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Exploring Public Knowledge, Attitudes, and Perceptions of the Marianas Trench Marine National Monument

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ABSTRACT

With the increase in development of large marine protected areas (LMPAs) worldwide, there have been calls from social scientists to gather better empirical information about the human dimensions of LMPAs. Of the social research done on LMPAs to date, most has focused on the perceptions of stakeholders closely connected to their implementation, and little research has explored the general public's response. This paper presents the results of a phone survey conducted in the US territories of Guam and the Commonwealth of the Northern Mariana Islands to assess residents' knowledge, attitudes, and perceptions of the Marianas Trench Marine National Monument—a LMPA designated offshore in 2009. The survey was administered in 2012 to 500 randomly-selected residents from each territory. Findings suggest: (1) public awareness of the Monument prior to the survey was low; (2) residents generally supported designation of the Monument; (3) most residents did not believe that the Monument would affect them or their community; and (4) knowledge and perceptions of the Monument varied between fishing and non-fishing households. This research illustrates that awareness and views differ between stakeholders and those of the general public, which should be used to inform social research on LMPAs and outreach for LMPA managers.

KEYWORDS

fisheries; human dimensions; large marine protected area; Marianas Trench Marine National Monument; perceptions

Introduction

Large marine protected areas (LMPAs) have emerged as a prominent trend in marine conservation. Scholars have defined LMPAs as marine protected areas (MPAs) that are greater than 100,000 km² (Leenhardt et al. 2013). Between 2006 and 2014, 16 LMPAs were established worldwide and several additional sites were under development. There was continued development of LMPAs from 2014–2016, as US President Barack Obama expanded the existing MPAs in the Western Pacific to create the world's first and second largest MPAs (Marketos 2016; Eilperin 2014). Research shows that LMPAs have played an important role in meeting global targets for ocean protection; as of 2015, the largest 20 MPAs in the world accounted for 60% of global MPA coverage (Gruby et al. 2015;

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Spalding et al. 2013). However, only 3.4% of the world's oceans are designated as protected, and Edgar et al. (2014) caution that marine biodiversity protection cannot be achieved by targeting area alone without careful consideration for design and management (Juffe-Bignoli et al. 2014).

With the increase in development of LMPAs worldwide, there have been calls from social scientists to gather better empirical information about the human dimensions of LMPAs (Gruby et al. 2015; Christie and Lewis 2016). LMPAs tend to be developed in remote areas of the ocean where there is less human use; therefore, proponents and developers of LMPAs did not initially think that social considerations were as important when compared with conventional nearshore MPAs. However, scholars argue that while human dimensions may take different forms in LMPAs, they remain important to ensure social justice, equity, and acceptability in the design and management of LMPAs (Gruby et al. 2015; Christie and Lewis 2016; DeSanto 2013; Leenhardt et al. 2013; Richmond and Kotowicz 2015).

Of the limited human dimensions research conducted on LMPAs, most has involved the collection of data using qualitative interviews with stakeholders connected to LMPAs or the review of policy documents related to the creation of LMPAs (Gruby et al. 2015; Richmond and Kotowicz 2015; DeSanto, Jones, and Miller 2011; DeSanto 2013). In these cases, researchers have examined the attitudes and perceptions of those closely connected to the formation and management of LMPAs including fishermen, business owners, and community members who could be affected by the LMPAs; policy-makers involved in the planning and decision-making surrounding LMPAs; and environmental NGOs, citizen groups, and other activists who provide input into LMPA processes. There has been little research that has examined how members of the general public perceive LMPAs implemented in nearby waters. For example, DeSanto, Jones, and Miller (2011) point to some sources of public input regarding the creation of the Chagos LMPA. An assessment of public perceptions can answer important questions: To what extent are members of the public aware of the development of offshore LMPAs in their waters? Is the public in support of local LMPAs? To what extent do members of the public feel they could be affected by LMPAs? Understanding the public's attitudes toward and perceptions of LMPAs can provide key insights into the social processes surrounding LMPAs including ideas about how to best approach public outreach and public participation in LMPA processes (Voyer, Gladstone, and Goodall 2012). In this paper, we present the results of a survey about the general public's knowledge, attitudes, and perceptions of the Marianas Trench Marine National Monument (Monument), a LMPA formed off the coast of the US Territories of the Commonwealth of the Northern Mariana Islands (CNMI) and Guam in 2009 (Presidential Documents 2009). In 2012, we surveyed 500 randomly selected residents from each of the territories of CNMI and Guam. The goals of the survey were to assess:

- a. Public knowledge and awareness of the Monument
- b. Public perceptions of the potential benefits and impacts of the Monument
- c. Public perceptions of Monument management
- d. Group differences in knowledge and perceptions between fishing and non-fishing households

The results of the survey provide information about public perceptions that can be integrated into the Monument's management. These findings can also contribute to conversations about the social process surrounding LMPAs.

