

# Mapping Local Knowledge on Recreational Boating in the Southern Strait of Georgia

Darcy Gray<sup>1</sup>, Rosaline Canessa<sup>2</sup>, and Peter Keller<sup>3</sup>

<sup>1</sup> M.A. Candidate, Department of Geography, University of Victoria [dgray@uvic.ca](mailto:dgray@uvic.ca)

<sup>2</sup> Assistant Professor, Department of Geography, University of Victoria [rcanessa@mail.geog.uvic.ca](mailto:rcanessa@mail.geog.uvic.ca)

<sup>3</sup> Professor, Department of Geography, University of Victoria [soscdean@uvic.ca](mailto:soscdean@uvic.ca)

## Abstract

Effective coastal and marine management requires an understanding of the overall use of an area by stakeholders. The goal of this study is to spatially characterize the use of British Columbia's southern Strait of Georgia by recreational boaters. The study involved the use of a face to face questionnaire, in which boaters were asked to plot on a map the route of their current boating trip. 543 boating routes were collected, and this information was subsequently digitized and overlaid to create a boating density map of the region. The ongoing GIS visualization and analysis conducted through this study will contribute to an increased understanding of the use of the area by boaters and highlight areas of potential environmental and safety concern based on boat concentrations and intensity of use.

## Background and Relevance

The southern Strait of Georgia is one of the busiest waterways in Canada, and is characterized by multiple uses and a sensitive marine environment. One of the dominant activities in the region is recreational boating. While boating can have a variety of positive social and economic impacts, research has also documented negative environmental effects, including impacts associated with sewage discharge (Guillon-Cottard *et al.*, 1998; Shafer & Yoon, 1998), impacts of anchoring on benthic communities (Creed & Filho, 1999; Leatherbarrow, 2005), and impacts of boating on marine fauna (Burger, 1998; Janik & Thompson, 1996; Wall *et al.*, 2005). However, despite these potential impacts and the popularity of the area for boating, there currently exists a lack of information on the overall spatial distribution and intensity of use of boating in the region. Given the potential impacts outlined above, such information is essential to achieving sustainable management of the marine environment.

A number of methods have been employed in an attempt to spatially characterize recreational boating in other areas of the world, including direct observation (Jaackson, 1998; Widmer & Underwood, 2004), aerial photographs (Reed-Andersen *et al.*, 2000; Sidman & Flamm, 2001), and mail-in questionnaires (Heatwole & West, 1982; Sidman & Fik, 2005). This study explored the use of face to face questionnaires as a method of capturing boater knowledge of their own vessel movements in the southern Strait of Georgia. Mapping and visualization of boating in the region has a number of direct practical applications, including the identification of areas of environmental concern

due to high levels of boating, and the identification of potential risks and conflicts between boating and other marine activities (Pelot & Wu, 2007).

## **Methods and Data**

A structured questionnaire was delivered to randomly selected boaters at nine popular anchorages in the region from June to September 2007. Respondents were provided with a map of the study area and were asked to plot the route of their current boating trip, as well as the location of any stops made while en route. A total of 543 vessel routes were collected during the study period. Each hand-drawn map was subsequently scanned and imported into ArcGIS 9.2. Boating routes were digitized as vector shapefiles, converted to raster format, and overlaid to produce an overall boating density map of the region. In addition, the questionnaire also collected a wide range of additional information (e.g., demographic information, boat type, horsepower, and point of origin). As this information is linked to each vessel route, this provides the capability to conduct a great deal of additional detailed GIS mapping and analysis of boating in the region.

## **Results**

Although analysis of the data gathered in this study is ongoing, the maps produced thus far show an overall snapshot of boating activity and density during the peak season in the southern Strait of Georgia. Several clear hotspots, both in terms of destination harbours and travel corridors, are evident. While, as expected, the locations at which boaters were surveyed appear as high traffic areas, there are also a number of additional locations which appear to be heavily used. Boating patterns for different types of boats (which have different environmental and safety concerns associated with them) have been separated and mapped. Knowing the geographic locations that are heavily used for boating is critical for decision makers in the region, as it indicates areas that may require additional environmental protection or mitigation measures.

