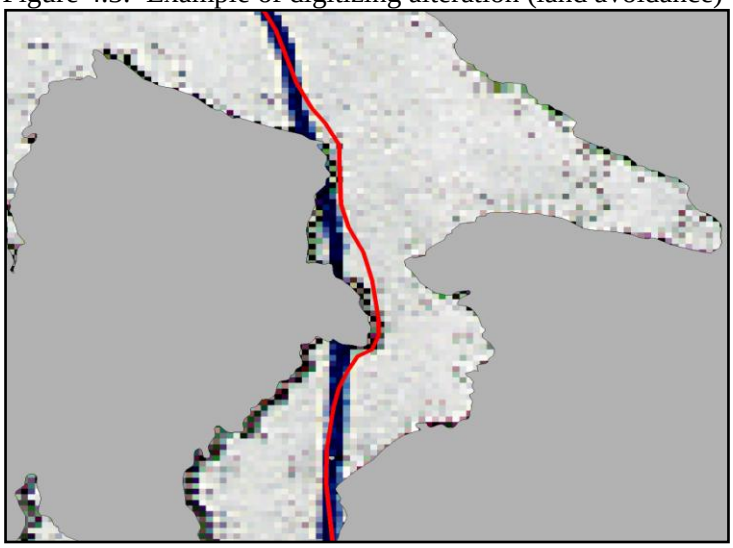
4.3.5 Digitizing and Mapping of Spatial Information

Following methods employed by O'Brien (2004), respondent maps were scanned and imported into ArcGIS 9.2 for digitizing. Due to aberrations in the printing process, scanned paper maps needed to be georeferenced to known locations on the digital coastline file (Albers Equal Area projection, NAD 1983 datum) prior to digitizing. Following georeferencing, spatial data was digitized on screen, at an approximate scale of 1:24,000. Trip origin locations were digitized as point features, and vessel routes were digitized as vector line features. To ensure route directionality information was maintained, each route was digitized as a series of legs (defined as the portion of the route from one indicated origin or stop point to the next stop point). During the digitizing process, routes were coded with the following information: survey number (a unique identification number that allows spatial data to be linked with additional attribute information from the questionnaire), leg number (the numerical order of legs in multiple-stop routes), start point (the starting location of each leg), and end point (the finish location of each leg).

While the majority of a typical respondent's route was digitized exactly as plotted, in a number of cases route alterations or generalizations were required. In plotting their route maps, many respondents drew a route that crossed over or encroached upon a portion of land, with varying degrees of error (e.g., crossing a narrow point of land or touching land while plotting a route through a narrow passage). Although consideration was given to digitizing the route precisely as drawn, it was decided that in such cases, the digitized route would be gradually altered to avoid the landform, after which it was reconnected to the route as plotted by the respondent (see example in Figure

4.3). While this meant that not all routes were digitized exactly as plotted, it was reasoned that such an approach would more accurately portray the actual route of the vessel. Although such alterations represented by far the most common changes made when digitizing, other alteration types included slightly extending routes into harbours to reflect the proper location of anchorages, and smoothing out extremely sharp turns in plotted routes to better reflect the movement of a vessel. In total, approximately 80% of vessel routes required some form of alteration when digitizing; however, the majority of these were considered to be minor. In all cases, alterations were done in a consistent manner, and the nature and extent of alterations were noted in the metadata for the individual route shapefiles.

Figure 4.3: Example of digitizing alteration (land avoidance)

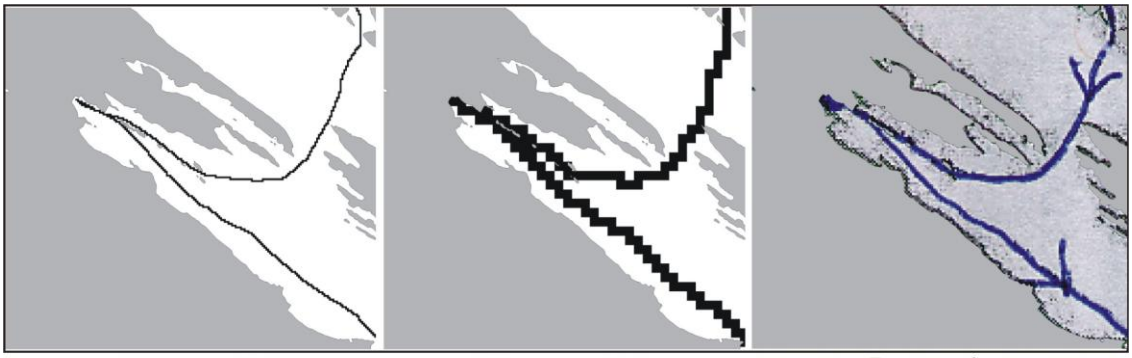


To produce boating density maps, a rasterization procedure (converting vector shapefiles to raster format then overlaying each route) was chosen over a vector overlay, for several reasons. First, raster data is well suited for displaying continuous phenomena (Bernhardsen, 2002), such as the density of recreational vessel routes. Furthermore, as rasterization involves pixilation of a vector data source, it inherently involves some generalization (Bernhardsen, 2002). Given the scale of the map that respondents were provided (1:450,000), as well as the alterations made when digitizing, such generalization was deemed appropriate for the data collected. Finally, vector overlays, particularly in cases with a large amount of data, require significantly more time and computational effort than raster overlays.

Each vector route was thus converted to raster format, wherein cells containing a vessel route were classified as having a value of one, and all other cells as having a value of ‘no data’. During the rasterization process, various cell sizes were investigated. However, a raster cell size of 250 metres was eventually chosen, as this best represented

the vessel routes as drawn, and was thus the best data resolution that could reasonably be expected (see Figure 4.4). Following conversion to raster, vessel routes were combined using map algebra, in which the individual values for each raster cell were added, resulting in recreational boating route density information per 250 metre raster cell within the study area.

Figure 4.4: Examples of raster cell sizes and a respondent-plotted route



4.4 Results

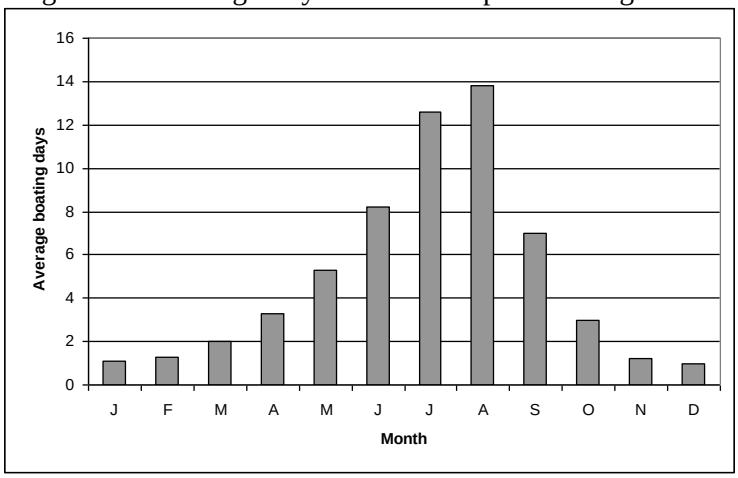
4.4.1 Respondent, Trip, and Vessel Characteristics

Sixty eight percent of respondents were from British Columbia, with an additional 4% from other areas in Canada. Vessels from the United States represented 27% of respondents, highlighting the importance of cross border vessel traffic in the region. 59% of respondents had two people on board, with only 10% having more than four persons on board. The mean number of persons on board vessels was 2.8. Considering boat type, there was a roughly even split between sailboats (52%) and powerboats (48%). Vessel size ranged from 13 to 78 feet, with a mean length of 35 feet.

Ten percent of respondents indicated they were on a day trip when intercepted, 41% were on a cruise of between two and seven days, 24% were on a cruise of between one and two weeks, and 24% were on a cruise greater than two weeks in length. The median trip length for all respondents was nine days. Considering boating activity over the past year, Figure 4.5 displays the average number of days per month that respondents spent boating. As can be seen, the peak boating season is in July and August (58% of all

boating days), with a distinct shoulder season in May, June, and September. May through September together accounted for 78% of all boating days for the year. Respondents averaged approximately sixty days of boating over the past twelve months.

Figure 4.5: Average Days Per Month Spent Boating

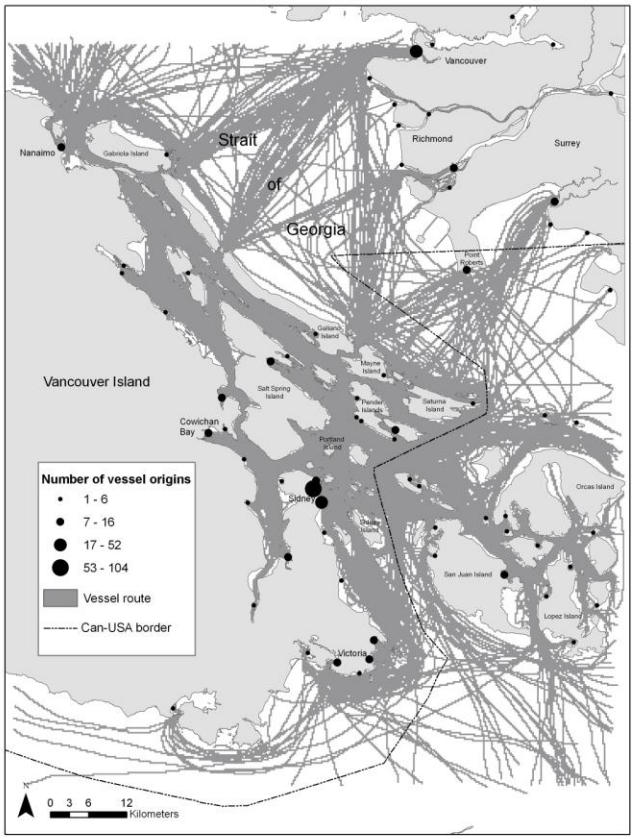


4.4.2 Points of Origin and Vessel Distribution

The overall distribution of vessel routes and points of origin is displayed in Figure 4.6. Most boating trips originated within the study area, with by far the most dominant clustering of origins (33% of all trips) located in and around Sidney on Vancouver Island. This concentration is reflective of Sidney's nature as a focal point for local boating, as it contains several marinas, yacht clubs, docks, and launching points for vessels. Additional clusters of trip origins are evident throughout the region, most notably Vancouver on the B.C. mainland. Although comparatively few routes originated within the southern Gulf Islands, two clusters of trip origins can be seen in Bedwell Harbour (Pender Islands) and Ganges Harbour (Salt Spring Island). Within U.S. waters, trip origins are scattered throughout the San Juan Islands; however, 17% of all vessel routes originated outside the map boundaries, most of which were from a variety of cities in Washington State.

Considering the overall distribution of vessel routes throughout the SSG, Figure 4.6 clearly indicates that a large portion of the region is utilized for recreational cruising. Nearly all of the cells within the southern Gulf Islands and San Juan Islands, extending from Nanaimo in the northwest to Lopez Island in the southeast, are occupied by at least one vessel route. Figure 4.6 also highlights the trans-boundary nature of boating in the region, as a large number of vessel routes cross the international border in both directions, particularly where it divides the Gulf Islands from the San Juan Islands.

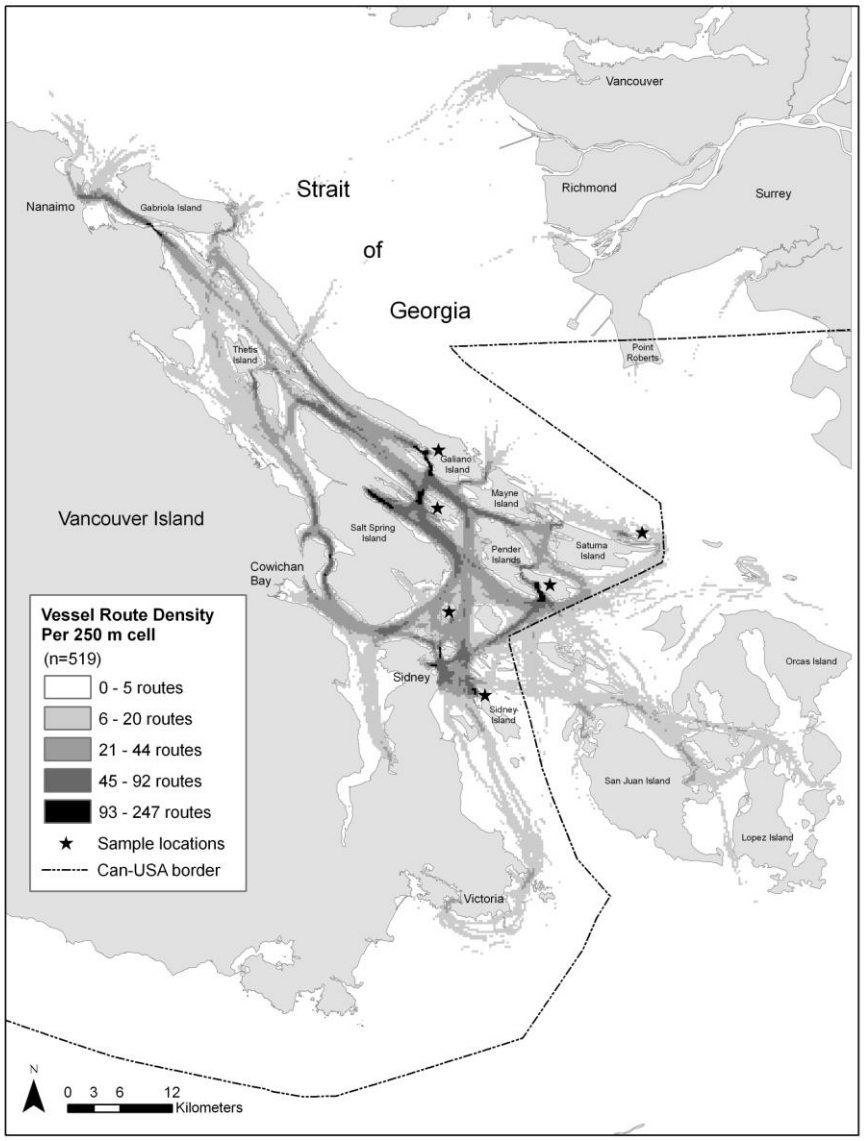
Figure 4.6: Vessel origins and route distribution in the Southern Strait of Georgia, British Columbia



4.4.3 Vessel Route Density and Hotspot Destinations

While Figure 4.6 is useful for depicting the overall distribution of vessel routes in the study area, of greater interest from an environmental and safety perspective is the relative density of recreational boating traffic. Figure 4.7 displays the density of vessel routes per 250 metre cell within the entire study area, while Figure 4.8 provides a close-up view of the hotspot destinations and waterways of the core southern Gulf Islands region. The data on both maps is displayed in five categories of density, which were determined using the natural breaks method in ArcGIS. This method delineates category break points by selecting those that best maximize the differences between classes (ESRI, 2008). Figure 4.7 also shows the location of the six survey sites used in this study.

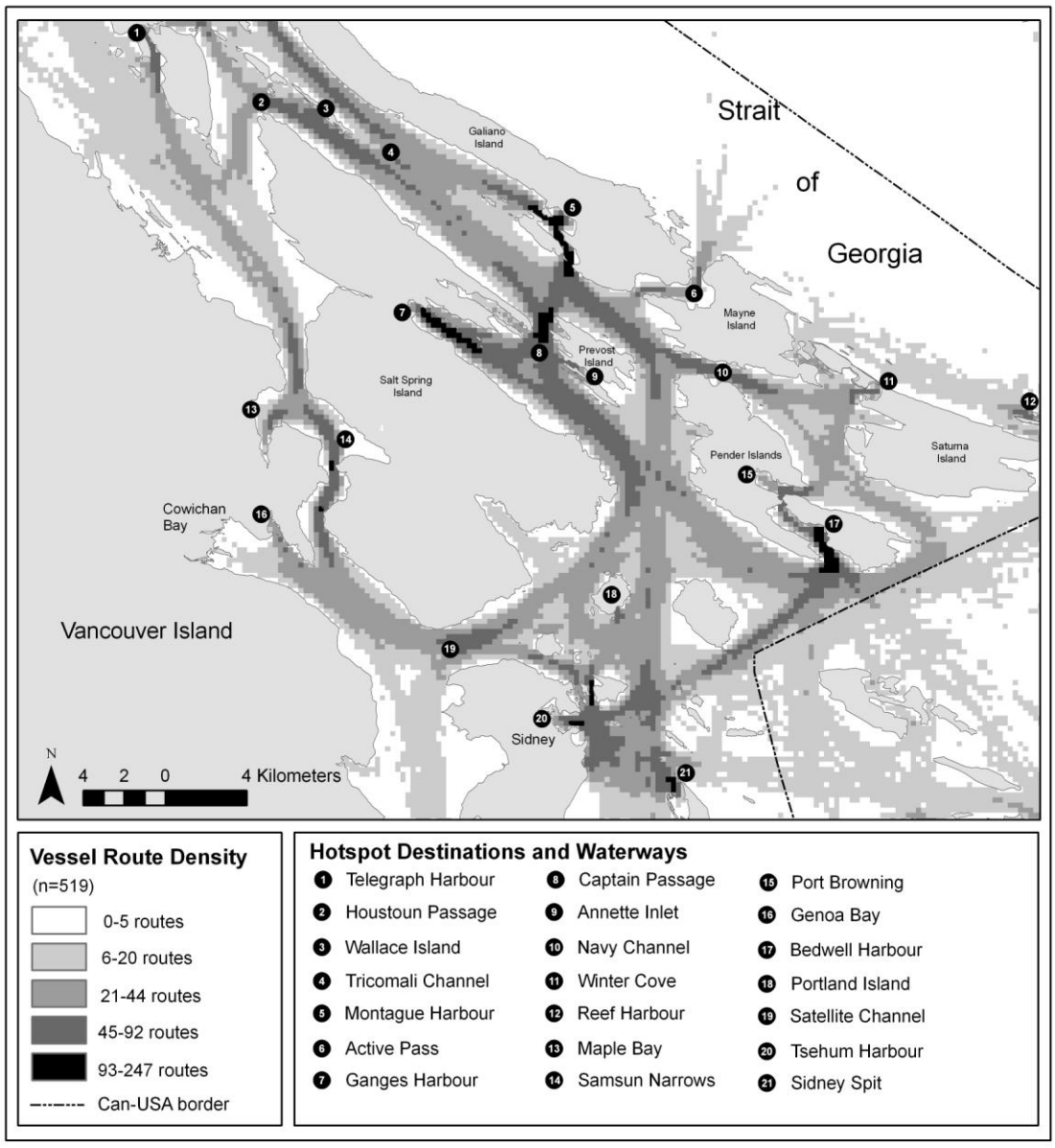
Figure 4.7. Recreational vessel route density in the southern Strait of Georgia, British Columbia



Hotspot Destinations

Figures 4.7 and 4.8 clearly show five particularly heavily frequented harbours within the southern Gulf Islands, including Ganges Harbour, Bedwell Harbour, Montague Harbour, Tsehum Harbour, and Sidney Spit. Figure 4.8 also indicates approximately seven other hotspot destinations that emerged at the second highest category of route density.

