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Research Note

Specialization and Marine Based Environmental Behaviors Among SCUBA Divers

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The purpose of this study was to explore the relationship between recreation specialization and marine based environmental behaviors among SCUBA divers. Additionally, the study compared relationships with various types of environmental behaviors employing an overall multiple-item index and individual dimensions of recreation specialization (behavioral, cognitive and affective). Data (n = 370) were collected (May-September 2002) in the St. Petersburg/Sarasota region of southwest Florida, USA. Measures of environmental behaviors (16 items) and recreation specialization (17 items) were adapted from the literature. This study identified a positive association between the level of specialization and marine based environmental behaviors; as specialization in SCUBA diving increased, environmentally responsible behaviors also increased. In addition, individual specialization dimensions revealed more explanatory detail for the three distinct behavioral dimensions. Implications for further research and marine resource management are discussed.

KEYWORDS: *Environmental education, coral reefs, conservation, marine environment.*

Introduction

Coral reefs are a major attraction for SCUBA (Self Contained Underwater Breathing Apparatus) divers, and with the global growth in diving, concerns about the negative impacts of divers on the reefs has grown. It has been estimated that there are between 5-7 million active divers worldwide,

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and the United States alone accounts for between 1.6-2.9 million divers (Professional Association of Diving Instructors (PADI), 2005).

Recent accounts have projected that 60% of the world's reefs are currently under threat (Mastny, 2001), while 27% have already been lost (Status of the Coral Reefs of the World, 2000). Major tourist dependent communities that specialize in dive tourism have experienced substantial damages to their reefs due to heavy concentration of divers at certain sites (Hawkins & Roberts, 1994). In addition to visitor numbers, lack of technical competence in diving and inappropriate behaviors, such as direct physical contact, often lead to irreversible damages or death of the coral (Talge, 1993). However, the impact can be minimized with education and improvement in technical competence among divers, such as proper buoyancy control skills and finning techniques. Highly developed buoyancy control skills allow divers to direct their bodies and equipment in order to avoid contact with coral. Also, higher confidence levels and the ability to adapt to different diving situations, such as strong currents, poor visibility, or different diving environments, can reduce contact with marine environments. Through an observational study, Davis and associates (1995) found that more experienced divers made significantly less contact with the reef than less experienced divers whose buoyancy control is less developed. Similarly, Harriott, Davis, and Banks (1997) noted that a disproportionate amount of damage was caused by divers who had poor buoyancy control and finning techniques.

In addition to skill level, the lack of knowledge about the marine ecosystem and environmentally responsible behaviors all contribute to negative impacts. Environmental education about the marine ecosystem is fundamental in the promotion of responsible behavior. Education and behavioral instructions offered during pre-dive briefings by dive operators are usually brief and specific, but can have significant impacts on diver behaviors (Medio, Ormond, & Pearson, 1997; Townsend, 2000). Additional education aimed at creating an environmental ethic among divers has been instituted within the certification process by numerous diving organizations. Furthermore, certain destinations such as the Florida Keys Marine Sanctuary have been proactive with on-site education and interpretive programs (McCawley & Teaff, 1995).

Previous research suggests that level of skill and experience are major determinants of proenvironmental orientations among recreationists. Bryan's (1977) theory of recreation specialization underlies much of this research. Bryan (1977) defined recreation specialization as "a continuum of behavior from the general to the particular, reflected by equipment and skills used in the sport and activity setting preferences" (p. 175). Basically, as individuals increase their level of specialization within their respective activity, their attitudes, values and behaviors related to the activity may simultaneously change. Since the introduction of recreation specialization based on anglers, subsequent empirical research has examined a multitude of appreciative, consumptive and motorized activities (Scott & Shafer, 2001). Studies have examined differences with respect to various associated correlates, such as motivations (McFarlane, 1994), place attachment (Bricker & Kerstetter,

2000), perceived crowding (Graefe, Donnelly, & Vaske, 1986), recreation choice behavior (Kuentzel & Heberlein, 1992), and norms of depreciative behavior (Wellman, Roggenbuck, & Smith, 1982). Moreover, specialization theory has also been employed to examine recreationists' proenvironmental orientations (Dyck, Schneider, Thompson, & Virden, 2003; Katz, 1981; Kauffman, 1984; Mowen, Williams, & Graefe, 1997; Thapa, 2000).