Literature review: Perceptions and MPAs

Scholars and managers are increasingly recognizing the importance of perceptions data in environmental management and conservation decision-making (for a review see: Bennett 2016). Bennett (2016, 1) states that, “Studies of the perceptions of local people can provide important insights into observations, understandings and interpretations of the social impacts, and ecological outcomes of conservation; the legitimacy of conservation governance; and the social acceptability of environmental management.” Gathering quantitative and qualitative perceptions data can play an important role in monitoring and evaluation of conservation projects such as managing protected areas. In particular, there has been considerable research related to local perceptions of conventional near-shore MPAs (e.g., Christie 2005; Leleu et al. 2012; Pita et al. 2011; Bennett and Dreaden 2014a; McClanahan, Davies, and Maina 2005). These scholars have shown that perceptions data can help inform outreach strategies, the design of governance structures, and the development of regulations in near-shore MPAs in order to best position them for success. This study examines four key components of MPA perceptions, each of which derive from a substantial body of literature related to MPAs: knowledge and awareness; benefits and impacts; management and governance; and variation in perceptions among different groups.

Knowledge and awareness

Assessing public awareness of MPAs can help managers identify knowledge gaps to build outreach strategies to connect nearby residents to offshore ocean areas. Studies to assess ocean literacy on a national scale in the United States have shown that public knowledge and awareness of MPAs and their potential benefits is very low (Belden, R. & S., and American Viewpoint 1999; Steel et al. 2005). A study of coastal residents in Oregon found high levels of awareness of recently implemented MPAs with 85% of surveyed residents indicating some level of knowledge (Perry et al. 2014). However, the study also found that knowledge about the MPAs was superficial as 65% of respondents answered fewer than half of basic factual questions about the MPAs correctly. Previous studies of MPAs have identified public awareness and knowledge as important factors in MPA success (Pomeroy et al. 2005; Pollnac, Crawford, and Gorospe 2001). Scholars indicate that LMPAs may be sociologically unique because they are typically established in remote ocean areas that have low levels of human use (Gruby et al. 2015). Due to their remoteness, one might expect lower public awareness of LMPAs—particularly compared to nearshore MPAs. However, since LMPAs have been covered in popular media, it is possible that public awareness might be higher when compared to awareness of nearshore MPAs. Higher levels of awareness could provide an opportunity to increase ocean literacy among the general public.

Benefits and impacts

Several scholars have suggested that public perceptions of the potential benefits and impacts of MPAs are an important indicator of social acceptability of those MPAs (Leleu et al. 2012; Blyth et al. 2002; McClanahan, Davies, and Maina 2005). If people perceive that MPAs will provide ecological, social, or economic benefits to their region, they may be more likely to support and comply with MPA regulations. Several studies have explored local perceptions

of the potential environmental outcomes linked to MPAs. In a study of MPAs in Southeast Asia, Christie (2005) examined local perceptions of the ecological outcomes of nearby MPAs and found they can sometimes deviate from scientific findings about MPAs' ecological effectiveness. He suggested that managers could use these findings to uncover areas where better outreach and communication was needed between managers, scientists, and local populations. In their examination of local fishermen's perceptions of a northwestern Mediterranean MPA, Leleu et al. (2012) found that the majority of fishermen believed that MPAs could benefit ecosystems and fisheries. Pita, Theodossiou, and Pierce (2013) found that fishermen's perceptions of the ecological benefit of a MPA in Scotland varied depending on the type of gear and vessel they used.

Studies have also examined fishermen's perceptions of the potential economic and social benefits (and impacts) of MPAs. For example, Leleu et al.'s (2012) study found that while fishermen believed the MPA could benefit ecosystems, the majority did not believe that it would benefit their activity or economic bottom line. In a study of households adjacent to nearshore MPAs in Thailand, Bennett and Dearden (2014a) found that study participants perceived limited to negative impacts of MPAs on local fishing and agriculture. The authors indicated that perceptions of negative economic impacts could undermine the MPAs as community members may not remain supportive of restrictions that they believe are negatively affecting their households.

Because LMPAs tend to be offshore and in more remote locations, some proponents believe that their impacts to fishermen and communities will be reduced (Nelson and Bradner 2010). However, there have been few studies to examine public perceptions of the impacts of LMPAs. In addition, in the campaigns to designate LMPAs, proponents have often touted the potential benefits that they can bring. For example, during discussions about developing the Marianas Trench Marine National Monument, proponents highlighted many potential benefits including increased tourism, increased economic development, benefits to the marine environment, and the establishment of at least one visitors center in the Marianas (Iverson 2008; Nelson 2007; Nelson 2008; Friends of the Monument 2010). In this case, it is important to assess whether the public believes that some of the potential benefits of LMPAs discussed during development are achievable, and if these benefits may affect them directly.

Governance

Several studies highlight the importance of understanding local perceptions of the governance processes associated with MPAs (Gelcich, Edwards-Jones, and Kaiser 2005; McClanahan, Davies, and Maina 2005; Bennett and Dreadon 2014a). In their review of the concept, Lemos and Agrawal (2006, 298) define environmental governance as "the set of regulatory processes, mechanisms and organizations through which political actors influence environmental actions and outcomes." Much of the research on MPA governance has examined local attitudes towards the process of MPA formation and the level of local inclusion in that process (Pita, Pierce, and Theodossiou 2010; McClanahan, Davies, and Maina 2005; Suman, Shivlani, and Milon 1999; Chuenpagdee et al. 2013). Research shows that perceptions of strong public inclusion in MPA planning processes can be crucial for the long-term success and legitimacy of MPAs (Pollnac, Crawford, and Gorospe 2001; Pomeroy et al. 2005; Bennett and Dreadon 2014b). Scholars write that LMPAs tend to be established through more top-down processes (for example, see Leenhardt et al. 2013)—such as the Executive Order

that created the Marianas Trench Marine National Monument. There has been little empirical research thus far to assess public awareness and perceptions of the process through which a specific LMPA has been formed. This survey provides an example of an opportunity to assess public attitudes toward the LMPA and views about types of activities that should be restricted or permitted therein.