Figure 4.8. Hotspot Destinations and Waterways in the Southern Gulf Islands



To compare whether destination hotspots identified through the route density map (as compiled from single trips of respondents) would be representative of the destinations most frequently visited by those same respondents, the questionnaire also asked boaters to list the three locations that they visited most often over the past twelve months. A total of 72 destinations were listed, which were ranked based on the number of times they were mentioned. Table 4.1 outlines the top fourteen destinations provided (listed by 5% or more of respondents), as well as the density rank for each based on Figure 4.8 (1=highest density, 5=lowest density). The results show good agreement between

frequent destinations listed and those identified by the map. The top four locations of Montague Harbour, Bedwell Harbour, Ganges Harbour, and Sidney Spit (all listed as frequent locations by 20% or more of respondents) were correctly identified on the map as being very high density locations, and eight of the other ten destinations (frequent destinations of between 5 and 14% of respondents) were classified at the second highest level of density based on the map. The biggest anomaly on the list is Sidney, which was rated as being a frequent destination by only 8% of respondents, yet it emerged as one of the highest areas of boat density in Figure 4.8; however, this can largely be attributed to the number of vessel trips that originate in the Sidney area, as previously discussed. These results suggest that, given an adequately large sample size, a compilation of single trips is a useful method for visualizing overall destination patterns of boaters.

Table 4.1. A comparison of "most frequent destinations" listed by respondents and those identified by vessel density map

Destination	Location	% listing it as a frequent destination	Intensity of use rank based on Figure 4.8 [a]
Montague Harbour	Galiano Island	29%	1
Bedwell Harbour	Pender Island	26%	1
Ganges Harbour	Salt Spring Island	22%	1
Sidney Spit	Sidney Island	20%	1
Portland Island	Portland Island	14%	2
Wallace Island	Wallace Island	9%	2
Sidney	Vancouver Island	8%	1
Winter Cove	Saturna Island	6%	2
Reef Harbour	Tumbo Island	6%	2
Annette Inlet	Prevost Island	6%	2
Genoa Bay	Vancouver Island	5%	3
Port Browning	Pender Island	5%	3
Maple Bay	Vancouver Island	5%	2
Telegraph Harbour	Thetis Island	5%	2

[a] Based on the category of density as outlined in Figure 4.8, where 1=most visited and 5=least visited.

In examining destinations that are heavily visited, it is clear that certain characteristics are attracting recreational cruisers to these sites. Of the four primary hotspot destinations, three (Sidney Spit, Montague Harbour, and Bedwell Harbour)

include either national or provincial marine park areas that provide anchorage, moorage, and shore access. Furthermore, in the case of Bedwell and Montague Harbours, a private marina is also located nearby. Ganges Harbour, while not the site of a marine park, offers a number of services and attractions for boaters, including anchorage space, marinas, restaurants, boating services, and shopping (Vassilopolous, 2006). Considering the secondary hotspot destinations outlined in Table 4.1, with the exception of Annette Inlet on Prevost Island, all are once again either marine park sites, or sites with marinas and associated amenities. Thus, it is evident that such characteristics and facilities make a site attractive for recreational cruising and contribute to the travel patterns observed.

In addition to destination choice, another factor influencing destination patterns is the fact that all vessels entering the region from the United States are required to clear customs at one of several locations. Within the study area, by far the busiest port of entry for vessels arriving from the U.S. is Bedwell Harbour, followed by Sidney (Statistics Canada, 2008); consequently, this is also contributing to the dense flow of recreational vessel traffic to and from these locations.

Route Density

In addition to hotspot destinations, Figures 4.7 and 4.8 clearly indicate a number of corridors that are heavily traveled by recreational vessels. Many of those that experience particularly dense vessel traffic are indicated on Figure 4.8, including Captain Passage, Tricomali Channel, Houstoun Passage, Samsun Narrows, Navy Channel, Satellite Channel, and Active Pass. Figure 4.7 also shows a clear corridor of travel through the U.S. San Juan Islands.

As noted, research has shown recreational boat traffic to be a function of both geography and destination preference (e.g., Sidman & Fik, 2005), and Figures 4.7 and 4.8 suggest that both appear to play a role in dictating routing patterns in the SSG. The geography of the region funnels much of the traffic into and out of the southern Gulf Islands through four narrow passages, all of which are highlighted by dense vessel movements. In addition, narrow passages within the southern Gulf Islands serve as bottlenecks for a large number of vessels, resulting in the boat densities observed in areas such as Samsun Narrows, Satellite Channel, Houstoun Passage, and Captain Passage.

In addition to geographical considerations, it is evident that destination choice is also dictating the observed spatial patterns. Boaters tend to minimize distance between destinations when traveling (Sidman & Flamm, 2001), and this trend is observed through a number of heavily traveled corridors linking popular destinations. For example, the popularity of Ganges and Montague Harbours is likely largely responsible for the density of movement through Captain Passage. Likewise, distinct corridors of travel can be observed connecting Sidney to both Sidney Spit and Bedwell Harbour. Other popular destinations, such as Telegraph Harbour (Thetis Island), Winter Cove (Saturna Island), and Nanaimo (Vancouver Island) also appear to have a strong influence on the overall flow of traffic through the region, as clear corridors to and from these destinations are evident.

4.4.2 Mapping Boating Patterns by Vessel Type and Vessel Size

As noted, one of the primary strengths of a questionnaire-based approach to mapping recreational boating activity is the ability to link spatial data with other questionnaire variables (Sidman & Flamm, 2001). Indeed, the dataset produced through this study is extremely rich, as spatial information can be linked to aspects such as:

- seasonality or day of the week;
- point of origin;
- vessel information (type, size, horsepower); and,
- boater demographics, activities, and preferences.

This provides the opportunity for extensive analysis and customized mapping. To demonstrate the richness and utility of the data, spatial patterns have been mapped based on vessel type, with a focus on sail and motor powered vessels, and vessel size, with a focus on smaller vessels (<30 feet) and larger vessels (>40 feet). Figures 4.9 and 4.10 display this information. In both cases, these figures include separate maps displaying vessel route densities (categories determined using natural breaks); in addition, they contain maps highlighting the differences between the two categories of vessel, which were created in ArcGIS, using map algebra to calculate the difference in the number of

routes per 250 m cell. For the sailboat and motorboat comparison (Figure 4.9), those cells with a difference of ten vessel routes or more have been highlighted; for the smaller and larger vessel comparison (Figure 4.10), those cells with a difference of five vessel routes or more have been highlighted.

Mapping by Vessel Type

Figure 4.9 displays the density of vessel routes for sailboats and motorboats. Understanding differences in the spatial patterns of these vessel types is important, as they have varying safety and environmental risks associated with them. For example, motorboats are more likely than sailboats to be involved in a boating accident; however, where accidents involving sailboats do occur, they are more likely to be in crowded anchorages than in open water (McKnight *et al.*, 2007). From an environmental perspective, motorboats pose more of a concern than sailboats due to their speed (and associated wake), fuel and oil emissions, and greater potential to disturb marine wildlife.

In examining Figure 4.9, it can be seen that the main hotspot destinations and corridors, containing the greatest density of vessel routes, are similar for both boat types; however, several differences are evident. Pender Canal (between north and south Pender Islands) emerged as the greatest area of difference between the two vessel types. This is largely the result of geographical considerations, as a bridge connecting the islands precludes most sailboats from transiting the canal. As a result, motorboat density is greater traveling through the canal, while sailboat density is greater traveling out of Bedwell Harbour and around south Pender Islands. Other, more minor differences are also evident throughout the study area; however, these differences notwithstanding, there remain distinct similarities between sail and motor traffic in the region.

Figure 4.9: Mapping recreational boat route density by vessel type: (a) motorboat density, (b) sailboat route density, and (c) differences between motor and sail

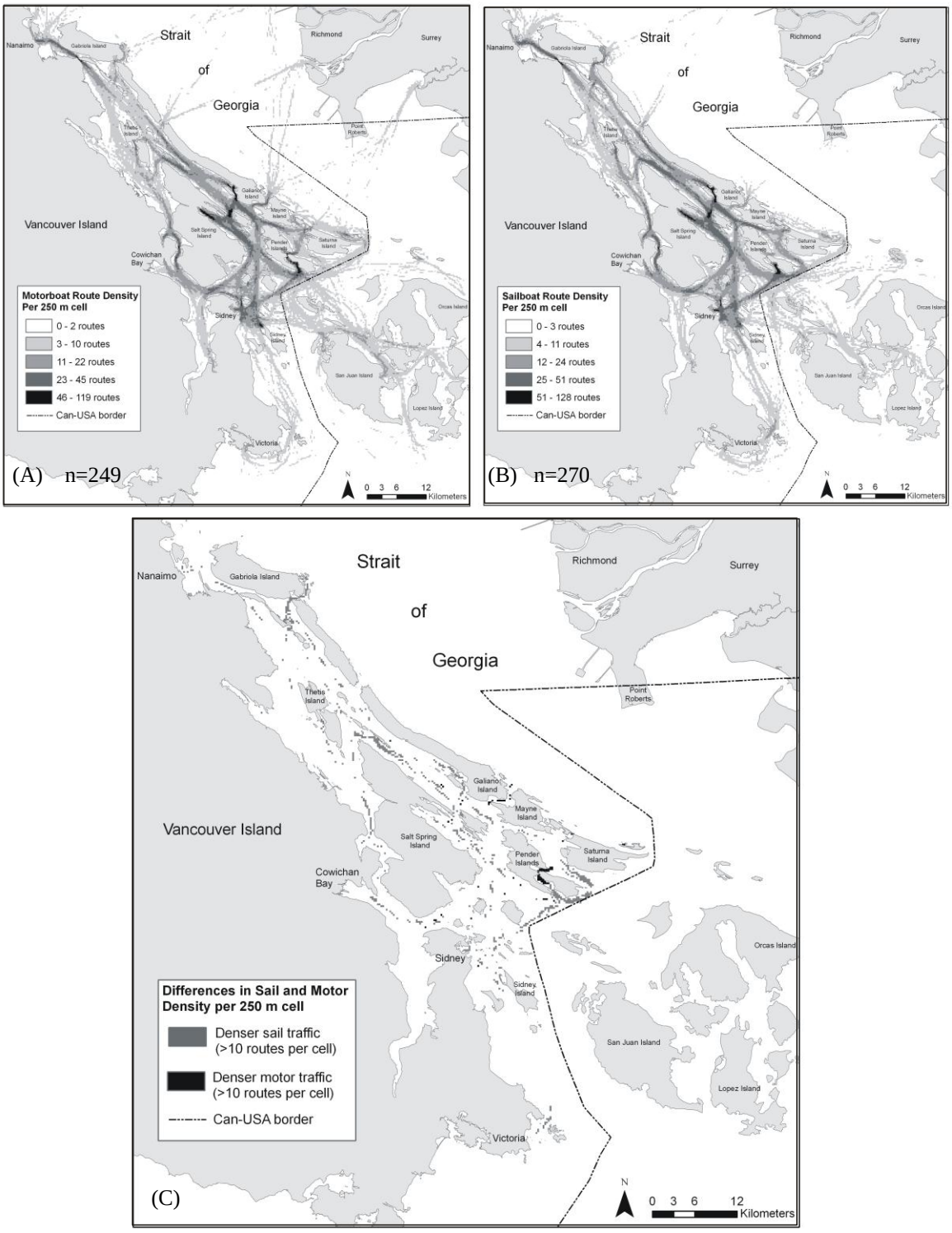
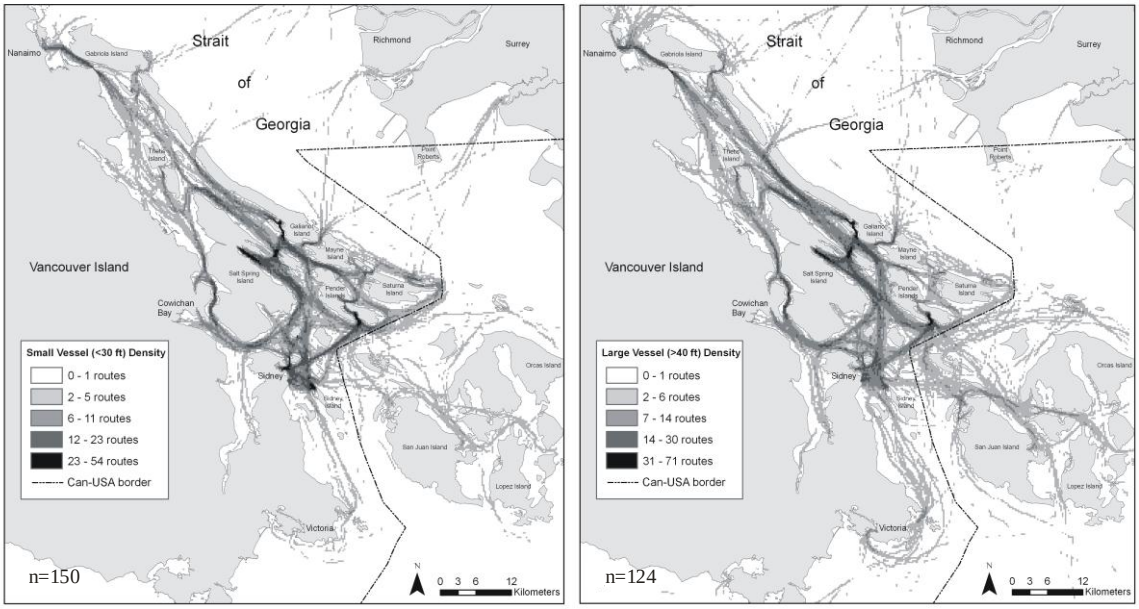
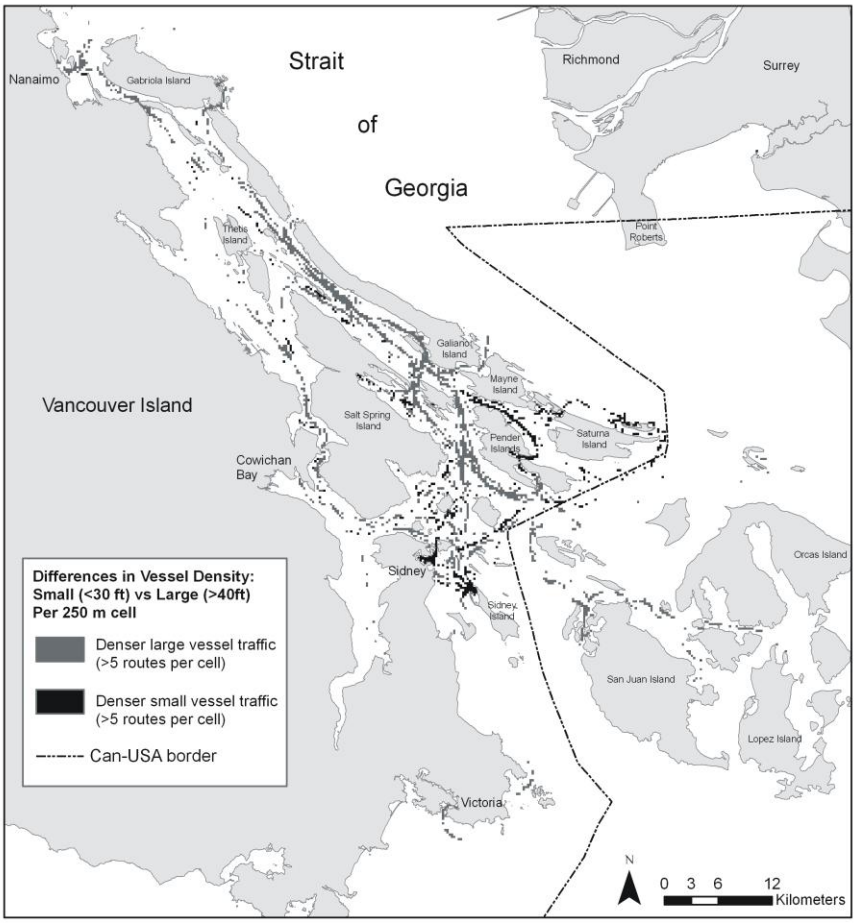


Figure 4.10: Mapping recreational boat route density by vessel size: (a) smaller vessel (<30 ft) density, (b) larger vessel (>40 ft) density, and (c) differences between smaller and larger vessels





Mapping By Vessel Size

Figure 4.10 displays the comparison of smaller and larger vessels, and several clear differences in spatial patterns are evident. Smaller vessels (<30 feet), 75% of which were of Canadian origin, are more dominant in the southern portion of the study area (i.e., closer to the survey locations). This is likely due to the fact that these vessels represent mostly local boaters that were typically not traveling as far as larger vessels. Smaller vessels are also far more dominant in Tsehum Harbour (the major point of origin), and in destinations such as Port Browning (Pender Islands), Sidney Spit (Sidney Island), Portland Island, and Reef Harbour (Cabbage/Tumbo Islands). These locations, particularly the latter three, are ones in which deeper draft vessels are not able to enter, thus accounting for the greater concentration of smaller vessels.

Larger vessels (>40 feet), 40% of which were of American origin, are more predominant in the central corridor through the San Juan and Gulf Islands, in a northwest-southeast orientation. This pattern is likely due to the fact that many of the larger vessels intercepted were on longer cruises (many from the USA), often on their way to northern boating destinations outside of the study area (e.g., Desolation Sound or the Broughton Archipelago). Furthermore, larger vessels are more dominant in certain destination harbours, including Bedwell Harbour, Pender Island (the major port of entry for U.S. vessels) and Montague Harbour, Galiano Island (which is able to accommodate deeper draft vessels).

4.4.4 Locational Bias

The intent of this research was to gather baseline information on the intensity and distribution of recreational boating in the southern Strait of Georgia. However, any interpretation of Figures 4.7 through 4.10 in terms of both destination hotspots and route densities must take into account potential bias towards the six sampling locations used in this study. For example, of the five main hotspot destinations that emerged, three (Sidney Spit, Bedwell Harbour, and Montague Harbour) were used as sample sites. While some amount of locational bias is unavoidable and undoubtedly exists given the nature of this study, this was thought to be minimized by the fact a large majority (90%)

of boaters surveyed were on multi day/multi-destination cruises, with a median trip length of nine days. Consequently, this research captured spatial movements for vessels visiting a large number of destinations throughout the study region, in addition to the sample sites. Thus, many hotspot destinations (and associated travel corridors) that were not sample sites emerged.