Research on the relationship between recreation specialization and proenvironmental orientations generally supports Byran's (1977) propositions. Specifically, increases in the level of specialization have been associated with greater environmental concern and more emphasis on preservation of the natural setting. One of the earlier studies noted that anglers with high levels of activity involvement were more committed towards specific environmental issues (Katz, 1981). Chipman and Helfrich (1988) showed that more specialized anglers focused on non-consumptive use and supported regulations for resource protection. Among canoeists, highly specialized canoeists were more likely to report a higher sense of environmental concern (Kauffman, 1984). Mowen et al. (1997) suggested that highly specialized recreationists are more concerned with site-specific environmental issues than with general or broad environmental issues. In a recent study of mountaineers, highly specialized climbers were more aware of low impact practices, and subsequently showed more favorable attitudes towards such practices (Dyck et al., 2003).

Operationalization of the specialization construct has evolved from being a single item behavioral measure to multiple-item indexes that integrate the behavioral, cognitive, and affective components of recreation specialization. The traditional behavioral component emphasizes the level or frequency of participation as well as experience with the activity, while the cognitive component focuses on items such as level of knowledge, skill, and setting attributes. The affective (psychological) component centers on recreationists' attachment to the activity including the centrality of the activity to their lifestyle (Manning, 1999; McIntyre & Pigram, 1992; Thapa, 2000). Based on these underlying components, multiple-item indexes of recreation specialization have generally been employed, although differences in the individual components of specialization have also been examined (Bricker & Kerstetter, 2000; Kuentzel & Heberlein, 1997; 1992; Kuentzel & McDonald, 1992; Lee & Scott, 2004; McFarlane, 2004; Scott, Baker, & Kim, 1999). For example, Lee and Scott (2004) empirically supported the existence of three dimensions (behavior, commitment and skill and knowledge) of recreation specialization among birders utilizing confirmatory factor analysis. McFarlane (2004) examined three dimensions (affective, behavioral, and cognitive) of recreation specialization among vehicle-based campers, while Bricker and Kerstetter (2000) utilized four major dimensions (level of experience, skill level and ability, centrality to lifestyle, equipment and investment) to classify white water recreationists.

Kuentzel and McDonald (1992) tested the differential effects of three specialization dimensions (past experience, commitment, and lifestyle) on

participants' motives for participation, perceptions of crowding, and preferences for management actions. Their results showed different relationships between motivations and various specialization dimensions. Kerstetter, Confer, and Graefe (2001) further questioned the strategy of relying on a multidimensional measure of specialization to embrace the specialization concept. Since specialization is a multidimensional construct, each dimension should be individually examined, as combining the multiple measures into a composite index may lead to conceptual ambiguity of the construct.

The limited research among SCUBA divers has employed indicators of level of experience, such as number of dives completed in a lifetime, level of certification, or level of development (Todd, 2000; Todd, Cooper, & Graefe, 2000). For example, Todd et al. (2000) found that beginners were more likely to favor invasive management practices (e.g. implementation of fines for removal of artifacts), while advanced divers were more inclined to favor making divers responsible for their own actions. To our knowledge, other indices of recreation specialization have not been used to empirically examine SCUBA divers. Hence, the use of additional measures to represent different dimensions of the specialization construct offers potential for an improved assessment of diving involvement and proenvironmental orientations.

Although the literature has documented some degree of relationship between the level of specialization and environmental concern, the relationship to environmental behaviors is lacking, especially among SCUBA divers. With the growth of diving participation, additional research about divers and subsequent strategic managerial actions, such as educational and interpretive materials, zoning and restricting access is needed to protect fragile coral ecosystems. The purpose of this study was to further explore the relationship between recreation specialization and marine based environmental behaviors among SCUBA divers, and to compare the ability to predict environmental behaviors employing a multiple-item specialization index versus individual dimensions of recreation specialization.