Factors affecting perceptions

Research on local perceptions of nearshore MPAs shows that several factors can influence respondents' awareness of and perceptions of the benefits from MPAs. These factors include: education level or socioprofessional status (McClanahan, Davies, and Maina 2005; Pita, Theodossiou, and Pierce 2013; Thomassin et al. 2010), stakeholder category (Suman, Shivlani, and Milon 1999; McClanahan, Davies, and Maina 2005), and gear type and years of experience in fishing (Pita et al. 2011; Blyth et al. 2002). In their study, Perry et al. (2014) examined the role of geographic location on knowledge and awareness of MPAs in Oregon. They compared responses from those that resided in "communities of proximity"—geographic areas close to and connected to the ocean—with the responses of those who did not live near the coast. In their analysis, they found very little difference between respondents from these two locations. The Oregon study did not compare awareness of MPAs based on connection to the marine environment through use, which could be another important fact in perceptions. In this study, we compare knowledge and perceptions between households with members who fish, and are therefore more likely to be connected to the marine environment, with those of non-fishing households.

Overall

This paper builds off the large body of literature related to social perceptions and MPAs by bringing in findings from a LMPA context. As a result, we can provide insights into how the dynamics surrounding social perceptions may be similar or different in LMPAs versus nearshore MPAs. This research is able to contribute to the emerging field of study on human dimensions of LMPAs by bringing in findings from a large-scale quantitative survey of public perceptions. Much of the human dimensions research on LMPAs to date is qualitative research with connected stakeholders; this work can fill a gap by examining how the public is engaging with and reacting to LMPA processes.

Methods

Study area and context

In January 2009, President George W. Bush established the Marianas Trench Marine National Monument (Monument) by Presidential Proclamation 8335. The Monument encompasses approximately 95,216 square miles of area divided into three units within the 200 nm Exclusive Economic Zone around Guam and the CNMI; the islands of these two U.S.-affiliated entities comprise the Mariana Archipelago (Figure 1). The Monument's *Trench Unit*, almost 1,100 miles long and 44 miles wide, extends along the length of the archipelago and includes only the submerged lands. The *Volcanic Unit* consists only of the

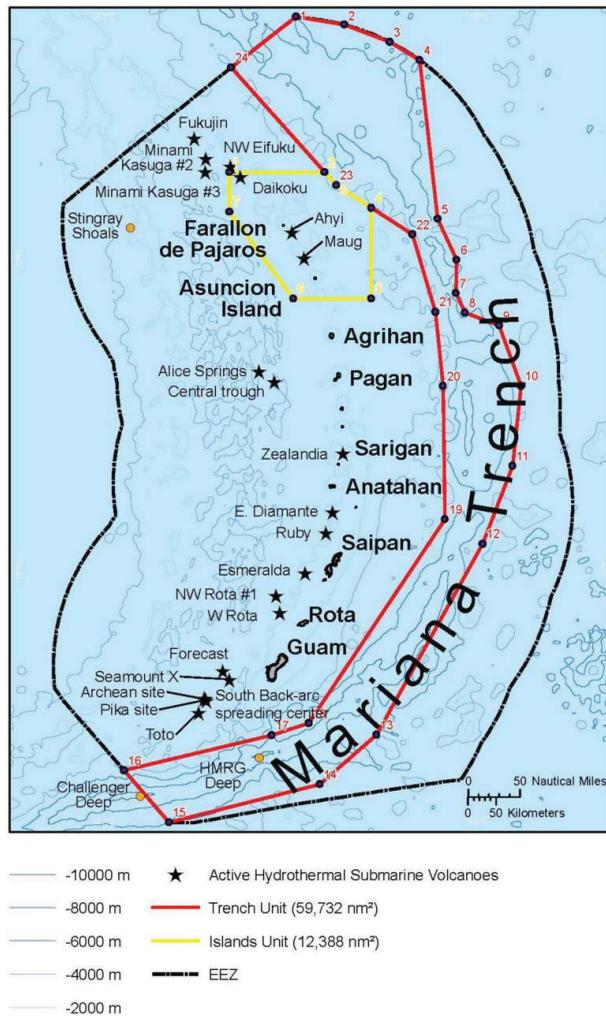


Figure 1. Features and boundaries of the Marianas Trench Marine National Monument (Revised from NOAA 2009).

submerged lands within 1 nm of 21 active undersea mud volcanoes and thermal vents scattered along the Mariana Arc. The *Islands Unit* includes both the waters and submerged lands below the mean water line within the unit boundaries around the three northernmost Mariana Islands: Farallon de Pajaros (also known as Uracas); Maug; and Asuncion.