As one way to examine the magnitude of any potential bias towards sample locations, Table 4.2 outlines (a) the percentage of respondent routes that visited each of the six survey locations, as well as Ganges Harbour, and (b) how these percentages change if all respondents from a particular sample site are removed. As this table demonstrates, while removal of all respondents from a particular sample site does have an impact on the percentage of respondents visiting each location, in many cases the magnitude of change is small. As would be expected, the greatest impact is on the percentage of trips that visit the location that has been removed. In such cases, there is a decrease in visitation of between 7 and 19 percent, with the largest change occurring in locations characterized by a larger proportion of day trips (e.g., Sidney Spit. Portland Island). However, when any one sample site is removed, the magnitude of change on the *other* six sites is relatively small (no more than six percent). Furthermore, the numbers show that even if the hotspot locations of Montague Harbour or Bedwell Harbour were not used as study sites, they would have still emerged as hotspot destinations (visited by 35-36% of respondents). Thus, the numbers in Table 4.1 suggest that perhaps the best way to interpret the observed patterns is to assume that vessel traffic to the six sample locations is proportionally slightly lower than indicated, while vessel traffic to non-sampled locations is proportionally slightly higher than is indicated.

Table 4.2. Examining the impact of locational bias

	n	Percentage of Respondents Visiting Each Location						
		Sidney Spit[a]	Bedwell Hbr.[a]	Montague Hbr.[a]	Prevost Isl.[a]	Portland Isl.[a]	Reef Hbr.[a]	Ganges Hbr.
All Vessels	**519**	**34%**	**50%**	**46%**	**26%**	**23%**	**12%**	**36%**
Sidney Spit Removed	403	15%	55%	52%	31%	27%	16%	39%
Bedwell Hbr. removed	404	39%	36%	47%	30%	29%	14%	36%
Montague Hbr. removed	431	36%	51%	35%	29%	26%	14%	34%
Prevost Isl. Removed	435	39%	54%	45%	12%	25%	14%	33%
Portland Isl. Removed	443	37%	54%	50%	28%	10%	13%	39%
Reef Hbr. removed	480	36%	50%	46%	28%	23%	5%	35%

[a] denotes sampling location

4.5 Discussion

4.5.1 Implications for Managers

Assessing and Managing Safety Risk

Results of this research have implications for managers tasked with assessing and managing safety risk. First, results clearly demonstrate the peak and shoulder seasons for recreational cruising, during which times the large increase in vessel movement throughout the region may lead to a corresponding increase in risk of collision or accident requiring assistance. Furthermore, this research also quantified a number of hotspot destinations and heavily traveled corridors. Harbours and anchorages in which a particularly large number of recreational vessel movements occur are likely to be areas with a greater chance of vessel collision, particularly in cases where the harbour entrance is narrow or constricted. The same can be said for travel corridors and passes that experience a large volume of vessel traffic. In particular, high density corridors and passes which are also subject to navigation hazards and tidal currents are likely to pose the greatest hazard to recreational vessels. Given that no information on recreational

vessel movements in the southern Strait of Georgia existed prior to this study, the traffic patterns identified make a significant contribution to identifying areas of particular concern and can assist managers in assessing risk and subsequent allocation of resources.

While there are differing safety risks associated with sail and motor powered vessels (Heatwole and West, 1982; McKnight *et al.*, 2007), this research showed little evidence to suggest that traffic patterns between the two vessel types are substantially different amongst recreational cruisers in the SSG. Furthermore, where differences occurred, they tended to be a result of geographic factors rather than differences in destination choice. Given this, and coupled with the fact that powerboats and sailboats represented an almost even split of respondents, management of safety risk in the region can likely be based on analysis of overall recreational vessel movements rather than separate analyses of sail and motor powered traffic.

Finally, as an extremely rich baseline spatial dataset for recreational vessel traffic, the results of this study also offer many further opportunities for analysis related to marine safety. Because spatial information is linked to additional questionnaire variables, mapping and analysis can be tailored to suit specific research questions; for example, if managers were concerned with the risks posed by particularly fast-moving watercraft, maps could be created to display movement patterns of vessels with the highest horsepower to length ratio. Furthermore, the spatial data produced in this study can be overlaid and compared with existing or future datasets – such as Coast Guard incidents, ferry and shipping routes, popular kayaking areas, or commercial fishing zones – for the purposes of risk identification and analysis.

Assessing and Managing Environmental Risk

The results of this study also contribute to the identification and assessment of environmental risk posed by recreational boating. This is particularly relevant in the study region, given that it is currently under consideration for a National Marine Conservation Area (NMCA). Hotspot anchorages and harbours, particularly ones which are confined and experience little natural flushing action, may require monitoring or mitigation with respect to concentrations of recreational boat pollutants (e.g., sewage, grey water, oil and gas). In addition, these same sites are those in which the impacts of

repeated and extensive anchoring may be greatest. Furthermore, heavily traveled corridors, particularly in narrow passageways (e.g. Pender Canal), may be subject to increased environmental impacts due to wake.

As previously noted, if the proposed NMCA is created, a zoning plan will be developed for the waters that will include both fully protected zones and zones for a range of sustainable uses (Government of Canada, 2002). The data produced through this study can make an important contribution to any future zoning analysis. For example, spatial data for recreational boating can be overlaid and compared with existing datasets on sensitive marine environments, eelgrass location, or sensitive bird, fish, and mammal habitat in order to identify priority areas of concern with respect to zoning. It can also be overlaid with datasets of other marine activities in order to identify possible use conflicts that can potentially be addressed through zoning strategies. Finally, results can help to identify locations and corridors that are particularly popular and important for recreational boating, in order to ensure that the importance such areas to boaters is taken into consideration when zoning decisions are made.

4.5.2 Implications for Researchers

Given that a number of methods are available for spatially characterizing recreational boating, a goal of this study was to assess the utility of using an on-the-water questionnaire to obtain such information. Results show that for the boating population of interest in this study region, such a method proved to be an effective approach; however, the method has both strengths and limitations that should be recognized.

As with mail questionnaires, a strength of this approach relative to other methods is that it allows for the collection of spatial information in conjunction with a variety of behavioural, vessel, and demographic information (Sidman & Flamm, 2001), thereby producing a very rich dataset and allowing for detailed and customized mapping and analysis. However, in comparing an on-the-water questionnaire to a mail-based questionnaire, several distinctions can be made. While mail questionnaires are assumed to offer the most representative sample of a boating population, results from this study show that any mailing based on a local vessel registry would have excluded over 32% of

the boating population accessing the region. Furthermore, having a researcher on the water to interact with and deliver the questionnaire to boaters resulted in an 88% response rate for the spatial aspects of the questionnaire. This can be compared to a number of mail-based boating studies, which have experienced response rates anywhere from 19% to 33% (Heatwole & West, 1982; Hepner & Wales, 1986; Sidman & Flamm, 2001; Sidman *et al.*, 2004; Sidman *et al.*, 2007). It has been suggested that in recreation research, even in a population that is relatively homogeneous, a minimum 65% response rate is preferred to adequately control for non-response bias (Dolsen & Michlis, 1991). An on the water questionnaire also carries the distinct advantage of being able to collect spatial information from boaters while they are engaged in boating. Particularly in studies examining in detail the routes and destinations of boaters, it is assumed that asking about a respondent's current trip will result in more accurate information through a reduction in recall error. While boaters may be on an atypical trip when intercepted, with a large enough sample and careful selection of survey locations, the aggregate spatial data should adequately represent frequent destination patterns, as this study demonstrated.

While there are undoubtedly advantages to a face-to-face approach with boaters, this method also has its limitations. As with mail-based questionnaires, this method relies on boater accuracy when plotting their routes. Consequently, the spatial data collected is subject to a number of errors, as evidenced by the numerous respondent maps that required alterations when digitizing (although most alterations were minor). There is also a risk that boaters are plotting where they think they went rather than where they actually went. For this study, the researcher had little control over this, as plotted routes could only be verified for one location (i.e. where the boat was intercepted). Furthermore, the accuracy of the information will be constrained by the scale of the map; consequently, research will require a compromise between area covered by the study and amount of spatial detail captured. For example, because this study was interested in a relatively large area, the scale of the map was such that not all bays and harbours could be displayed in great detail, which has an effect on respondent accuracy when plotting routes. As previously discussed, perhaps the greatest limitation of the face-to-face approach is the potential for bias towards the locations that the questionnaire was

delivered. However, in many cases the magnitude of bias was relatively small, and can be reduced if the boating population of interest is predominantly on multi-destination cruises. Furthermore, because this study developed an easily repeatable methodology, an avenue for future research in the region would be to select different sampling locations and compare the extent to which traffic patterns and hotspot destinations differ. Compiling spatial data from on-the-water questionnaires over several research seasons in different sampling locations would minimize spatial bias, and result in a more complete picture of vessel movement patterns throughout the region.

4.6 Summary and Areas For Future Research

Information on the spatial patterns of recreational boating has been identified as a data gap in both British Columbia (Ban & Alder, 2008) and Canada (Pelot *et al.*, 2004). This research has partially addressed this gap by gathering an extremely rich baseline spatial dataset for recreational boating in the southern Strait of Georgia. The utility of this study is further highlighted by the fact that results are currently being utilized by provincial and federal agencies for marine and coastal planning, as well as being incorporated into the zoning analysis for the proposed NMCA. While there are both strengths and limitations of this method, it proved to be an effective approach for the southern Strait of Georgia, given the characteristics of the boating population under study. A face-to-face approach may thus be a good option in areas characterized by a large population of out of region boaters, and in populations predominantly on multi-day/multi-destination cruises.

Results from this research also suggest avenues for future study. As previously noted, one area for further research would include additional applications of the methodology to different study sites in order to further reduce the effect of potential locational bias in the dataset. It is also recognized that this study focused on a subset of the recreational boating population (recreational cruisers), and that future studies of other boating types, such as ocean kayaks or smaller powerboats, are warranted in order to give a more complete picture of recreational traffic in the region. Furthermore, data from this study clearly show the influence of popular destinations on vessel traffic patterns within

the study area. Thus, further research into the reasons why boaters select certain destinations over others would enable a greater understanding of spatial patterns in the region. Finally, while this study focused on a baseline description of boating patterns in the region, an avenue for future research would include predictive modeling of recreational vessel traffic, based on aspects such as boater destination preference, vessel origin, or seasonality (Sidman & Fik, 2005). Such modeling would have significant utility to managers and researchers interested in predicting and assessing both environmental and safety risk. The baseline data from this study can provide an important input into any such modeling, and thus provides a strong basis for future research into spatial patterns of recreational boating in the region.

Chapter 5:

Summary: Conclusions, Contributions, and Recommendations

5.1 Introduction

This study utilized a face-to-face questionnaire (n=543, response rate=92%) and a focus group (n=6) to examine preferences, attitudes, perceptions, and patterns of use of recreational boaters in the southern Gulf Islands region, a 900 km^2 portion of which is currently under consideration for a National Marine Conservation Area (NMCA). The purpose of this chapter is to review and summarize the major findings of this research, outline the contributions of the study, and make recommendations for both management and future research.

Marine protected areas (MPAs) commonly have both biological and social goals (Jones, 2002); however, research indicates that biological benefits are unlikely to accrue if MPAs are not supported by, or responsive to the needs of, major stakeholders. Multiple use marine zoning has thus emerged as a strategy to potentially accommodate both the biological and social goals of a MPA, and such a strategy will be employed in the proposed NMCA, should it be designated. Given the varied goals of MPA zoning (Bohnsack, 1996), developing a zoning plan requires a synthesis of both biological and social information (Laffoley, 1995). This thesis has taken the need to understand stakeholder perspectives and the resultant need for social science input into MPA planning (Christie *et al.*, 2003) as its basic tenet and driving rationale.

Although Canada committed in the 1990s to establishing a national system of MPAs, progress has been slow. This can be attributed to a number of factors, including inadequate funding, the multi-jurisdictional nature of marine resources in Canada, the time and effort required to consult with a variety of stakeholders, and conflicts between conservation and other interests (Guenette & Alder, 2007). Many of these issues can be seen to manifest themselves in the current NMCA proposal in the southern Strait of Georgia (SSG). In particular, the SSG is one of the most heavily used marine areas in the country, and is thus host to a large number of activities and user groups which must be considered when planning for the NMCA and associated zoning plan.

Recreational boating is a particularly dominant user group in the region; however, despite this, there is a lack of information on the attitudes, preferences, and use patterns of boaters in the region – information critical to NMCA planning. Furthermore, in addition to the regional import of such information, issues associated with recreational boating and MPAs have received very little attention in MPA literature (though see Salmanoa & Verardi, 2001; Sutton, 2005). In order to address this existing research gap, this study took a broad approach to examining motor- and sail-powered recreational boaters in the southern Gulf Islands by focusing on three discrete but related issues:

(1) The activities, setting preferences, and sources of perceived conflict of recreational boaters (chapter 2);
(2) The attitudes of recreational boaters towards the concept of marine zoning (chapter 3); and,
(3) The spatial patterns of use in the region by recreational boaters (chapter 4).

This summary chapter is divided into five sections: section 5.2 reviews the major findings from each chapter of the thesis; section 5.3 outlines the contributions of this research to management, literature, and theory; section 5.4 summarizes the main management recommendations of the thesis; and, section 5.5 discusses limitations of this study and suggests areas for future research. It should be noted that because this thesis has been structured as a series of self-contained manuscripts, most of the information presented in this chapter is a summary of the findings, recommendations, and conclusions contained in chapters 2, 3, and 4.

5.2 Summary of Findings

5.2.1 Activities, Setting Preferences, and Conflict Amongst Boaters (Chapter 2)

This chapter examined activities, setting preferences, and perceptions of conflict amongst recreational boaters. In doing so, it drew upon theories and concepts from leisure and recreation literature, including the recreation opportunity spectrum (ROS) and

models of recreation conflict. Selected demographic highlights from this chapter are as follows:

- 68% of recreational boaters in the region are from British Columbia, with 27% hailing from the United States and 4% from other areas in Canada;
- A majority of respondents (59%) are over 55 years of age;
- Boaters in the region are quite experienced, with 72% having more than 20 years of boating experience, and 78% rating their boating skill as being either "advanced" or "expert"; and,
- 52% of boaters belong to at least one boating club or organization.

This chapter found that boaters engage in a varied list of activities when boating in the region, both on the water and on the shore. Of particular note is the frequency of participation in extractive activities: 48% of boaters usually participate in crabbing, and 28% usually participate in fishing when boating in the region. Although not a majority in either case, the number of recreational vessels accessing the region in the summer months indicates that a significant amount of recreational crabbing, and to a lesser extent fishing, is taking place in the southern Gulf Islands. Furthermore, while there were very few differences in activity participation based on boat type, motorboat operators are significantly more likely to participate in both crabbing and fishing. Also of interest is the large number of boaters who usually partake in land-based activities (trail walking, accessing beaches, accessing land-based amenities), which suggests the need to consider the importance of boater access to such activities and facilities as zoning decisions are made.

Another finding of this chapter is that boaters are diverse in terms of setting preferences, and that of all demographic variables examined, boat type had the strongest influence on these preferences across social, environmental, and managerial setting classes. Sailboat operators place a greater importance on settings characterized by nature/environment and quiet/solitude than do motorboat operators, while motorboat operators place a greater importance on settings characterized by built facilities and extractive activities than do sailboat operators. This variability supports the potential application of a ROS classification system to MPA planning in the region, as a means of

identifying and preserving a range of setting types as a zoning plan is developed. Such a strategy can help to ensure that boater satisfaction in the region is maintained, which in turn can potentially lead to increased boater support for the NMCA.

While diversity in setting preferences based on boat type was clearly evident, such diversity tended to be in terms of intensity of importance rather than relative ranking of setting elements. Consequently, nature/environment and quiet/solitude settings were rated as being the most important to both sailboat and motorboat operators. Furthermore, while settings which facilitate extractive activities received the lowest importance score from boaters, the high standard deviations for these items indicates that there is a portion of the population to whom such activities are very important.

This chapter also examined sources of perceived conflict among recreational boaters and other marine activities. The three activities which emerged as being the largest sources of perceived conflict for boaters included personal watercraft (PWC), commercial whale watching boats, and shellfish aquaculture. Exploration of the underlying reasons for perceived conflict indicates that issues associated with PWC are the most likely to be successfully addressed through zoning, a strategy which has been recommended by other researchers (Roe & Benson, 2001; Wang & Dawson, 2005). However, findings show that zoning may also have some utility in partially addressing conflicts related to commercial whale watching boats.

Finally, findings indicate that boat type had an influence on perceived conflict, as sailboat operators reacted more negatively to encounters with loud, motorized activities than did motorboats. There also appears to be an asymmetrical conflict between sailboats and motorboats, a finding consistent with other research examining conflict between motorized and non-motorized activities (Graefe & Thapa, 2004).

5.2.2 Dimensions of Support for and Opposition to Zoning Amongst Boaters (Chapter 3)

This chapter focused on assessing recreational boater support for the concept of marine zoning, as well as specific management strategies that may form the basis of an eventual zoning plan. It also examined variables influencing support for or opposition to zoning amongst boaters – information critical to understanding and communicating with

this user group. Considering the level of boater support for marine zoning, major findings were as follows:

- Fifty six percent of respondents expressed support for the general concept of marine zoning, 25% were opposed, and 19% were unsure.
- Regarding specific management actions, the greatest support was expressed for seasonally closing certain environmentally sensitive areas (60%), limiting commercial fishing in some areas (58%), and limiting anchoring in some sensitive areas (56%).
- The lowest level of support was observed for limiting motorized access to some sensitive areas (46%), limiting all access to some sensitive areas (43%), and limiting recreational fishing in some areas (40%). In particular, the latter two strategies had a nearly equal number of respondents opposing as supporting the strategy.

These findings indicate a relatively strong base level of support for the concept of marine zoning amongst boaters, which can form a basis for engaging this stakeholder group in zoning discussions. Despite this, 25% of boaters remain opposed to the concept, and nearly 40% expressed opposition to specific strategies that will form the basis of future "fully protected" zones in the NMCA; this suggests that zoning, and particularly the location and size of fully protected zones, are likely to be a source of contention amongst a portion of the boating population.

Support for marine zoning was found to be strongly related to perceived benefits of a zoning plan, particularly environmental benefits. Results show that even if boaters have concerns about marine zoning, they are still likely to support the strategy if they also recognize potential environmental benefits; furthermore, some boaters specifically noted that they would be willing to give up some freedom of access if it meant protecting the environment. Those in support of zoning were also shown to have different setting preferences than those who opposed zoning, placing greater importance on settings characterized by natural environment features, as well as peaceful and quiet surroundings. This finding suggests that boaters in support of zoning may view the strategy as being compatible with these setting types. While demographics did not have a

strong influence on a respondent's position towards zoning, those in support were more likely to be both slightly younger boaters and sailboat operators.

Key dimensions of opposition to zoning were also identified. While perceived constraints did not have as strong an influence as perceived benefits, they were still significant predictors of opposition to zoning. In particular, perceptions that zoning would detract from the respondents' boating experience and that it would represent over-regulation of the sea were strongly correlated with opposition. In addition, qualitative analysis identified several other prominent concerns of boaters, including mistrust of the federal government and fears of losing access and freedom for boating. Boaters opposed to zoning also placed greater importance on extractive activities compared to those in support of zoning, suggesting that zoning is viewed as a threat to these aspects of the boating experience. Finally, those opposed to zoning were more likely to be both older boaters and motorboat owners.

