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Value orientations toward coral reefs in recreation and tourism settings: a conceptual and measurement approach

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This paper examines recreationist and tourist value orientations toward coral reefs (e.g. protection–use, biocentric-anthropocentric), tests a scale for measuring these orientations in recreation and tourism settings, groups individuals based on their orientations and examines demographic and activity differences among groups. Data were obtained from surveys of 2821 users at three coastal and marine sites in Hawai`i. Belief statements about reefs (e.g. "coral reefs have value whether humans are present or not") were used to measure value orientations. Users agreed with protectionist and disagreed with use-oriented beliefs. Except for one statement ("humans should manage coral reefs so that humans benefit"), the scale provided a reliable and valid measure of value orientations toward reefs. Respondents were grouped into three subgroups (strong protection, moderate protection, mixed protection–use). The largest number of users had strong protectionist orientations toward reefs, and there was no group possessing only use orientations. There were no relationships between value orientations and site, age and residence. Females, snorkelers and sunbathers had stronger protectionist orientations, whereas most scuba divers and anglers had mixed orientations. Given that most respondents had protectionist orientations, efforts to conserve reefs would be supported, whereas activities with deleterious effects on reefs would not be widely supported.

Keywords: coastal recreation and tourism; coral reefs; demographics; validity and reliability; value orientations

Introduction

Coral reefs are one of the most ecologically diverse, valuable and productive systems on this planet, and the global decline in the health of coral reefs is an important conservation concern (Bellwood, Hughes, Folke, & Nystrom, 2004; Dearden, Bennett, & Rollins, 2006, 2007; Friedlander et al., 2005). Threats to coral reefs and reef species include climate change and coral bleaching, disease, coastal development and runoff, pollution, trade in coral and live reef species, ship groundings and anchor damage, overharvesting, marine debris and trash, aquatic invasive species and oil and gas exploration (Bellwood et al., 2004; Briggs, 2005; Friedlander et al., 2005; Hodgson, 2000). Underlying many of these threats is the reality that immediate social and financial returns from destructive practices often outweigh potential long-term benefits of coral reef conservation and protection (Dearden et al., 2006).

A number of studies have demonstrated that recreation and tourism activities such as scuba diving and snorkeling are another threat to coral reefs because touching and standing on reefs can cause damage such as coral breakage, abrasion and mortality (e.g. Barker &

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Roberts, 2004; Hawkins et al., 1999; Rodgers & Cox, 2003; Rouphael & Hanafy, 2007; Tratalos & Austin, 2001). Many of these and other studies have discussed the need for future research to examine why some recreationists and tourists engage in these depreciative behaviors and if these individuals understand and care about the fragility of reefs and other aspects of the marine environment (e.g. Leujak & Ormond, 2007; Rouphael & Inglis, 2002; Uyarra, Watkinson, & Cote, 2009). User awareness and behavior in recreation and tourism settings can be influenced by evaluations of specific conditions and experiences, which are shaped by value orientations, norms, attitudes and other cognitions (Manfredo, Teel, & Bright, 2004; Needham & Rollins, 2009). It is important to understand and measure cognitions such as value orientations (e.g. protection–use, biocentric-anthropocentric) because they can influence behavior such as coral trampling and predict support of, and receptivity toward, management responses for mitigating impacts. Little is known, however, about value orientations toward coral reefs in recreation and tourism settings. This paper, therefore, examines recreationist and tourist value orientations toward reefs, tests the reliability and validity of a scale for measuring these orientations, groups individuals based on their value orientations and examines demographic and activity differences among these groups.

Conceptual background

Recreationists and tourists are heterogeneous, exhibiting a range of skills, attitudes and behaviors (Needham, Vaske, Donnelly, & Manfredo, 2007). Given this diversity, researchers have emphasized the importance of grouping individuals into meaningful homogeneous subgroups to improve understanding of behavior and responses to natural resources (Bright, Manfredo, & Fulton, 2000; Vaske, Beaman, Stanley, & Grenier, 1996). Studies, for example, have differentiated between consumptive and nonconsumptive users (e.g. anglers versus wildlife viewers; Duffus & Dearden, 1990), experienced and less experienced users (Cole & Scott, 1999; Needham et al., 2007) and different demographic groups (e.g. male versus female, urban versus rural residency; Cordell, Bergstrom, Betz, & Green, 2004; Dougherty, Fulton, & Anderson, 2003; Zinn & Pierce, 2002). Studies have also grouped the public based on competing views among interest groups and citizen advocacy organizations (Needham & Rollins, 2005).

