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Identifying ‘public values’ for marine and coastal planning: Are residents and non-residents really so different?

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Abstract

Planning and management for marine and coastal areas is often contentious, with competing interests claiming their preferences are in the ‘public interest’. Defining the public interest for marine and coastal areas remains a wicked problem, however, resistant to resolution. A focus on more tangible ‘public values’ offers an alternative for policy and planning in specific contexts. However, ambiguity surrounds who or what constitutes the ‘public’, with stakeholder engagement often used as a proxy in marine and coastal research. In this study, the outcomes of participatory processes involving the public from diverse backgrounds and geographical locales were explored. A public participation GIS (PPGIS) survey was undertaken in the remote Kimberley region of Australia to identify the spatial values and management preferences for marine and coastal areas. Similarities and differences between the volunteer public (n = 372) and online panel respondents (n = 206); and for the volunteer public only, differences between residents (n = 118) and non-residents (n = 254) were assessed. Online panelists evidenced lesser quality mapping data and did not provide a reliable means of accessing ‘public’ values. Residents were more likely to map general recreational and recreational fishing values while non-locals were more likely to map biological/conservation and wilderness values. Overall, residents and non-residents were more alike than dissimilar in their mapping of values and management preferences, suggesting that the need to preference local views may be overstated, although there may be differences in policy priorities. Future research should focus on the breadth and representativeness of stakeholder interests to access the views of wider society and hence public values, rather than current approaches where local interests are often the primary focus of participatory stakeholder engagement.

Keywords: Public interest; Stakeholder analysis; PPGIS; Residents; Values

1. Introduction

Planning for marine and coastal areas is characterised by complexity and conflict, with multiple values and uses involving trade-offs between conservation and human uses. The development of policies for marine and coastal areas may be considered a type of ‘wicked problem’ for which there may be no undisputable public good and no objective definition of equity (Rittel and Webber, 1973). Yet, planning for coastal and marine areas is premised on the protection of public resources, such as fisheries, and as such should be undertaken in accordance with the public interest (Mikalsen and Jentoft, 2001). ‘Public interest’, however, is an ambiguous ideal that may also be context dependent. Bozeman (2007) links this idealistic nature to the virtual impossibility of exactly determining the ‘public interest’. A focus on public values, which have a specific, identifiable character, offer a more grounded and tangible approach for policy and management. Viewing ‘public interest’ policy issues empirically through a lens of public values is more likely to produce useful outcomes. Such values, which sit within the framework of public interest theory, thus offer a pragmatic means of operationalizing the public interest (Bozeman, 2007).

In the context of public resources such as marine and coastal environments, public values − also referred to as social or community values (cf. Brown, 1984; Lockwood, 1999) − are often operationalized and measured by assessing multiple stakeholder perspectives. This includes attention to stakeholder values, attitudes, preferences and opinions (Strickland-Munro et al., 2016). The close involvement of stakeholders in determining public values appears logical and essential for coastal and marine management (Tompkins et al., 2008; Abecasis et al., 2013). Some contend that a stakeholder-driven approach adds “political clout and normative credibility” to decision making for marine environments, assisting management to be cognizant of multiple public interests and concerns (Mikalsen and Jentoft, 2001 p291). Yet, human-environment interactions within and concerning marine and coastal environments are complex (Kittinger et al., 2014), and display the diversity, complexity and conflict typical of linked social-ecological systems. Who participates, and which stakeholder groups are included can have a fundamental influence on the types of public values expressed. Consideration of public values requires inclusion and analysis beyond stakeholder groups.

For marine and coastal environments, stakeholders may be considered as those individuals, groups, or organisations most interested, involved or affected by a given project or action towards resource use. This includes those affected by management decisions or with claims over an area of resources, those dependent on resources, and those whose activities impact on the area or resources (Pomeroy and Rivera-Guieb, 2006). Stakeholders may thus include local residents, Indigenous bodies, government representatives, conservation groups/interests (e.g., marine protected areas), extractive industries (e.g., mining), scientists, commercial and recreational fishing organisations, and other interest groups such as tourism operators. Geographically distant, and more amorphous stakeholder groups such as ‘wider society’ (Grimble and Wellard, 1997) may also be of relevance. This diversity of stakeholder groups requires decision-makers to make trade-offs and mitigate potential conflicts arising from multiple uses and values in the pursuit of ecosystem-based management (Kittinger et al., 2014). Underpinning this is an explicit choice regarding which stakeholder groups are prioritized within specific planning and management processes, with some stakeholders seen as more salient than others (Pomeroy and Douvere, 2008).

Within the marine and coastal literature, local community or residents are often privileged as a key stakeholder group (e.g., Pajaro et al., 2010; Abecasis et al., 2013). Several factors underpin this. One; the acknowledged importance of integrating local and traditional knowledge (and issues) into marine decision-making to support conservation outcomes (Charles and Wilson, 2009; Jarvis et al., 2015). Two; assumptions of, and a research focus on, the close involvement of locals with geographically proximate marine and coastal areas. Three; coastal communities (particularly those with traditional links to fishing) are directly affected by marine conservation efforts (Pita et al., 2013).

The literature has focused on user groups and resource-dependent stakeholders – typically commercial and/or local fishers – as those most impacted by decisions and management regulations associated with marine conservation (Mikalsen and Jentoft, 2001; Charles and Wilson, 2009; Pajaro et al., 2010; Pita et al., 2011). A broader interpretation of resource-dependency may also include local residents involved in recreational fishing and other recreational pursuits, tourism, and extractive industries based on marine environments. Spatial planning that neglects this resource dependency and associated community territoriality, or inadequately recognizes the links between terrestrial communities and adjacent coastal or offshore locations, risks enhancing stakeholder conflict (Pomeroy and Douvere, 2008). The costs and benefits associated with marine conservation are another factor underlying the privileging of local residents. Evidence suggests that user groups/locals are more likely to be disadvantaged by resource and access restrictions associated with marine conservation while the benefits – e.g., biodiversity conservation – accrue more broadly (Charles and Wilson, 2009).

This has also extended into the tourism literature and studies examining the relationship between residents and visitors in relation to tourism development. While previously it has been shown that residents hold negative perceptions of tourism development, Raymond and Brown (2007) explored the effect of distance from tourism core on attitudes towards tourism. Their spatial data analysis indicated that, rather than a wholesale negative perception of tourism development, residents evidenced place-specific constraints as to where tourism development can occur.

The challenge remains, however, to access and include the values of wider society (Grimble and Wellard, 1997). Widespread stakeholder engagement cognizant of the importance of including the views of today's diverse society can be achieved through the participation of a broad range of stakeholders beyond the local. Given the public nature of many marine resources (Mikalsen and Jentoft, 2001), recognition of the values of wider society is fundamental for effective and long lasting marine conservation (Pomeroy and Douvere, 2008; Charles and Wilson, 2009; Pollnac et al., 2010; Voyer et al., 2012) and capturing and analyzing public values provides a means of doing so.