5.2.3 Spatially Characterizing Recreational Boating Using an On-The-Water Questionnaire (Chapter 4)

This chapter focused on spatial characterization and mapping of recreational boating activity in the study area. Such information is critical to the proposed NMCA, as sound zoning decisions regarding recreational boating cannot be made without an understanding of the density and distribution of boating activity. Furthermore, because such information has significant utility beyond the scope of the NMCA, this chapter also focused on its contributions to managing for environmental and safety risk. Finally, a goal of this chapter was to assess the strengths and limitations of a face-to-face questionnaire as a method of spatially characterizing boating activity.

The most prominent contribution of this chapter is its production of a an extremely rich and versatile spatial data set depicting recreational boating distribution and density during the peak season in the southern Strait of Georgia. Such information was previously unavailable, provides a strong baseline indication of boating activity in the region, and can serve as a basis for a great deal of future research and analysis. Mapping and display of this data resulted in a number of conclusions:

- Considering overall distribution of vessel traffic, a majority of the region is utilized for recreational boating;
- The trans-border nature of boating in the region is clearly evident;
- The five most heavily frequented destinations in the southern Gulf Islands include Ganges Harbour (Salt Spring Island), Bedwell Harbour (Pender Islands), Montague Harbour (Galiano Island), Tsehum Harbour (Vancouver Island), and Sidney Spit (Sidney Island);
- 33% of vessel trips originated in and around Sidney on Vancouver Island;
- Mapping of vessel route density identified approximately eleven marine channels and passages that experience a particularly dense concentration of recreational vessel movements (see Chapter 4);
- Recreational traffic flow appears to be driven by a combination of geographic factors and destination choice of boaters;
- There are several minor differences in vessel traffic patterns between sailboats and motorboats; and,
- There are differences in spatial patterns based on vessel size.

In assessing the use of a face-to-face questionnaire at obtaining spatial information for recreational boating, a number of strengths were identified. The greatest strength of this method is that spatial data can be linked with questionnaire variables, allowing for a great deal of specialized mapping and display. Furthermore, the face-to-face approach had a high response rate which, combined with a large sample size, results in a reduction in non response and coverage error (Salant & Dillman, 1994). Unlike methods such as aerial photography and direct observation, spatial data collected through this method resulted in a temporal element, as an entire boating trip route was collected rather than a single boat position at a given time. Finally, the method relies on collecting data from boaters while they are engaged in boating, thereby reducing the chance of recall error associated with mail-based questionnaires. Limitations of the face-to-face approach include the fact that resolution of the data will be constrained by the scale of the map – in the case of this study, providing a map that showed the entire study area meant that not all bays and harbours could be shown in great detail. Furthermore, unlike aerial

photography, accuracy of the data is dependent on respondent accuracy when plotting their route and, as discussed in Chapter 4, errors in plotted routes (e.g. crossing land) were fairly common. Finally, such a method carries the risk of sampling bias towards the locations at which the questionnaire was delivered.[7]

5.3 Contributions of this Research

As this study took a broad and multi-faceted approach to understanding recreational boating perceptions, attitudes, preferences, and use patterns in the southern Gulf Islands, it has made contributions to a number of areas of inquiry, including:

- a regional understanding of recreational boating,
- marine protected area literature,
- recreation theory and literature, and
- studies examining methods for spatially characterizing recreational boating.

From a regional perspective, this study has made a significant contribution to understanding marine recreational boating in the southern Gulf Islands, a heretofore understudied stakeholder group. Although the findings of this study will be useful to any agency tasked with making management decisions in the southern Strait of Georgia (e.g., Parks Canada, Transport Canada, Fisheries and Oceans Canada, B.C. Parks, or the Islands Trust), it is of particular value to the proposed NMCA, given the eventual need to create a zoning plan in the region. As outlined in Table 5.1, all three areas of inquiry in this study are directly relevant to making informed decisions about marine zoning, and can therefore contribute to developing a zoning plan that is responsive to both biological and stakeholder needs. Furthermore, the results from this study provide valuable baseline information from which to measure future changes (e.g., in support, perceptions, and spatial patterns of boaters) as a result of any future zoning plan. While it is recognized that any zoning decisions require a synthesis of a variety of information in addition to

[7] While this is meant to be a brief summary of the strengths and limitations of the method, the reader is referred to Chapter 4 for additional discussion of both.

that contained in this thesis, the present research has addressed one of the pressing information gaps in the region. The practical contributions of this research to MPA planning and management in the region are highlighted by a number of specific management recommendations that have been made in chapters 2-4, which are summarized in section 5.4.

Table 5.1 Information required to develop a marine zoning plan (after Laffoley, 1995)

Information need	**Addressed in this thesis?**
Physical and biological characteristics of an area	No
User activities and patterns of use	Yes (Chapters 2 and 4)
Conflicts between different users	Yes (Chapter 2)
User attitudes, preferences, and perceptions	Yes (Chapters 2 and 3)
Conflicts between users and the environment	Not directly, but spatial information in Chapter 4 can help identify areas of concern

This study has also made contributions to MPA literature. While research has clearly documented the importance of stakeholder support for MPA initiatives if they are to be successful (e.g., Fiske, 1992; Lien, 1999; Davis, 2005), the response of recreational boaters to MPAs has thus far been a significant research gap. This is particularly true given the extent of recreational boating in coastal and marine areas (Sant, 1990; Widmer & Underwood, 2004; Sidman & Fik, 2005) and the fact that opposition from recreational boaters has, in at least one case, impeded the designation of an MPA (Salmanoa & Verardi, 2001). By examining boater attitudes towards marine zoning in a proposed MPA, this study has identified key aspects of both support and opposition amongst this important user group. As a result, it complements other attitudinal case studies examining the response of stakeholders such as commercial and recreational fishers (Suman *et al.*, 1999; Salz & Loomis, 2004; Stump & Kriwoken, 2006), scuba divers (Suman *et al.*, 1999), environmental groups (Suman *et al.*, 1999), First Nations groups (Ayers, 2006), and residents (Cocklin *et al.*, 1998; McCallum, 2005). Consequently, this study has contributed to an increased understanding of stakeholder response to MPA initiatives.

Although the intent of this study was not to advance recreation and leisure theory, but rather to use it as a basis for investigation, this thesis nevertheless makes several contributions to this area of literature through its application of the recreation opportunity spectrum (ROS) and models of recreation conflict. ROS researchers in particular have stressed the need for research examining relationships among activities, setting preferences, and experience in a variety of recreationists and geographical areas (Driver *et al.*, 1987; Pierskalla *et al.*, 2004), and to this author's knowledge this is the first study to examine the relationship between activity (boat) type and setting preference among marine recreational boaters. Moreover, it stands among very few published studies that have applied ROS concepts to the marine environment (e.g., Shafer & Inglis, 2000; Sorice *et al.*, 2007; Roman *et al.*, 2007). Results from this research clearly show that diversity exists amongst boaters with respect to setting preferences, and that activity type has an influence on these preferences across social, environmental, and managerial setting types. As a result, findings support the purported relationships that provide the basis for the ROS (Manning, 1999), and indicate that it may be a useful planning model for managing recreation settings in the marine environment.

This study also makes contributions to recreation conflict research. Published studies examining recreational boating conflict have typically been conducted in river systems or freshwater lakes (e.g., Lucas, 1964; Gramman & Burdge, 1982; Adelman *et al.*, 1982; Ivy *et al.*, 1992), with limited attention directed to multiple use marine environments (though see Wang & Dawson, 2005). This study expands upon such research by exploring sources of perceived conflict between recreational boaters and a variety of other marine activities – both recreational and non-recreational. Furthermore, research has stressed the importance of distinguishing between goal interference and social values based conflict, as each requires a different mitigation approach (Vaske *et al.*, 2007). While other studies have used a series of structured questions to discern conflict type between two activities (Vaske *et al.*, 1995; Carrothers *et al.*, 2001; Vaske *et al.*, 2007), this study explored the use of an open ended question to elicit underlying reasons for conflict between boaters and a variety of other activities. This proved to be a useful exploratory approach, as underlying reasons could be categorized and classified according to conflict type. Furthermore, as noted in chapter 2, while further research

may be needed to examine additional aspects of conflict between recreational boaters and personal watercraft, whale watching vessels, and shellfish aquaculture, responses from the open-ended question in this study can greatly assist in developing questions for future research.

Finally, this study also makes a contribution to literature exploring methods of spatially characterizing recreational boating. While a number of studies have examined spatial aspects of recreational boating through methods such as aerial photography (Ashton & Chubb, 1972; Reed-Andersen *et al.*, 2000; Leon & Warnken, 2008), satellite imagery (Pegler *et al.*, 2007), direct observation (Jaakson, 1988; Widmer & Underwood, 2004), and mail-back questionnaires (Heatwole & West, 1982; Sidman & Fik, 2005), to this author's knowledge this is the first attempt to do so using a face-to-face, on-the-water questionnaire with boaters. As a result, the analysis of the strengths and limitations of this approach (discussed in detail in Chapter 4) have significant utility to researchers interested in assessing available methods and choosing one or more appropriate to their particular objectives. Furthermore, the spatial dataset produced through this research can provide a basis for a great deal of future research into the spatial patterns of recreational boating.

5.4 Management Recommendations

One of the primary objectives of this study was to develop a series of recommendations for NMCA planners and managers in the southern Gulf Islands region. While marine zoning decisions may often be born of a desire to protect the marine environment, such decisions cannot be made in isolation from social factors – in fact, making such decisions in the absence of sound social science data may actually be counterproductive to conservation, as stakeholder buy-in and support is essential to the success of a marine zoning plan. Although management recommendations have been included in each of chapters 2, 3, and 4, six main recommendations that emerged from this study are briefly summarized below.

(1) Managers must recognize and plan for variability amongst recreational boaters when making zoning decisions.

One of the consistent findings of this study was that recreational boaters are variable in terms of their activities, attitudes towards zoning, setting preferences, and perceptions of conflict. Of particular note is variability in setting preferences, where boat type was found to be the most useful means of segmenting the boating population. Given that different setting types provide for different recreation experiences and opportunities for satisfaction (Manning, 1999), managers tasked with creating a marine zoning plan should strive to preserve a variety of setting types for boating, if boater support is to be achieved. To this end, consideration should be given to applying a ROS classification to boating destinations in the region (i.e. a continuum from undeveloped to highly developed), as a means of characterizing and preserving a variety of settings.

However, it must also be recognized that settings characterized by natural environment features, quiet, and solitude were rated as being the highest importance to a majority of boaters, and managers should bear this high level of importance in mind when making zoning decisions. While undeveloped bays and anchorages that exhibit a relatively low intensity of use may be the most attractive areas for fully protected zones due to a relatively undisturbed environment, these may also be the areas that are most likely to provide the types of settings that are most highly valued by boaters. Thus, if boater support for zoning decisions is a concern, a balance may need to be reached between protection and access to such areas.

Finally, despite the fact that settings which facilitate extractive activities (fishing, crabbing, and shellfish gathering) were rated at the lowest level of importance to boaters as a group, it is critical to note that there remains a portion of the boating population to whom such activities are important, as particularly evidenced by the number of respondents who opposed limiting recreational fishing in some areas. This suggests that the size and placement of any fully protected zones may be a source of contention for many boaters, which may require both focused communication (see recommendation #2) and involvement of boaters in zoning decisions (see recommendation #3).

(2) Developing a zoning plan requires focused communication with recreational boaters.

This research identified dimensions of support for and opposition to marine zoning amongst recreational boaters, and MPA planners looking to communicate with boaters regarding zoning must recognize and respond to these issues. First, planners must address the dominant concerns of boaters with respect to zoning, including perceptions of over-regulation, fears of losing freedom and access, and perceived negative impacts on the boating experience. In particular, MPA planners must clarify in all communications with boaters how the NMCA would complement and/or enhance existing environmental and fishery regulations, rather than representing "another layer of bureaucracy". Furthermore, given the strong influence of perceived environmental benefits of zoning on boater support for such a plan, MPA planners will likely benefit from (a) communicating how MPA zoning has resulted in positive environmental effects elsewhere in the world, and (b) monitoring the environmental effects of any future zoning plan and communicating these effects to stakeholders as a means of gaining support (see recommendation #4).

In addition, it must be recognized that the size and placement of "fully protected" zones are likely to be a source of contention amongst the recreational boating community, particularly motorboat operators. This research has highlighted the need to clearly document and communicate the reasoning behind any such decision to boaters, in order to mitigate the perception that such decisions would be made "arbitrarily". Meaningful involvement of the boating community in zoning decisions may also mitigate this (see recommendation #3).

Finally, in communicating with recreational boaters in the region, it should be recognized that only 52% belong to some form of boating organization; thus, any communication strategy focusing solely on boating clubs (e.g. Canadian Power and Sail Squadron and Yacht Clubs) will not reach a large portion of the boating population. However, evidence from the spatial aspects of this study suggests that a majority of recreational cruisers in the summer months visit or originate from one of five main destinations while on boating trips in the southern Gulf Islands (Ganges Harbour, Montague Harbour, Bedwell Harbour, Tsehun Harbour, and Sidney Spit). Consequently,

these would be ideal locations to deliver communication messages to the recreational boating community.

(3) Consideration should be given to meaningful involvement of recreational boaters in zoning decisions.

In addition to the fears and concerns outlined above, other issues that emerged from this research were a level of mistrust among recreational boaters of federal government involvement in managing marine resources in the region, as well as an underlying fear of the unknown regarding what a zoning plan might entail. In order to assuage these fears and instill a sense of ownership in any eventual zoning plan, this research is in agreement with other studies that have stressed the need to meaningfully involve stakeholder groups in the decision making process (e.g., Dalton, 2005; Helvey, 2004; Davis, 2005). Indeed, this was specifically suggested by a number of recreational boaters. As discussed in chapter 3, one suggested way that this might be achieved would be to create an advisory council of local recreational boaters, and directly involve such a group in NMCA zoning decisions. Such a strategy may have the benefits of providing two-way communication between MPA planners and recreational boaters, facilitating input of local boater knowledge, diminishing boater fears and concerns, and helping to built trust between government representatives and this important user group.

(4) Early planning is needed to identify social and environmental indicators from which to measure the success of a zoning plan.

If multiple use marine zoning is to be used as a means of achieving biological and social objectives in the region, early consideration should be given to identifying both social and biological indicators, and gathering baseline information on these indicators from which to measure subsequent changes as any zoning plan is implemented. As noted in recommendation #2, one potential way of achieving the support of stakeholders is to communicate the biological benefits of any zoning plan over time; however, in order to do this, planners must have a strong baseline understanding of the biological conditions of the areas *prior* to any zoning plan being implemented, and must also have a program in place to monitor changes to selected indicators (Pomeroy *et al.*, 2004).

In addition, MPA planners and managers should identify and monitor social indicators from which to measure changes over time, such as stakeholder attitudes, perceptions, and level of support. As noted by Cocklin (1998), increase in stakeholder support is one way to measure the social success of an MPA. Considering the views of recreational boaters, the results of this study can provide a number of useful baseline social indicators from which to measure change. For example, this study has documented that 54% of recreational boaters are supportive of the general concept of marine zoning, and this number can be used to measure change in boater support as the NMCA is implemented. Furthermore, if zoning is to be used as a means of reducing user conflict (see recommendation #5), boater perceptions of conflict identified through this study may prove to be a useful means of measuring changes in the level of perceived conflict as a result of any future zoning plan.

(5) Consideration should be given to using zoning as a means of conflict resolution.

Evidence from this study suggests that there are several notable activities which are a source of perceived conflict for recreational boaters, including PWC, commercial whale watching vessels, and shellfish farms. If boater satisfaction is to be maintained, managers should consider the potential application of zoning as a means to reduce some of these conflicts. This research suggests that perceived conflicts with PWC (based mostly on goal interference) are most likely to be addressed through spatial separation. Although perceived conflict with commercial whale watching boats was found to be a result of a mixture of social values and goal interference, designating areas as "marine mammal refuge" (e.g., off limits to both commercial and recreational vessels when whales are present) may have utility in reducing boaters' perceptions that whale watching vessels are continually "harassing" orcas and causing them harm. In addition, given the large number of boaters, particularly sailboat operators, who react negatively to loud, motorized activities, managers may wish to investigate the utility of "no motor" or "quiet" zones (which were suggested by a number of boaters). However, it should be noted that in all cases further research will be required to more fully understand the nature and extent of perceived conflict across a number of stakeholder groups.

(6) The environmental impacts of recreational boating in the southern Gulf Islands should be monitored.

Research has documented a number of potential environmental impacts of recreational boating, and given the popularity of boating in the region, it is recommended that the environmental impacts of the activity be monitored, particularly in the most heavily used anchorages and the most densely traveled corridors. Given that agency resources are often limited, the spatial data produced in this study can greatly assist managers in identifying areas of priority concern for attention and monitoring. As discussed in Chapter 4, one example of how this may be achieved is through spatial overlay of data related to sensitive marine environments and recreational boating distribution. In addition, of particular note may be the potential effects of recreational boat fishing and crabbing in the southern Gulf Islands. Indeed, the relatively high rates of both crabbing (48%) and fishing (27%) amongst recreational boaters, combined with the large number of vessels accessing the region during the summer season, suggests a need to monitor the effects of this extraction within the proposed NMCA.

5.5 Limitations and areas for future research

As with any research, it is important to recognize the limitations of the study. As noted elsewhere in this thesis, a limitation of this study is that it only focused on a portion of the recreational boating population. While the term "recreational boater" is used throughout this thesis in describing respondents, the boating population under study is more accurately described as motor- or sail-powered recreational vessels that access selected southern Gulf Island anchorages in the summer months. Thus, other important categories of recreational vessel, including personal watercraft, human powered watercraft, and smaller motor powered boats without cabins, were not captured as part of this research. It is possible that even greater variability in attitudes, preferences, and spatial patterns would have been observed had these vessel types been included. Consequently, in order to achieve a more complete understanding of recreational boating in the region, it is recommended that future research focus on those elements of the

boating population that were not included in this study. It is recognized, however, that accessing vessels that typically do not anchor or moor represents a challenge, and would require an entirely different sampling strategy than the one employed in this thesis.

One of the findings of this study was that boaters place the greatest level of importance on settings which are characterized by natural environment features, as well as quiet and solitude. As was discussed in chapter 2, a limitation of this study is that it failed to clarify how boaters define these types of settings. Indeed, given that this high level of importance was consistently expressed across a variety of setting types (both highly developed and undeveloped), it is likely that boaters have varying definitions as to what constitutes "natural", "quiet" and "solitary" settings. For example, to some respondents, criteria for a "natural" setting may be met in a relatively developed anchorage (e.g. Montague Harbour, Galiano Island), while to others is may only be met in a completely undeveloped anchorage (e.g. Annette Inlet, Prevost Island). A useful approach for future research would be to apply a "limits of acceptable change" (LAC) model, looking at both the natural and social environment for boating. Such an approach has been used in other marine applications (Shafer & Inglis, 2000; McCallum, 2005; Roman *et al.*, 2007), and can help to characterize how boaters define natural, quiet, and solitary settings, as well identify at what point the amount of development of the number of other boaters begins to detract from these settings.