Participants in recreation and tourism activities have also been grouped according to their value orientations toward general objects or natural resources (Bright et al., 2000; Vaske & Needham, 2007). Value orientations (Kluckholn, 1951) refer to general classes of objects (e.g. wildlife, forests, coral reefs) and are revealed through the pattern, direction and intensity of basic beliefs (Fulton, Manfredo, & Lipscomb, 1996; Vaske & Donnelly, 1999). Value orientations toward wildlife, for example, have been reliably measured by asking individuals how strongly they identify with biocentric or protectionist belief statements (e.g. "wildlife should have equal rights as humans") and utilitarian or use beliefs about wildlife (e.g. "wildlife should be used by humans to add to the quality of human life"; Bright et al., 2000; Fulton et al., 1996). In most studies, these basic beliefs have reliably and consistently factored into value orientation continuums such as the protection–use continuum (Bright et al., 2000; Dougherty et al., 2003; Fulton et al., 1996; Vaske & Needham, 2007) and the biocentric-anthropocentric continuum (Shindler, List, & Steel, 1993; Steel, List, & Shindler, 1994; Vaske & Donnelly, 1999). An anthropocentric or use orientation reflects human-centered or utilitarian views of the nonhuman world (Eckersley, 1992). This approach assumes that providing for human use and benefit is the primary goal of natural resource allocation and management regardless of whether uses are for commodity (e.g. timber), aesthetic or physical (e.g. recreation) benefits. Natural resources

are viewed as materials to be used by humans, and there is little recognition that nonhuman aspects of nature are valuable in their own right or for their own sake (Scherer & Attig, 1983). A use orientation emphasizes the instrumental value of natural resources for humans rather than any inherent worth of these resources (Vaske, Donnelly, Williams, & Jonker, 2001).

A biocentric or protectionist value orientation is a more nature-centered approach. The value of ecosystems, species and natural resources is elevated to a prominent level (Eckersley, 1992). Human needs and desires are still important, but are viewed within a larger perspective. This approach assumes that environmental and natural resource objects have instrumental and inherent worth, and that human uses and benefits are not always the most important. In a natural resource management context, these inherent values are to be respected and preserved even if they conflict with human-centered values (Thompson & Barton, 1994; Vaske et al., 2001). Protectionist and use orientations are not mutually exclusive; they can be arrayed along a continuum with protectionist orientations at one end and use orientations at the other end; the midpoint represents a mix of these two extremes (Shindler et al., 1993; Vaske & Donnelly, 1999). Users arranged along this value orientation continuum can then be grouped into more meaningful homogeneous subgroups (Bright et al., 2000; Vaske & Needham, 2007).

Value orientations can predict higher-order cognitions such as attitudes and behavioral intentions (Fulton et al., 1996; Vaske & Donnelly, 1999). Although value orientations are related to these other cognitions, they are conceptually different. Like value orientations, for example, attitudes are also evaluations of an object. Attitudes, however, differ from value orientations in at least three ways. First, attitudes focus on positive or negative evaluations (i.e. affect, emotions), whereas value orientations are derived from basic beliefs (i.e. cognitions, thoughts). Second, an individual may hold thousands of attitudes, whereas value orientations are limited in number (e.g. protection–use, biocentric-anthropocentric). Third, attitudes have a more focused object than orientations. If the object, for example, is "favor or disfavor toward black bears in urban proximate areas", the evaluation is an attitude. By comparison, the object of a value orientation is more general, such as all wildlife in general (Eagly & Chaiken, 1993; Fishbein & Ajzen, 1975).

Studies have examined public value orientations toward forests (Steel et al., 1994; Vaske & Donnelly, 1999), wildlife (DeRuiter & Donnelly, 2002; Dougherty et al., 2003; Kellert, 1987; Manfredo, Pierce, Fulton, Pate, & Gill, 1999; Manfredo, Zinn, Sikorowski, & Jones, 1998; Vaske & Needham, 2007; Zinn, Manfredo, & Barro, 2002) and more general environmental issues (Bright, Barro, & Burtz, 2002; Dunlap & Van Liere, 1978; Kellert, 1993). Some of these studies have shown relationships between demographic characteristics and value orientations. People with a protection orientation, for example, are often more likely to be females and younger and live in more urban or developed areas (Manfredo, Teel, & Bright, 2003; Vaske et al., 2001).

Although there have been studies of use, attitudes and behavior of recreationists and tourists in coastal settings such as coral reefs (e.g. Dearden et al., 2006, 2007; Inglis, Johnson, & Ponte, 1999; Lankford, Inui, & Whittle, 2008; Leujak & Ormond, 2007; Lynch et al., 2004; Marion & Rogers, 1994; Shafer & Inglis, 2000; Sorice, Oh, & Ditton, 2007; Tonge & Moore, 2007; Uyarra et al., 2009), little research has specifically examined recreationist and tourist value orientations toward reefs. This paper addresses this knowledge gap because value orientations are useful for: (1) identifying diverse groups with different preferences and behaviors; (2) predicting attitudes and behavior associated with natural resource conservation and management; and (3) anticipating receptivity to, and polarization over, strategies that are designed to reduce or prevent damage to natural resources such as coral reefs (see Manfredo et al., 2004, and Needham & Rollins, 2009, for reviews).