Assessing public values and preferences for policy decisions through this broad engagement can be achieved through multiple methods including surveys, indirect and direct value elicitation, focus groups, and public involvement (Keeney et al., 1990). Within the conservation domain, there is a clear impetus for tools capable of linking ecological data with social data gained through participatory processes in a spatially explicit manner (Pert et al., 2013).

For marine and coastal environments, this need is being met through the advent of marine conservation planning (Douvere and Ehler, 2009). Marine conservation planning involves the development of spatial plans to allocate resource use and management to achieve multiple ecological, economic, and social objectives. Typically conducted at regional scales, conservation planning seeks to minimize conflict among potentially competing uses and user groups. The integration of ecological and human use/other social data is an important aim (Douvere and Ehler, 2009).

The same premise applies to decisions and management regulations arising from marine conservation (Pita et al., 2013). However, given the 'commons' nature of regional and global marine areas (see Berkes, 2006), sampling design should also consider more geographically distant interests alongside more proximate concerns. This can help balance the tendency for local respondents to bias mapping towards places they are more familiar with, while also recognizing that people need not be personally familiar with an area to value it and have opinions regarding its use and management (Brown, 2015). Consider, for example, the global importance of marine areas such as the Great Barrier Reef off the eastern coastline of Australia. Collective versus individual, and direct versus indirect interests, are further considerations in sampling (Brown et al., 2014).

The research was guided by an interest in exploring how to determine public values through place-based research and whether there are any similarities and differences between stakeholders. Specifically, this study seeks to answer the following research question: are there any similarities and/or differences between mapped values and management preferences of i) volunteer public and online panel stakeholders and ii) residents and non-residents? Differences between resident and non-resident perspectives are of particular interest given that policy and planning often privileges local views. The capacity of spatially explicit participatory processes, called public participation GIS

(PPGIS), to capture the place-based values and management preferences of wider society, and hence reflecting the public's values for use in marine conservation planning, is used to examine this question. Two alternative sampling designs are compared to assess how well they help to understand public values: stakeholder proximity (residents versus non-residents) and stakeholder recruitment (volunteer public versus use of an online panel). Stakeholder analysis is particularly relevant for marine conservation issues as any inherent impacts are likely to involve externalities, involve different uses and user groups and traverse biological and social systems (Brown et al., 2016).

2. Methods

2.1. Study location and context

This research focused on the Kimberley coast in northwestern Australia, a 13,296 km stretch of coastline (including 1710 islands) from the Western Australia State border southwards to the southwestern end of Eighty Mile Beach (Fig. 1). Generally little developed due to isolation from the Western Australian capital city of Perth and other major economic centers (Scherrer et al., 2008), the Kimberley is sparsely populated with around 34,000 residents, 43.5% of whom are Indigenous. Key regional centers include Broome, Kununurra, Derby and Wyndham. Additionally, over 200 discrete Indigenous settlements exist (Australian Bureau of Statistics, 2013). Key economic drivers include mining, oil and gas production, commercial fishing and aquaculture, pastoralism and tourism.

The Kimberley coast is renowned for its natural attractions, including large megafauna such as migratory humpback whales and spectacular coastal landscapes such as the Horizontal Falls and Montgomery Reef (Scherrer et al., 2011). The region also boasts an extensive cultural history, with Indigenous rock art dating back 30–40,000 years (O'Connor, 1999; Morwood, 2002) and history relating to early European explorers and missionaries (Zell, 2007). Research in the region to date has been limited and the Kimberley Science and Conservation Strategy (Government of Western Australia, 2011) highlighted several key ecological knowledge gaps, as well as the need for social research addressing human-environment relations. This paper addresses this latter knowledge gap, presenting research into the social values and management preferences held by people for the Kimberley coastline and marine environment.

2.2. Public participation GIS (PPGIS) as a research method

PPGIS is a participatory research process that seeks to identify and document socio-spatial information for land use (Brown and Kyttä, 2014) and increasingly, marine spatial planning (e.g. Ruiz-Frau et al., 2011; Klain and Chan, 2012; Jarvis et al., 2015; Brown et al., 2016). PPGIS involves the lay public (non-experts) identifying spatial information for planning such as landscape values, development preferences, management preferences, place qualities, and personal experiences (Brown et al., 2012). In so doing, PPGIS offers a means to operationalize and translate the ‘wisdom of crowds’, the public's knowledge and judgment, into spatially explicit information for land use decisions (Brown, 2015) and can assist in bridging the knowledge divide between the public and experts (Zolkafli et al., 2017a) while building capacity for a lay public to engage in complex planning processes (Zolkafli et al., 2017b). Limited research to-date illustrates that who participates − which public − has an important bearing on PPGIS outcomes (Brown, 2017).

The challenge of obtaining representative and unbiased participation is exacerbated by larger social trends showing a decline in survey participation rates across all modes of data collection (Pocewicz et al., 2012). Online panels offer one solution to address low response rates (Brown, 2017) and are receiving increasing attention. For PPGIS research, online panels offer streamlined recruitment and participation with invited panelists clicking on a PPGIS survey link contained within an email message. Only a few studies have employed this method to date. Brown et al. (2012) provide one example in a study of park experiences, values, perceived impacts and facility preferences undertaken on behalf of Parks Victoria, Australia. While participation rates of eligible panelists (those who met screening requirements) were high (77%, n = 304), the mean number of markers placed and time spent mapping was significantly less than the public samples in other reported PPGIS surveys. In the Netherlands, de Vries et al. (2013) used a sample of 3293 online panelists to explore social landscape values at a local, regional and national scale. The authors concluded that while panelist mapping produced an accurate map of highly valued places, data were not spatially representative and mapping coincided strongly with an area's popularity as a holiday destination – that is, mapping coincided with places that were visited. In this research, online panels were used given their potential for greater efficiency in terms of reduced time for data entry and to increase the precision in mapping given the large size of the study area.

2.3. Data collection

Data collection relied on an internet-based PPGIS survey. The survey comprised three sections. First, pre-mapping questions included socio-demographic questions (e.g., place of residence, Indigenous heritage) and self-identified knowledge of the region. Second, the main PPGIS mapping activity of identifying place-based values and management preferences. Third, post-mapping questions to ascertain other socio-demographic variables (e.g., gender, age, education) as well as ease of access and value orientations via the Environmental-Economics Priority Scale (cf. Abrams et al., 2005).