Methods

Study Site and Selection of Subjects

The study site was the St. Petersburg/Sarasota area on the southwest Florida Gulf coast (USA), which offers an incredible diversity of underwater sites for divers of all interests and skill levels participating in various trips, such as safari tours (general site-seeing), wreck dives, night dives, treasure hunting (collecting of artifacts) and spear fishing. A major dive shop owned and operated by one of the largest corporate diving companies in the United States was chosen as the sampling site. A total of 422 divers were approached (10-minute voluntary survey) during the peak season between May-September, 2002 (58 days), and 370 agreed to complete the questionnaire (88% response rate).

Operationalization of Variables

Collectively, 16 marine based environmental behavior items were adapted from the literature (Thapa, 2000; Todd, 2000), and from environmental codes of conduct published by conservation organizations (Coral Reef Alliance and The International Ecotourism Society). Behaviors were self-reported and were very specific to SCUBA diving. The items were phrased as, "How often have you . . . ?" and measured using a 5-point Likert-type scale with 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Frequently, 5 = Usually.

Specialization was conceptualized and empirically tested as a multi-dimensional index and as individual dimensions (behavioral, cognitive and affective). A total of 17 items (adapted from Bricker & Kerstetter, 2000; Todd, 2000) were utilized to measure specialization. The first dimension addressed the behavioral component (5 items), including the respondent's level of experience and frequency of participation in SCUBA diving. The second dimension addressed the cognitive aspect (6 items), including certification level and self-reported skill level items such as confidence, buoyancy control, and knowledge and ability to adapt to different diving situations while SCUBA diving. Similar activity-specific items have also been utilized by previous researchers (Dyck, et al., 2003; Lee & Scott, 2004; McFarlane, 2004). The third dimension addressed the affective element (6 items), including four questions related to enduring involvement and two questions referring to centrality to lifestyle.

Data Analysis

The association between levels of specialization and environmental behaviors was tested with Pearson correlation coefficients (r). Correlations between the composite specialization index and the environmental behavioral dimensions as well as the individual dimensions of specialization and environmental behavioral dimensions were compared. In the final step of the analysis, multiple regression analysis was used to investigate the combined influence of the various dimensions of specialization on the different environmental behaviors. The purpose of this analysis was to identify which of the specialization dimensions were the most effective predictors of responsible environmental behaviors, as well as the cumulative effect of the various dimensions. Other variables were not included in this analysis, as the intent was to assess the various aspects of specialization rather than to build a comprehensive predictive model of environmental behaviors.

Results

Profile of Respondents

The majority (91%) of the respondents were Caucasian; males comprised 76% while 24% were females. About 40% of the respondents were

under 35 years old, and 34% were over the age of 46. Respondents were well educated as 34% had completed a four-year college education and 20% had attended graduate school. Similarly, respondents were fairly affluent with 25% reporting earning over $75,000, and 37% reporting between $45,000-$74,999. Almost 90% of the respondents were domestic visitors to Florida, representing 33 U.S. States, while about 10% were international visitors.

Environmental Behaviors

Overall, participants reported that they usually behaved in an environmentally responsible manner while diving. Principal component analysis with varimax rotation was employed for the marine based behavioral items. Following the factor analysis, three factors were identified explaining 49% of the total variance (two items were removed due to weak alphas) (see Table 1). The first factor (6 items) pertained to physical contact with aquatic marine life (*Contact Behavior*). The second factor (5 items) included other diving behavioral items (*General Diving Behavior*). The third factor (3 items) was educationally oriented (*General Educational Behavior*). Based upon the reliability analysis, the mean values of the items within each factor were computed into a composite index score for each factor.