Measuring value orientations toward coral reefs in recreation and tourism settings may provide an understanding of cognitive reasons why some recreationists and tourists engage in depreciative behaviors such as handling or standing on coral. This information may be able to assist managers in identifying target groups for information and education campaigns aimed at minimizing resource impacts.

It is possible that value orientations toward reefs may differ from orientations toward other natural resources such as wildlife and forests. Although previous research has examined the protection–use continuum, this research has typically focused on resources with a clear use component (see Manfredo et al., 2004 for a review). Wildlife, for example, can provide meat for people to eat and forests provide lumber for building houses and making paper. Although coral reefs are sites for occasional fishing and specimen collecting for aquariums, the direct use component for coral reefs is less obvious. It is possible, therefore, that the full range of value orientations along the protection–use continuum will not emerge in the context of coral reefs and that most groups of recreationists and tourists will reflect varying degrees of protectionist beliefs.

Research objectives

This paper has three primary objectives. First, it examines protection–use value orientations toward coral reefs among recreationists and tourists, and whether the protection–use continuum extends to reefs in this context. Second, it tests the reliability and validity of a scale that can be used in onsite surveys for measuring these value orientations toward coral reefs in recreation and tourism settings. Third, it groups users based on their value orientations and then examines demographic and activity differences among these groups to identify characteristics of groups who hold different value orientations toward coral reef areas.

Methods

Study sites

Data were obtained from summer users visiting one of three coastal sites on the island of O`ahu, Hawai`i: (1) Pūpūkea Marine Life Conservation District (MLCD), (2) Waikīkī Diamond Head Shoreline Fisheries Management Area (FMA) and (3) Kailua Beach Park (Figure 1). Pūpūkea MLCD is on the north shore of the island and includes three bays:

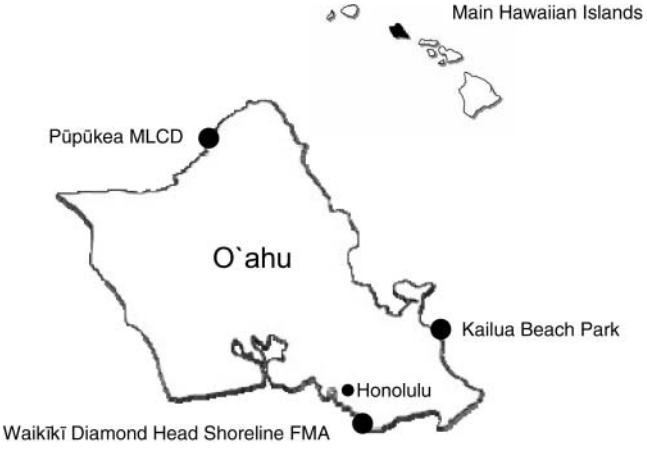

Figure 1. Map of three study sites on the island of O`ahu, Hawai`i.

Waimea Bay, Three Tables and Shark's Cove. Summer activities at this site include swimming, beach walking, snorkeling and scuba diving. Waikīkī Diamond Head Shoreline FMA is on the leeward south coast of the island and extends from the Waikīkī War Memorial Natatorium to Diamond Head Lighthouse. Popular areas for summer activities such as sunbathing, swimming and surfing are Sans Souci/Kaimana Beach and Diamond Head Beach. Kailua Beach Park is on the windward northeast coast of O`ahu and is renowned for its long sandy beach and turquoise waters. Summer activities at this site include sunbathing, swimming, beach walking, kayaking, kitesurfing, windsurfing and fishing. Although these sites have regulatory and jurisdictional differences in that they range from a state marine protected area to a county beach park, they are similar in terms of activities and facilities. Coral reefs are present at all three sites, although they are more prevalent and popular at Pūpūkea MLCD (Friedlander et al., 2005; Needham et al., 2008).

Data collection

Surveys were administered onsite to individuals at these three sites during two weeks in July 2007 and two weeks in August 2007. Travel use trends show only marginal seasonal variation in visitation to coastal and marine areas in Hawai`i (Friedlander et al., 2005). The surveys were four pages in length, addressed a variety of concepts and took respondents an average of 15 minutes to complete. To increase probability of achieving a representative sample of summer users, sampling was stratified and alternated so that surveys were administered at each site at least once for each day of the week and at least once for each of three time periods each day (8:00 am to 10:30 am, 11:30 am to 2:00 pm, 3:00 pm to 5:30 pm). Given that these sites are relatively popular, it was not feasible or necessary to survey every person encountered during the survey periods. Individuals were selected through a systematic random sampling procedure to reduce selection bias (e.g. one random individual selected from every 5th or 10th group depending on the size and popularity of the site; Vaske, 2008). In total, 3227 summer visitors were approached and 2821 of these individuals completed surveys onsite (overall response rate = 87%). Sample sizes were 975 at Pūpūkea MLCD (response rate = 93%), 925 at Waikīkī Diamond Head Shoreline FMA (response rate = 84%) and 921 at Kailua Beach Park (response rate = 85%). These sample sizes are similar and large enough to ensure a margin of error of $\pm 3\%$ at each site, but no accurate data exist on actual use levels at each site to determine if these sample sizes are proportional to visitation (Friedlander et al., 2005).

