

NORM POWER OF SCUBA DIVING AND SNORKELING BEHAVIORS IN THE FLORIDA KEYS

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Abstract

The sustainability of recreation and tourism in coral reefs depends on ecological health and environmentally responsible behaviors in those ecosystems, which are partly guided by social norms. The power of social norms lies in the behavioral obligations imposed by a group, and in the informal sanctions enforced by others or felt by oneself when conforming to or violating those obligations. This study examined the norm power of 12 coral reef behaviors of non-resident SCUBA divers and snorkelers in the Florida Keys. In a mail questionnaire, respondents rated how obligated they were to do each of the 12 behaviors when diving or snorkeling on a coral reef, and how embarrassed (informal sanction) they would feel if they were seen violating each of those behaviors. Overall, the results showed that divers and snorkelers were obligated to do all 12 types of behaviors, but the amount of norm power was distinguished by the level of embarrassment varying between the two groups. High norm power values suggest that SCUBA divers and snorkelers self-regulate and enforce desirable behaviors within their activity groups. Relatively low norm power behaviors should be monitored and may need targeted communication strategies or management interventions to help instill a sense of obligation and sanction. These findings have important implications for monitoring behavioral compliance, promoting ocean stewardship, and establishing management policies to sustain coral reef ecosystem services.

Keywords: Social Norms; Obligations; Sanctions; Coral Reefs; SCUBA Diving; Snorkeling

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1. Introduction

Coral reefs provide valuable ecosystem services such as recreation, tourism, and aesthetic value (Brander et al., 2007; Moberg and Folke, 1999). In Southeast Florida, coral reefs form the foundation of the region's identity, providing habitat for ecologically and economically important species, and drawing visitors seeking to dive, snorkel, and fish (Leeworthy et al., 2010). However, coral reefs are also facing pressures from increased recreational use, pollution, anchor damage, and sedimentation (Kelble et al., 2013). These pressures are directly or indirectly linked to human behaviors and the ways in which people interact with the coastal-marine ecosystem. Humans can alter coral ecosystems and the quality of services provided, as well as make them susceptible to natural disturbances or climate change (Hughes et al., 2010). Management agencies attempt to address marine resource issues by establishing regulations through zoning restrictions, prohibiting boat anchoring and increasing the number of mooring buoys to mitigate human impacts to corals. Enforcement of these regulations, however, is not always sufficient to ensure compliance in marine areas, necessitating a further understanding of what drives human behavior.

People sometimes fail to support or comply with management actions because they lack adequate information and understanding about a topic. The desire to "educate the public" assumes that providing information will increase awareness and change people's behavior. This information deficit model suggests that the public lacks information on which to base good judgments (DeYoung, 2000; Weaver, 1991). Disseminating information can help to enhance awareness of environmental issues and promote desirable behavior (Steg and Vlek, 2009), but messages are sometimes ill conceived and do not always attract the intended attention or audience (Scannell and Gifford, 2013; Smith et al., 2006).

Education and outreach are important and can be effective if done strategically, but the provision of information alone may be ineffective in changing the public's attitudes and behaviors (Bolderdijk et al., 2013; Davies et al., 2002; Gigliotti, 1990). People consciously or unconsciously select new information that is consistent with their values, beliefs, attitudes, and/or norms (Bright and Tarrant, 2002; Smith et al., 2006; Tesser and Leone, 1977). A focus on enhancing technical knowledge does not always promote thoughtful decisions (Bright and Barro, 2000; Kahneman and Tversky, 2000). People may not be

motivated to change their behavior unless there is a perceived obligation to do so (Cruz et al., 2000; Dunning, 2017). Such beliefs are driven by personal views of what is right and wrong, and social norms (unwritten rules or standards) for acceptable and unacceptable behavior (Heywood, 2002; Smith et al., 2006). One of the factors people use in making behavioral decisions is how others are behaving in the same context. When norms influence behavior, people consider the positive or negative consequences associated with compliance (Chung and Rimal, 2016; Lapinski and Rimal, 2005). These normative influences are often shared by members of the same social network or group (McDonald and Crandall, 2015).