Recreation Specialization

The majority of respondents (49%) were open water divers (entry level/basic diving certification), and the most popular dive-related activity was underwater photography. Frequency of diving participation was relatively high with 39% reporting completion of over 150 dives; 20% had dived over 31 times in the past 12 months, and 21% reported they had completed over 100 dives in the area. Almost 18% of the respondents had been involved with diving for over 20 years. Based on a 10-point scale, most respondents rated themselves 8 or higher on confidence level (67%), buoyancy control (71%), diving knowledge (50%) and ability to adapt to different diving situations (65%). Overall, 34% rated themselves at an intermediate level, while 30% felt they were advanced divers. Forty-five percent of respondents were certified by the Professional Association of Dive Instructors (PADI), and 34% by the National Association of Underwater Instructors (NAUI). The majority (86%) felt diving was one of the most enjoyable activities that they participated in. About 51% subscribed to a diving magazine, and 28% held membership in a dive club.

Since the specialization items included ordinal, interval and ratio measures, a composite additive specialization index was created using standardized responses (*z*-score transformations) for each item (see Chipman & Helfrich, 1988; Dyck, et al., 2003; Hopkin & Moore, 1995; Thapa, 2000; Virden & Schreyer, 1988; Wellman et al., 1982). Additionally, this process was repeated to create three index scores for the three specialization dimensions. Reliability analysis (Cronbach's alpha) was conducted for the individual and overall specialization constructs (see Table 2).

TABLE 1
Reliability Analysis for Marine Based Environmental Behavioral Dimensions

Questionnaire Items	Mean	SD[a]	Corrected Item Total Correlation	Alpha If Item Deleted
Contact Behavior[b]				
Touched shipwrecks, artifacts, or coral in order to examine them more closely[1,2,3]	3.75	1.2	0.58	0.66
Touched shipwrecks, artifacts or coral to take photos[2,3]	4.26	1.1	0.45	0.70
Stood or held on to coral for support[1]	4.57	0.8	0.60	0.66
Fed aquatic life while underwater[1]	4.20	1.1	0.44	0.70
Bought or collected coral/marine life/artifacts as a souvenir or for a private aquarium[1]	4.48	0.9	0.41	0.71
Ridden marine animals[1]	4.83	0.6	0.38	0.72
Overall Index Standardized Item Alpha = .74	***4.35***	***0.61***		
General Diving Behavior				
Anchored away from a wreck or on a mooring buoy[2,3]	3.10	1.6	0.50	0.62
Streamlined all equipment[1,2,3]	3.69	1.4	0.46	0.64
Used protective gloves/kneepads in coral reef environments[2]	3.14	1.6	0.41	0.66
Helped another diver improve finning technique or body control[1,2]	2.68	1.3	0.50	0.62
Hunted marine life for personal consumption[2]	2.48	1.5	0.38	0.67
Overall Index Standardized Item Alpha = .70	***3.01***	***0.99***		
General Educational Behavior				
Read books/magazines about the environment/ marine life/conservation[4]	3.33	1.0	0.51	0.62
Joined in community cleanup efforts, such as litter or fishing line[3]	1.99	1.1	0.64	0.45
Watched TV programs about the environment/ marine life/conservation[4]	3.59	0.9	0.42	0.74
Overall Index Standardized Item Alpha = .71	***2.97***	***0.79***		
Composite Index Standardized Item Alpha = .79				

*Variables coded on a 5-point scale with 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Frequently, 5 = Usually

[a]Standard Deviation

[b]Items reverse coded prior to analysis

[1]Adapted from the Marine Ecotourism Fact Sheet, The International Ecotourism Society (1998)

[2]Adapted from Coral Friendly Divers, The Coral Reef Alliance, (2002)

[3]Adapted from Todd (2000)

[4]Adapted from Thapa (2000)