Survey variables used in analyses

An individual's value orientation toward coral reefs was constructed from four variables designed to measure protectionist basic beliefs and four variables measuring use beliefs. Users indicated their level of agreement with the following protectionist statements: (1) "coral reef areas should be protected for their own sake rather than to simply meet the needs of humans"; (2) "coral reef areas should have rights similar to the rights of humans"; (3) "recreational use of coral reef areas should not be allowed if it damages these areas"; and (4) "coral reef areas have value whether humans are present or not". The four variables measuring use beliefs were: (1) "humans should manage coral reef areas so that humans benefit"; (2) "the needs of humans are more important than coral reef areas"; (3) "recreational use of coral reef areas is more important than protecting the species that live there"; and (4) "the primary value of coral reef areas is to provide for humans". Variables

were measured on five-point recoded scales of −2 "strongly disagree" to +2 "strongly agree" and, with the exception of context (coral reefs), are identical to those in studies of value orientations toward wildlife and forests (Fulton et al., 1996; Vaske & Donnelly, 1999).

Three demographic characteristics and two activity-related variables were also recorded. The two activity-related variables were site (Pūpūkea MLCD, Waikīkī Diamond Head Shoreline FMA, Kailua Beach Park) and the main activity in which users participated at the site (e.g. swimming/sunbathing, snorkeling, scuba diving, fishing). The three demographic variables were gender, age and location of residence.

Data analyses

Measurement reliability of the eight belief statements measuring value orientations toward coral reefs was examined using Cronbach alpha reliability coefficients. Measurement reliability is defined as the internal consistency among variables and means that multiple items measure the same concept (i.e. variables intercorrelate with each other; Vaske, 2008). An alpha coefficient greater than or equal to 0.65 and item total correlations greater than or equal to 0.40 indicate that variables are reliably measuring their respective orientation and are measuring the same concept, and justifies combining them in further analyses (Cortina, 1993, Nunnally & Bernstein, 1994). Item total correlations represent correlations between the response to a given variable and sum of other variables associated with the orientation (Cortina, 1993; Vaske, 2008).

Construct validity of these belief statements measuring the two latent dimensions/factors of value orientations toward reefs (i.e. protection, use) was assessed using confirmatory factor analysis (CFA), which tested the extent that variables measuring each of these two first-order factors provided a good fit. Construct validity refers to the way that variables and concepts relate to each another within a system of theoretical relationships, and is demonstrated if protectionist belief statements are explained by the latent protectionist orientation and statements related to use of coral reefs are explained by the latent use orientation (Vaske, 2008). EQS 6.1 software and Satorra–Bentler robust estimation to correct for multivariate nonnormality were used for the CFA because data skewness and kurtosis indicated violations of the normal distribution assumption (Byrne, 1994; Chou & Bentler, 1995). CFA generates factor loadings for variables and model fit indices. Factor loadings for variables should be greater than or equal to 0.40 to be retained in an orientation or index (Vaske, 2008). Robust corrected comparative fit index (CFI*), nonnormed fit index (NNFI*) and root mean square error of approximation (RMSEA*) assessed model fit (*denotes robust corrected estimation and indices). CFI* and NNFI* values equal to or greater than 0.90 and RMSEA* values equal to or less than 0.08 suggest acceptable CFA model fit (Browne & Cudeck, 1993; Byrne, 1994; Chou & Bentler, 1995).

K-means cluster analysis was then performed on the belief variables to group respondents based on their value orientations toward reefs in recreation and tourism settings. Cluster analysis classifies individuals into smaller, more homogeneous groups based on patterns of responses across variables or scales (Hair & Black, 2000). Bivariate analyses (e.g. χ^2) then compared demographic and activity characteristics among the value orientation groups. Cramer's V effect sizes were reported where appropriate. Effect size statistics indicate the strength of relationships between independent and dependent variables, are standardized estimates of the magnitude of these variable relationships and are influenced

less by sample size than tests for statistical significance (Cohen, 1988; Vaske, 2008). SPSS 17.0 software was used for these analyses.

Results

On average across the sites, respondents agreed with the protectionist variables and disagreed with the use oriented variables (Table 1). For example, respondents agreed most strongly with the belief statement that "coral reef areas have value whether humans are present or not" and disagreed most strongly with the statement that "the primary value of coral reef areas is to provide for humans". The alpha reliability coefficients were 0.76 for the use orientation and 0.74 for the protectionist orientation, suggesting that variables for each reliably measured their respective orientation (Table 1). All variables in the protectionist scale and all but one in the use scale ("humans should manage coral reef areas so that humans benefit", item total correlation = 0.33) met the criterion of item total correlations being greater than or equal to 0.40 (Nunnally & Bernstein, 1994; Vaske, 2008). Deletion of any variable from the protectionist scale did not improve reliability of this orientation, but deletion of the item "humans should manage coral reef areas so that humans benefit"

Table 1. Reliability analyses of protectionist and use value orientations toward coral reefs.