The Islands Unit is the only portion of the LMPA that contains fishing restrictions, with the remainder of the LMPA covering only the submerged lands. Within the Islands Unit of the Monument commercial fishing is prohibited but sustenance, recreational, and traditional indigenous fishing can be allowed on a sustainable basis (Proclamation 8335, 2009). The Islands Unit encompasses waters that are approximately 300 miles north of Saipan, the northernmost island in the chain that is currently inhabited. A recent assessment of human use in the Islands Unit of the Monument revealed that trips to the waters of the LMPA are rare but culturally important events, with an average of four trips per year by residents,

during which fishing for food is almost always a part of the trip even if not the main purpose (Richmond and Kotowicz 2015).

The Secretary of the Department of the Interior (through the U.S. Fish and Wildlife Service), in consultation with the Secretary of the Department of Commerce (through the National Oceanic and Atmospheric Administration), is responsible for the management of the Monument in cooperation with the Department of Defense, U.S. Coast Guard, and the Government of CNMI (Proclamation 8335, 2009).

Figure 1 (map of monument)

The designation of the Monument was a rapid process, taking just 14 months to go from a proposal to an implemented LMPA. The Monument became a key issue of contention and debate in the CNMI community over that period. Opinions of some residents about the Monument prior to and following its designation were evident in local papers, formal letters, websites, and other forms of media.

Monument managers were tasked with developing a Monument Management Plan directly after designation and designed a broad consultation process with CNMI and Guam residents. As part of this consultation process, Monument managers solicited comments from residents during public scoping meetings. However, these comments were made by a few individuals with strong opinions. Monument managers sought other ways to understand the public's knowledge and preferences for its management. This survey was developed in close collaboration with them, including evaluating support for various potential activities to be managed therein, and assessing perceptions of potential benefits that were enumerated by proponents of the Monument's designation as they lobbied for its declaration in local newspapers and public forums, primarily in CNMI. Monument managers anticipated using the data from this survey to directly inform aspects of the management plan.

Data collection and analysis

A telephone survey was determined to be the most appropriate method to collect data about knowledge, attitudes, and perceptions from a randomized sample of residents in CNMI and Guam. The survey was administered by an established polling firm in January and February 2012, using random digit dialing (RDD). The sample was designed for a total of 1,000 respondents, with 200 of the interviews initiated as cell phone calls and an even distribution between respondents in CNMI (500) and Guam (500). Due to the large number of unknown and non-residential numbers contacted using RDD, the overall response rate was 38%; however, after accounting for unknown contact outcomes and other non-residential numbers for the survey, the rate of response was 50%. Residents that began but did not complete the survey were counted as a rejection. Based on the resident populations of CNMI (total population of 53,274) and Guam (total population of 161,833), a randomized sample of 500 residents from each location provides estimates with a sampling error within $\pm 4.2\%$ of population values at the 95% confidence level.

Interviews lasted an average of 25 min. Initial contact for interviews was conducted in English; however, the interviews could be conducted in English, Tagalog, or Chamorro, the three most commonly spoken languages in CNMI and Guam.¹

Data were collected from the respondents assessing public knowledge, attitudes, and perceptions about the Monument. The survey questions used for this analysis were either multiple choice or 5-point Likert scale-style questions. Questions examining awareness of the

Monument, use of permits, and perception of whether the Monument will improve protection of marine resources in the region were multiple choice format questions with an option to respond that they “don’t know” or to refuse to answer the question.

To assess perceptions surrounding designation of the Monument and for activities to be permitted within its boundaries, respondents were asked their level of support or opposition on a 5-point scale from “strongly support” to “strongly oppose”. For those respondents who reported they had heard of the Monument prior to the phone survey ($n = 460$), they were asked their overall perception at two time periods—first, when they first heard about designation and second, at the end of the phone survey. For respondents who reported they had not heard of the Monument prior to the phone survey ($n = 540$), they were asked their overall perception only at the conclusion of the survey. Questions examining perceptions of the effects of the Monument on respondents also used categorical 5-point scales related to the level of perceived effect (from “definitely” to “definitely not”; and “strong negative” to “some negative and some positive”). A more detailed description of the survey instrument and methodology can be found in Kotowicz and Allen (2015), whereas project metadata can be referenced with PIFSC (2017).

Where there were notable differences in responses across island areas, they are reported individually, but most responses were similar and are therefore reported together. Group differences were examined between households where respondents reported there was at least one fisherman (fishing households) and those that reported no fishermen in the household (non-fishing households). Although the survey was directed at the general populations of CNMI and Guam, the Monument was designated in fishing grounds and regulations on fishing are especially important to fishing households (Richmond and Kotowicz 2015; Kotowicz and Richmond 2013). Chi-square (χ^2) tests were conducted to assess differences between these two groups. Where actual cell frequencies were less than expected cell frequencies for the χ^2 , a Fisher’s Exact Test was used instead. To determine effect size for these tests, Cramer’s V is reported.

Results

Demographic overview

Demographic information such as age, educational background, employment, and household income was collected from respondents and is further described in Kotowicz and Allen (2015). In total, there were 1,000 survey respondents with 48% representing Guam and 52% representing CNMI. Just over half of the respondents were male (56%) and 44% were female. Thirty-six percent of respondents represented fishing households and approximately 10% reported that they themselves were fishermen.