TABLE 2
Reliability Analysis for SCUBA Diving Specialization

Specialization Items	Corrected Item Total Correlation	Alpha If Item Deleted	Corrected Item Total Correlation	Alpha If Item Deleted
	Individual Dimensions		**Overall Index**	
Behavioral[a,b]				
How many years have you been involved in diving	0.47	0.62	0.43	0.88
How many dives have you completed in your lifetime	0.60	0.56	0.46	0.87
Excluding today, have you dived within the past 12 months	0.44	0.62	0.45	0.88
How many times have you been diving in this area	0.24	0.71	0.23	0.88
During your lifetime, where have you been diving[1]	0.45	0.63	0.53	0.87
Standardized Item Alpha = .68				
Cognitive[a]				
Self reported skill level[2]	0.72	0.87	0.73	0.86
Confidence level as a diver[3]	0.75	0.87	0.64	0.87
Ability to maintain buoyancy control[3]	0.74	0.87	0.64	0.87
Level of diving knowledge[3]	0.73	0.87	0.63	0.87
Ability to adapt to different diving situations[3]	0.81	0.86	0.70	0.87
Certification level	0.55	0.90	0.61	0.87
Standardized Item Alpha = .89				
Affective[b]				
Diving is one of the most enjoyable things I do[4]	0.60	0.74	0.44	0.88
Diving is very important to me[4]	0.71	0.71	0.55	0.87
Diving says a lot about who I am[4]	0.61	0.74	0.51	0.87
I find that a lot of my life is organized around diving[4]	0.61	0.74	0.60	0.87
Diving club membership[5]	0.31	0.81	0.25	0.88
Subscription to diving magazines[5]	0.43	0.78	0.32	0.88
Standardized Item Alpha = .79				
Composite Index Standardized Item Alpha = .88				

[1]Based on total count: Cave, Cavern, Lake, Ocean, Open Water Springs, Quarry/Mine, River, Sink Hole

[2]Based on five categories: Beginner, Intermediate, Advanced, Expert, and Post-Expert

[3]Variable coded on a 10-point scale with 1 = lowest and 10 = highest

[4]Variable coded on a 5 point scale where 1 = strongly disagree, 2 = moderately disagree, 3 = neutral, 4 = moderately agree and 5 = strongly agree.

[5]Variable coded as Yes/No

[a]Adapted from Todd (2000)

[b]Adapted from Bricker & Kerstetter (2000)

Pearson correlation coefficients (Pearson's *r*) were used to investigate the association between the level of specialization and environmental behaviors. The correlations were all statistically significant (see Table 3). The *composite specialization index* and the *composite behavioral index* were positively correlated, indicating that, as specialization in SCUBA diving increased, overall environmental behaviors also increased. Similarly, the *composite specialization index* was positively correlated with the *general diving index* (strongest relationship among all 16 correlations), and the *general educational index.* A negative relationship was recorded with the *contact diving index,* indicating that, as specialization increased, divers were less likely to engage in environmentally harmful behaviors such as touching coral.

Among the specific specialization dimensions, the *behavioral specialization index* revealed the strongest relationship with the *general diving behavior index,* followed by the *general education behavior index.* These results indicated that, as divers' level of experience (behavioral dimension of recreation specialization) increased, their level of participation in pro-environmental diving behaviors and educational behaviors also increased. Furthermore, an increase in the level of experience was associated with decreasing participation in environmentally insensitive contact diving behaviors.

Similarly, the *cognitive specialization index* displayed the strongest relationship with the *general diving behavior index,* followed by the *contact diving index.* These results indicated that, as divers' skill level and ability (cognitive dimension of recreation specialization) increased, their participation in pro-environmental diving behaviors increased, and their participation in environmentally insensitive contact diving behaviors decreased.

The *affective specialization index* showed the strongest relationship with the *general education index,* followed by the *general diving index.* The *contact diving index* was again negatively correlated and displayed the weakest rela-

TABLE 3
Correlations Between Diving Specialization and Marine Based Environmental Behaviors

SCUBA Diving Specialization	Marine Based Environmental Behaviors							
	Composite Index		Contact Diving Index		General Diving Index		General Educational Index	
	r	*N*	*r*	*N*	*r*	*N*	*r*	*N*
Composite Index	.39**	368	−0.36**	368	.55**	368	.43**	368
Behavioral Index	.27**	368	−0.29**	368	.42**	368	.32**	368
Cognitive Index	.32**	368	−0.36**	368	.53**	368	.28**	368
Affective Index	.35**	364	−0.22**	364	.35**	364	.44**	364

**Significant at .01 level (2-tail significance)

tionship. These results indicated that, as enduring involvement and centrality to lifestyle (affective dimension of recreation specialization) increased, general educational behaviors increased, and participation in environmentally insensitive contact diving behaviors decreased.