Orientations and variables	Item code	Mean[a]	Standard deviation[a]	Item total correlation	Alpha (α) if deleted	Cronbach alpha (α)
Use orientation[b]						0.76
The primary value of coral reef areas is to provide for humans.	V_1	−1.20	1.03	0.64	0.63	
Recreational use of coral reef areas is more important than protecting species that live there.	V_2	−1.13	1.08	0.61	0.66	
The needs of humans are more important than coral reef areas.	V_3	−1.09	1.07	0.53	0.75	
Protectionist orientation						0.74
Coral reef areas have value whether humans are present or not.	V_4	1.40	0.83	0.52	0.67	
Coral reef areas should be protected for their own sake rather than to meet the needs of humans.	V_5	1.26	0.94	0.55	0.66	
Recreational use of coral reef areas should not be allowed if it damages these areas.	V_6	0.98	1.01	0.53	0.66	
Coral reef areas should have rights similar to the rights of humans.	V_7	0.58	1.18	0.51	0.69	
Overall value orientation index						0.78

[a] Variables measured on five-point recoded scales of −2 "strongly disagree" to +2 "strongly agree".
[b] The variable "humans should manage coral reef areas so that humans benefit" was removed from the use orientation scale due to poor reliability. Statistics in this table represent results with this variable dropped from the analyses.

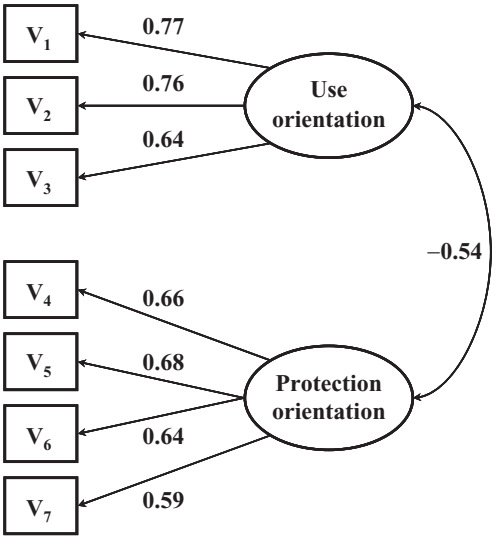

Figure 2. CFA of value orientations toward coral reefs. *Note*. See Table 1 for variables/items corresponding to codes (e.g. V_1). All loadings significant at $p < 0.001$. Model fit indices: NNFI* = 0.94, CFI* = 0.97 and RMSEA* = 0.06. The variable "humans should manage coral reef areas so that humans benefit" was removed from the use orientation scale due to poor reliability (Table 1), a decision confirmed by CFA because the factor loading was 0.37 (below 0.40) and the model significantly improved after this variable was deleted, $\Delta\chi^2_{(\text{model 1 [retained] versus model 2 [dropped]})} = 38.67$, $p < 0.001$. Ancillary analysis involving a principal components exploratory factor analysis (EFA) with varimax rotation supported these CFA results. EFA extracted two factors from the belief statements, explaining 61.3% of the total variance. Variables in factor 1 were the protectionist beliefs (variance explained = 31.8%, eigenvalue = 2.22, loadings = 0.70–0.75). Factor 2 contained the use beliefs (variance explained = 29.5%, eigenvalue = 2.07, loadings = 0.73–0.85). The EFA results did not differ among the three sites.

from the use orientation scale substantially improved reliability, so it was removed from the analysis (reliability increased from 0.70 to 0.76 by deleting this variable). Reliability of the final seven-item overall value orientation scale was high at 0.78. These descriptive and reliability results did not differ substantively among the three sites.

CFA demonstrated that the data provided an acceptable model fit and supported the construct validity of the value orientation measures (Figure 2). Factor loadings met the criterion of being greater than or equal to 0.40 (Hair & Black, 2000), as they ranged from 0.64 to 0.77 for the use orientation and 0.59 to 0.68 for the protectionist orientation. All loadings were statistically significant at $p < 0.001$ and fit indices were strong (CFI* = 0.97, NNFI* = 0.94, RMSEA* = 0.06). Consistent with results of the reliability analysis, deletion of the variable "humans should manage coral reef areas so that humans benefit" was supported by the CFA because the factor loading of 0.37 was below 0.40 and the chi-square difference test showed that the model improved significantly after this variable was removed, $\Delta\chi^2_{(\text{model 1 [retained] versus model 2 [dropped]})} = 38.67$, $p < 0.001$. These CFA results did not differ substantively among the three sites.

Having demonstrated the factor structure, reliability and construct validity of variables used to measure value orientations toward coral reefs in recreation and tourism settings, K-means cluster analysis was then performed on these variables to group respondents. A series of two- to six-group cluster analyses showed that a three-group solution provided the best

Table 2. Bivariate differences in demographic and activity characteristics among value orientation groups.