Median household size for all survey respondents was 4; for fishing households the median size was 5 residents. Thirty-two percent of survey respondents that provided a response for household income reported their income was less than US\$20,000, which is lower than the US Census poverty threshold for households with 4 people (US\$22,314), and for 5 people (US\$26,439)².

Of the survey respondents, just 7% from CNMI and 8% from Guam indicated that they had visited the three northernmost islands (the Islands Unit of the Monument).

Table 1 provides values for comparisons between fishing and non-fishing households with responses. Statistically significant differences between these groups were found in responses

Table 1. Comparing responses from fishing and non-fishing households on select questions.

	χ^2	<i>p</i>	Effect Size
When did you first hear of the Monument?	21.70	0.001	0.147
How much do you know about the Monument?	0.97*	0.835	n/a
Adequate attempt to understand and include the views regarding designation?	7.31	0.026	0.126
Did you support/oppose the Monument when first heard of it? (Initial)	14.35	0.014	0.177
Do you support/oppose the Monument at end of survey? (Only initial respondents)	11.13*	0.046	0.157
Do you support/oppose the Monument at end of survey? (All respondents)	19.20*	0.001	0.188
Level of support and strong support for activities in the Monument			
Charter/Recreational Fishing	27.22	0.001	0.165
Fishing for food	33.16	0.001	0.182
Traditional/Indigenous Fishing	38.20	0.001	0.195
Tourism	13.30*	0.019	0.116
Scientific Research	13.19*	0.019	0.116
Cultural/Religious Uses (Other than fishing)	20.00	0.001	0.141
Monitoring/Enforcement	30.28*	0.001	0.172
Military Activities	19.53	0.002	0.140
Should public use permits be more or less restrictive?	7.57	0.023	0.087
Will Monument improve protection of marine resources?	8.07	0.018	0.090
Do you think that the Monument will affect you and your household?	7.25	0.203	n/a
What type of effect do you think it will have?	8.68	0.123	n/a
Have you visited Uracas, Maug or Asuncion?	17.79	0.001	0.133
How much confidence do people have in Monument managers?			
Guam Government	9.62	0.047	0.098
CNMI Government	18.00	0.001	0.134
Military/DoD	21.88	0.001	0.148
Federal Agencies	15.79	0.003	0.126
Advisory Council	5.179	0.269	n/a

Statistically significant results are in bold;

*denotes where Fisher's exact test was used.

to many of these questions, with χ^2 values from 7.31 to 38.20, and effect size (Cramer's V) = 0.087 to 0.195. The two smallest effect size values were below the threshold for 0.1 while all others were in the range of a small effect size. Where significant differences were found using the Fisher's exact test, values ranged from 11.13 to 30.28, with small effect size values from 0.116 to 0.188.

Knowledge and awareness of the monument

Overall, knowledge and awareness of the Monument was low; however, awareness was substantially higher in CNMI than Guam. Forty percent of CNMI residents had heard of the Monument before it was designated, 23% heard about the Monument after it was designated. In contrast, 72% of Guam residents had not heard about the Monument at all prior to the survey. Fishing households were significantly more likely to report that they had heard of the Monument prior to the survey compared to non-fishing households.

When those respondents who indicated awareness of the Monument prior to the survey were asked about their level of knowledge, the majority of respondents indicated they knew little or nothing about the Monument (57% CNMI; 59% from Guam), while 21% from CNMI and 15% from Guam indicated they knew a moderate amount or quite a bit. Group differences were not found between fishing and non-fishing households' responses on their level of knowledge about the Monument.

Respondents who were aware of the Monument prior to the survey were asked if they felt there was an adequate attempt to understand and include views of residents during the

Monument designation process. Forty-eight percent of CNMI residents and 55% of Guam residents said “no,” 43% of CNMI and 34% of Guam respondents said “yes,” and 10% of CNMI and 11% of Guam residents said they didn’t know or refused to answer. Fishing households were statistically more likely to report that there was not an adequate attempt to include local views during the creation of the Monument.

Level of support for designation and activities

Respondents who had heard of the Monument prior to the survey were asked about their level of support for the Monument both when they first heard about it and at the conclusion of the survey. Initial responses indicated a strong tendency towards supportive or neutral feelings about the Monument. Of the respondents who had heard of the Monument, 52% either supported or strongly supported the Monument and 26% were neutral toward it. Fourteen percent of respondents opposed or strongly opposed the Monument when they heard about it. Fishing households who had heard about the Monument prior to the survey were significantly less likely to report strong support for the Monument at the beginning of the survey compared with non-fishing households (Figure 2).

During the survey, interviewers provided brief information about the Monument including when it was designated, where it is located, what types of activities will be managed within it, and what government entities will be involved in its management. At the end of this description all respondents were asked about the level of support for the Monument. For all respondents there was a high level of support at the end of the survey, with 65% either supporting or strongly supporting the Monument. Fishing households who had not heard about the Monument prior to the survey were statistically more likely to strongly support the Monument at the end of the survey when compared with non-fishing households (Figure 3).