Finally, linear regression analysis was used to investigate the combined influence and strength of the relationships between SCUBA diving specialization and environmental behaviors (see Table 4). For the composite environmental behaviors, 15% of the variation was explained from the overall specialization index. Including the three individual specialization dimensions showed a slightly higher predictive power of 16%. Among the three specialization dimensions, the affective index had the highest predictive power, followed by the cognitive index (the behavioral index was not significant).

Switching to the specific types of environmental behaviors, use of the individual specialization indices resulted in a slightly higher percentage of variance explained for each behavioral index. The cognitive index demonstrated the most predictive power for the *general* and *contact diving behaviors,* while the affective index was the strongest predictor of the *general educational behaviors.* The strength of the regression model (R^2 = .31) for the *general educational behaviors* was much stronger than for the *composite behavior index* or the other behavioral dimensions.

The *contact diving behaviors* were predicted only by the cognitive specialization index (the behavioral and affective indexes were not significant). The regression analysis of the *general diving behaviors* showed a similar pattern. In this case, however, all three specialization indices were significant, but with

TABLE 4
Regression Analysis of Diving Specialization on Marine Based Environmental Behaviors

SCUBA Diving Specialization (Independent Variables)	Marine Based Environmental Behaviors (Dependent Variables)							
	Composite Index		Contact Diving Index		General Diving Index		General Educational Index	
	beta	R^2	beta	R^2	beta	R^2	beta	R^2
Composite Index	.39***	.15	−.36***	.13	.55***	.30	.42***	.18
Behavioral Index	.09	.16	−.12	.14	.14***	.31	.21***	.23
Cognitive Index	.16**		−.27***		.40***		−.02	
Affective Index	.26***		−.06		.12**		.38***	

** Significant at .01 level (2-tail significance)
*** Significant at .001 level (2-tail significance)

notably lower beta values for the behavioral and affective indexes. For the final analysis (*general educational index*), the affective component of specialization demonstrated the greatest effect. Interestingly, the cognitive index failed to reach significance in this regression model.

Discussion

Literature has generally supported Bryan's (1977) notion of a positive relationship between recreation specialization and environmental concern. This study identified a positive association between the level of specialization and marine based environmental behaviors, whereby as specialization in SCUBA diving increased, environmentally responsible behaviors also increased. Moreover, analysis with the individual specialization dimensions (behavioral, cognitive and affective) revealed more explanatory detail for the specific behavioral dimensions.

While the individual dimensions generally explained about the same amount of variance in environmental behaviors as the overall specialization index, the strength and significance of the various dimensions varied for the different types of environmental behaviors. Notably, specialization (both overall and individual dimensions) accounted for twice as much of the variance in *general diving behaviors* as for the other behavioral measures. Most of the additional explanation appears to be due to the cognitive aspect of specialization (Beta = .40). Conversely, the cognitive dimension of specialization had nothing to do with the *educational behaviors.*

The behavioral dimension of specialization was not very effective as it failed to significantly predict *contact diving behaviors,* and only weakly predicted the other two behavioral dimensions. This finding is consistent with Todd et al.'s (2000) examination of the relationship between diving attitudes/management preferences and diver level of development. More experienced divers have had greater opportunities to engage in diving contact behaviors and may accept such behaviors as part of the tradition of underwater diving. They may feel that some of these behaviors, if done properly, do not harm the marine environment. It would be interesting to test whether some of the individual diving contact behaviors are more closely related to diver experience than others. The weaker relationships may also reflect the lower reliability for the items within the behavioral dimension index (alpha = .68). In a previous study of forest recreationists, the behavioral dimension was also problematic due to the lack of internal consistency within that dimension (Thapa, 2000).

