

CROWDING, USE LEVELS, AND SOCIAL CAPACITY ISSUES IN COASTAL AND MARINE ENVIRONMENTS: INTRODUCTION TO THE SPECIAL ISSUE

MARK D. NEEDHAM* AND BRIAN W. SZUSTER†

*Department of Forest Ecosystems and Society, Oregon State University, Corvallis, OR, USA

†Department of Geography, University of Hawai‘i, Honolulu, HI, USA

Approximately half of the world’s population is expected to be living within 100 km (60 mi) of the coast by 2015, and this trend has contributed to the growing popularity of coastal and marine tourism and recreation (Lück, 2008; Orams, 1999; Weaver, 2008). More than 80% of annual visitors to Hawai‘i, for example, participate in some form of marine recreation during their trip, and popular areas such as Hanauma Bay receive up to 1.75 million visitors per year (Friedlander et al., 2005). Travel to Australia’s Great Barrier Reef increased almost 10-fold between the early 1980s and late 1990s (Inglis, Johnson, & Ponte, 1999), and visitation to the Galapagos Islands increased from 17,500 in 1980 to more than 145,000 in recent years (Taylor, Dyer, & Stewart, 2003; Weaver, 2008). The total number of people visiting marine areas in southeast Alaska, such as Glacier Bay and Tracy Arm, increased from 85,000 in 1980 to more than 1 million by 2007, largely due to greater cruise ship access (Zegre, Needham, Kruger, & Rosenberger, 2012).

Participation in activities such as snorkeling, scuba diving, boating, and whale watching has also increased in coastal and marine areas. The Professional Association of Dive Instructors (PADI), for

example, has certified more than 17 million scuba divers since 1966, and millions of individuals participate in this activity at locations around the world (Szuster, Needham, & McClure, 2011). Participation in whale watching increased from 5 million people in 65 countries in 1994 to 9 million individuals in 87 countries in 1998, to 13 million people in 119 countries in 2008 (Finkler & Higham, 2004; O’Connor, Campbell, Cortez, & Knowles, 2009).

Numerous studies have examined the biophysical impacts of coastal and marine tourism and recreation activities, including damage caused by users handling coral, standing on reefs, feeding marine species, or getting too close to marine mammals (e.g., Barker & Roberts, 2004; Dinsdale & Harriott, 2004; Duffus & Dearden, 1993; Hawkins & Roberts, 1993; Kay & Liddle, 1989; Meyer & Holland, 2008; Orams, 2002; Rodgers & Cox, 2003; Williams, Trites, & Bain, 2006; Zakai & Chadwick-Furman, 2002). Increasing use levels and activity participation can, however, also generate social impacts such as crowding and conflict among groups. These issues have received substantial attention in the literature, but an overwhelming majority of studies have focused on terrestrial parks and protected areas (see

Manning, 2007, 2011; Needham & Rollins, 2009, for reviews). Studies examining these social impacts have received comparatively less attention in coastal and marine environments, with most only occurring quite recently (e.g., Anderson & Loomis, 2011; Bell, Needham, & Szuster, 2011; Ceurvorst & Needham, 2012; Freimund, Vaske, Donnelly, & Miller, 2002; Lankford, Inui, & Whittle, 2008; Manning, Johnson, & VandeKamp, 1996; Needham, Szuster, & Bell, 2011; Shafer & Inglis, 2000; Szuster et al., 2011). Investigation of use levels, crowding, encounters, and other indicators of social capacity issues, therefore, represents an emerging area of research in coastal and marine environments as the popularity of these areas for tourism and recreation continues to increase.

This special issue builds on this emerging body of research by presenting cutting edge studies that advance the applied, conceptual, and theoretical understanding of crowding, use levels, and other social capacity issues in coastal and marine environments. Articles in this special issue examine concepts such as use levels, reported encounters, crowding, encounter norms, willingness to pay, experience, indicators and standards of quality, and codes of conduct. These issues are examined relative to individuals engaging in various activities and settings, including kayakers in the Broken Group Islands in western Canada, scuba divers in Barbados and Tobago, participants swimming with whales in the Great Barrier Reef in Australia, paddlers in Lake Champlain in the northeast US, scuba divers and snorkelers in the Florida Keys, visitors to several coastal and marine sites in Hawai‘i, and multiple stakeholders in the Tracy Arm-Fords Terror coastal wilderness area in Alaska.