The PPGIS mapping activity used a Google® maps interface (Fig. 2) that allowed respondents to drag and drop digital markers representing place values and management preferences onto a map of the Kimberley region, within the boundaries of the study area (Fig. 2). A definition of each value and preference was available by hovering over the relevant marker icon. The choice of values and management preferences was pre-defined based on earlier qualitative research conducted by the authors (citation withheld). The implemented value typology was similar to the one developed by Brown and Reed (2000) and subsequently used in multiple PPGIS studies (see Brown and Kyttä, 2014).

Pilot testing of the PPGIS survey was undertaken in March 2015 with different coastal user groups. Feedback obtained resulted in adjustments to the mapping scale and clarification of mapping instructions and mapping orientation markers (e.g., place names).

2.4. Sampling design and recruitment

The survey was open between April–July 2015. The public of interest was people living in or visiting the Kimberley region, in addition to those who may be geographically remote, but maintain an ongoing interest in the region. Recruitment sought to maximize the number and diversity of respondents, a challenge given the Kimberley's vast size and small, scattered population. Recruitment sought to include members of the interested public living outside of the Kimberley as well as individuals residing within the Kimberley while covering a broad range of stakeholder groups. In a divergence from a common public sampling approach used in PPGIS studies, an online panel was also engaged to enable comparison between the data generated by those with an identifiable interest in the Kimberley and those without (online panel). This comparison between participants with and without an identifiable interest in the region is an important part of this paper.

Differing recruitment methods were used to engage the stakeholder groups including direct personal contact by the authors; resident postal invitation; email; social and traditional media; and survey invitation cards. As per above, 200 panelists from an online research company were recruited with the sample required to be representative of broader Western Australian socio-demographics (age, sex, gender). A combined minimum sample of 350 respondents was sought.

2.5. Data analyses

To identify differences in the characteristics and mapping behaviors between different types of 'public', the data were first coded for respondents sourced from the online panel (hereafter 'panel') and those sourced from other recruitment methods (hereafter 'public'). The public sample was further coded as either 'resident' or 'non-resident' based on response to the question 'Are you a resident of the Kimberley region'? Comparisons were undertaken between i) public and panel and ii) resident and non-resident cohorts within the public cohort. Comparisons included group characteristics (e.g., environmental orientation, level of familiarity), intensity of mapping (mean number of *markers* placed for each value/preference by group), and propensity to map (number of *individuals* by group that placed one or more of a given value/preference). T-tests were used to compare the mean number of markers by group (group mapping intensity), while chi-square tests were used to determine whether the number of individuals that mapped a given value or preference differed by group (group propensity to map). If a participant mapped one or more of a given value or preference, that individual was classified as "YES" for the marker category, otherwise "NO". This categorical treatment of mapping behavior supplements the analysis of group means which can be influenced by a few individuals placing a large number of markers within a marker category.

Standardized residuals were calculated in the chi-square analysis by dividing the residual value by the standard error of the residual. Residuals greater than +2 indicated significantly greater observed frequencies than expected and residuals less than −2.0 indicated significantly fewer observed counts than would be expected. Larger standardized residuals (±2.0) indicate a greater deviation from expected counts and warrant particular consideration.

Spatial analysis was implemented for the resident and non-resident cohorts to determine whether differences in the quantities of values and preferences mapped also manifested in locational differences in mapping. The general assumption in environmental policy and planning that resident views are paramount underpinned this spatial analysis. The spatial distribution of values and preferences were plotted using the global density method to create kernel point densities (cf. Karimi et al., 2015) for each value and preference. These maps were constructed using 2 km × 2 km grid cells and a 20 km search radius; parameters appropriate given the size of the study area. As there were uneven counts of markers between different values and preferences, kernel density surfaces were standardized. This was accomplished by subtracting the mean grid density and dividing by the standard deviation of the grid density. Normalized data were subtracted to show the difference between resident and non-resident mapping.

3. Results

3.1. Socio-demographic characteristics of respondents

A total of 763 responses were recorded. Analysis presented here is based on full survey completions only (i.e., respondents who completed both the pre- and post-mapping questions and placed one or more markers), reducing the sample to 578. Of the 578, n = 206 respondents were *panel* respondents and the remaining n = 372 respondents were *public* respondents. The *public* respondents (n = 372) were further categorized as either *residents* (n = 118) or *non-residents* (n = 254). Selected socio-demographic characteristics for the combined cohort and for each respondent category are given in Table 1. For the combined cohort, 21% were aged 55–64. This compared to 18% aged 55–64 for the panel, 23% public, 17% residents and 26% non-residents. The combined cohort and non-resident category had more female respondents than male, with this trend reversed for the other cohorts. The combined cohort, panel, and residents had the highest percentage of respondents with an undergraduate/bachelor degree while the public and non-resident cohorts had the highest percentage of respondents with post-graduate qualifications.

Initial data analysis focused on a comparison between the characteristics of the different respondent groups. For the survey question measuring general value orientation toward environmental protection versus economic development, panel respondents had a mean value of 3.07 compared to the public respondents' mean of 2.40, indicating that the panel was more economic development orientated, and less environmental protection oriented, than the public (Table 2). Panel respondents also had a lower self-rated level of knowledge of the study area, than the public respondents. Residents had a higher mean of 2.78 compared to the mean of 2.23 for the non-residents on the environmental orientation scale (Table 2). Not surprisingly, residents had a greater level of knowledge of the study area than non-residents and also found access to be easy when compared to non-residents.

3.2. Intensity of mapping

Comparisons were made between the mean number of markers placed for each value and preference per respondent category. Collectively, the public placed more markers than panel respondents for 10 of the 14 values including scenic/aesthetic, fishing (recreational), biological/conservation, and Aboriginal culture/heritage (Table 3). Comparing residents to non-residents, residents placed more markers for scenic/aesthetic, recreation, and recreational fishing.

The relative importance of the values to each respondent group within the value typology was assessed by ranking values based on the number of individuals that mapped one or more of the values. Residents valued recreational fishing (rank #1) and general recreation (rank #3) more than non-residents (#7 and #6 respectively) while non-residents valued biological/conservation and wilderness/pristine values more than residents. The panel expressed relatively higher importance for recreational fishing and non-tourism economic development, and relatively lower importance for biological/conservation and wilderness/pristine values.

Statistically significant differences were also identified for the mean number of markers placed for management preferences (Table 4, 13 preferences). The public placed more markers than panel respondents to increase conservation/protection, increase Aboriginal management, improve/increase access, restrict/limit access, commercial fishing/aquaculture; no oil/gas development and new port development. The preference to improve/increase access was the only statistically significant difference between residents and non-residents, with residents placing more markers than non-residents.