Respondents were informed that their input on potential activities to be managed in the Monument would be used to develop a management plan and asked about their level of support for or opposition to various activities. Respondents reported strongest support for scientific research and tourism and lowest levels of support for military activities. Eighty-two percent of respondents either supported or strongly supported scientific research, 75% expressed support or strong support for tourism, while military activities were supported or strongly supported by 40% of respondents. Fishing households were more likely to support or strongly support fishing for food, traditional fishing³, cultural/religious uses, and

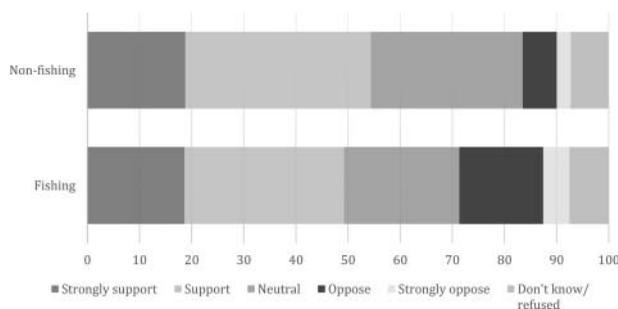


Figure 2. Attitude towards Monument upon first hearing of the designation, by household type ($n = 460$).

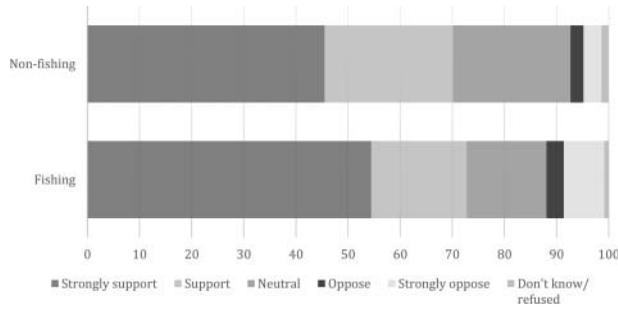


Figure 3. Attitude towards Monument after completion of survey, by household type ($n = 1,000$).

monitoring and enforcement in the Monument when compared to non-fishing households (Figure 4).

Respondents were informed that permits could be required for some types of activities within the Monument. They were asked whether they thought the permit process should be more restrictive to err on the side of resource protection, or less restrictive to err on the side of resource use. Sixty-one percent of respondents supported more restrictive permitting, and 34% supported less. Fishing households were more likely to support less restrictive public use permitting for managed activities in the Monument than non-fishing households.

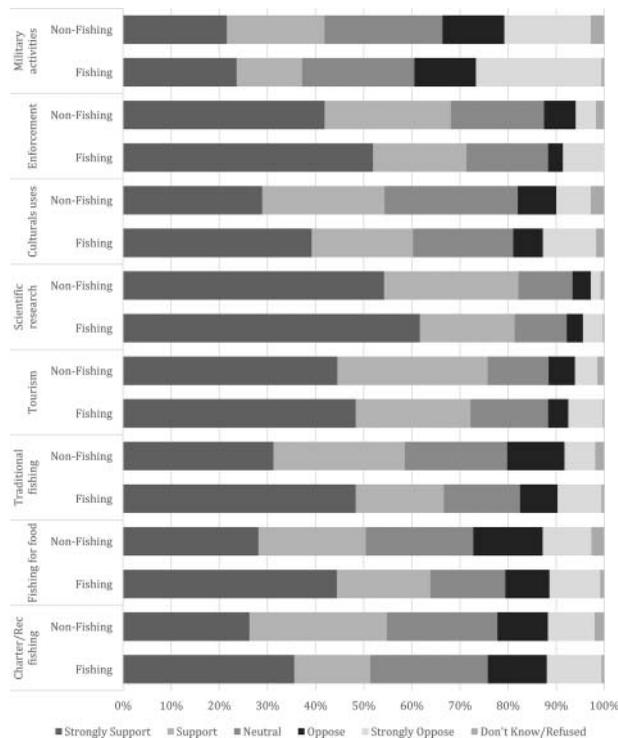


Figure 4. Levels of support for activities in the Monument, by household type.

Perceived impacts and confidence in the Monument's management

All respondents were asked if they believed that the Monument would improve protection of marine resources in waters around the Marianas Islands. Eighty-two percent of respondents said “yes,” and 12% said “no.” When asked if the Monument would have some effect on their household (positive or negative), 41% reported they thought the Monument definitely, probably, or might affect them. Of those who reported an expected effect on their household ($n = 604$), the majority of respondents indicated that their household would be at least somewhat positively affected. Forty-nine percent of respondents reported that they thought they would be positively or strongly positively affected and a substantial number of respondents (38%) indicated that they thought the Monument would have some positive and some negative effects upon their households. Notably, group differences were not found in responses from fishing and non-fishing households about whether and how the Monument would impact respondents' households.

Respondents were informed that a number of government entities would be involved in the management of the Monument, including NOAA Fisheries, the U.S. Fish and Wildlife Service (USFWS), the governments of Guam and CNMI, an advisory council with federal and CNMI members, and the military/Department of Defense. People were asked their level of confidence in each entity's ability to manage the Monument. Eighty-three percent of residents reported moderate or high confidence in NOAA Fisheries and USFWS' ability to manage the Monument, and 72% reported moderate or high confidence in the military's ability to manage it. Survey respondents reported lowest confidence in the CNMI government's ability to manage the Monument, with 44% reporting moderate or strong confidence. Significant differences were not found between fishing and non-fishing households regarding their confidence in the Monument Advisory Council; however, significant differences were found in reported confidence in Guam government, CNMI government, military/Department of Defense, and federal agencies' ability to manage the Monument (Figure 5). Fishing households reported lower levels of confidence in these entities' Monument management abilities when compared to non-fishing households.