Curnock, Birtles, and Valentine examined use levels and encounters associated with tours providing opportunities to swim with dwarf minke whales in the Great Barrier Reef in Australia. Vessel effort data and sightings reported by tourism operators revealed a 91% increase in the number of whale encounters over a 6-year period. Findings also showed a small number of locations that accounted for a substantial proportion of these encounters with whales. Industry effort data revealed that shifting effort among permitted operators was the most likely cause of these increasing encounters with whales. Substantial latent capacity was identified despite the number of operators in the area being capped since permits

were introduced in 2003. The authors recommended, however, that the number of permits for this activity should not increase given that potential cumulative impacts of tourist interactions with these whales remain unknown.

Needham examined encounters, norms, and crowding of individuals visiting six coastal and marine sites on the island of O‘ahu, Hawai‘i. Encounters and norms were measured with photographs of various use densities. Results showed that encounters and crowding differed among these sites with 38–55% of respondents feeling crowded. On average, however, respondents encountered fewer than half as many people (i.e., 63–192 per 500 × 200 yards) compared to their normative standard for the maximum use density they felt should be allowed at each site (i.e., 206–381 people per 500 × 200 yards). Only 11–21% of respondents encountered more people than their norm at these sites, and these individuals felt more crowded than those who encountered fewer people than their norm. Crowding and encounters were important indicators at each site, and there was relatively high agreement regarding use densities that should and should not be allowed. The author suggested that all three concepts (i.e., encounters, norms, and crowding) should be measured when addressing social capacity issues.

Randall and Rollins investigated perceived crowding and encounter norms of kayakers visiting the Broken Group Islands in Pacific Rim National Park Reserve in Canada. Encounter norms were measured with photographs depicting increasing densities of tents at a campsite and kayaks and motorboats on the water. Analysis of norm curves showed that kayakers would not accept encountering more than approximately five kayaks, two motorboats, and five tents at one time. Perceptions of crowding differed between marine (39% felt crowded on the water) and terrestrial sites (80% felt crowded at campsites). The authors recommended that park personnel assess the appropriateness of both terrestrial and marine conditions when managing kayakers in this area, especially if user quotas or campsite expansion are considered.

Anderson and Manning surveyed paddlers (i.e., kayakers and canoeists) along a water trail on Lake Champlain in northeastern US to examine their experience levels and normative evaluations of encounters, shoreline development, and campsite impacts.

Paddler perceptions of use-related issues and normative evaluations of a range of motorboat and sailboat use, shoreline development, and impacts at campsites were determined and compared among groups with different levels of experiences (i.e., trip frequency and duration). Results showed that perceptions and normative evaluations did not differ based on either of these measures of experience level. Respondents did, however, differ in their perception of problems related to development and access, and in their normative evaluations of shoreline development and campsite impacts based on the length of their longest paddling trip. The authors suggested that trip duration may be a more useful measure of experience than trip frequency for understanding differences in paddler perceptions of social and resource conditions such as use levels and campsite impacts.

Vaske, Heesemann, Loomis, and Cottrell presented an innovative approach for measuring agreement or consensus among users regarding their acceptance of use levels and encounters in marine tourism and recreation environments. They combined the structural norm approach with the Potential for Conflict Index (PCI_2) to examine snorkeler and scuba diver normative acceptance and consensus (i.e., norm crystallization) regarding the number of people encountered at one time (PAOT) at sites in the Florida Keys. Each activity group evaluated their acceptance of seeing a range of scuba divers or snorkelers at one time (i.e., 0–25 or more). Results showed that both groups rated 0 in-group PAOT less positively than 5 PAOT, perhaps due to safety issues. In general, however, as the number of scuba divers or snorkelers increased, acceptance decreased. Scuba divers accepted a maximum of 10 other divers or snorkelers, whereas snorkelers accepted more snorkelers (17) than divers (10). PCI_2 values revealed the greatest consensus that 25 or more PAOT was unacceptable and 5 PAOT was most acceptable. The authors recommended that researchers should combine the normative approach with PCI_2 to facilitate understanding research findings and formulating standards of quality for management.