The relative salience of management preferences to each respondent group was assessed by ranking preferences based on the number of individuals that mapped one or more of the preferences. Residents were more concerned with adding recreation facilities (rank #4) than non-residents (rank #9), while non-residents appeared more concerned about adding tourism facilities (rank #6) than residents (rank #9). Key differences in salience between the public and panelists was found on preferences for adding facilities and new tourism development, with panelists expressing greater salience than the public group.

3.3. Propensity to map value and preference markers

Analysis was undertaken to determine whether the cohorts of respondents were more likely to map a particular value or preference. This analysis focused on the number of individuals that mapped one or more specific values or preferences, not the total number of markers that can be potentially distorted by a few individuals placing a large number of markers. Public respondents were more likely to place markers for scenic/aesthetic, biological/conservation, intrinsic/existence and ‘special place’ values. They were also more likely to place markers for non-development related management preferences – to increase conservation/protection, no commercial fishing, no oil/gas development, and no port development. Panel respondents were more likely to place markers for therapeutic value and for oil/gas development (Table 5).

In comparison to non-residents, residents were more likely to place markers relating to general recreation and recreational fishing (Table 5). Non-residents were more likely to place markers relating to biological/conservation and wilderness/pristine area values. Residents were also more likely to map preferences for additional facilities, including adding recreational facilities and development of a new port. Non-residents did not have a propensity to map any particular preference over another.

Normalized kernel density maps were produced for those values and preferences that displayed significant differences in the intensity of mapping (number of markers, Tables 3 and 4). Distinct spatial differences were evident for residents and non-residents. Fig. 3 depicts the relationship between resident and non-resident mapping, with hotspots displayed being representative of places where one group mapped more intensively than the other. Compared to residents, non-residents placed more markers for recreation value in the Broome and Roebuck Bay area as well as along Eighty Mile Beach (Fig. 3a). For recreational fishing values, residents mapped more intensively in distinct areas surrounding Buccaneer Archipelago and King Sound, while non-resident mapping was more diffuse and spread along almost the entire coastline (Fig. 3b). Residents mapped scenic/aesthetic values in the Buccaneer Archipelago including Horizontal Falls while non-residents mapped more intensively around St. George Basin and the Prince Regent River (Fig. 3c). For the preference to increase or improve access, non-residents mapped more intensively near Kalumburu (Fig. 3d).

4. Discussion

The who or which public participates in spatial planning can influence outcomes (Brown, 2017). Marine conservation planning, as with other land use planning, faces competing demands from diverse stakeholder groups and interests, the management of which requires ongoing attention. This study, one of the first of its kind, explored similarities and differences in mapped values and preferences between i) volunteer public and online panel respondents, and ii) residents and non-residents within the volunteer public cohort. The results from this study challenges the propensity of marine policy and planning to privilege local views (e.g., Charles and Wilson, 2009; Pajaro et al., 2010; Pita et al., 2013). Are residents and non-residents really so different? While the two groups evidenced statistically significant differences in mapping behavior for four attributes – recreation, recreational fishing and scenic/aesthetic value, and the preference to increase or improve access (cf. Tables 3 and 4) – there were far more similarities than differences in their mapping behavior.

Two factors help explain differences between resident and non-resident mapping behavior. First, is the influence of place familiarity on mapping behaviour. Knowledge of the study area is recognized as influencing both the type and amount of spatial data provided in PPGIS studies (Brown and Kyttä, 2014) as well as mapping effort (Brown et al., 2012). Residents reported having excellent knowledge of the area and believed access to be easy, while non-residents reported average knowledge and difficult access (Table 2). The four attributes evidencing significant differences in mapping behavior are largely localized concerns − for example, residents were more likely to map recreation and recreational fishing values.

The high value placed on recreation by locals is well established in the literature. Ruiz-Frau et al. (2011) and van Riper et al. (2012) identified recreation as one of the most cited values in their respective studies of marine and coastal values in Wales and Australia's Hinchinbrook Island. Recreation also figured prominently in Darvill and Lindo (2015) study of cultural and provisioning ecosystem services in Canada's Upper Peace River Watershed. Similar to this study, Heck et al. (2011) report links between high local use/familiarity with an area and increased importance placed on recreational activities off Canada's west coast.

The influence of familiarity is also reflected in the distinct spatial patterns of resident and non-resident mapping (Fig. 3). Non-resident mapping hotspots largely correspond to well-known tourism destinations. Recreation value, for example, exists as a concentrated hotspot at Broome and Roebuck Bay, with Broome a popular, well-known tourism destination providing the gateway to the Kimberley. de Vries et al. (2013) reports an analogous finding, with mapping by (non-local) online panelists coinciding with known tourism destinations, prompting concerns over the data's spatial representativeness. Non-residents also tended to map much more of the coastline as valued than did residents, especially for general recreation and recreational fishing values (Fig. 3a and b).

Resident hotspots, in contrast, tended to concentrate on specific locations, suggesting the influence of greater familiarity and ease of access. This spatial distinctiveness is particularly evident for recreational fishing value, where resident mapping coalesced on the less-touristed and more difficult to access (for non-residents) regions of King Sound and Buccaneer Archipelago. These results may also reflect the influence of specific local knowledge. Similarly, resident mapping for the preference to increase or improve access manifested in less accessible, non-tourist locations while non-resident mapping focused on less-accessible tourism locations such as Kalumburu (Fig. 3d). This spatial differentiation between resident and non-resident mapping suggests the potential for conflict may be overstated, with the two groups displaying preferences for different locations along the coast. Thus, in many instances, decision makers may not be required to make tradeoffs between potentially conflicting local and non-local interests and values.

Second, is the influence of spatial discounting on mapping behaviour. Such discounting offers a potential source of bias and further explanation for differences in resident and non-resident mapping. Spatial discounting refers to the tendency for individuals to be more concerned with places that are closer than more distant. In other words, respondent domicile influences mapping behavior, with places further from a respondent's residence less likely to be mapped. Spatial discounting implies that development and negative environmental conditions are preferred in more distant locations (Pocewicz et al., 2012) while amenities are preferred to be closer. Spatial discounting can strongly influence mapping results and is likely reflected in the geographic differences evident in resident and non-resident mapping.

Residents are often considered to hold more negative views towards land development activity than visitors, a consequence of the NIMBY (not in my backyard) syndrome. Beliefs such as these overlook, however, the place-specific nature of development. In this study, residents were more likely to map preferences for additional facilities, including recreational facilities and new port development, than non-residents (Table 5), although the desired location of these was very place specific. Other PPGIS studies support the notion of careful attention by residents to place-specific land use development preferences. Raymond and Brown (2007), for example, report highly place-specific resident support for tourism development in the form of harbours and commercial/retail centres in their study of tourism development in the Otways region of Australia (see also Brown, 2006 for exploration of place-specific resident attitudes towards tourism development). In Finland, Brown et al. (in press) compared development preferences among permanent residents, holiday home owners, and visitors in multiple locations. The authors concluded the evidence for spatial discounting was relatively weak as preferences for land use change among the three groups were more similar than different. However, place and project-specific differences in development preferences were evident in some of the findings.