As discussed in chapter 2, another limitation of this research is in its measurement of perceived conflict. While the questions employed in this study were useful at exploring perceptions of boaters towards a variety of activities, they did not ask respondents either how often they encounter the activities, or the extent to which problematic behaviour is observed with each encounter. As a result, it is possible that the perceived conflicts identified stem more from a general attitude towards those activities rather than a persistent conflict (based on encounters) in the southern Gulf Islands. It is thus recommended that future research in the region employ the more structured approach developed by Vaske *et al.* (2007), looking not only at perceptions of other activities, but also how often they are encountered and the extent to which problematic behaviour is observed.

In measuring the level of support for the concept of marine zoning in chapter 3, an important limitation of this research is that it is assessing boater response to a *concept* rather than an actual zoning plan. Furthermore, given that 72% of boaters were previously unaware of the NMCA proposal prior to participating in the research, there is the possibility that respondents misunderstood what the concept of marine zoning would entail. Although this was mitigated in the questionnaire by assessing the level of support for six specific management strategies that may form the basis of a zoning plan in addition to the general concept of zoning, boater support for zoning in this study should best be interpreted as an initial reaction to the management concept. Consequently, as a more specific zoning concept is developed, future research should continue to assess stakeholder support. However, in any such future research, the level of boater support identified through this study can serve as a useful baseline from which to measure change.

A further limitation of this study is that, given the numerous potential boating destinations within the southern Gulf Islands, the sampling strategy employed carries the risk of bias towards the six survey locations. As discussed in chapter 4, this is an issue that is most evident in the spatial data collected through this study. Although such bias was minimized through careful selection of sample locations, the fact that most boaters were on multi-day cruises, the high response rate, and large sample size, some amount of locational bias towards the survey locations is unavoidable. However, because this is study developed an easily repeatable methodology, a recommended avenue for future research in the region would be to select different sampling locations and compare the extent to which spatial traffic patterns differ. Compiling spatial data from on-the-water questionnaires over several research seasons in different sampling locations would likely result in a more complete picture of vessel movement patterns throughout the region. Alternately, the data from this study could be integrated with data from other methods such as aerial photography.

Finally, while the spatial focus of this thesis was primarily assessing the use of a face-to-face questionnaire at characterizing recreational boating activity and providing a descriptive analysis of the resultant data, the spatial data set produced through this study can provide the basis for extensive future research. As discussed in chapter 4, one

recommended area for research includes analyses of environmental and safety risk in the region through GIS overlay with existing or future data sets. For example, from the perspective of marine safety, relating boating traffic density in the region to incidence of marine accidents would be a useful way of analyzing and predicting areas of safety risk. Furthermore, while this study focused on a *description* of the spatial patterns of boating, the logical next step would be *prediction* of boating activity. It is thus recommended that future research examine predictive modeling of recreational vessel traffic based on aspects such as boater destination choice, setting preference, vessel origin, or seasonality. The spatial data set produced through this research can provide a valuable input into any such modeling.

5.6 Summary

This thesis has taken a broad approach to understanding recreational boating in the southern Gulf Islands, and although the information produced is applicable to a range of issues in the region, it has been primarily framed within the context of the proposed Southern Strait of Georgia NMCA. Major areas of focus in this study included (1) the activities pursued by recreational boaters, (2) variability in boater setting preferences, (3) areas of perceived conflict and variability in these perceptions, (4) level of boater support for marine zoning strategies, (5) underlying dimensions of support for and opposition to marine zoning, and (6) the spatial distribution and density of boating in the region.

Findings from this research address a significant research gap and contribute to an increased understanding of this important user group. Consequently, this research can contribute to making more informed marine zoning decisions in the southern Strait of Georgia. Furthermore, this study has resulted in a number of contributions to several areas of inquiry, including literature associated with MPAs, recreation, and spatial characterization of recreational boating. As summarized in this chapter, results from this study have led to a number of recommendations, both for current management and future research.

Finally, it is important to recognize that planning for marine conservation in the southern Strait of Georgia requires a synthesis of a large body of information, both

biological and social. Although this thesis has taken the need for MPAs to be responsive to and supported by stakeholders as its fundamental rationale, it must be recognized that MPAs and associated zoning plans are ultimately born out of a need to protect the marine environment from the impacts of human use. As noted by Dearden (2002), "there is a difference … in paying due heed to local stakeholders and in compromising the fundamental goals of protected area establishment as a common resource for the good of all society now and in the future" (p. 369). Consequently, while zoning decisions should certainly be informed by social data, the fundamental conservation goals of a MPA must not be lost when final decisions are made. It is anticipated that by elucidating some of the preferences, attitudes, and use patterns of recreational boaters in the southern Gulf Islands, this thesis has contributed information necessary to make informed zoning decisions that integrate biological and social needs in the southern Gulf Islands.

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Appendix A: Human Research Ethics Board Certificate of Approval

Human Research Ethics Board
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University of Victoria
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University of Victoria

Human Research Ethics Board
Certificate of Approval

Principal Investigator	Department/School	Supervisor
Darcy Gray **Master's Student**	**GEOG**	**Dr. Rosaline Canessa**

Co-Investigator(s):

Project Title: **A Study of Recreational Boaters in the southern Gulf Islands of British Columbia, Canada**

Protocol No.	Approval Date	Start Date	End Date
07-090	**30-Apr-07**	**30-Apr-07**	**29-Apr-10**

Certification

This certifies that the UVic Human Research Ethics Board 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. Richard Keeler
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 a "Research Status" form.

07-090 Gray, Darcy

Appendix B: Focus Group Consent Form

Participant Consent Form

Focus Group

A Study of Recreational Boating in the Southern Gulf Islands, British Columbia

You are invited to participate in a study entitled *A Study of Recreational Boating in the Southern Gulf Islands, British Columbia*. This research is being conducted by Darcy Gray, a Master of Arts candidate in the Department of Geography, University of Victoria. This research is being funded in part by the Canadian Coast Guard and the Social Sciences and Humanities Research Council of Canada.

As a graduate student, I am required to conduct research as a major component of my degree. The purpose of this research project is to gain an increased understanding of recreational boating in the southern Gulf Islands. Specifically, this research aims to gather information related to the spatial distribution of boating in the area, the importance of various elements to the overall experience of boating, feelings of boaters towards other marine activities, and the attitudes of boaters towards potential management strategies in the region. Research of this type is important because it contributes to an increased understanding of boater use, perspectives, and issues in the southern Gulf Islands. Any decisions on use and management of the marine environment must be made with a clear understanding of the major stakeholders.

This study involves two stages: the use of focus groups to discuss issues relevant to boaters in the region, and the delivery of a questionnaire to boaters at selected destinations throughout the southern Gulf Islands. As a representative of a boating organization in the region, you have been selected to participate in the focus group component of the research.

If you agree to voluntarily participate in this research, your participation will include approximately 1.5-3 hours to participate in a focus group discussion. There are no known or anticipated risks to you by participating in this research. Your participation in this research is completely voluntary.

The discussions during the focus groups will be audio recorded for future review by the researcher at a later time. While the nature of focus groups do not allow for complete anonymity, at no point will personally identifying information be used in the analysis and reporting of this information. If direct quotes from focus group participants are used in the analysis and reporting phase of this project, they will remain anonymous. Names of boating organizations will not be used. Furthermore, audio recordings of the discussions will remain in a locked cabinet at the University of Victoria for the duration of the analysis phase of the project, after which time they will be erased.

If you do decide to participate, you may withdraw at any time without any consequences or any explanation. Please note that, should you decide to withdraw partway through the study, it will be logistically impossible to remove your contributions from recordings of the focus group discussion; however, in this case any specific comments or contributions you made in the discussions will not be used in the analysis and reporting phase of the research.

It is anticipated that the results of this study will be disseminated and communicated through the publication of a formal thesis, as well as through possible scholarly publications and/or meetings. In addition, summarized versions of the data may be communicated to relevant agencies involved in making decisions regarding the marine environment of the southern Gulf Islands (e.g., The Canadian Coast Guard, Parks Canada, Fisheries and Oceans Canada).

This research is being conducted under the supervision of Dr. Rosaline Canessa, Department of Geography, University of Victoria. If you have any questions or concerns about this research, please feel free to contact either Darcy Gray (250-477-7278) or Dr. Canessa (250-721-7339).

In addition, 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 the University of Victoria (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 researchers.

_____	_____	_____
Name of participant	*Signature*	*Date*

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

Appendix C: Participant Consent Form, Questionnaire

Participant Consent Form

A Study of Recreational Boating in the southern Gulf Islands, British Columbia

You are invited to participate in a study entitled *A Study of Recreational Boating in the Southern Gulf Islands, British Columbia*. This research is being conducted by Darcy Gray, a Master of Arts candidate in the Department of Geography, University of Victoria. This research is being partially funded by the Social Sciences and Humanities Research Council of Canada and GEOIDE (geomatics for informed decision making).

The purpose of this research project is to gain an increased understanding of recreational boating in the southern Gulf Islands. Specifically, this research aims to gather information related to the spatial distribution of boating in the area, the importance of various elements to the overall experience of boating, and the attitudes of boaters towards potential management strategies in the region. Research of this type is important because it contributes to an increased understanding of boater use, perspectives, and issues in the southern Gulf Islands. Any decisions on use and management of the marine environment must be made with a clear understanding of the major stakeholders.

This study is being conducted at various locations throughout the southern Gulf Islands. As a visitor to one of the sampled locations, you have been randomly selected to participate in this study. If you agree to voluntarily participate in this research, your participation will include approximately 20-25 minutes to complete a questionnaire. There are no known or anticipated risks to you by participating in this research. Your participation in this research is 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, any partially completed questionnaire will not be included in the data analysis. In addition, anonymity will be guaranteed, as the questionnaire does not include any personally identifying information. All completed questionnaires will be stored in a locked cabinet at the University of Victoria, and will be destroyed upon completion of the analysis phase of the research (approximately one year).

It is anticipated that the results of this study will be communicated through the publication of a formal thesis, as well as through possible scholarly publications and/or meetings. In addition, summarized versions of the data may be communicated to relevant agencies involved in making decisions regarding the marine environment of the southern Gulf Islands (e.g., The Canadian Coast Guard, Parks Canada, Fisheries and Oceans Canada). Portions of the data collected through this research may be made available to other researchers examining risk assessment on the British Columbia coast.

This research is being conducted under the supervision of Dr. Rosaline Canessa, Department of Geography, University of Victoria. If you have any questions or concerns about this research, please feel free to contact either Darcy Gray (250-419-3370) or Dr. Canessa (250-721-7339).

In addition, 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 the University of Victoria (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 researchers.

_____	_____	_____
Name of participant	*Signature*	*Date*

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

Appendix D: Questionnaire Administered to Boaters

Recreational Boating in the Southern Gulf Islands

Boater Survey - Summer 2007

Research conducted by:
Darcy L. Gray
Department of Geography
University of Victoria
dgray@uvic.ca

GEOIDE

University of Victoria
British Columbia • Canada

TO BE COMPLETED BY RESEARCHER

Initials: _____

Date: _____

Location: _____

Time: _____

YOUR BOATING EXPERIENCE

Q.1 My visit to this location today is…

1. A DAY TRIP
2. PART OF AN EXTENDED CRUISE OF _____ DAYS

Q.2 How many people are on board your vessel for this trip?

_____ ADULTS (OVER 18 YEARS OF AGE)

_____ CHILDREN / YOUTH (18 YEARS OF AGE AND UNDER)

Q.3 When boating in the southern Gulf Islands, what activities do you USUALLY participate in? (circle the number of all that apply).

1. SPORT / RECREATIONAL FISHING
2. CRABBING
3. GATHERING SHELLFISH
4. DIVING / SNORKELLING
5. BIRDWATCHING
6. WILDLIFE VIEWING
7. PHOTOGRAPHY
8. CAMPING
9. HIKING/TRAIL WALKING
10. WALKING OR RELAXING ON BEACHES
11. ACCESSING SHOPS / RESTAURANTS / ENTERTAINMENT ON SHORE
12. OTHERS (PLEASE SPECIFY):

    _____
    _____
    _____

Q.4 Which boat type best describes your primary vessel for this trip?

1 SAILBOAT (WITH AUXILIARY POWER)
2 SAILBOAT (WITHOUT AUXILIARY POWER)
3 MOTORBOAT (WITH CABIN)
4 MOTORBOAT (WITHOUT CABIN)
5 INFLATABLE / RIB
6 OTHER (SPECIFY):_____

Q.5 What is the length and horsepower of your vessel? (if applicable)

LENGTH:_____ metres / feet (circle units)

HORSEPOWER:_____

Q.6 Do you own this vessel?

1 YES
2 NO, I CHARTERED / RENTED THIS VESSEL
3 NO, I BORROWED THIS VESSEL
4 OTHER:_____

IMPORTANT ASPECTS OF YOUR BOATING EXPERIENCE

Q.7 Please indicate the importance of each of the following elements/facilities to your general boating experience in the southern Gulf Islands (Circle your responses for each answer, where 1=NOT AT ALL IMPORTANT, and 5=EXTREMELY IMPORTANT).

		NOT AT ALL IMPORTANT	SLIGHTLY IMPORTANT	SOMEWHAT IMPORTANT	VERY IMPORTANT	EXTREMELY IMPORTANT
A	Boating in clean/unpolluted water	1	2	3	4	5
B	Viewing natural scenery	1	2	3	4	5
C	Seeing undeveloped shoreline	1	2	3	4	5
D	Catching fish	1	2	3	4	5
E	Crabbing	1	2	3	4	5
F	Gathering shellfish	1	2	3	4	5
G	Viewing marine wildlife	1	2	3	4	5
H	Being around other boaters	1	2	3	4	5
I	Being in a peaceful, quiet place	1	2	3	4	5
J	Being away from other boaters	1	2	3	4	5
K	Safe anchorages	1	2	3	4	5
L	Mooring buoys	1	2	3	4	5
M	Pumpout facilities	1	2	3	4	5
N	Marinas	1	2	3	4	5
O	Dinghy docks	1	2	3	4	5
P	Access to supplies (fuel, groceries)	1	2	3	4	5
Q	Social/entertainment opportunities	1	2	3	4	5
R	Access to beaches	1	2	3	4	5
S	Access to walking/hiking trails	1	2	3	4	5
T	Access to camping facilities	1	2	3	4	5

SATISFACTION WITH YOUR EXPERIENCE

Q.8 Overall, how would you rate your satisfaction with the following elements/facilities in the southern Gulf Islands on THIS boating trip? (Circle your response for each answer, where 1=VERY DISSATISFIED, and 5=VERY SATISFIED.

		VERY DISSASTISFIED	SOMEWHAT DISSATISFIED	NEITHER	SOMEWHAT SATISFIED	VERY SATISFIED
A	Boating in clean/unpolluted water	1	2	3	4	5
B	Viewing natural scenery	1	2	3	4	5
C	Seeing undeveloped shoreline	1	2	3	4	5
D	Catching fish	1	2	3	4	5
E	Crabbing	1	2	3	4	5
F	Gathering shellfish	1	2	3	4	5
G	Viewing marine wildlife	1	2	3	4	5
H	Being around other boaters	1	2	3	4	5
I	Being in a peaceful, quiet place	1	2	3	4	5
J	Being away from other boaters	1	2	3	4	5
K	Safe anchorages	1	2	3	4	5
L	Mooring buoys	1	2	3	4	5
M	Pumpout facilities	1	2	3	4	5
N	Marinas	1	2	3	4	5
O	Dinghy docks	1	2	3	4	5
P	Access to supplies (fuel, groceries)	1	2	3	4	5
Q	Social/entertainment opportunities	1	2	3	4	5
R	Access to beaches	1	2	3	4	5
S	Access to walking/hiking trails	1	2	3	4	5
T	Access to camping facilities	1	2	3	4	5

Q.9 Are there any boating facilities or services that you would like to see more of in the southern Gulf Islands?

_____

_____

_____

_____

_____

_____

MAPPING YOUR TRIP IN THE SOUTHERN GULF ISLANDS

We would now like to ask you about your route on your current boating trip in the southern Gulf Islands. For the following questions, please use the map on the **FOLLOWING PAGE** of this survey. Please provide as much information as you can.

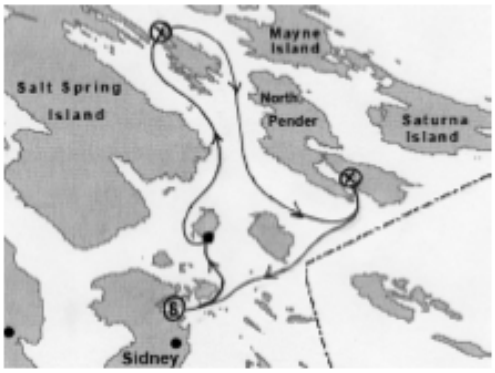
Q.10 Please indicate on the map the starting point of your trip, using the letter '**S**'.
Note: If your start point is outside of the map, indicate your route starting at the point where you entered the area covered by the map.

Q.11 Using a solid line, trace the approximate route that you have taken / plan to take.

Q.12 Indicate on the map with a solid circle (●) locations that you temporarily stopped (e.g. lunch stops, day trips) and use an '**X**' to indicate each place that you did (or plan to) stop overnight.

Q.13 If needed, use the space at the bottom of the map to provide a few brief notes to describe your trip.

EXAMPLE:



Comments:
- I started my trip in Tsehum Harbour, and I stopped at Princess Bay on Portland Island.
- I am spending tonight anchored in James Bay.
- I am planning to spend tomorrow night at the marina in Bedwell Harbour before returning to Tsehum Harbour.

Q.14 Thinking about your boating trips over the last twelve months, please indicate the three most frequent destinations (anchorages, moorages, or marinas) you visited in the southern Gulf Islands region and, if you can, label them on the map using the numbers 1, 2, and 3.

1._____ 2._____ 3._____

PLEASE USE THIS MAP TO ANSWER QUESTIONS 10-13 ON THE PREVIOUS PAGE

Comments:

ENCOUNTERING OTHER ACTIVITIES

Q.15 The southern Gulf Islands marine environment is host to a number of different types of activities. Thinking about your boating trips in the region, how does encountering the following types of marine vessels/activities affect your enjoyment of your boating trips?