Schuhmann, Cazabon-Mannette, Gill, Casey, and Hailey estimated scuba diver willingness to pay (WTP) to avoid high numbers of encounters with other divers at sites in Barbados and Tobago. They surveyed scuba divers to examine their demographics, experience, satisfaction with conditions (e.g., crowding, coral cover, visibility, diversity of fish and marine life), dive

characteristics (e.g., number of divers encountered), and maximum WTP for the dive. Results showed that WTP was a function of dive location, diver income, encounters, and amount paid for the dive. On average, these scuba divers were willing to pay upward of US\$4.51 per additional diver to avoid high encounter levels. The authors suggested that these results can inform pricing strategies and spatial planning of dive sites, and can aid in policies that maximize economic returns from diving and reduce impacts on coral reefs and scuba diver experiences.

Pomeranz, Needham, and Kruger examined use-related indicators that various stakeholders prioritized for inclusion in a collaborative approach for mitigating impacts of watercraft-based tourism in the Tracy Arm-Fords Terror Wilderness area in Alaska. This approach is known as the Wilderness Best Management Practices (WBMP) and involves codes of conduct for managing use-related impacts in this area. Data were obtained from qualitative interviews with tour operators, agency personnel, cruise industry representatives, and local residents. Results showed that vessel use levels, noise, pollution, and impacts on wildlife (e.g., seals) were important social and environmental indicators. Economic and institutional indicators were considered to be less important and included opportunities for stakeholder communication. Motivations for compliance mainly involved self-interest reasons (e.g., company image, public relations), but some stakeholders were motivated by peer pressure, stewardship, and awareness. The authors recommended prioritizing indicators and standards as part of these codes of conduct for mitigating impacts of use in this area and then monitoring compliance with these standards.

Taken together, these articles improve the conceptual and theoretical understanding of crowding, use levels, and other social capacity issues in coastal and marine environments. These articles also inform the management of impacts related to tourism and recreation use in these settings. Both the authors and referees of articles in this special issue are thanked for their contributions. Crowding, use levels, and other social capacity issues in coastal and marine environments, however, are extremely complex, and research on these topics is still in its infancy. The studies presented in this special issue represent substantial advancements in the collective understanding of these complex topics, but much work still remains.