In this study, the expressed values and preferences of residents and non-residents were far more similar than dissimilar. Of the 14 values, there were only statistically significant differences for four while significant differences were evident for 2 of the 13 management preferences (Table 5). A possible explanation for this is the heterogeneity within each group. Although stakeholder groups (cf. residents and others) are often considered as homogenous entities (Pomeroy and Douvere, 2008), residents and non-residents are in fact, highly heterogeneous, with diverse members, interests, values and preferences. This within-group heterogeneity masks the differences in values and preferences between the interests within each group. This suggests attention to the more specific stakeholders that comprise both groups (Brown et al., 2016) rather than affording primacy to locals, as has been the case in many recent coastal and marine studies where stakeholders have been a central consideration (citation withheld).

What then are the advantages (and disadvantages) of seeking non-local participation in marine conservation planning? Results indicate that the two stakeholder groups are really quite similar, prompting the question, is the propensity for conflict between local and non-local views overstated? The engagement of residents addresses management and political concerns regarding place-based use/resource dependency, ensures due recognition of local issues, and delivers more nuanced information driven by greater levels of familiarity and knowledge of the area and resources in question. Resident and proximate user group engagement is thus critical in exploring and addressing potential resource use and access conflicts associated with conservation.

Equally important are the views of non-resident or less proximate stakeholders. There are political advantages to obtaining broader support (or opposition) to potentially controversial conservation and development activities, despite lesser familiarity and knowledge of the study area. This information complements the more detailed local knowledge gained through resident engagement, and may highlight policy issues not of immediate local relevance but of broader societal concern. An example of this is the placement and boundaries of marine reserves with the need to have a system (beyond the local) that is representative of the diversity of the biota of a region, state or nation.

Further, the majority of the public associated with public lands and resources – such as coastal and marine environments – derive significant intangible benefits despite not being direct users of the area (Brown et al., 2014). All citizens stand to lose should marine and coastal resources, and their associated values, be depleted (Mikalsen and Jentoft, 2001). Thus the values and preferences of this non-local, wider public matter, despite often being discounted in participatory processes that focus on more proximate stakeholders (Mikalsen and Jentoft, 2001; Brown et al., 2014). Both local and non-local engagement, then, remain important in the pursuit of public values to support marine and coastal planning. From a policy perspective, analysis based on stakeholder group values and preferences, rather than a resident/non-resident distinction, appears essential to augment methods assessing local versus regional or national interests (Brown et al., 2016).

Additionally, from a methodological standpoint, the results show that online panelists invested lesser mapping effort (number of markers placed and the amount of clock time spent mapping) than the public sample. Specifically, the panelists spent an average of about seven minutes mapping compared to about 15 min for the public sample. This concurs with other PPGIS research involving online panels which report consistently lower quality spatial data from panel respondents (where quality is equated to mapping effort in terms of number of markers placed and time spent mapping, cf. Brown, 2017). While panelists in this study had greater mapping effort than reported in other PPGIS research (e.g., Brown et al., 2012), differences between public and panel data quality likely indicate differences in the familiarity with the study region (see results in Table 2) and the existence of satisficing in the mapping activity.

Satisficing − where lesser mapping effort is recorded from respondents with lower intrinsic motivation to engage (Kaminska et al., 2010) − provides one plausible explanation for the disparate mapping effort observed in this study. Brown et al. (2012) discuss satisficing in their study in regional Victoria, Australia, that compared online panel respondents with household and volunteer samples. They suggest satisficing may be linked to online panelists completing research surveys to receive extrinsic rewards while minimizing response effort. In contrast, volunteer public respondents are more likely to participate based on intrinsic motivation, i.e., a pre-existing interest in the Kimberley region, with this interest translating into greater mapping effort, as evident here. Thus, there appear to be trade-offs when using online panels versus volunteer samples for elucidating 'public' values. There is greater inferential uncertainty with data from panelists given the lesser quantity and quality of spatial data generated in the mapping process, while the inferential uncertainty with volunteer public sampling is more associated with the greater potential for response bias based on pre-existing interests.

Despite producing lower quality spatial data, however, online panels may be warranted in instances where response rates and comprehensive public participation processes are a central concern. The high participation of volunteer public respondents means this study comprised largely citizen-driven or volunteered geographic information. This presents a possible source of bias, with previous research indicating that interest groups can mobilize participatory processes in support of vested interests (e.g. Mikalsen and Jentoft, 2001; Brown et al., 2014). The inclusion of representative samples of the public (such as the panel cohort in this study) may therefore be warranted for comparative purposes where crowd-sourced data contains potential bias (Jarvis et al., 2015).

5. Conclusion

This research provided a novel way of examining whether there are any similarities and differences between residents and non-residents, an idea often promoted by managers, policy makers and researchers through PPGIS analysis and the use of online panels. Two implications are evident for future participatory spatial processes seeking to capture public values. One, resident and non-resident mapping evidenced more similarities than differences, suggesting that the need to preference local views in marine and coastal planning and management decisions may be overstated, although there may be differences in policy priorities. Two, on their own, online panelists do not provide the most effective means of accessing public values. Future research would thus benefit from a focus on stakeholder groups, which explicitly recognizes multiple interests and highlights potential areas of agreement and conflict, rather than an over-simplistic local/non-local dichotomy. Future research should also focus on increasing PPGIS participation rates that involve general household sampling because nonresponse is more likely to induce bias in survey estimates (Groves, 2006).

Ultimately, planning and management of marine and coastal areas usually seeks to take into account the public interest. This is often problematic given that the public interest and wider society is often described as being characterised by conflict and competing demands from a broad range of stakeholders. Acceptance of marine and coastal management as a form of environmental politics in which diverse stakeholder groups have legitimacy and saliency is, however, gaining traction. An approach to coastal and marine management conservation planning premised on stakeholder group interests has the benefit of sensitizing policy and planning to multiple non-spatial interests (Mikalsen and Jentoft, 2001), while the explicitly spatial PPGIS approach used here highlights areas of agreement and difference among stakeholder values and preferences. These understandings provide impetus for future research based on a spatially explicit understanding of stakeholder interests and public values.

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Fig. 1. Study area (Geoscience Australia, 2015; Department of Parks and Wildlife (pers comm.) Sept 2015).