		SIGNIFICANTLY DETRACTS	SOMEWHAT DETRACTS	NEITHER	SOMEWHAT ENHANCES	SIGNIFICANTLY ENHANCES
A	Jet skis / Personal watercraft	1	2	3	4	5
B	Sailboats	1	2	3	4	5
C	Powerboats	1	2	3	4	5
D	Kayaks / Rowboats / Canoes	1	2	3	4	5
E	Commercial whale watching boats	1	2	3	4	5
F	Commercial fishing boats	1	2	3	4	5
G	Ferries	1	2	3	4	5
H	Commercial shipping (freighters/tugs)	1	2	3	4	5
I	SCUBA divers/snorkelers	1	2	3	4	5
J	Shellfish farms	1	2	3	4	5
K	Float planes	1	2	3	4	5
L	Cruise ships	1	2	3	4	5

Q.16 For any activities above that you identified as 'somewhat detracting' or 'significantly detracting' from your boating experience in the southern Gulf Islands, please provide some additional information on HOW/WHY these activities affect your enjoyment.

_____

_____

_____

_____

_____

_____

POSSIBLE STRATEGIES FOR MANAGING THE MARINE ENVIRONMENT

Q.17 Some people feel that in order to manage the marine environment of the southern Gulf Islands, it is appropriate to limit certain activities in some areas. Other people feel that such regulation is <u>not</u> an appropriate strategy. We would like your views. Please indicate how you feel about the following possible strategies.

		STRONGLY OPPOSE	SOMEWHAT OPPOSE	NOT SURE	SOMEWHAT SUPPORT	STRONGLY SUPPORT
A	Limiting commercial fishing in some areas.	1	2	3	4	5
B	Limiting recreational fishing in some areas.	1	2	3	4	5
C	Limiting motorized access in some areas.	1	2	3	4	5
D	Limiting anchoring in some environmentally sensitive areas.	1	2	3	4	5
E	Limiting all access to some environmentally sensitive areas.	1	2	3	4	5
F	Seasonally closing certain environmentally sensitive areas.	1	2	3	4	5

The waters surrounding the southern Gulf Islands are currently under consideration for a **National Marine Conservation Area**, which is a marine area "managed for conservation and sustainable use" by Parks Canada. This is a <u>PROPOSAL ONLY</u> and no definite commitments have been made one way or another.

Q.18 Were you previously aware that a feasibility study is in progress regarding the potential establishment of a National Marine Conservation Area in the southern Gulf Islands region?

1. YES
2. NO
3. NOT SURE

Q.19 If you answered YES to Q.18, where did you receive information regarding the National Marine Conservation Area proposal? (circle all that apply).

1. PARKS CANADA NMCA E-NEWS / WEBSITE
2. PARKS CANADA INFORMATION SESSIONS
3. NEWSPAPER / MAGAZINE
4. BOATING CLUB OR ORGANIZATION
5. ENVIRONMENTAL ORGANIZATION
6. WORD OF MOUTH
7. OTHER (PLEASE SPECIFY):_____

POSSIBLE STRATEGIES FOR MANAGING THE MARINE ENVIRONMENT

If a National Marine Conservation Area is created in the southern Gulf Islands region, a marine zoning plan will be developed through extensive public consultation. A marine zoning plan would establish areas that allow or do not allow specific uses, in order to increase stocks of marine life and to reduce use conflicts. At least one zone would offer full protection from harvesting (e.g. no fishing or crabbing), while other zones would allow for a mix of sustainable uses, including harvesting and recreational boating.

Q.20 Zoning in the proposed National Marine Conservation Area has a number of possible benefits and a number of possible concerns. Looking first at possible benefits, please indicate your level of agreement with each of the following statements.

	Marine zoning in the southern Gulf Islands would…	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NOT SURE	SOMEWHAT AGREE	STRONGLY AGREE
A	…Protect species and habitats.	1	2	3	4	5
B	…Allow fisheries to recover.	1	2	3	4	5
C	…Provide clear ground rules for certain activities and areas.	1	2	3	4	5
D	…Reduce conflict amongst users.	1	2	3	4	5
E	… Provide economic certainty for some activities.	1	2	3	4	5
F	…Enhance understanding of the marine environment.	1	2	3	4	5
G	…Improve my boating experience in the region.	1	2	3	4	5
H	…Help promote a wilderness experience for boating.	1	2	3	4	5

Q.21 Now thinking about some of the possible concerns with marine zoning in the southern Gulf Islands, please indicate your level of agreement with each of the following statements.

	Marine zoning in the southern Gulf Islands would…	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NOT SURE	SOMEWHAT AGREE	STRONGLY AGREE
A	…Have a bias towards certain activities.	1	2	3	4	5
B	…Have a bias towards marine conservation.	1	2	3	4	5
C	…Curtail freedom of movement / access.	1	2	3	4	5
D	…Represent over-regulation of the sea.	1	2	3	4	5
E	… Be difficult to enforce.	1	2	3	4	5
F	…Have a low compliance rate.	1	2	3	4	5
G	…Create economic barriers to existing uses.	1	2	3	4	5
H	…Increase conflicts amongst users.	1	2	3	4	5
I	…Detract from my boating experience in the region.	1	2	3	4	5

Q.22 Overall, how do you feel about the **general concept** of creating a zoning plan for the southern Gulf Islands marine environment?

1. STRONGLY OPPOSE
2. SOMEWHAT OPPOSE
3. NOT SURE
4. SOMEWHAT SUPPORT
5. STRONGLY SUPPORT

Q.23 Do you have any other thoughts or suggestions about the concept of creating a zoning plan for the southern Gulf Islands marine environment?

_____

_____

_____

_____

_____

_____

ABOUT YOU

Finally, we would like to ask you some questions about yourself to help us interpret the results of this survey. In addition, it will help us attain a greater understanding of individuals visiting this area.

Q.24 From the list below, please circle the number for each type of boat that you **own**.

1. JET SKI / PERSONAL WATERCRAFT
2. KAYAK / CANOE
3. INFLATABLE / RIB
4. ROWBOAT
5. SAILBOAT (WITH AUXILIARY POWER)
6. SAILBOAT (WITHOUT AUXILIARY POWER)
7. MOTORBOAT (WITH CABIN)
8. MOTORBOAT (WITHOUT CABIN)
9. OTHERS?: _____

Q.25 Thinking about your boating activity over the past twelve months, approximately how many days did you spend boating for each month?

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
____ days	____ days	____ days	____ days	____ days	____ days	____ days	____ days	____ days	____ days	____ days	____ days

Q.26 Are you a member of a boating club or organization?

1. NO
2. YES. Which one(s)?_____

Q.27 Approximately how many years of boating experience do you have?

1. LESS THAN 1 YEAR
2. 1-5 YEARS
3. 6-10 YEARS
4. 11-20 YEARS
5. MORE THAN 20 YEARS

Q.28 How would you rate your boating skill?

1. NOVICE
2. INTERMEDIATE
3. ADVANCED
4. EXPERT

Q.29 Where do you live?

CITY OR TOWN:_____

PROVINCE OR STATE:_____

Q.30 Approximately how many years have you lived in the Pacific Northwest / Georgia Basin region (if applicable)?

1. LESS THAN 1 YEAR
2. 1-5 YEARS
3. 6-10 YEARS
4. 11-20 YEARS
5. MORE THAN 20 YEARS
6. NOT APPLICABLE (I DO NOT LIVE IN THE REGION)

Q.31 What is your gender?

1. MALE
2. FEMALE

Q.32 What is your present age?

1. UNDER 25 YEARS
2. 26-35 YEARS
3. 36-45 YEARS
4. 46-55 YEARS
5. 56-65 YEARS
6. OVER 65 YEARS

(please turn over)

Q. 33 Is there anything else you'd like to tell us about recreational boating issues in the southern Gulf Islands? If so, please use the space below to express your views.

THANK YOU for taking the time to complete this survey. Your views are very important to my graduate research.

If you have any questions or concerns about this questionnaire or this study, please feel free to contact either DARCY GRAY (419-3370) or DR. R. CANESSA (721-7339) at the DEPARTMENT OF GEOGRAPHY, UNIVERSITY OF VICTORIA.

Appendix E: Questionnaire Results – Raw Data Tables

Q.1: Trip length

Trip length	% Boats	n
Day trip	9.7%	52
1-3 days	16.7%	90
4-7 days	24.2%	130
8-14 days	24.0%	129
15-21 days	8.9%	48
22-28 days	3.0%	16
29-35 days	5.0%	27
More than 35 days	8.6%	46

Q.2: Number of Passengers on board the vessel

	Percentage of Boats		
Number of Persons	Adults	Children	Total
0	0.0%	78.8%	0.0%
1	5.4%	9.3%	4.4%
2	72.6%	7.4%	58.9%
3	8.7%	2.4%	11.4%
4	10.7%	1.7%	14.9%
More than 4	2.6%	0.4%	9.7%

Q.3: When boating in the southern Gulf Islands, what activities do you usually participate in?

Activity	% Boaters who Usually Participate
Hiking/Trail Walking	80.8%
Walking or Relaxing on Beaches	77.4%
Wildlife Viewing	70.7%
Photography	61.4%
Accessing Shops, Restaurants, Entertainment	61.4%
Birdwatching	48.1%
Crabbing	47.9%
Recreational Fishing	28.0%
Gathering Shellfish	15.9%
Diving / Snorkeling	7.3%
Camping	4.9%

Others (write-in responses)

- Kayaking/Paddling (8.4%)
- Sailing (6.9%)
- Swimming (3.4%)
- Reading (2.5%)
- Relaxing (2.5%)
- Being at anchor (1%)
- Meeting other boaters (1%)
- Exploring by dinghy (1%)

Less than 1% response for: listening to music, golf, cruising, spas, dinghy sailing, painting, enjoying the scenery, biking, drinking, dog walking, work on boat, sailboat racing, pubs/wineries, picnic/BBQ, hanging out at the dock, disc golf, socializing on board, study history of the area, sleeping, chart and GPS use, sun tanning, yacht club events, gathering shells, research.

Q. 4 Boat Type

Boat Type	Percent
Sailboat (with auxiliary power)	52.0%
Motorboat (with cabin)	47.3%
Motorboat (without cabin)	0.7%

Q.5 Boat length and horsepower

Length (feet)	All Boats	Sailboats (n=280)	Motorboats (n=257)
1-19 feet	1.9%	1.4%	2.3%
20-29 feet	26.4%	22.1%	31.1%
30-39 feet	45.4%	55.0%	35.0%
40-49 feet	20.1%	17.9%	22.6%
50-59 feet	3.7%	6.1%	5.1%
60-79 feet	2.5%	1.1%	3.9%

Horsepower	% All Boats	% Sailboats	% Motorboats
25 hp and less	23.6%	48.5%	0.0%
26 – 50 hp	19.9%	39.0%	2.0%
51 – 100 hp	7.0%	11.4%	3.3%
101 – 200 hp	8.3%	1.1%	17.4%
201 – 300 hp	11.4%	0.0%	25.6%
301 – 400 hp	5.2%	0.0%	11.6%
401 – 500 hp	7.2%	0.0%	16.1%
More than 500 hp	10.7%	0.0%	24.0%

Q.6 Does respondent own vessel they are in at time of intercept?

Boat Type	Percent
Yes	93.5%
No - chartered	4.3%
No - borrowed	1.3%
Other	0.9%
Missing	0.6%

Q.7 Important aspects of boating experience[8]

	NOT AT ALL IMPORTANT	SLIGHTLY IMPORTANT	SOMEWHAT IMPORTANT	VERY IMPORTANT	EXTREMELY IMPORTANT	MISSING	MEAN	STANDARD DEVIATION
A. ENVIRONMENTAL								
Viewing natural scenery	0.0%	0.4%	2.8%	36.9%	60.0%	6	4.56	0.57
Clean/unpolluted water	0.0%	0.7%	4.9%	38.6%	55.8%	7	4.49	0.63
Viewing marine wildlife	0.6%	4.1%	14.7%	46.5%	34.1%	12	4.09	0.83
Seeing undeveloped shoreline	1.7%	3.8%	23.3%	34.0%	37.2%	11	4.01	0.95
Crabbing	23.1%	21.4%	29.3%	16.5%	9.8%	10	2.68	1.26
Catching fish	34.1%	31.3%	20.5%	7.9%	6.2%	12	2.20	1.18
Gathering shellfish	45.4%	23.6%	18.8%	8.0%	4.2%	17	2.02	1.17
B. SOCIAL								
Being in a peaceful, quiet place	0.6%	1.3%	7.8%	34.0%	56.3%	5	4.44	0.74
Being away from other boaters	7.5%	18.5%	39.2%	22.0%	12.9%	7	3.14	1.10
Being around other boaters	42.4%	27.1%	22.2%	7.3%	1.1%	7	1.98	1.02
Social/entertainment opportunities	39.2%	32.5%	20.3%	6.7%	1.3%	5	1.98	0.99
C. FACILITIES								
Safe anchorages	0.0%	0.7%	4.7%	32.6%	62.0%	6	4.56	0.62
Access to walking/hiking trails	1.3%	4.5%	20.3%	38.8%	35.1%	5	4.02	1.72
Access to beaches	1.7%	9.2%	23.2%	35.9%	30.1%	8	3.84	1.01
Access to supplies	3.0%	11.3%	36.4%	32.7%	16.5%	5	3.49	0.99
Dinghy docks	7.5%	16.6%	26.9%	30.0%	19.0%	7	3.37	1.18
Pumpout facilities	18.5%	15.1%	25.0%	23.9%	17.5%	7	3.07	1.35
Mooring buoys	21.6%	18.1%	26.3%	19.6%	14.4%	7	2.87	1.34
Marinas	14.1%	21.0%	37.7%	19.5%	7.8%	4	2.86	1.12
Access to camping facilities	60.1%	18.8%	12.5%	6.0%	2.6%	5	1.72	1.06

[8] Note: the three categories used here (environmental, social, facilities) are my own groupings, and not the result of any statistical grouping (e.g. factor analysis).

Q.8 Satisfaction with aspects of experience on this boating trip[9]

	VERY DISSATISFIED	SOMEWHAT DISSATISFIED	NEITHER	SOMEWHAT SATISFIED	VERY SATISFIED	MISSING	MEAN	STANDARD DEVIATION
A. ENVIRONMENTAL								
Viewing natural scenery	0.2%	0.2%	1.1%	29.6%	68.9%	9	4.67	0.52
Clean/unpolluted water	0.4%	3.6%	3.2%	41.5%	51.3%	11	4.40	0.75
Viewing marine wildlife	1.1%	6.8%	12.7%	57.1%	22.0%	16	4.02	2.38
Seeing undeveloped shoreline	0.6%	5.7%	14.2%	37.1%	42.4%	15	4.15	0.91
Crabbing	4.6%	7.8%	62.8%	16.2%	8.6%	43	3.16	0.86
Catching fish	8.1%	7.9%	75.6%	6.5%	2.8%	50	2.88	0.75
Gathering shellfish	5.5%	5.3%	78.9%	6.1%	4.3%	49	2.98	0.71
B. SOCIAL								
Being in a peaceful, quiet place	0.4%	8.3%	7.5%	47.8%	36.0%	10	4.11	0.89
Being away from other boaters	1.9%	11.1%	39.5%	35.3%	12.2%	19	3.45	0.91
Being around other boaters	2.1%	9.5%	45.4%	32.8%	10.2%	16	3.40	0.87
Social/entertainment opportunities	1.2%	1.9%	73.5%	13.1%	10.4%	23	3.30	0.72
C. FACILITIES								
Safe anchorages	0.0%	2.2%	6.9%	41.2%	49.6%	7	4.38	0.71
Access to walking/hiking trails	0.4%	5.3%	10.6%	40.8%	43.0%	13	4.21	0.86
Access to beaches	0.8%	4.7%	14.7%	43.8%	36.1%	11	4.10	0.87
Access to supplies	0.9%	5.3%	30.5%	41.3%	21.8%	15	3.85	1.96
Dinghy docks	3.6%	10.7%	31.6%	36.2%	17.9%	18	3.54	1.02
Pumpout facilities	17.1%	10.4%	62.4%	8.1%	2.1%	22	2.68	0.92
Mooring buoys	2.5%	8.4%	42.9%	22.4%	23.8%	21	3.57	1.02
Marinas	1.3%	5.7%	45.1%	31.9%	16.0%	17	3.56	0.87
Access to camping facilities	1.1%	1.0%	79.1%	10.5%	8.2%	21	3.24	0.66

[9] Note: this data was not used in the thesis, as analysis and interpretation was problematic. Because there was no "not applicable" category, many boaters indicated "neither" for aspects/activities that they did not use/participate in. As a result, it is impossible to tell whether a large "neither" response indicates that many people are not satisfied, or if they simply do not use/participate in that element/activity.

Q.9 <u>Additional boating services or facilities that you would like to see in the Southern Gulf Islands?</u> [open-ended question]

Facility type	% of respondents
Pumpout facilities	22% (121)
Mooring buoys	
• *Increase number of mooring buoys*	20% (106)
• *Specific areas/types: In marine parks (7); Narvaez Bay (1), Bedwell Harbour (1), Prevost Island (2), Wallace Island (3), Pirate's Cove (4), Portland Island (3), Ganges (1), Winter Cove (2), Lyall Harbour (1), Sidney Spit (1), Montague Harbour (1), D'Arcy Island (1), Isle De Lis (1), in out of the way harbours (2), in places where it is unsafe to anchor (1), in high use areas (1), buoys rated for larger vessels (2), buoys that multiple boats can tie up to (2)*	
• *Other mooring buoy comments*	2% (10)
Docks / dinghy docks	
• *More dinghy docks*	8% (45)
• *Specific areas: At marine parks (8), Winter Cove (5), Beaumont (1), Prevost Island (2), Cabbage Island (1), Tsehum Harbour (1), Sidney Spit (1), Ganges (1)*	
• *More dock space / government docks / improved dock condition*	2% (10)
No more facilities	8% (42)
Supplies & Services	
• *More access to food / groceries / restaurants / liquor*	3% (17)
• *More fuel / propane services*	2% (9)
• *Showers*	1% (8)
• *Others (7)*	3% (14)
Parks / park services	
• *Increase the number of marine parks*	5% (26)
• *More / improved outhouses / composting toilets*	1% (8)
• *More places to have campfires / BBQ*	1% (6)
• *More parks staff for enforcement / interpretive talks / nature houses / etc*	1% (6)
• *Others*	1% (6)
Beaches and trails	
• *More hiking trails / better access to trails / signage for trails*	4% (24)
• *More beach access / less private beaches*	1% (4)
• *Others*	1% (3)
More places to dispose of recycling/compost/garbage	30 (6%)
More access to fresh / potable water	27 (5%)
Fishing-related	
• *Less commercial crabbing in/near marine parks*	*1% (6)*
• *Enforcement/removal of derelict crab floats*	*1% (4)*
• *Others*	*1% (7)*
Marinas	
• *More marinas / slips*	1% (8)

• *Other marina comments*	1% (4)
Stern tie rings	1% (9)
Enforcement and monitoring	
• *Monitoring / enforcement of speed*	1% (5)
• *More monitoring of noise / parties*	1% (4)
Dog walk / off leash areas / dog waste disposal	1% (6)
More / varied anchorage space (e.g. undeveloped areas)	1% (6)
Boating safety	
• *More rock markers*	1% (3)
• *More detailed weather reports*	1% (2)

Q.14 Three most frequent boating destinations in the Southern Gulf Islands over the past 12 months[10]

Location:	Number of Respondents	Percentage of Respondents
Montague Harbour • *Montague Harbour (158)* • *Montague Harbour Marina (1)*	159	29%
Bedwell Harbour / Beaumont • *Bedwell/Beaumont (117)* • *Poet's Cove Marina (24)*	141	26%
Ganges Harbour • *Ganges (119)* • *Ganges Marina (1)*	120	22%
Sidney Spit	108	20%
Portland Island • *Portland Island (60)* • *Princess Bay (10)* • *Royal Cove (5)*	75	14%
Wallace Island • *Wallace Island (36)* • *Connover Cove (6)* • *Princess Cove (5)*	47	9%
Greater Sidney Area • *Sidney (22)* • *Port Sidney (9)* • *Tsehum Harbour (6)* • *Van Isle Marina (2)* • *Canoe Cove Marina (2)*	41	8%
Winter Cove	34	6%
Reef Harbour (Cabbage/Tumbo)	32	6%
Annette Inlet	30	6%
Genoa Bay	29	5%
Port Browning	27	5%
Maple Bay / Bird's Eye Cove • *Maple Bay (23)* • *Bird's Eye Cove (1)*	24	5%
Telegraph Harbour	24	5%
Tod Inlet	22	4%
Nanaimo • *Nanaimo (20)* • *Nanaimo Yacht Club (1)*	21	4%

[10] Note: Because respondents listed frequent destinations with varying degrees of specificity, some categorization has been required.