Overall, the affective dimension of specialization exhibited the strongest predictive power for environmental behavior, and especially for *general education behaviors,* which further substantiates the finding by Mowen et al. (1997) that the affective dimension was a better predictor of environmental attitudes among general recreationists. The finding in this study is logical as individuals who showed a strong emotional connection and vested interest

in diving were more likely to read books and magazines or watch TV programs about the environment, marine life and conservation, and participate in community cleanup efforts.

It is notable that neither the behavioral nor affective indices contributed to the explanation of *contact diving behaviors.* The contact diving behaviors were linked only to the cognitive dimension of specialization. This has important implications for diver education, as the cognitive dimension pertains to divers' knowledge and skill development. These findings are consistent with the literature showing that the degree of actual impact is influenced by level of experience and skill of divers (Davis, et al., 1995; Harriott et al., 1997). Since the cognitive dimension was a major predictor of behaviors that were very specific to diving, it is essential that the diving industry emphasize skill development and improvement of technical competence during certification and beyond. Recently, Lee and Scott (2004) also noted that the cognitive component (skill and knowledge) was a more effective measure than the behavioral and commitment components of specialization among birders.

SCUBA diving is an appreciative activity, but some participants do engage in consumptive behaviors such as hunting and collecting aquatic trophies, while others may participate in buying corals or other marine life for souvenirs or a private aquarium. Education and interpretation are effective in alleviating such depreciative behaviors, and need to be further stressed and not limited to the pre-dive briefings (Townsend, 2000). Educational programs should be formulated by various stakeholders, such as marine conservation organizations, governmental agencies and the diving industry. Certain efforts have been underway in promoting conservation of aquatic resources by some organizations and additional programs need to be implemented. For example, divers could be required to sign a responsible code of diving ethics during the pre-dive briefing. Such a code of diving ethics could be integrated by dive masters and instructors into pre-dive briefings and other diving courses, and may help to reinforce the importance of being a responsible diver.

Given the positive effect of specialization on pro-environmental behavior, diving professionals should encourage divers to become more involved in diving through continuing education and social activities. Building social relationships through dive shops or recreational dive clubs may lead to higher involvement and personal identification with the sport, which in turn may increase environmentally responsible behaviors.

In light of the exploratory nature of this study, future research is needed to verify the specific dimensions of specialization and marine based environmental behaviors. Additional items such as prior environmental or specific marine based course participation, volunteering for marine organizations, and monetary donations given towards marine conservation can be added to the list of environmental behaviors. The study of environmental behaviors from a social science perspective (including this study) has limitations because it tends to rely on self-reported instead of observed behaviors. Self-

reported behaviors can be affected by social desirability bias when interviewees respond in a certain manner that may be politically correct or does not reflect their true feelings or behaviors. Reliance on self-reported behaviors appears to be the accepted norm in the social sciences due to the exorbitant level of time and costs associated with behavioral observation. Another limitation to this study is that the findings are not generalizable to the general population of SCUBA divers, due to sampling only divers in the southwest region of Florida through one dive operator.

The operationalization of the specialization construct remains a debatable issue. There seems to be consensus that recreation specialization is a multidimensional construct, although the dimensions and indicators of specialization are less clear. In addition to the composition of each dimension, the art of analysis with respect to the use of multiple-item composite indices or individual dimensions is arguable, as each study uses its own method to validate its respective measures. However, recent research (Bricker & Kerstetter, 2000; Lee & Scott, 2004; McFarlane, 2004) has corroborated the individual dimension perspective and this research also supports it. Based on the parameters of this research, the use of individual dimensions is recommended for future research as it offers more explanatory detail to predict associated correlates.

A key objective of this study was to assess the ability to predict environmental behaviors employing a multiple-item specialization index versus individual dimensions of recreation specialization. Overall, the recreation specialization construct was shown to be a useful tool for understanding environmental behaviors of SCUBA divers. However, other potential predictors of pro-environmental behavior were not examined. Future research should consider more explanatory variables to build upon this study's explanation of environmentally responsible behavior. Along with other variables, the specialization concept can be used for segmenting recreation participants and subsequently implementing management programs for various types of divers.

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