References

- Anderson, L., & Loomis, D. (2011). Scuba diver specialization and behavior norms at coral reefs. *Coastal Management*, 39, 478–491.
- Barker, N., & Roberts, C. (2004). Scuba diver behavior and the management of diving impacts on coral reefs. *Biological Conservation*, 120, 481–489.
- Bell, C., Needham, M., & Szuster, B. (2011). Congruence among encounters, norms, crowding, and management in a marine protected area. *Environmental Management*, 48, 499–513.
- Ceurvorst, R., & Needham, M. (2012). Value orientations and normative evaluations of individuals visiting coral reef areas in Hawaii. *Tourism in Marine Environments*, 8, 111–126.
- Dinsdale, E., & Harriott, V. (2004). Assessing anchor damage on coral reefs: A case study in selection of environmental indicators. *Environmental Management*, 33, 126–139.
- Duffus, D., & Dearden, P. (1993). Recreational use, valuation, and management of killer whales on Canada's Pacific coast. *Environmental Conservation*, 20, 149–156.
- Finkler, W., & Higham, J. (2004). The human dimensions of whale watching: An analysis based on viewing platforms. *Human Dimensions of Wildlife*, 9, 103–117.
- Freimund, W., Vaske, J., Donnelly, M., & Miller, T. (2002). Using video surveys to access dispersed backcountry visitors' norms. *Leisure Sciences*, 24, 349–362.
- Friedlander, A., Aeby, G., Brainard, R., Brown, E., Chaston, K., Clark, A., et al. (2005). The state of coral reef ecosystems of the main Hawaiian Islands. In J. Waddell (Ed.), *The state of coral reef ecosystems in the United States and Pacific Freely Associated States* (pp. 222–269). Silver Spring, MD: NOAA/NCCOS Center for Coastal Monitoring and Assessment.
- Hawkins, J., & Roberts, C. (1993). Effects of recreational scuba diving on coral reefs: Trampling on reef-flat communities. *Journal of Applied Ecology*, 30, 25–30.
- Inglis, G., Johnson, V., & Ponte, F. (1999). Crowding norms in marine settings: A case study of snorkeling on the Great Barrier Reef. *Environmental Management*, 24, 369–381.
- Kay, A., & Liddle, M. (1989). Impacts of human trampling in different zones of a coral reef flat. *Environmental Management*, 13, 509–520.
- Lankford, S., Inui, Y., & Whittle, A. (2008). Exploring social carrying capacity based on perceived levels of crowding: A case study of Hanauma Bay, Hawaii. *Tourism in Marine Environments*, 5, 43–53.
- Lück, M. (2008). *The encyclopedia of tourism and recreation in marine environments*. Wallingford, UK: CABI.
- Manning, R. (2007). *Parks and carrying capacity: Commons without tragedy*. Washington, DC: Island Press.
- Manning, R. (2011). *Studies in outdoor recreation: Search and research for satisfaction*. Corvallis, OR: Oregon State University Press.
- Manning, R., Johnson, V., & VandeKamp, M. (1996). Norm congruence among tour boat passengers to Glacier Bay National Park. *Leisure Sciences*, 18, 125–141.
- Meyer, C., & Holland, K. (2008). Spatial dynamics and substrate impacts of recreational snorkelers and scuba divers in Hawaiian marine protected areas. *Journal of Coastal Conservation*, 12, 209–216.
- Needham, M., & Rollins, R. (2009). Social science, conservation, and protected areas theory. In P. Dearden & R. Rollins (Eds.), *Parks and protected areas in Canada: Planning and management* (pp. 135–168). Don Mills, ON: Oxford University Press.
- Needham, M., Szuster, B., & Bell, C. (2011). Encounter norms, social carrying capacity indicators, and standards of quality at a marine protected area. *Ocean and Coastal Management*, 54, 633–641.
- O'Connor, S., Campbell, R., Cortez, H., & Knowles, T. (2009). *Whale watching worldwide: Tourism numbers, expenditures and expanding economic benefits*. Yarmouth, MA: International Fund for Animal Welfare.
- Orams, M. (1999). *Marine tourism: Development, impacts, and management*. London, UK: Routledge.
- Orams, M. (2002). Feeding wildlife as a tourism attraction: A review of issues and impacts. *Tourism Management*, 23, 281–293.
- Rodgers, K., & Cox, E. (2003). The effects of trampling on Hawaiian corals along a gradient of human use. *Biological Conservation*, 112, 383–389.
- Shafer, C., & Inglis, G. (2000). Influence of social, biophysical, and managerial conditions on tourism experiences within the Great Barrier Reef World Heritage Area. *Environmental Management*, 26, 73–87.
- Szuster, B., Needham, M., & McClure, B. (2011). Scuba diver perceptions and evaluations of crowding underwater. *Tourism in Marine Environments*, 7, 153–165.
- Taylor, J., Dyer, G., & Stewart, M. (2003). The economics of ecotourism: A Galapagos Islands economy wide perspective. *Economic Development and Cultural Change*, 51, 977–997.
- Weaver, D. (2008). *Ecotourism*. Sydney, Australia: Wiley.
- Williams, R., Trites, A., & Bain, D. (2006). Behavioral responses of killer whales to whale watching boats: Opportunistic observations and experimental approaches. *Journal of Zoology*, 256, 255–270.
- Zakai, D., & Chadwick-Furman, N. (2002). Impacts of intensive recreational diving on reef corals at Eilat, northern Red Sea. *Biological Conservation*, 105, 179–187.
- Zegre, S., Needham, M., Kruger, L., & Rosenberger, R. (2012). McDonaldization and commercial outdoor recreation and tourism in Alaska. *Managing Leisure*, 17, 333–348.