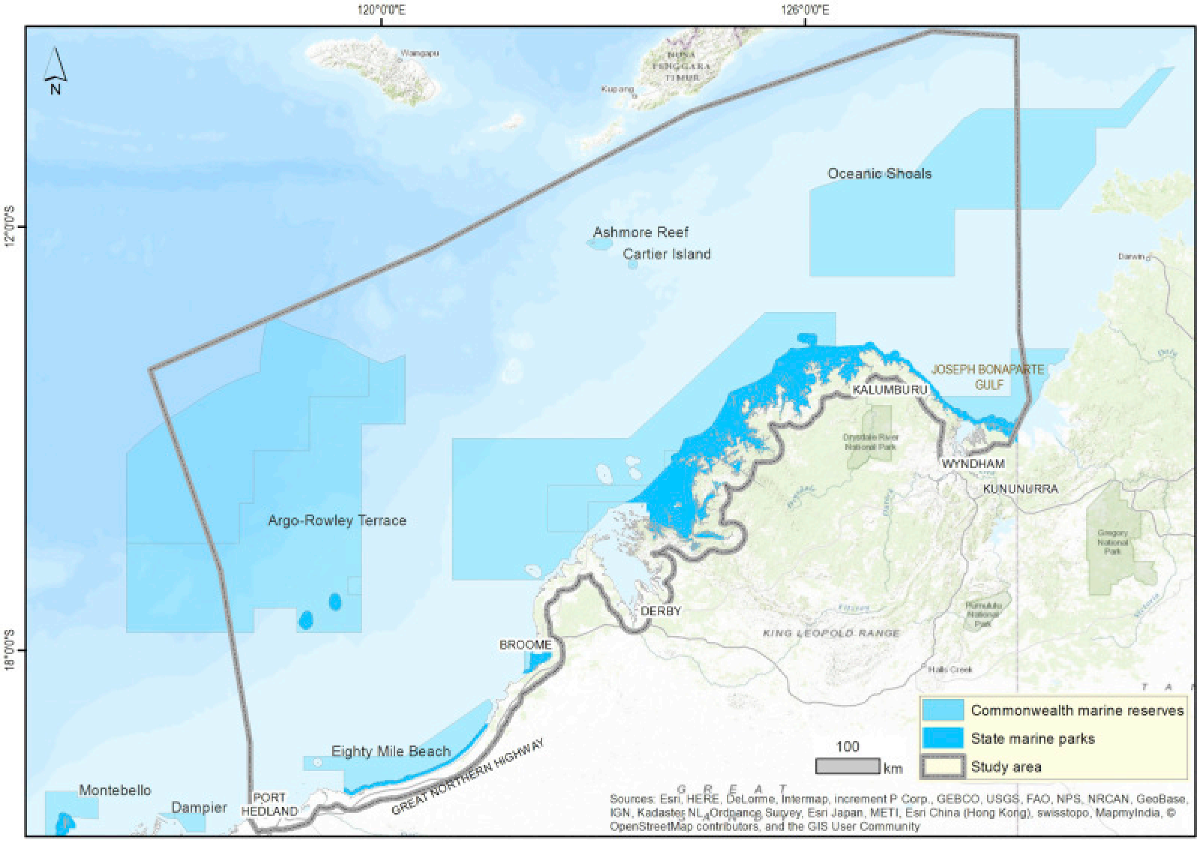

Fig. 2. PPGIS mapping interface showing values and preferences associated with the Kimberley coast.

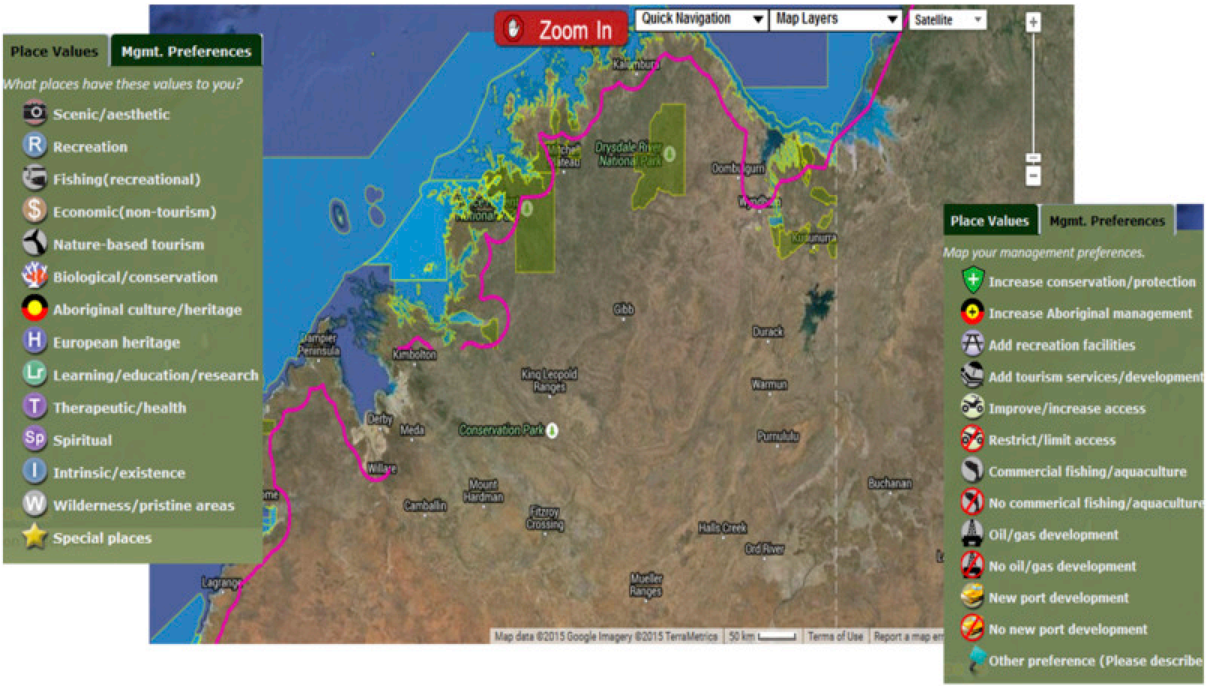

Fig. 3. Normalized kernel density map depicting differences between resident and non-resident mapping for a) recreation values b) recreational fishing values c) scenic/aesthetic values and d) preference to increase or improve access. Red areas indicate higher mapping densities for non-residents over residents while blue areas indicate higher resident mapping densities compared to non-residents. Kernel densities are displayed with a 0.5% clip in the histogram option. The darker the color, the greater the difference. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