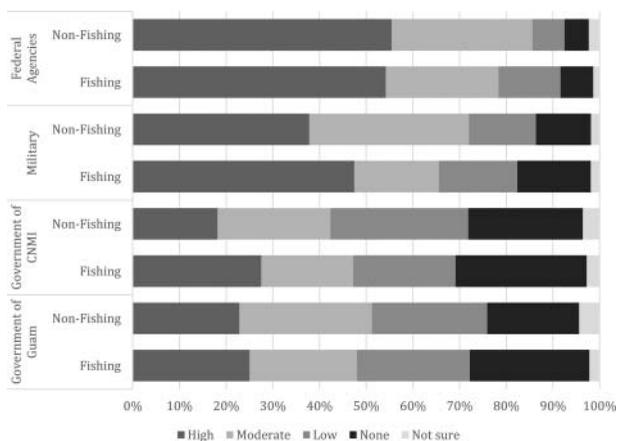


Figure 5. Confidence in agency ability to manage the Monument, by household type.

Discussion

Knowledge, awareness, and support of the Monument

Overall, knowledge and awareness of the Monument was low—only 40% of respondents from CNMI and 28% of respondents from Guam had heard of the Monument prior to the survey. Of those who had heard of the Monument, more than half reported that they knew little or nothing about the Monument. In contrast, a survey of residents in coastal Oregon found that 85% of respondents had some level of awareness of a high-profile MPA initiative taking place in that region (Perry et al. 2014). It is not surprising that CNMI residents had a higher level of awareness about the LMPA than Guam residents; more of the conversation surrounding designation had taken place in CNMI and the Islands Unit is in CNMI waters. Scholars have reported that LMPAs may be sociologically unique due to the high-profile, nation scale at which they are often implemented and discussed (Gruby et al. 2015). The Monument was a high-profile issue, often covered in local newspapers in the year it was designated and regularly discussed by local government officials. However, the survey revealed that this coverage did not lead to high levels of awareness among the general public. Research in conventional MPAs suggests that low levels of awareness may correspond with lower levels of ownership and stewardship of the protected areas (Bennett 2016). High overall support for the Monument, and greater support after learning more about it, may be a significant finding that aligns with other studies that have found general support for MPAs (Perry et al. 2014). Proponents and managers of MPAs may be able to mobilize people who are not direct stakeholders for support. For LMPAs specifically, where stakeholders may be difficult to define (see Gruby et al. 2015), managers may build on general public support to educate, engage with, and mobilize people in greater numbers and to raise awareness about LMPA objectives. Monument managers and LMPA scholars may also want to note that even after high-profile LMPA designation processes, targeted outreach may still be necessary to educate the general public about the protected area and its benefits.

Governance and the Monument's perceived benefits and impacts

Several scholars have found that public participation and involvement is key to an MPA's long-term success (Pollnac, Crawford, and Gorospe 2001; Pomeroy et al. 2005; Bennett and Dreadon 2014b). Over half of the respondents who felt they had enough knowledge to assess whether local views were considered in the designation process reported that they did not believe this effort was sufficient. This finding suggests challenges for Monument managers going forward, as there may be low levels of support for the legitimacy of the Monument which was designated through US executive action under the Antiquities Act, where public input is not required. This along with the swift timeline for implementation may have contributed to the public's sense that not enough effort was made to include local views. Future attempts to designate LMPAs may want to consider protocols that better incorporate public input. Given that Gruby et al. (2015) found a low level of awareness that LMPAs involve human dimensions among managers, advocates, and donors working on LMPA development, it is likely that even those involved in a campaign to designate a LMPA are not aware of the importance of seeking public engagement. The challenge to incorporate public sentiment may begin with proponents of LMPAs.

As managers develop regulations for the Monument, they can gain important insights from survey respondents' level of support for various activities. The survey uncovered high levels of overall support for the Monument and for all of the proposed activities that could potentially be managed in the Monument. These findings suggest that the public may view many of the potential activities positively if they were to be permitted in the Monument and that there would be support for a plan that balanced multiple uses.

A majority of respondents indicated that they believed the Monument would improve marine resource conditions in nearby waters, suggesting public perception that the Monument designation will lead to positive ecological outcomes, a similar finding to studies of perceptions of nearshore MPAs (Leleu et al. 2012; Christie 2005). However, a majority of respondents did not think that the Monument would affect their households either positively or negatively. This finding is surprising since these are island communities where over one-third of the households surveyed reported to have at least one fisherman, and previous studies have found that fishermen perceived high levels of impacts associated with MPAs (McClanahan, Davis and Maina 2005). The disconnect between the perception of the impact of the Monument and its potential effect to one's household, especially for fishing households, is a potential area for future research with regard to LMPAs that are often distant from population centers.