Characteristics	Cluster groups[a] Mixed protection–use	Moderate protection	Strong protection	Total	χ^2 value	p value	Cramer's V effect size
Gender					82.13	<0.001	0.18
Female	14	35	51	57			
Male	27	38	35	43			
Age[b]					5.53	0.063	0.05
Less than 40 years	21	37	42	56			
40 years or older	18	35	47	44			
Residence					8.21	0.084	0.04
Hawai`i	21	35	44	55			
Rest of USA	18	39	44	37			
International	17	36	48	9			
Site					4.07	0.397	0.03
Pūpūkea	21	37	42	35			
Waikīkī Diamond Head	19	35	47	33			
Kailua	20	36	44	33			
Main activity					23.78	0.002	0.07
Sunbathing/swimming	18	36	46	71			
Snorkeling	18	39	43	14			
Board sports (surf, windsurf)	25	36	40	12			
Scuba diving	20	51	29	3			
Fishing	48	29	24	1			

[a]Cell entries are percentages (%).
[b]Dichotomous groups based on median split.

fit for the data. To validate this solution, data were randomly sorted and a cluster analysis was conducted after each of four random sorts. These additional analyses supported the solution identifying three distinct groups of individuals, labeled: (1) mixed protection–use orientation (cluster 1), (2) moderate protection orientation (cluster 2) and (3) strong protection orientation (cluster 3). These groups were compared in terms of their responses to the original value orientation belief statements. Respondents with a mixed protection–use orientation (cluster 1) reported the lowest mean scores on all protectionist variables and the highest scores on all use oriented variables; those with a strong protection orientation (cluster 3) had the highest scores on all protectionist variables and the lowest scores on all use-oriented variables and responses from those with a moderate protection orientation (cluster 2) fell in between these two groups. This pattern reflects a value orientation continuum. The largest percentage of respondents was classified in the strong protection orientation group (cluster 3 = 44%, $n = 1101$) followed by the moderate protection group (cluster 2 = 36%, $n = 904$). The fewest users were in the mixed protection–use orientation group (cluster 1 = 20%, $n = 494$). The cluster analysis did not identify any discernable group of individuals who possessed only use orientations toward coral reef areas.

Relationships between respondent value orientations and demographic and activity characteristics are shown in Table 2. In total, a slight majority of respondents were female (57%), younger than 40 years of age (56%) and residents of Hawai`i (55%). The largest proportion of respondents (71%) was sunbathing or swimming at the sites. Females were

more likely than males to hold strong protectionist orientations toward reefs (51% of females, 35% of males), whereas males were more likely than females to hold mixed protection–use orientations (27% of males, 14% of females). This relationship between value orientations and whether respondents were male or female was statistically significant, $\chi^2(2, N = 2413) = 82.13$, $p < 0.001$. The Cramer's V effect size was 0.18. Using guidelines from Cohen (1988) and Vaske (2008), this suggests that the strength of this difference between males and females can be described as "weak to medium" or "minimal to typical" respectively. Younger respondents were slightly less likely to hold stronger protectionist orientations toward reefs, but this relationship between age and value orientations was "weak" and not statistically significant, $\chi^2(2, N = 2376) = 5.53$, $p = 0.063$, $V = 0.05$. There was also no relationship between location of residence (e.g. Hawai`i, international) and value orientations toward reefs, $\chi^2(4, N = 2390) = 8.21$, $p = 0.084$, $V = 0.04$.

The percentages of users classified in each of the three value orientation groups did not differ among the three sites, $\chi^2(4, N = 2499) = 4.07$, $p = 0.397$, $V = 0.03$ (Table 2). Value orientations toward coral reefs, however, did differ among main activity groups. The largest activity group, swimmers and sunbathers, were most likely to hold strong protectionist orientations toward reefs (46%). Although fishing was not a popular summer activity at any of the sites in 2007, anglers were least likely to hold strong protectionist orientations (24%) and were most likely to have mixed protection–use orientations (48%). Interestingly, snorkelers were more likely to hold stronger protectionist orientations toward coral reefs (43%) than scuba divers (29%); the majority of scuba divers had a moderate protection orientation (51%). These differences in orientations among activity groups were statistically significant, but the effect size was "minimal" or "weak", $\chi^2(8, N = 2445) = 23.78$, $p = 0.002$, $V = 0.07$ (Vaske, 2008).