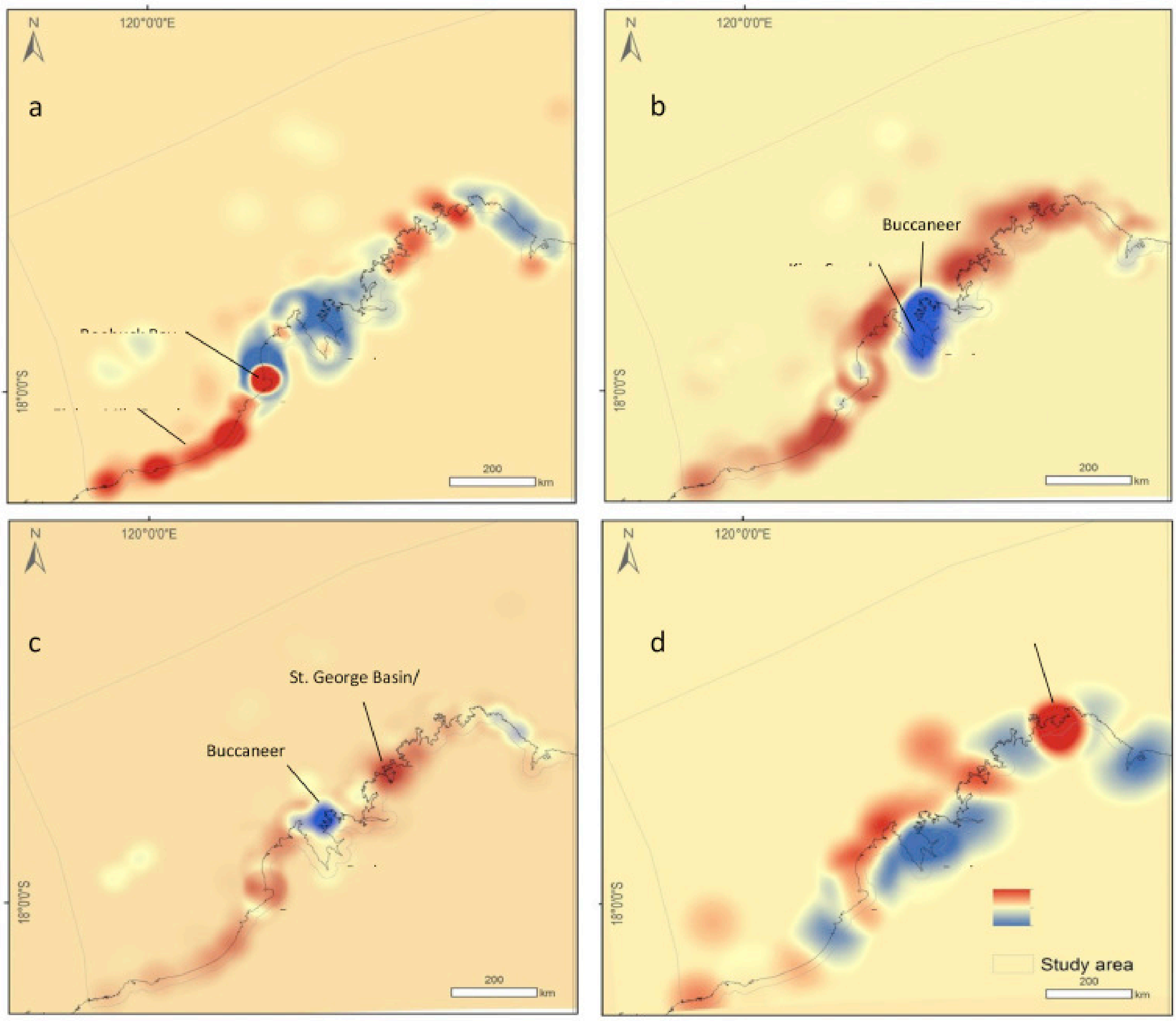

Table 1. Respondent characteristics as a total cohort and per category.

	Combined cohort (n = 578)	Panel (n = 206)	Public (n = 372)	Public residents (n = 118)	Public non-residents (n = 254)
Age (%)					
18–24	11	8	5	4	5
25–34	19	24	16	13	17
35–44	16	23	19	25	17
45–54	20	18	22	29	19
55–64	21	18	23	17	26
65–74	9	9	9	6	11
75–84	2	0	3	3	3
Unspecified	2	0	3	3	2
Gender (%)					
Male	47	63	53	65	47
Female	52	37	46	34	52
Unspecified	1	0	1	1	1
Indigenous (%)	2	1	3	6	1
Highest level of education completed (%)					
Primary	1	0.5	1.5	2	1
Secondary	12	18	8	11	7
Some tertiary	14	15	13	11	14
Undergraduate/Bachelor degree	30	32	29	34	27
Vocational/technical training	17	22	15	26	10
Postgraduate degree	25	12.5	32	15	39
Unspecified	1	0	1.5	1	2

Table 2. Comparison of characteristics of survey respondents.

	Environmental orientation (environmental priority = lower scores, economic priority = higher scores)	**Level of knowledge (higher scores = higher self-rated knowledge of study region)**	**Level of knowledge**	**Ease of access**
Public (n = 372)	Mean = 2.40	Mean = 3.51	Good (+)	Not significant
Panel (n = 206)	Mean = 3.07	Mean = 2.56	Poor (+)	Not significant
Test statistic	t-stat = −5.21*	t-stat = 11.23*	χ^2 = 119.59*	Not significant
Resident (n = 118)	Mean = 2.78	Mean = 3.80	Excellent (+)	Easy (+)
Non-resident (n = 254)	Mean = 2.23	Mean = 3.37	Average (+)	Difficult (+)
Test Statistic	t-stat = 3.44*	t-stat = 4.71*	χ^2 = 22.65*	χ^2 = 28.26*

*Denotes associated p-value < 0.05 (+) indicates more individuals in the respondent cohort group selected this option than respondents not in the cohort.

Table 3. Comparison of mapping intensity (mean number of value markers) by respondent category. Significant mean differences ($p < 0.05$) are highlighted in green (public/panel) and orange (resident/non-resident cohorts). The relative importance of the value to the respondent group was rank-ordered based on the number of individuals (N) mapping one or more the values.