Otter Bay	18	3%
Silva Bay	16	3%
Pirate's Cove	16	3%
Clam Bay	15	3%
Victoria	12	2%
Cowichan Bay • *Cowichan Bay (10)* • *Dungeness Marina (1)* • *Pier 66 Marina (1)*	12	2%
Newcastle Island / Mark Bay	11	2%
Russell Island	11	2%
Glenthorne Passage	10	2%
James Bay	8	1%
Tent Island	7	1%
Long Harbour	6	1%
Musgrave Landing	5	1%
Burgoyne Bay	5	1%
Lyall Harbour	5	1%
Fulford Harbour	5	1%
Sucia Island	4	1%
Selby Cove	4	1%
Roche Harbor	4	1%
Vancouver	4	1%
Chatham Island • *Chatham Island (3)* • *Puget Cove (1)*	4	1%
Ruxton Island • *Ruxton Island (2)* • *Herring Bay (2)*	4	1%
D'Arcy Islands • *D'Arcy Island (2)* • *Little D'Arcy Island (2)*	4	1%
1 or 2 responses each: Kendrick Island, Friday Harbor, Irish Bay, Chemainus, Boot Cove, Dionisio Point, Dengen Bay, Discovery Island, Rum Island, Scott Point, North Cove, Gossip Island, Stuart Island, Narvaez Bay, Ladysmith, Horton Bay.		

Q.15 How does encountering the following activities affect your enjoyment of boating trips in the SGI?

	SIGNIFICANTLY DETRACTS	SOMEWHAT DETRACTS	NEITHER	SOMEWHAT ENHANCES	SIGNIFICANTLY ENAHNCES	MISSING	MEAN	STANDARD DEVIATION
Jet skis / Personal watercraft	62.1%	22.6%	14.6%	0.6%	0.2%	7	1.54	0.773
Whale watching boats	16.6%	29.2%	45.3%	7.6%	1.3%	6	2.48	0.90
Shellfish farms	15.6%	23.1%	56.3%	3.9%	0.9%	10	2.52	0.83
Cruise ships	11.7%	15.6%	54.6%	16.8%	1.3%	6	2.80	0.90
Float planes	7.8%	19.0%	45.2%	25.1%	3.0%	5	2.97	0.94
Commercial shipping boats	4.7%	15.7%	61.9%	16.0%	1.7%	7	2.94	0.76
Commercial fishing boats	4.6%	14.9%	59.9%	17.5%	3.2%	5	3.00	0.80
Powerboats	4.2%	22.7%	42.9%	20.8%	7.7%	9	3.05	0.96
Ferries	3.4%	17.8%	59.7%	16.9%	2.2%	9	2.97	0.76
SCUBA divers / snorkelers	0.7%	2.8%	74.3%	18.6%	3.5%	6	3.22	0.58
Kayaks / Rowboats / Canoes	0.4%	1.9%	29.3%	41.3%	27.2%	17	3.93	0.82
Sailboats	0.9%	1.3%	24.1%	31.1%	42.6%	15	4.13	0.89

Q.17 & Q.22 Possible Strategies for Managing the Marine Environment

	STRONGLY OPPOSE	SOMEWHAT OPPOSE	NOT SURE	SOMEWHAT SUPPORT	STRONGLY SUPPORT	MISSING	MEAN	STANDARD DEVIATION
General support for the concept of zoning	**10.5%**	**14.9%**	**19.1%**	**40.5%**	**15.1%**	**19**	**3.35**	**1.21**
Limiting commercial fishing in some areas	4.1%	17.3%	20.3%	32.4%	25.9%	6	3.59	1.16
Seasonally closing certain environmentally sensitive areas	10.0%	13.8%	16.0%	38.5%	21.7%	5	3.48	1.25
Limiting anchoring in some environmentally sensitive areas	11.6%	15.9%	16.1%	37.0%	19.4%	8	3.37	1.28
Limiting motorized access in some areas	15.6%	18.0%	20.6%	32.1%	13.7%	10	3.10	1.29
Limiting all access to some environmentally sensitive areas	16.4%	23.3%	17.1%	26.1%	17.1%	6	3.04	1.34
Limiting recreational fishing in some areas	14.9%	22.9%	22.0%	27.4%	12.7%	7	3.00	1.27

Q.16 For any activities that detract, why/how do they detract? [open-ended question]

Activity (number of respondents who felt negatively towards activity in parentheses)	**Number of responses**	% of those who felt negatively[a]
Personal watercraft / PWC *(454)*		
Noise	342	75%
Dangerous/reckless behaviour	87	19%
Wake	59	13%
Lack of respect/consideration for others	52	11%
Speed	39	9%
Inexperienced/lack boating training	25	6%
Environmental effects (pollution/disturbance to wildlife)	18	4%
Unpredictable movement/hard to navigate around	15	3%
Commercial Whale Watching Boats *(246)*		
Environmental concerns/effects on whales	72	30%
Noise	49	20%
Wake	42	17%
Too many boats / people	25	10%
Speed	23	9%
Lack boating etiquette / knowledge	21	9%
Too commercial an activity	6	2%
Prevent others from viewing whales	6	2%
Moral objections	3	1%
Commercial shellfish farms *(206)*		
Limit harbour/bay/beach access	68	33%
Aesthetic concerns	33	16%
Pollution/environmental concerns	28	14%
Not natural	10	4%
Leave too much refuse in the area	6	3%
Moral objections	5	3%
Safety concerns (navigation)	3	1%
Cruise Ships *(147)*		
Pollution/environmental concerns	24	16%
Too many people/contributes to crowding	19	13%
Wake	19	13%
Noise	16	11%
Not appropriate for the region	8	5%
Safety	4	3%
Aesthetic concerns	3	2%
Too much commercialization / consumption	2	2%
Powerboats *(146)*		
Wake	65	45%
Noise	53	36%
Generator use	19	13%
Lack of respect/consideration for others	15	10%
Speed	15	10%
Pollution/environmental concerns	10	7%
Smell (exhaust/fumes)	9	6%
Lack boating etiquette/knowledge	8	5%
Safety concerns	4	2%

Float Planes *(144)*		
Noise	70	49%
Safety issues	8	6%
Smell	6	4%
Wake	5	3%
Pollution	2	1%
Limit anchoring space	1	1%
Provides easy access to special places	1	1%
Commercial Shipping *(109)*		
Wake	26	24%
Noise	13	12%
Obstruction to navigation / need to change course	13	12%
Pollution (air/water)	7	6%
Large/stressful	5	4%
Aesthetic concerns / smells	5	4%
Commercial Fishing *(105)*		
Depletion of stocks / competition with sports fishery	14	13%
Navigational hazard (fish nets / crab traps)	14	13%
Wake	11	10%
Noise	6	6%
Discourteous / lack respect for other boaters	6	6%
Not appropriate in marine parks	2	2%
Compete for a limited amount of dock space	2	2%
Pollution	2	2%
Speed	1	1%
Ferries *(113)*		
Wake	31	27%
Noise	9	8%
Requires a change of course	6	5%
Too many / constant	2	2%
Speed	2	2%
Inability to maneuver	1	1%
Inadequate requirements for captains	1	1%
SCUBA Divers *(19)*		
Difficult to see	4	21%
Endanger habitat	1	5%
Kayaks *(12)*		
Difficult to see	4	33%
Unsafe behaviour / practices	3	25%
Slow / un-maneuverable	1	8%
Sailboats (12)		
In the way when tacking	1	8%
Hard to anticipate what they'll do	1	8%
Lack of knowledge of rules of navigation	1	8%

Other activities mentioned: crab traps, derelict mooring buoys, cigarette boats, generators

Q.20: Perceived Benefits of zoning

Marine zoning in the SGI would…	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NOT SURE	SOMEWHAT AGREE	STRONGLY AGREE	MISSING	MEAN	STANDARD DEVIATION
Protect species and habitats	3.1%	4.8%	13.0%	41.3%	37.9%	20	4.06	0.99
Provide clear ground rules for certain activities and areas	2.1%	4.8%	15.5%	41.6%	35.9%	22	4.04	0.95
Allow fisheries to recover	3.4%	5.7%	15.7%	35.8%	39.4%	20	4.01	1.05
Enhance understanding of the marine environment	4.6%	7.6%	20.5%	41.0%	26.2%	21	3.77	1.07
Reduce conflict amongst users	5.5%	12.4%	31.8%	26.9%	23.4%	18	3.50	1.14
Help promote a wilderness experience for boating	6.9%	10.5%	29.5%	31.4%	21.6%	21	3.50	1.15
Improve my boating experience in the region	8.6%	13.6%	31.6%	27.0%	19.3%	20	3.41	1.76
Provide economic certainty for some activities	4.6%	12.3%	41.9%	28.1%	13.1%	23	3.32	1.00

Q.21: Perceived Constraints of zoning

Marine zoning in the SGI would…	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NOT SURE	SOMEWHAT AGREE	STRONGLY AGREE	MISSING	MEAN	STANDARD DEVIATION
Be difficult to enforce	1.5%	6.6%	15.7%	42.9%	33.3%	26	4.00	0.95
Have a bias towards marine conservation	2.5%	5.7%	14.4%	45.5%	29.1%	20	3.97	0.95
Curtail freedom of movement/access	3.8%	5.4%	15.1%	51.2%	24.5%	20	3.87	0.97
Have a bias towards certain activities	1.0%	5.0%	23.5%	50.9%	19.9%	20	3.83	0.83
Have a low compliance rate	2.1%	10.8%	31.5%	40.4%	15.2%	23	3.56	0.95
Increase conflict amongst users	1.5%	13.7%	31.9%	40.0%	13.0%	20	3.49	0.94
Create economic barriers to existing uses	1.7%	12.3%	40.9%	32.9%	12.1%	24	3.41	0.92
Represent over-regulation of the sea	6.5%	17.5%	25.1%	31.8%	19.1%	18	3.39	1.17
Detract from my boating experience in the region	7.7%	18.2%	31.8%	27.4%	14.9%	21	3.24	1.15

Q.22: Do you have any thoughts or suggestions about zoning in the southern Gulf Islands?
[open-ended question; 266 respondents provided some form of comment]

Category of Comment	# of comments	% of comments[a]
Unqualified support	**24**	**9%**
Comments expressing need to protect the marine environment / achieve sustainability	22	8%
NMCA should be larger / protect more area	2	1%
Qualified Support / Concerns	**123**	**46%**
Opposition to regulation of the ocean / fears of over-regulation	33	12%
Worries / skepticism about government involvement in managing / regulating the marine environment	29	11%
Fears / opposition to losing access or freedom of movement for boating and anchoring	17	6%
Skepicism about lack of enforcement / difficulty enforcing and managing a zoning plan	15	6%
Concerns about bias towards certain interests (e.g. commercial, First Nations)	13	5%
Generally supportive, but depends on final outcome of plan	6	2%
General disagreement (no specific reason provided)	5	2%
Opposition due to fears of fees / loss of affordability	5	2%
Specific Suggestions For Zoning	**100**	**38%**
Education and Communication		
If zoning is implemented, must have a strong education / awareness component	14	5%
Need to communicate any environmental changes as a result of zoning	3	1%
Need for more communication with boaters regarding the NMCA	1	<1%
Involvement and Consultation		
Need for consultation with all stakeholders	11	4%
Need for consultation with / involvement of recreational boaters	5	2%
Need for First Nations involvement	2	1%
Fishing-Related Suggestions		
Reduce / restrict commercial fishing/crabbing	15	6%
Reduce / restrict both commercial and recreational fishing/crabbing	3	1%
Other	2	1%
Types of Zones		
Noise free zones	2	1%
"No jet ski/cigarette boat" zones	2	1%
"No whale watching" zones	2	1%
Rotating "no fishing" zones	1	<1%
Crabbing free zones	1	<1%
"No anchor" zones in critical habitats	1	<1%
Designated shoreline activity areas	1	<1%
Timing and Implementation		
Slow / gradual / phased approach	5	2%
Need quick implementation	2	1%
Requires short / medium / long term strategies	1	<1%
Other suggestions		
Increase number of pumpout stations	7	3%
Increase number of mooring buoys	4	2%
Need to control pollution from land-based activities	3	1%
Implement an annual boating fee/anchoring fees to fund enforcement	2	1%

More remote areas would be more appropriate for this type of strategy	1	<1%
Use a lottery / draw for certain areas to limit use	1	<1%
Any plan should lean towards recreational uses	1	<1%
Need to develop more facilities to avoid crowding / dissatisfaction	1	<1%
Include a marine conservation component in operator's card requirements	1	<1%
Zoning needs to have clear benchmarks to measure changes	1	<1%
Need to manage seal population	1	<1%
Need a cruising tax for foreign vessels	1	<1%
Ban activities of high impact, encourage activities of low impact	1	<1%
Must respect private property rights and use of the area	1	<1%
Need more information / questions about zoning	**36**	**13%**
Need more information to give educated opinion	22	8%
Specific questions	14	5%
Other (non-zoning or NMCA related) Comments	**22**	**8%**
Concerns over the number of US vessels	4	2%
Others	18	6%

[a] Percentage based on the number of respondents who provided comments (266), not the total number of comments provided

Q.18: Previously aware of NMCA proposal?

Yes	25.6%
No	71.5%
Not sure	2.4%

Q.19 If "yes", where did you receive information regarding the NMCA proposal?

Information Source	% of those who were aware that used source
Newspaper / Magazine	52%
Boating Club or Organization	30%
Word of Mouth	27%
Others	19%
Parks Canada Information Sessions	16%
Parks Canada NMCA E-News/Website	10%
Environmental Organization	6%

Q.24: Respondent Ownership of Different Boats

Boat type	**% own**
Jet ski/Personal Watercraft	1.7%
Kayak/Canoe	36.7%
Inflatable/RIB	56.9%
Rowboat	24.5%
Sailboat (w/ auxiliary)	50.5%
Sailboat (w/o auxiliary)	7.7%
Motorboat (w/ cabin)	46.8%
Motorboat (w/o cabin)	7.7%
Other	4.5%

Q. 25 Average Number of Boating Days Per Month

January	1.2	July	12.6
February	1.3	August	13.8
March	2.0	September	7.0
April	3.3	October	3.0
May	5.3	November	1.2
June	8.2	December	1.3

Q.26: Membership in Boating Club or Organization

Yes (52%)
No (48%)

Q.27: Years of Boating Experience

Years of experience	All boats	Sailboats	Motorboats
Less than 1 year	0.8%	0.4%	1.2%
1-5 years	6.2%	5.5%	7.6%
6-10 years	6.4%	6.9%	5.8%
11-20 years	15.0%	14.9%	15.2%
20+ years	71.6%	72.4%	70.1%

Q.28: Self Rated Boating Skill

	All boats	Sailboats	Motorboats
Novice	1.7%	1.5%	2.0%
Intermediate	20.8%	20.1%	21.6%
Advanced	56.1%	55.3%	56.9%
Expert	21.4%	23.1%	19.7%

Q.29: Residence of Boaters by Province/State and Country

By Country:

	All Boats	Sailboats	Motorboats
Canada	72.1%	75.7%	68.2%
United States	27.1%	23.9%	30.6%
Others (4)	0.8%	0.4%	1.2%
Missing (16)			

By province/state:

	All boats	Sailboats	Motorboats
British Columbia	68.8%	71.3%	64.7%
Washington	20.3%	17.6%	22.7%
Alberta	4.0%	4.0%	3.9%
California	2.7%	1.5%	3.9%
Oregon	1.5%	1.5%	1.6%
Other Provinces	0.4%	0.7%	0.0%
Other States	2.4%	2.9%	1.6%

Missing (21)

Q.30: Years in the Pacific Northwest / Georgia Basin Region

Years in the PNW	All Boats	Sailboats	Motorboats
Less than 1 year	0.6%	0.7%	0.4%
1-5 years	4.2%	5.4%	2.8%
6-10 years	3.4%	4.3%	2.4%
11-20 years	9.2%	10.1%	8.3%
More than 20 years	72.5%	68.5%	76.8%
Not applicable	10.2%	10.9%	9.4%

Missing: 13

Q.31: Respondent Gender

Of those that filled out the questionnaire, 75.6% were male, 18.2% were female, and 6.2% noted that they filled it out as a couple (i.e. both male and female). No inferences on the boaters population as a whole can be made from these numbers, however, because the boaters selected was not at random (the boat owner who wanted to fill it out did so, and this was more often than not the male on the boat).