Discussion

The objectives of this paper were: (1) to examine protection–use value orientations toward coral reefs among recreationists and tourists and whether the protection–use continuum extends to reefs in this context; (2) to test the reliability and validity of a scale that can be used in onsite surveys for measuring these orientations toward reefs in recreation and tourism settings; and (3) to group users based on their orientations and examine demographic and activity differences among groups to identify characteristics of people with different value orientations. Results showed that respondents agreed with protectionist and disagreed with use-oriented variables. Reliability and confirmatory factor analyses revealed that except for one variable ("humans should manage coral reef areas so that humans benefit"), the scale measuring value orientations toward coral reefs was valid and reliable. Cluster analysis grouped respondents into three orientation subgroups (strong protection, moderate protection, mixed protection–use). The largest number of users had strong protectionist orientations and there was no group with only use orientations toward reefs. There were no relationships between value orientations and site, age and residence. Females, snorkelers and swimmers/sunbathers had stronger protectionist orientations, whereas scuba divers and anglers were more likely to have mixed protection–use or moderate protection orientations toward reefs. These findings have implications for management and future research.

Management implications

From a management perspective, users were somewhat heterogeneous and exhibited a range of value orientations toward coral reefs. Although the largest proportion of respondents at

all three sites had strong protectionist orientations, many respondents had more moderate protectionist or mixed protection–use orientations. Value orientations are important because they can be determinants of more specific attitudes that, in turn, can help to explain patterns of human intentions and behaviors toward natural resources such as coral reefs (Fishbein & Ajzen, 1975; Fulton et al., 1996). If people have a use orientation toward reefs, for example, they may be less concerned about the health of the resource and more inclined to engage in depreciative behaviors such as touching or disturbing coral and reef species. Results showed that males and people who were scuba diving and fishing were less likely to have strong protectionist orientations toward reefs, so managers seeking to encourage conservation-related behaviors may want to consider targeting these groups with information and education messages that aim to promote environmentally responsible behavior (Briggs, 2005). Not all users behave in the same manner, so information about value orientations is useful for understanding subgroups of participants who may participate in depreciative behaviors and why they might engage in these behaviors.

A large number of studies have documented biophysical impacts on coral reefs (e.g. trampling, breakage) associated with depreciative behaviors of scuba divers and snorkelers (e.g. Barker & Roberts, 2004; Hawkins et al., 1999; Rodgers & Cox, 2003; Rouphael & Hanafy, 2007; Rouphael & Inglis, 2002; Tratalos & Austin, 2001). Results of this study, however, showed that most recreationists and tourists had strong protectionist orientations toward reefs, so it would seem that these impacts should be nearly absent. It is interesting that these users had a strong appreciation and protectionist orientation toward coral reefs, yet there is extensive literature showing that users continue to damage coral reefs. Although depreciative behaviors and impacts do occur when scuba divers and snorkelers touch or stand on coral, these actions may not be intentional or in line with their value orientations toward this resource. Managers, therefore, should continue efforts to educate users of the consequences of touching or standing on coral, and perhaps consider zoning areas to minimize direct contact with corals (Lück, 2008).

Understanding subgroups of recreationists and tourists and knowing the proportion of people who belong to each group can be useful for estimating possible reactions to these types of management actions (Vaske & Needham, 2007). Given that many users had strong protectionist orientations and others had more mixed protection–use orientations, not all users will respond in the same manner to changes in conditions and management at each site. The largest proportion of respondents, however, had strong protectionist value orientations toward coral reefs, suggesting that management decisions and uses that have deleterious effects on reef ecosystems are not likely to be widely supported at each site. There was also no clear group of users with only use orientations toward reefs, so it is likely that management efforts that attempt to conserve or protect marine resources such as coral reefs will be supported.

Although effecting change in support for management may be difficult to accomplish because value orientations are relatively stable over time, they should not be construed as never changing (Fulton et al., 1996). Research has shown that value orientations in many countries are changing slowly as societies are shifting to more protectionist or biocentric orientations toward natural resources (Dunlap & Van Liere, 1978; Inglehart, 1990; Manfredo et al., 2003). Value orientations are formed early in life and during socialization, so they are relatively stable and resistant to immediate change (Fulton et al., 1996). Shifts in orientations, therefore, may continue to occur only gradually (Manfredo et al., 2004). As a result, attempts to inform individuals with protectionist orientations toward coral reefs to consider adopting a favorable attitude and vote in support of actions that may be harmful to reefs are unlikely to be successful at this moment.

Research implications

From a research perspective, results were somewhat consistent with past research on value orientations toward other natural resources (e.g. wildlife, forests), but a few differences emerged, so considerations are offered to increase the generalizability of these findings and inform future research. First, an objective of this paper was to test the reliability and validity of a scale that can be used in onsite surveys for measuring value orientations toward coral reefs in recreation and tourism settings. In most previous studies of value orientations toward natural resources such as wildlife and forests, data were obtained from relatively long mail surveys (e.g. Fulton et al., 1996; Vaske & Needham, 2007). Respondent burden is of less concern in mail surveys, and as a result, scales used to measure value orientations in these studies contained upward of 40 belief statements. Onsite surveys, however, are typically shorter in length to minimize disruption to recreation and tourism experiences (Vaske, 2008). This study adopted a sample of belief statements used in past studies of value orientations toward wildlife and forests (e.g. Fulton et al., 1996; Vaske & Donnelly, 1999), and with the exception of context (coral reefs), they were identical to those in these earlier studies. Reliability and confirmatory factor analyses showed that the statements provided valid and reliable measures of value orientations toward reefs. It is important to recognize, however, that the eight belief statements asked and seven statements retained in the scales are only a partial sample of all possible beliefs that could be associated with value orientations toward coral reefs. In addition, the statement "humans should manage coral reef areas so that humans benefit" was not a valid or reliable variable. In human dimensions of wildlife studies, however, similar statements (e.g. "humans should manage wild animal populations so that humans benefit") have yielded relatively high factor loadings and measurement reliability (e.g. Fulton et al., 1996). Research is needed, therefore, to confirm these results in other marine areas and identify additional belief statements to improve understanding of value orientations toward reefs in recreation and tourism areas.

