175 Assessment of visitation patterns in Gray's Reef National Marine Sanctuary: An offshore aquatic protected area

Marieke J. Lemmen[1], **Robert C. Burns[1]**, **Ross G. Andrew[1]**, **Danielle Schwarzmann[2]**, [1]West Virginia University, USA. [2]NOAA Office of National Marine Sanctuaries, USA

The United States includes over 600,000 square miles of underwater parks designated as National Marine Sanctuaries (NMS). These areas often serve as a popular destination for natural resource exploration, recreation, tourism, and they offer many other ecosystem services. Understanding visitor use is fundamental for engaging and improving management in protected areas. As part of a larger scale project, named NMS-COUNT, which is developing a methodology to estimate the number of visitors in National Marine Sanctuaries, two questionnaires were distributed to potential visitors of Gray's Reef National Marine Sanctuary (GRNMS) and surrounding coastal Georgia. The first survey instrument was focused on visitation and trip characteristics and the second one was focused on economics. Both questionnaires included questions about the participants' demographics, trip characteristics, recreation activities and the location of GRNMS as well as departure points, the most visited location of coastal Georgia and departure points for ocean recreation trips. Participants were asked to indicate the locations on separate heat maps. The sample size of this study was 1,650 effective survey contacts, with a response rate of 50.7 %.

The results show that a large majority (80% and more) of the participants were US- residents, male, and white. The average age of the visitors was 55 years old. A large majority (86%) of respondents indicated relatively high education levels, with at least "some college" education or more. Approximately half (49%) of respondents indicated their annual household incomes over $100,001. In a typical year, respondents reported spending an average of 37 days doing ocean recreation in and around coastal Georgia, an average of 8 days traveling offshore for any activity more than 3 miles, and they visited Gray's Reef National Marine Sanctuary 3 days on average. During a trip for ocean recreation in the focal area the main activities indicated were Private Fishing and General Boating and participants were going in groups of in average 4 persons overall. Participating in their indicated main activity, the visitors spend on average $156.51 on fishing and $84.67 on general boating for a single trip, which also represents the highest costs per activity. Respondents indicated highest levels of spending on lodging ($373.83), food at restaurants ($188.98), and charter/party boat fishing fees ($176.30) for a typical visit to the coastal Georgia area. Additionally, the respondents indicated the average amount of $129 as the total cost for a typical trip to GRNMS across all activity types. Respondents indicated their most frequently used departure points to travel into the ocean for recreation, which were coastal areas surrounding Brunswick, GA, Shellman Bluff, GA, and Savannah, GA. However, the results showed that the majority of respondents (57%) were not familiar with the location of GRNMS. Visitor profiles were further examined across these groups of GRNMS awareness levels, to explore visitor dynamics of those aware of the Sanctuary and those unaware of the Sanctuary. Weather and ocean conditions were indicated as the most important factors influencing the visitors motivation and decision to make a trip to GRNMS or any ocean recreation.

The collected data can help to inform and create science based policies and decisions that better serve the visitors desires and needs. To improve the management of the ecosystem and their carrying capacity including sustainability it is important to understand visitation and its social, ecological and economic impacts. Management helps conserving the (vulnerable) reef by adapting policies to new insights regarding the area and their visitors. Consistent monitoring in areas in the ocean is very challenging due to lacking entry gates, visible area boundaries, roads, or other infrastructural facilities to potentially count traffic or intercept visitors for surveying. Therefore, adaptive data collection that identifies visitor patterns without intensive field sampling in diffuse locations is

beneficial. In addition to the survey data collected, it is also helpful for visitor number estimation to include comparisons and analyses of covariate information, such as AIS data, indirect counts obtained through social media post analyses, remote sensing, and buoy data.

Predicting and analyzing human behavior is very complex. Nevertheless, addressing people's perceptions of use in such remote aquatic areas can lead to insights about the status of an ecosystem, besides the usual ecological monitoring. Due to the COVID-19 pandemic on site surveys were not possible as initially planned. For more valuable data it could be useful to conduct on site traffic data, onsite observations and on site interviews. Additionally, the methods used here may be applicable to other aquatic visitation monitoring, assuming the capacity for data sources exists. Results derived from remote surveys are subject to bias associated with recall of activities, locations, and timing of use. However, in settings that are offshore, interception of visitors at the time of use maybe have low likelihood of success. Therefore, the survey methods and results obtained here provide an effective way to collect data in such visitation settings that may otherwise be challenging across space and time.