## **Conclusions**

The use of face to face questionnaires proved to be an effective means of capturing spatial information for vessel movements in the southern Strait of Georgia. Particular strengths of this approach include an extremely high response rate, the ability to collect detailed information from boaters while they are engaged in boating, and the ability to link spatial information to additional information collected in the questionnaire (thereby enabling a great deal of specialized mapping and analysis). Weaknesses of the method include potential inaccuracies of boaters when plotting their route, a bias of the data towards the nine sample locations, and the relatively large cost of data collection and analysis. Despite this, the information gathered through this study makes a substantial contribution to understanding the use of the area by boaters, and can be used to make more informed decisions regarding safe and sustainable management of the marine environment.

## References

- Burger, J. (1998). Effects of motorboats and personal watercraft on flight behavior over a colony of common terns. *The Condor* 100: 528-534.
- Creed, J.C., and G.M.A. Filho (1999). Disturbance and recovery of the macroflora of a seagrass (*Halodule wrightii acheron*) meadow in the Abrolhos Marine National Park, Brazil: an experimental evaluation of anchor damage. *Journal of Experimental Marine Biology* 235: 285-306.
- Guilon-Cottard, I., H. Augier, J.J. Console, and O. Esmieu (1998). Study of microbiological pollution of a pleasure boat harbour using mussels as bioindicators. *Marine Environmental Research* 45(3): 239-247.
- Heatwole, C.A., and N.C. West (1982). Recreational-boating patterns and water-surface zoning. *Geographical Review* 72(3): 304-314.
- Jaakson, R. (1989). Recreation boating spatial patterns: theory and management. *Leisure Science* 11(2): 85-98.
- Janik, V.M., and P.M. Thompson (1996). Changes in surfacing patterns of bottlenose dolphins in response to boat traffic. *Marine Mammal Science* 12(4): 597-602.
- Leatherbarrow, K.E. (2006). *Monitoring Environmental Impacts of Boat Anchoring on Eelgrass (Zostera marina L) and Benthic Invertebrates in the Gulf Islands National Park Reserve of Canada*. Unpublished Master's Thesis. University of Victoria: Victoria, B.C.
- Pelot, R. and Y. Wu (2007) Classification of recreational boat types based on trajectory patterns. *Pattern Recognition Letters* 15(1): 1987-1994.
- Reed-Andersen, T., E.M. Bennett, B.S. Jorgensen, G. Lauster, D.B. Lewis, D. Nowacek, J.L. Riera, B.L. Sanderson, and R. Stedman (2000). Distribution of recreational boating across lakes: do landscape variables affect recreational use? *Freshwater Biology* 43: 439-448.
- Shafer, E., and J. Yoon (1998). Environmental management of human waste disposal for recreational boating activities. *Environmental Management* 22(1): 99-107.
- Sidman, C., and R. Flamm (2001). *A Survey of Methods for Characterizing Recreational Boating in Charlotte harbor, FL*. Florida Sea Grant Publication #TP-109.
- Sidman, C.F., and T.F. Fik (2005). Modeling spatial patterns of recreational boaters: vessel, behavioral, and geographic considerations. *Leisure Sciences* 27: 175-189.
- Wall, L.M., L.J. Walters, R.E. Grizzle, and P.E. Sacks (2005). Recreational boating activity and its impacts on the recruitment and survival of the oyster *crassostrea virginica* on

intertidal reefs in Moquito Lagoon, Florida. *Journal of Shellfish Research* 24(4): 965-973.

Widmer, W.M., and A.J. Underwood (2004). Factors affecting traffic and anchoring patterns of recreational boaters in Sydney Harbour, Australia. *Landscape and Urban Planning* 66: 173-183.