Second, consistent with past research (Bright et al., 2000; Vaske & Needham, 2007), cluster analysis results reflected a protection–use value orientation continuum and supported grouping respondents along this continuum from mixed protection–use to strong protection. This analysis, however, did not identify any discernable group of individuals who possessed only use orientations toward coral reefs. The full range of value orientations along the protection–use continuum, therefore, did not emerge in the context of reefs in recreation and tourism settings. It is possible that the variables used to measure value orientations influenced these findings, but these items have been used in many studies of value orientations toward other natural resources (e.g. wildlife, forests) and were simply modified for application to coral reefs (see Manfredo et al., 2004 for a review). A more probable explanation for these findings is that although research has examined the protection–use continuum relative to wildlife and forests, these resources have a more obvious use component with wildlife providing meat for human consumption and forests providing lumber for houses and paper. The use component for coral reefs is less obvious and this seems to be reflected in recreationist and tourist value orientations. Some research has also revealed additional value orientation dimensions (e.g. bequest and existence, appreciation, consumptive and nonconsumptive) that may make it more challenging to classify people along a single bipolar continuum (Fulton et al., 1996; Manfredo et al., 2003). Research is needed to confirm these findings and the extent that additional value orientation dimensions may be important in a marine context in general and in a coral reef context in particular.

Third, results showed that females were slightly more likely than males to have strong protectionist orientations toward coral reefs in recreation and tourism settings. This finding is consistent with public value orientations toward other natural resources (e.g. forests,

wildlife) in other settings (Manfredo et al., 2003; Vaske et al., 2001). In addition, activity groups such as anglers had weaker protectionist orientations and more mixed protection–use orientations toward reefs. This finding is also consistent with earlier research. Manfredo et al. (2003), for example, found that anglers were less likely to have protectionist values toward fish and wildlife. Somewhat contrary to research in other settings (e.g. Manfredo et al., 2003), however, younger respondents were slightly less likely to hold stronger protectionist orientations toward coral reefs, but this relationship between age and value orientations was insignificant and weak. Research is needed to confirm these findings in other coral reef environments.

Fourth, research has shown that value orientations predict attitudes, which can then influence intentions and behaviors (Fishbein & Ajzen, 1975; Vaske & Donnelly, 1999). The goal of this paper was not to test relationships between value orientations and higher order concepts in this cognitive hierarchy model. Rather, one objective was to develop and validate a scale to be used in onsite surveys for measuring value orientations toward coral reefs in recreation and tourism areas. Research should test path models of relationships among value orientations and other cognitions and behaviors in coastal and marine settings such as coral reefs.

Fifth, sites in this study included a state-managed marine protected area (Pūpūkea MLCD), a special resource use management area (Waikīkī Diamond Head Shoreline FMA) and a relatively unregulated county beach park (Kailua Beach). These sites are generally representative of the different coastal and marine recreation and tourism settings in Hawai`i, and could be considered along a continuum of management from an area protected and managed primarily for conservation purposes (Pūpūkea MLCD) to a beach park that is managed mostly for recreation use (Kailua Beach). Despite these regulatory and jurisdictional differences, value orientations were almost identical across sites. This suggests that perhaps user value orientations are not just stable over time, but they may be consistent across a range of coastal and marine settings. It is important to recognize, however, that this study only considered one stakeholder group – people visiting coastal recreation and tourism sites. Other stakeholders may hold different value orientations toward coral reefs. Future research should examine value orientations of other groups with a vested interest in coastal and marine resources such as managing agencies, first nations (e.g. native Hawaiians), community organizations and other special interest groups. Incorporation of multiple stakeholders will allow for a more complete understanding of similar or potentially competing value orientations toward coral reefs.

Finally, this study was conducted at three recreation and tourism sites on one of the main Hawaiian Islands. Across all sites, most respondents had protectionist value orientations toward coral reefs. This finding could be a function of the types of people who dominated each site; most were sunbathers, swimmers or snorkelers. Findings may not generalize to all coastal and marine environments, especially areas dominated by more consumptive uses such as recreational or subsistence fishing. The applicability of these findings to other activity groups and geographical areas remains a topic for further empirical investigation.

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