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Public perceptions of marine threats and protection from around the world

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ABSTRACT

The ocean is increasingly facing direct and indirect threats from multiple human activities that alter marine ecosystems worldwide. Mitigating these threats requires a global shift in the way people perceive and interact with the marine environment. Marine public perceptions research has emerged as a useful tool to understand public awareness and attitudes towards the sea. This study compares available surveys of public perceptions of marine threats and protection involving > 32,000 respondents across 21 countries. Results indicate that 70% of respondents believe the marine environment is under threat from human activities, and 45% believe the threat is high or very high. Yet when asked about the ocean's health, only 15% thought it was poor or threatened. Respondents consistently ranked pollution issues as the highest threat, followed by fishing, habitat alteration and climate change. With respect to ocean protection, 73% of respondents support marine protected areas in their region. Most respondents overestimated the area of ocean currently protected, and would like to see much larger areas protected in the future. Overall, a clear picture emerged of the perceived threats and support for protection which can inform marine managers, policy makers, conservation practitioners and educators to improve marine management and conservation programs.

1. Introduction

Human activities have strongly altered, and continue to change the state of natural ecosystems around the world (Lotze et al., 2006; Halpern et al., 2008, 2015; McCauley et al., 2015). In the marine realm, consequences of human activities can be observed as global fish stock declines, extinct or threatened species, habitat loss, pollution, invasive species, ocean warming and acidification, among others (MEA, 2005; Dulvy et al., 2009; Worm et al., 2009; McCauley et al., 2015). Mitigating these threats requires a global shift in the way humans interact with the marine environment, which can be addressed through individual or collective action as well as national and international government policies, management plans and conservation programs (Mora et al., 2009; McKinley and Fletcher, 2010). These efforts, however, require public awareness of the underlying issues and support for mitigating actions (Pomeroy and Ouvre, 2008; Lotze et al., 2011; Jefferson et al., 2014; Gelcich & O'Keefe, 2016).

To understand public awareness and attitudes towards marine environmental issues, survey studies are most often used (Fletcher et al., 2009; Potts et al., 2011; Gelcich et al., 2014; Eddy, 2014; Hawkins

et al., 2016). Over the past decade, research on public perceptions of the marine environment has grown significantly and emerged as a useful tool for local and regional policy makers, managers, conservationists, scientists, and educators (Jefferson et al., 2014, 2015; Daigle et al., 2016; Gelcich et al., 2016). Public perception of and support for conservation has recently been identified as one of three emerging frontiers in perceptions research (Gelcich and O'Keefe, 2016); particularly, understanding how the public connects with aquatic threats and engages with aquatic conservation. Given that people's perceptions determine their behavior, perceptions research is essential to inform science, policy and management towards sustainability and conservation (Gelcich and O'Keefe, 2016; Lacroix et al., 2016; Potts et al., 2016).

Many marine perception studies have been limited to specific species groups, such as marine mammals or sharks (Scott and Parsons, 2005; Whatmough et al., 2011), specific threats, such as fisheries, pollution or ocean acidification (Kellert et al., 1995; Tudor and Williams, 2003; Frisch et al., 2015), or specific target audiences, such as fishers, managers or divers (McClanahan et al., 2012; Whatmough et al., 2011). However, an increasing number of studies has asked the

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public at large about their perception of the overall threat or health of the marine environment, the importance of different threats, or the level of and support for protection (Hynes et al., 2014). Most of these studies are restricted to a specific country or region, yet there are now enough data to compare existing surveys to better understand the common trends and differences in public perception of marine threats and protection around the world.

Marine protected areas (MPAs) or reserves are important tools for mitigation of harmful human activities and advancement of conservation (Roberts et al., 2005; Worm et al., 2009; Lotze et al., 2011; Edgar et al., 2014). However, as of 2016 only 4.1% of the global ocean was under some form of protection, with only 1.6% strictly or fully protected, despite scientific recommendations that 20–50% should be protected within this century (Lubchenco and Grorud-Colvert, 2015; UNEP-WCMC & IUCN, 2016). In contrast, about 15% of global land area is protected, with a goal of 17% by 2020 (CBD, 2014). Importantly, protected areas have been recognized as providing benefits for resource users, managers, tourism and the general public alike, and public awareness of MPAs can greatly enhance participatory management (Worm et al., 2006, 2009; McCook et al., 2010; Edgar et al., 2014). The establishment of MPAs, however, can be socially and politically controversial. Thus, understanding public support for MPAs is important as nations work toward achieving the 10% of marine protection recommended by the AICHI target 11 or, more ambitiously, the 30% recommended by the 2014 World Park Congress.