Value	Category	N	Mean	SD	T-stat
Scenic/aesthetic	Public (1)	293	7.23	8.51	5.33*
	Panel (1)	142	3.85	4.67	
	Resident (2)	95	9.37	9.82	2.77*
	Non-resident (1)	198	6.20	7.61	
Recreation	Public (3)	234	4.91	5.74	3.20*
	Panel (4)	122	3.04	4.12	
	Resident (3)	89	6.11	6.29	2.53*
	Non-resident (6)	145	4.18	5.25	
Recreational fishing	Public (6)	225	7.47	10.24	4.60*
	Panel (3)	127	3.57	5.69	
	Resident (1)	99	10.79	12.79	4.19*
	Non-resident (7)	126	4.87	6.66	
Economic (non-tourism)	Public (11)	113	2.85	2.94	-0.27
	Panel (8)	73	2.86	3.78	
	Resident (10)	36	2.94	3.11	0.23
	Non-resident (10)	77	2.81	2.88	
Nature-based tourism	Public (2)	252	5.56	7.03	4.90*
	Panel (2)	135	3.00	3.20	
	Resident (4)	77	6.65	8.62	1.45
	Non-resident (2)	175	5.07	6.16	
Biological/conservation	Public (5)	229	10.42	18.38	4.14*
	Panel (7)	88	3.92	9.32	
	Resident (7)	60	10.93	20.85	0.25
	Non-resident (4)	169	10.24	17.48	
Aboriginal culture/heritage	Public (7)	223	7.83	12.95	3.87*
	Panel (6)	109	3.76	6.19	
	Resident (5)	69	9.88	18.55	1.26
	Non-resident (5)	154	6.90	9.36	
European heritage	Public (10)	115	3.12	4.23	2.09
	Panel (9)	65	2.08	2.47	
	Resident (9)	39	2.36	2.23	1.82
	Non-resident (11)	76	3.51	4.92	
Learning/education/research	Public (8)	131	3.01	3.58	3.73*
	Panel (9)	65	1.66	1.45	
	Resident (8)	41	2.76	2.90	-0.54
	Non-resident (8)	90	3.12	3.86	
Therapeutic/health	Public (14)	34	1.82	1.49	1.72
	Panel (12)	37	1.32	0.85	
	Resident (14)	10	1.90	1.73	0.19
	Non-resident (14)	24	1.79	1.41	
Spiritual	Public (13)	80	2.89	4.08	2.84*
	Panel (11)	48	1.52	1.09	
	Resident (13)	20	4.60	6.64	1.45
	Non-resident (13)	60	2.32	2.59	
Intrinsic/existence	Public (12)	88	3.76	4.00	2.89*
	Panel (14)	23	2.13	1.77	
	Resident (12)	22	3.59	8.35	-0.23
	Non-resident (12)	66	3.82	4.02	
Wilderness/pristine areas	Public (3)	234	6.15	7.19	5.77*
	Panel (5)	113	2.89	3.32	
	Resident (6)	65	7.17	8.35	1.35
	Non-resident (3)	169	5.76	6.68	
Special places	Public (9)	117	2.92	6.46	1.37
	Panel (13)	36	1.44	0.77	
	Resident (11)	33	4.61	11.46	1.17
	Non-resident (9)	84	2.26	2.49	

N = total number of respondents that placed one or more markers

* denotes associated p-value < 0.05

Table 4. Comparison of mapping intensity (mean number of preference markers) by respondent category. Significant mean differences ($p < 0.05$) are highlighted in green (public/panel) and orange (resident/non-resident). The relative salience of the preference to the respondent group was rank-ordered based on the number of individuals (N) mapping one or more the preferences.

Preference	Category	N	Mean	SD	T-stat
Increase conservation/protection	Public (1)	176	8.37	11.67	2.34*
	Panel (1)	63	4.62	8.51	
	Resident (1)	52	7.23	8.04	-0.84
	Non-resident (1)	124	8.85	12.89	
Increase Aboriginal management	Public (4)	99	5.81	8.21	2.82*
	Panel (5)	42	2.81	4.37	
	Resident (6)	28	4.54	4.35	-0.97
	Non-resident (4)	71	6.31	9.28	
Add recreational facilities	Public (8)	70	2.53	2.69	0.46
	Panel (4)	44	2.30	2.61	
	Resident (4)	31	2.16	1.92	-1.02
	Non-resident (9)	39	2.82	3.16	
Add tourism services/development	Public (6)	81	2.38	2.12	0.33
	Panel (2)	47	2.21	3.65	
	Resident (9)	23	2.13	1.60	-0.67
	Non-resident (6)	58	2.48	2.30	
Improve/increase access	Public (9)	68	2.97	3.18	2.67*
	Panel (8)	32	1.78	1.26	
	Resident (7)	26	4.04	4.03	1.99*
	Non-resident (8)	42	2.31	2.33	
Restrict/limit access	Public (7)	74	3.11	3.24	3.20*
	Panel (11)	28	1.57	1.57	
	Resident (10)	20	2.55	2.33	-0.90
	Non-resident (7)	54	3.31	3.51	
Commercial fishing/aquaculture	Public (11)	47	2.83	3.55	2.59*
	Panel (7)	33	1.39	1.16	
	Resident (11)	17	3.53	3.95	1.02
	Non-resident (10)	30	2.43	3.31	
	Public (3)	108	6.09	8.60	2.57

Table 4 (cont)

No commercial fishing/aquaculture	Panel (6)	36	3.25	4.40	
	Resident (3)	41	8.10	11.83	1.64
	Non-resident (5)	67	4.87	5.56	
Oil/gas development	Public (12)	34	2.82	3.89	1.16
	Panel (8)	32	1.91	2.30	
	Resident (12)	13	2.77	1.92	-0.60
	Non-resident (12)	21	2.86	4.77	
No oil/gas development	Public (2)	148	9.43	17.75	3.89*
	Panel (3)	45	3.24	4.25	
	Resident (2)	45	7.47	10.42	-0.89
	Non-resident (2)	103	10.29	20.13	
New port development	Public (10)	53	1.51	0.93	2.29*
	Panel (10)	31	1.16	0.45	
	Resident (5)	30	1.47	0.77	-0.38
	Non-resident (11)	23	1.57	1.21	
No new port development	Public (4)	99	4.31	8.49	1.27
	Panel (11)	28	2.25	2.41	
	Resident (8)	25	2.88	3.53	-0.98
	Non-resident (3)	74	4.80	9.58	
Other preference	Public (13)	14	1.71	1.07	0.27
	Panel (13)	2	1.50	0.71	
	Resident (13)	9	1.89	1.27	0.81
	Non-resident (13)	5	1.40	0.55	

N = total number of respondents that placed one or more markers

* denotes associated p-value < 0.05

Table 5. Propensity to map particular values and preferences by respondent category (significant p-values of chi-square association less than 0.05 are reported).

Category	Value	Preference
Public	Scenic/aesthetic (+) 0.009	Increase conservation/protection (+) 0.000
	Biological/conservation (+) 0.000	No commercial fishing (+) 0.002
	Intrinsic/existence (+) 0.000	No oil/gas development (+) 0.000
	Special place (+) 0.000	No new port development (+) 0.000
Panel	Therapeutic (+) 0.002	Oil/gas development (+) 0.021
Resident	Recreation (+) 0.001	Add recreation facilities (+) 0.012
	Recreational fishing (+) 0.000	New port development (+) 0.000
		Other (+) 0.008
Non-resident	Biological/conservation (+) 0.004	
	Wilderness/pristine area (+) 0.033	