Q.32: Respondent Age

	All Boats	Sailboats	Motorboats
Under 25 years	0.4%	0.7%	0.0%
26-35 years	2.8%	3.7%	2.0%
36-45 years	9.3%	7.4%	11.3%
46-55 years	28.8%	26.1%	31.6%
56-65 years	37.7%	43.0%	32.0%
Over 65 years	21.0%	19.1%	23.0%

Q.33 Anything else you'd like to say about recreational boating issues in the southern Gulf Islands?
[open-ended question; 256 respondents provided some form of comment]

Category of Comment	% of those who provided a comment
Comments related to marine parks / facilities	**85 (33%)**
Need more mooring buoys	11 (4%)
More garbage disposal/recycling facilities in parks	6 (2%)
Have some sort of season's pass for marine parks/buoys	5 (2%)
More interpretive programs/signs	5 (2%)
Need more enforcement/presence re: collecting fees, monitoring noise	4 (2%)
Need more access to freshwater	4 (2%)
Concerns about Federal government taking over provincial parks (cost, lack of upkeep, etc)	4 (2%)
Charge fee for anchoring in marine parks	3 (1%)
More dinghy docks	3 (1%)
More docks for small boats (not dinghies)	3 (1%)
Let parks keep their profits	3 (1%)
Increase number of marine parks	3 (1%)
Expand volunteer programs	2 (1%)
Boaters should have to take care of their own garbage	2 (1%)
Better/more trails	2 (1%)
Better/more toilet facilities	2 (1%)
Miscellaneous comments (1 each)	23 (9%)
Comments Specifically Related to the NMCA/ zoning	**73 (29%)**
Comments expressing concern/opposition due to over-regulation	22 (9%)
Comments in support of NMCA / zoning / Marine Conservation	12 (5%)
Comments stressing the importance of maintaining recreational boater access when zoning decisions are made	8 (3%)
Comments stressing the need for public input and involvement	3 (1%)
Comments stressing the need for education and information	3 (1%)
Need more information about zoning	3 (1%)
Concerns about politics/bias/special interest group influence	3 (1%)
Difficult to enforce	2 (1%)
Closures would only result in crowding	2 (1%)
Others (1 each)	15 (6%)
Sewage Regulations / Pumpout Facilities	**60 (23%)**
Need for more pumpout facilities in the region	41 (16%)
Comments expressing opposition to proposed regulations	9 (4%)
Comments expressing support for regulations/ holding tank requirements	3 (1%)
Need to address Victoria's sewage issue	3 (1%)
Miscellaneous	3 (1%)
Generally Positive Comments	**51 (20%)**
Positive comments about boating/Gulf Islands in general	40 (16%)
Positive/encouraging comments about the study	11 (4%)
Fishing/Crabbing/Aquaculture Related	**36 (14%)**
Lack of enforcement of fishing regulations	6 (2%)
Comments expressing opposition to fish farms	5 (2%)
Comments expressing desire to limit commercial fishing/crabbing	5 (2%)

Comments expressing desire for seal population management	4 (2%)
Comments expressing opposition to fishing closures/ restricting	3 (1%)
Comments expressing concern over shellfish farming	2 (1%)
Comments supporting closing area to all fishing	2 (1%)
Need up to date/accurate information on shellfish closures	2 (1%)
Miscellaneous	7 (3%)
Activity Conflicts/Concerns	**27 (11%)**
Concerns about wake – need for education, enforcement	7 (3%)
Concerns about generators / need for "no generator" times or areas	6 (2%)
Concerns about noise/motor powered dinghies in anchorages	6 (2%)
Concerns about/opposition to jet skis	4 (2%)
Concerns about whale watching boats	2 (1%)
Others	2 (1%)
Obstructions to Navigation / Anchoring	**25 (10%)**
Concerns with proliferation/lack of regulation of crab traps	11 (4%)
Issues/concerns with proliferation/lack of regulation of private mooring buoys	9 (3%)
Concerns with proliferation /lack of regulation of derelict boats	9 (3%)
Marinas and government docks	**25 (10%)**
Need to expand marina facilities/slips	8 (3%)
Reintroduce / expand government docks for public use	6 (3%)
Lack of affordability at marinas	5 (3%)
Concerns about poor condition of marinas	4 (3%)
Others	2 (1%)
Residential / Shoreline Development	**16 (6%)**
Too much foreshore/land development in SGI	5 (2%)
Foreign ownership of foreshore/marine access properties	4 (2%)
Foreshore development restricting public access	3 (2%)
Need setbacks for shoreline development	3 (2%)
Incentives for green building	1 (1%)
Licensing and Regulation	**12 (5%)**
Need more enforcement/training/regulation/licensing of operators	12 (5%)
Issues with USA / foreign vessels	**11 (4%)**
Comments expressing need for cruising fee for foreign vessels	7 (3%)
Comments expressing concern over the number of US vessels in the region	2 (1%)
Comments expressing need for education of American mariners about our regulations	2 (1%)
Miscellaneous (1 each)	**40 (16%)**

Appendix F: Testing for Variability in Activity Participation, Setting Preferences, and Perceived Conflict

I. Activity Participation

All comparisons were done using Pearson's chi-square (comparing the percentage of respondents who usually participate in each activity)
[a] denotes statistically significant difference ($p<0.05$)

A. Size of Vessel

	Smaller Boats (<30') n=153	Larger Boats (>40') n=140	Chi-squre	df	Sig
Hiking/trail walking	82.4%	74.3%	2.82	1	0.09
Accessing beaches[a]	87.6%	64.7%	21.26	1	0.00
Wildlife viewing	70.6%	66.9%	0.46	1	0.50
Photography	62.1%	65.0%	0.27	1	0.61
Accessing amenities on shore[a]	54.2%	69.3%	6.97	1	0.01
Birdwatching	45.1%	45.0%	0.00	1	0.99
Crabbing	44.4%	51.4%	1.43	1	0.23
Sport/recreational fishing	30.1%	32.8%	0.15	1	0.69
Gathering shellfish	17.0%	15.7%	0.09	1	0.77
Diving / snorkeling	7.8%	7.1%	0.05	1	0.82
Camping[a]	11.8%	2.1%	10.17	1	0.00

B. Boat Club Membership

	% non-members who usually participate n=251	% members who usually participate n=272	Chi-squre	df	Sig
Hiking/trail walking[a]	76.7%	84.3%	4.90	1	0.03
Accessing beaches	78.3%	75.8%	0.44	1	0.51
Wildlife viewing	73.1%	68.9%	1.15	1	0.28
Photography	57.7%	65.0%	2.92	1	0.09
Accessing amenities on shore	58.5%	63.1%	1.19	1	0.27
Birdwatching	44.7%	51.1%	2.179	1	0.14
Crabbing	43.9%	51.8%	3.33	1	0.07
Sport/recreational fishing	29.2%	27.0%	0.33	1	0.57
Gathering shellfish	14.6%	17.5%	0.81	1	0.37
Diving / snorkeling	6.6%	7.5%	0.18	1	0.67
Camping[a]	7.5%	2.2%	8.24	1	0.01

C. Country of Origin

	% Canadians who usually participate n=378	% Americans who usually participate n=142	Chi-squre	df	Sig
Hiking/trail walking	82.5%	78.0%	1.35	1	0.25
Accessing beaches	78.2%	73.0%	1.52	1	0.22
Wildlife viewing[a]	66.5%	82.3%	12.35	1	0.00
Photography	61.5%	61.7%	0.00	1	0.97
Accessing amenities on shore[a]	58.6%	68.8%	4.48	1	0.03
Birdwatching	46.9%	53.9%	1.98	1	0.16
Crabbing	49.6%	42.6%	2.04	1	0.15
Sport/recreational fishing	30.2%	22.7%	2.89	1	0.09
Gathering shellfish	16.7%	13.5%	0.81	1	0.37
Diving / snorkeling	8.2%	5.0%	1.60	1	0.21
Camping	4.5%	5.0%	0.05	1	0.83

D. Self-Reported Experience

	% novice/intermediate who usually participate n=118	% advanced/expert who usually participate n=403	Chi-squre	df	Sig
Hiking/trail walking	83.8%	86.0%	0.81	1	0.37
Accessing beaches	79.5%	76.3%	0.52	1	0.47
Wildlife viewing[a]	63.2%	72.8%	4.03	1	0.05
Photography	59.8%	61.6%	0.12	1	0.73
Accessing amenities on shore[a]	71.8%	57.9%	7.390	1	0.01
Birdwatching	42.7%	49.3%	1.55	1	0.21
Crabbing	43.6%	49.3%	1.17	1	0.28
Sport/recreational fishing	28.2%	27.8%	0.01	1	0.94
Gathering shellfish	13.7%	16.7%	0.64	1	0.43
Diving / snorkeling	7.7%	7.1%	0.04	1	0.84
Camping	5.1%	4.4%	0.10	1	0.75

E. Age Level

	% younger boaters (<45) who usually participate n=66	% older boaters (>45) who usually participate n=350	Chi-squre	df	Sig
Hiking/trail walking	80.3%	82.0%	0.11	1	0.74
Accessing beaches[a]	89.3%	76.8%	5.28	1	0.02
Wildlife viewing[a]	60.1%	71.9%	3.39	1	0.07
Photography	57.6%	61.1%	0.30	1	0.59
Accessing amenities on shore	62.1%	62.0%	0.00	1	0.99
Birdwatching[a]	33.3%	50.8%	6.83	1	0.01
Crabbing	50.0%	45.1%	0.53	1	0.47
Sport/recreational fishing	36.4%	26.0%	2.98	1	0.08
Gathering shellfish	21.2%	12.9%	3.19	1	0.07
Diving / snorkeling[a]	15.2%	7.4%	4.19	1	0.04
Camping[a]	16.7%	3.0%	18.63	1	0.00

F. Boat Type

	% sailboats who usually participate n=279	% motorboats who usually participate n=255	Chi-squre	df	Sig
Hiking/trail walking[a]	84.3%	77.0%	4.63	1	0.03
Accessing beaches	77.9%	76.9%	0.08	1	0.78
Wildlife viewing	71.8%	69.4%	0.36	1	0.55
Photography	62.1%	60.5%	0.14	1	0.71
Accessing amenities on shore	57.5%	65.6%	3.72	1	0.05
Birdwatching	51.1%	44.9%	2.03	1	0.16
Crabbing[a]	40.0%	56.6%	14.84	1	0.00
Sport/recreational fishing[a]	21.1%	35.5%	13.90	1	0.00
Gathering shellfish	14.6%	17.2%	0.65	1	0.42
Diving / snorkeling	7.1%	7.4%	0.02	1	0.90
Camping	3.6%	6.3%	2.08	1	0.15

II. Setting Preferences

All comparisons were done using the student's t-test (comparing the mean importance level)
[a] denotes statistically significant difference ($p<0.05$)

A. Size of Vessel

	Smaller Boats (<30') n=151	Larger Boats (>40') n=138	t	Sig
Environment/Nature[a]	4.3	4.2	2.34	0.02
Quiet/Solitude	3.8	3.8	0.53	0.58
Natural Facility[a]	3.4	3.0	5.09	0.00
Built Facility	3.2	3.1	0.09	0.09
Extractive Activity	2.3	2.3	0.02	0.86

- Smaller boats place greater importance on environment/nature settings
- Smaller boats place greater importance on natural facility (likely because they tend to use camping facilities more often).

B. Boat Club Membership

	Non-members n=251	Members n=272	t	Sig
Environment/Nature	4.3	4.3	1.66	0.10
Quiet/Solitude	3.9	3.8	1.18	0.24
Natural Facility	3.3	3.1	1.72	0.09
Built Facility[a]	3.1	3.3	2.77	0.01
Extractive Activity	2.4	2.3	0.78	0.43

- Members of boating clubs place greater importance on built facilities

C. Country of Origin

	Canada n=378	USA n=142	t	Sig
Environment/Nature	4.3	4.3	0.52	0.61
Quiet/Solitude[a]	3.8	4.0	2.06	0.04
Natural Facility	3.2	3.1	1.41	0.16
Built Facility	3.2	3.1	0.98	0.49
Extractive Activity	2.3	2.3	0.69	0.33

- American vessels place a greater importance on settings characterized by quiet/solitude

D. Level of Experience

	Novice/Intermediate n=118	Advanced/Expert n=403	t	Sig
Environment/Nature[a]	4.4	4.3	2.21	0.03
Quiet/Solitude	3.8	3.9	1.35	0.18
Natural Facility[a]	3.4	3.1	2.88	0.00
Built Facility[a]	3.4	3.1	3.78	0.00
Extractive Activity	2.3	2.3	0.42	0.67

- Less experienced boaters place a greater importance on both facility types and also on environment/nature

E. Age Level

	Younger Boaters (<45) n=66	Older Boaters (>45) n=346	t	Sig
Environment/Nature	4.4	4.3	1.45	0.15
Solitude	3.7	3.9	1.81	0.07
Natural Facility[a]	3.5	3.2	3.06	0.00
Built Facility	3.2	3.2	0.45	0.65
Extractive Activity[a]	2.6	2.3	2.31	0.02

- Younger boaters place a greater importance on extractive activities and natural facilities.

F. Boat Type

	Sailboats n=279	Powerboats n=255	t	Sig
Environment/Nature[a]	4.3	4.2	2.04	0.04
Quiet/Solitude[a]	4.0	3.8	2.89	0.00
Natural Facility	3.3	3.1	1.91	0.06
Built Facility[a]	3.0	3.3	4.87	0.00
Extractive Activity[a]	2.1	2.5	3.59	0.00

- The most (and greatest) significant differences seen in any of the comparisons for setting preference. Sailboat operators place a comparatively greater importance on setting characterized by environment/nature and quiet/solitude, while motorboat operators place a comparatively greater importance on setting characterized by built facilities and those which facilitate extractive activities.

III. Perception of Conflict

All comparisons were done using Pearson's chi-square (comparing the percentage of respondents who rated encounters with each activity as 'detracting' from their boating experience)
[a] denotes statistically significant difference ($p<0.05$)

A. Size of Vessel

	Smaller Boats (<30') n=152	Larger Boats (>40') n=140	Chi-squre	df	Sig
Jet skis / PWC	84.2%	80.7%	0.62	1	0.43
Whale watching boats	44.7%	45.0%	0.00	1	0.96
Shellfish farms	39.1%	41.7%	0.21	1	0.65
Cruise ships	26.1%	28.9%	0.22	1	0.64
Motorboats	23.4%	20.9%	0.33	1	0.56
Float planes	30.1%	24.3%	1.51	1	0.22
Ferries[a]	27.6%	16.1%	5.60	1	0.02
Commercial shipping	26.8%	21.1%	1.32	1	0.25
Commercial fishing	23.5%	21.4%	0.19	1	0.67
Scuba divers / snorkelers	3.9%	5.7%	0.52	1	0.47
Kayaks / rowboats / canoes	2.7%	2.2%	0.07	1	0.79
Sailboats	1.0%	4.3%	2.48	1	0.12

B. Boat Club Membership

	% non-members who rate activity as detracting n=251	% members who rate activity as detracting n=272	Chi-squre	df	Sig
Jet skis / PWC	83.3%	86.9%	1.22	1	0.25
Whale watching boats	47.2%	45.3%	0.21	1	0.65
Shellfish farms[a]	33.1%	43.2%	5.70	1	0.02
Cruise ships	31.1%	23.7%	3.62	1	0.06
Motorboats	27.8%	26.7%	0.08	1	0.79
Float planes	29.5%	24.0%	2.06	1	0.15
Ferries	19.0%	22.7%	1.06	1	0.30
Commercial shipping	20.1%	20.2%	0.00	1	0.98
Commercial fishing	18.1%	19.6%	0.21	1	0.65
Scuba divers / snorkelers[a]	5.5%	1.8%	5.16	1	0.02
Kayaks / rowboats / canoes	2.4%	2.2%	0.02	1	0.89
Sailboats	1.9%	2.8%	0.53	1	0.47

C. Country of Origin

	% Canadians who rate activity as detracting n=378	% Americans who rate activity as detracting n=142	Chi-squre	df	Sig
Jet skis / PWC	84.4%	86.4%	0.32	1	0.57
Whale watching boats	45.1%	50.4%	1.13	1	0.29
Shellfish farms[a]	43.4%	26.4%	12.31	1	0.00
Cruise ships[a]	22.4%	40.0%	16.09	1	0.00
Motorboats	28.6%	24.3%	0.98	1	0.32
Float planes[a]	29.7%	15.6%	10.70	1	0.00
Ferries	22.2%	17.3%	1.51	1	0.22
Commercial shipping	20.3%	17.9%	0.29	1	0.53
Commercial fishing	19.5%	17.7%	0.20	1	0.65
Scuba divers / snorkelers	3.4%	2.9%	0.11	1	0.74
Kayaks / rowboats / canoes	2.4%	2.2%	0.03	1	0.87
Sailboats	1.3%	3.6%	2.74	1	0.10

D. Self-Rated Experience Level

	% novice/intermediate who rate activity as detracting n=119	% advanced/expert who rate activity as detracting n=404	Chi-squre	df	Sig
Jet skis / PWC[a]	76.5%	87.7%	9.01	1	0.00
Whale watching boats	46.6%	45.4%	0.05	1	0.82
Shellfish farms	31.9%	40.3%	2.75	1	0.10
Cruise ships	26.9%	27.6%	0.02	1	0.88
Motorboats	26.9%	27.5%	0.02	1	0.89
Float planes	27.3%	23.5%	0.66	1	0.41
Ferries	19.9%	25.2%	1.58	1	0.21
Commercial shipping[a]	30.3%	17.0%	10.02	1	0.00
Commercial fishing	19.2%	19.1%	0.00	1	0.96
Scuba divers / snorkelers	3.4%	3.7%	0.03	1	0.86
Kayaks / rowboats / canoes	4.3%	1.8%	2.65	1	0.10
Sailboats	1.7%	2.5%	0.25	1	0.62

E. Age Level

	% younger boaters (<45) who rate activity as detracting n=66	% older boaters (>45) who rate activity as detracting n=351	Chi-squre	df	Sig
Jet skis / PWC[a]	72.3%	84.8%	5.72	1	0.02
Whale watching boats	54.5%	45.0%	2.03	1	0.15
Shellfish farms[a]	24.2%	38.9%	5.00	1	0.03
Cruise ships	30.3%	27.6%	0.20	1	0.66
Motorboats	21.5%	27.9%	1.19	1	0.29
Float planes	19.2%	27.4%	1.69	1	0.19
Ferries	18.2%	21.2%	0.25	1	0.62
Commercial shipping	27.3%	20.0%	1.76	1	0.19
Commercial fishing	21.2%	18.5%	0.26	1	0.61
Scuba divers / snorkelers	3.0%	2.3%	0.13	1	0.72
Kayaks / rowboats / canoes	3.1%	2.6%	0.05	1	0.82
Sailboats	3.0%	2.6%	0.04	1	0.84

F. Boat Type

	% sailboats who rate activity as detracting n=279	% motorboats who rate activity as detracting n=255	Chi-squre	df	Sig
Jet skis / PWC[a]	89.5%	79.6%	10.09	1	0.00
Whale watching boats[a]	51.8%	39.4%	8.32	1	0.00
Shellfish farms	41.1%	36.0%	1.43	1	0.23
Cruise ships[a]	32.5%	21.9%	7.53	1	0.01
Motorboats[a]	46.2%	7.0%	103.15	1	0.00
Float planes[a]	32.0%	21.2%	8.80	1	0.00
Ferries	22.7%	19.5%	0.78	1	0.38
Commercial shipping	21.2%	19.4%	0.28	1	0.60
Commercial fishing	19.8%	19.2%	0.03	1	0.87
Scuba divers / snorkelers	3.6%	3.5%	0.01	1	0.93
Kayaks / rowboats / canoes	1.1%	3.6%	3.61	1	0.06
Sailboats[a]	0.7%	3.9%	6.104	1	0.01