The goal of this paper was to quantitatively compare and synthesize available surveys of public perceptions of marine threats and protection across different regions worldwide. First, we engaged in two case studies in one industrialized (Canada) and one developing (Kenya) country. Next, we compiled comparable surveys from around the world to assess public perceptions of whether the marine environment is under threat, the level of threat to or health of the ocean, and the major types of threats. We also compared the public's support for marine protected areas across surveys, and their estimate of ocean area currently protected and desired to be protected. Our analysis aimed at identifying common patterns in public perceptions of marine threats and protection around the world that can help support global policy initiatives, management and conservation efforts, but also regional differences since solutions to marine environmental issues require understanding of the regional situation and corresponding management actions.

2. Methods

2.1. Case studies

In Nova Scotia, Canada, we performed a public perceptions survey of marine environmental issues with adults and youths, separately. The survey included 22 questions: 10 dealt with demographic information and 12 with marine environmental issues (Guest, 2013), including 5 questions about marine threats and protection (Q1, 2a, 3, 5a and 5b, Table 1) using a ranking scale or selection of answers from a list (see Appendix for details on each question and answer options). For adults,

Table 1

Survey questions that were compared across studies. Not all studies asked all questions (see Appendix for further detail on questions and answer options in each study).

Question asked
Q1. Is the ocean under threat from human activities?
Q2a. What is the level of threat facing the oceans? or:
Q2b. What is the level of health of the marine environment?
Q3. What are the top threats to the marine environment?
Q4. Do you support marine protected areas?
Q5a. How much of the ocean do you think is currently protected? and:
Q5b. How much do you think should be protected?

surveys were distributed by mail (n = 159), online (n = 67), and at education centers (n = 13). The mail-out survey was sent to 1560 households in coastal Nova Scotia in December 2012, and all respondents were adults (age > 18 years, 46% females, 51% males). The online survey was circulated using social media, Dalhousie University e-mail lists, and marine- and environment-related websites from July 2013 to June 2014. We also set up survey stations at three education centers in Halifax in August 2013: Discovery Center, Nova Scotia Natural History Museum, and Maritime Museum of the Atlantic. Each station contained hardcopies of surveys, pencils, a locked survey drop-box, and explanation. All results were pooled into one adult sample (n = 243).

For Nova Scotia youths (aged 11–18), the same survey was used with slight modifications of language to ensure comprehension. Surveys were distributed in-person at summer camps (n = 80) and public schools (n = 723), online (n = 18), and at education centers (n = 10). Summer camps in Halifax were visited in-person in 2013, with most youths surveyed being 12–15 years old. In November–December 2013, 11 public schools were surveyed in 5 of the province's 7 school boards, with 723 students in grades 7–12 (ages 11–18, 48% females, 44% males) participating in the survey and associated knowledge quiz. Results of the knowledge quiz have been published (Guest et al., 2015), while the survey results on marine threats and protection are presented here. The online and education center surveys were open to all ages, so all respondents age 18 or younger were included in the youth sample. All results were pooled into one youth sample (n = 826).

In Kenya, a similar survey was conducted with the general public at the Mombasa Marine Park and Reserve in June 2014. In-person surveys (n = 100, 50% females, 50% males) were performed on the beach by trained MPA staff. Generally, paper surveys were used, and read orally to participants with low literacy when necessary. Most people visiting the beach were 15–45 years of age and considered adults. The overall survey consisted of 33 questions focused on knowledge of marine and MPA systems, associated values, and perceptions of ocean health, threats, MPA benefits, coverage, and regulatory effectiveness. Results from 4 questions (Q2b, 3, 5a and 5b, Table 1) pertaining to the ocean's health, threats and protection are presented here (see Appendix for details on each question and answer options).

2.2. Literature survey

To compare the two cases studies to other public perception surveys of marine threats and protection worldwide, we performed a literature search using the 'Web of Science' online reference system. The following search terms were selected to reflect common survey methods and the main terms used in the case study questions (Table 1) for comparability: public AND (survey* OR perception* OR opinion* OR awareness) AND (marine OR ocean) AND (i) (threat* OR human impact*), (ii) (protection OR protected area*), (iii) (management OR conservation), (iv) (environment* OR health). Overall, this search gained 573 results, of which 90 were relevant and 31 useful to our overall study topic and could be aligned with the questions asked (Table 1). However, only a subset of studies reported quantitative answers to one or more of the specific questions we were interested in (Table 1, Table A1). Thus, together with the two case studies including three surveys described above, we had 21 independent studies with 25 surveys across North and Central America, Europe, Africa, Asia, New Zealand and Australia (Table 2). Methods used in the different studies included telephone (n = 9), online (n = 6), mail-out (n = 4) and in-person surveys (n = 10) of mostly adults, but also some younger age groups, and ranging between 100 and 10,106 respondents. Together, the surveys involved a total of 32,830 respondents from 21 countries, spanning survey years from 1996 to 2016 (Table 2). In the following, each survey will be referred to with its survey ID consisting of their region, survey year and survey groups (e.g. youths, adults) if applicable (Table 2).

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