Study results show that respondents reported higher confidence in federal agencies and the military to manage the Monument than they do in the Guam and CNMI governments. This suggests that a federal—local partnership may be key moving forward. Scholars have pointed to the importance of confidence in managing entities in successful conservation governance (Bennett 2016). Additionally, high confidence in an advisory council with representation from different managing entities with which respondents already have experience suggests that such an entity has an opportunity to gain respect for managing the Monument, increasing confidence of residents, and providing an additional link to the Monument for these residents.

Factors affecting perceptions

The study uncovered significant differences in perceptions of many aspects of the Monument between fishing and non-fishing households. Fishing households showed higher awareness of the Monument, and at the same time they were less likely to strongly support it and less likely to believe that an adequate attempt was made to include local views in the Monument. Fishermen, particularly those who travelled to the Northern Islands, were key stakeholders in conversations surrounding the designation of the Monument. As a result, fishing households may have been more likely to connect with someone who knew about the Monument and to hear about its designation. Lower levels of support for the Monument and more belief that locals were not sufficiently incorporated into the process could be connected to fishing households' greater awareness of the Monument and greater understanding of the nuances involved in its designation.

These findings align with research on nearshore MPAs which show that fishermen and their families differ in their attitudes and perceptions both of management and environmental aspects of marine areas—often exhibiting less support due to concerns about their livelihoods (McClanahan, Davies, and Maina 2005). What is interesting about the LMPA context in this study is that fishing households differed from non-fishing on their perceptions of the Monument even though most fishing households reported that they did not believe that

they would experience any direct impacts from the Monument, and very few households contained a member who had ever fished in the Monument waters to be restricted. These findings suggest that merely having a fisherman in one's household can shape the lens through which one views marine conservation initiatives—even LMPAs far from shore. This finding also brings into question if there are differing viewpoints among fishing households based on other factors such as environmental attitudes, as was found in a study of artisanal fishers in Chile (Gelcich, Edwards-Jones and Kaiser 2005). According to Gruby et al. (2015), early proponents of LMPAs posited that human dimensions may not be as relevant since their remote locations mean few stakeholders will experience direct impacts. Findings from this survey suggest that public response may be more complex. A lack of direct impacts to fishing households does not necessarily translate into support for the LMPA. Based on their unique experiences with the ocean and with various management entities, fishing households may be predisposed to have different views of marine conservation initiatives like MPAs. Overall, this study indicates that the presence of a fisherman in one's household is an important variable for understanding public perceptions of marine protected areas.

Conclusions

Much of the research conducted or in development about the human dimensions of LMPAs has been qualitative in nature. Findings from this study indicate that quantitative social science research could and should play an important role in a human dimension of LMPAs research agenda. If researchers focus solely on qualitative studies incorporating interviews from key stakeholders, they may be missing key social patterns surrounding LMPA management.

Authors of this manuscript were involved in a separate qualitative study to gather data about stakeholders' perceptions of the Monument (Richmond and Kotowicz 2015; Kotowicz and Richmond 2013). For that study, we interviewed individuals who travelled to and fished in the Monument and interviewed local government representatives who were involved in designation discussions. In some cases, there were stark differences between stakeholder perceptions of the Monument and the public's perceptions of the Monument exhibited in the phone survey results.

The qualitative study found that many CNMI locals who were closely connected to the Monument were against or had strong reservations about the LMPA. However, the survey showed overall high levels of support for the Monument among the general public. The survey also indicated that respondents, even those who had heard of the Monument, had low overall knowledge about it. Perhaps stakeholders' greater awareness of the Monument and the process through which it was designated caused them to uncover aspects about the Monument that led them to exhibit lower support compared to the public.

Additionally, in the qualitative study, stakeholders were particularly concerned about the level of US federal involvement and control in the Monument designation process. Many people who were closely involved in the Monument designation process indicated that they would prefer a form of marine protection that was spearheaded by the CNMI and Guam governments. However, the results of this study indicate that the public has less confidence in the CNMI and Guam governments to manage the Monument when compared to various US federal agencies. These results indicate that the Advisory Council with representatives from federal and territorial entities may be an effective compromise for both stakeholders and the public.

These results have implications for future development and assessment of LMPAs. LMPA proponents and managers may want to consider a two-pronged approach to LMPA outreach and participation. First, they should make an effort to seek out and incorporate the views of individuals who are likely to be closely connected to or directly impacted by LMPA implementation. Second, they should attempt to incorporate broad public views. Quantitative studies like this phone survey are expensive and time-consuming and may not be realistic to implement in all situations. In addition, assessing stakeholder views may be more important, as those are the individuals most likely to be stewards of or create resistance towards LMPAs. However, interested parties could pool resources to develop a collaborative survey that collects data to serve multiple interests—those of government agencies, academic researchers, local groups, and conservation groups/LMPA proponents. This combined effort could serve to increase awareness and knowledge about the LMPA while gathering valuable knowledge about the initiative from the public. To truly understand local perceptions of LMPAs, it may be important to combine qualitative assessments of stakeholders' opinions with quantitative work to understand how the broader public feels about the initiative.

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Notes

1. An additional 126 respondents were contacted who did not speak one of the languages offered.
2. Source: <https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html>.
3. The term "traditional fishing" was purposefully not defined in the survey. The researchers wanted respondents to interpret the phrase for themselves.

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