A group of recreational SCUBA divers or snorkelers, for example, may share norms for appropriate behaviors in coral reefs (Anderson and Loomis, 2011). In sensitive environments, such as coral reefs, understanding the shared norms of social groups becomes especially important, since collective behaviors can impact the health of the ecosystem. SCUBA divers and snorkelers can physically damage reefs by kicking, touching, or holding on to coral, or by loose dive equipment dragging over coral surfaces (Barker and Roberts, 2004; Giglio et al., 2022; Hawkins et al., 1999). Improper fin kicking can stir up benthic sediments, which can cover coral surfaces and inhibit coral recruitment, feeding, and photosynthesis (Zackai and Chadwick-Furman, 2002). Divers and snorkelers can reduce their impacts to coral reefs by engaging in environmentally responsible behaviors, which are partly guided by social norms. The power of social norms lies in the behavioral obligations imposed by a group, and in the sanctions enforced by others when conforming to or violating those obligations (Anderson and Loomis, 2011). Studies have suggested a connection between SCUBA diver specialization level and strength of social norms for behaviors supporting continued reef health (Anderson and Loomis, 2011). SCUBA divers and snorkelers may respond to conflicts (e.g., inappropriate behavior) occurring within or between these activities by sanctioning the individuals or group causing the conflict (Needham et al., 2017). Information on social norms that influence self-regulating stewardship activities can assist managers in developing more effective communication and outreach that leverage the ways in which people interact

with and appreciate marine resources. This article examined the norm power of snorkeling and SCUBA diving groups in the Florida Keys.

1.1. Social Norms

Normative research is frequently applied to outdoor recreation and natural resource management. Norms can be linked to attitudes and both constructs influence behavior (Heywood, 2002). Whittaker et al. (2006) defined attitudes as “positive or negative evaluations of some object” and norms as “judgments about what is appropriate in a specific situation or standards that individuals use to evaluate whether behaviors or conditions should occur” (p. 518). While attitudes reflect measures of “good” or “bad”, norms define “what should be” or what is socially acceptable.

Norms are relevant for both individuals (personal norms) and groups (social norms). Personal norms are individual standards of behavior, whereas social norms are socially agreed upon rules of behavior or conditions for specific sets of circumstances and are shared by members of a group (McDonald and Crandall, 2015; Vaske et al., 1986; Vaske and Whittaker, 2004). Social norms can be used to understand the acceptability of certain conditions by providing a basis for measuring indicators and formulating standards of quality (Manning, 2011). These conditions may be either social conditions (e.g., acceptable encounters or use levels) or natural resource conditions (e.g., acceptable levels of coral bleaching or underwater visibility).

A norm can be descriptive or injunctive. *Descriptive norms* are based on what most people are doing or have done (Cialdini et al., 1990). For example, seeing people litter or seeing a littered setting can influence others to litter. Conversely, seeing someone picking up litter or seeing a non-littered setting can influence non-littering behavior. The descriptive littering norms convey the meaning that it is either acceptable or unacceptable to litter. *Injunctive norms*, which were the focus of this study, specify rules or standards for what people “should” do in a given situation (Cialdini et al., 1990; Cialdini et al., 1991; Cialdini et al., 2006). Individuals within a group feel obligated to behave in a given way based on these norms, and sanctions from other members of the group may be imposed if the norms are not followed.

1.2. Obligations and Sanctions

Obligations and sanctions enforce the rules that guide behaviors. *Obligations* are the cognitive component of norms and represent a “repository of social standards” in a person’s mind, allowing an individual to efficiently determine whether or not a behavior is appropriate (Heywood, 2002). Individuals learn obligations when sanctioned by significant others or group members. *Sanctions*, the emotional component of norms, are punishments (costs) or rewards (benefits) for violating or adhering to social norms. Three kinds of sanctions are recognized. First, *internal sanctions* are self-imposed positive or negative feelings (e.g., shame or pride, guilt or guiltlessness) when social obligations have been followed or violated. Second, *informal sanctions* are the positive or negative feelings (e.g., embarrassment or admiration) that result from rewards or punishments given to or received from others. Third, *formal sanctions* are the rewards (e.g., medals of honor) or punishments (e.g., fines or imprisonment) defined through laws and regulations, and enforced by authority figures, officers and judicial proceedings.

Informal sanctions were the focus of this study because voluntary compliance can achieve desired outcomes more effectively and efficiently than coercing compliance (Grasmick and Bursik, 1990; Grasmick et al., 1991; Grasmick et al., 1993). Threats of shame or embarrassment function similar to the threat of legal sanctions associated with social norms (Cornish and Clarke, 1986; Dibbs, 1975; Meier et al., 1984). While deterrence focuses on the threat of fines (Dibbs, 1975), significant others and an individual’s self-conscience play an analogous role (Williams and Hawkins, 1986). Shame, a self-imposed sanction, and embarrassment, a socially imposed sanction, increase the subjective cost of unacceptable behavior and reduce the likelihood that the behavior will occur (Grasmick et al., 1991). When people violate social norms, which are endorsed by people whose opinions matter, the risk of embarrassment increases. An immediate consequence of embarrassment is physiological discomfort, but more long-term consequences include the loss of valuable relationships or restrictions on achieving valued goals (Grasmick et al., 1991). When a norm is internalized, the norm affects behavior even when no one else is present (Elster, 1989; Etzioni, 2000). A norm’s ability to influence behavior is known as norm power.

1.3. Norm Power

Heywood (2002) defined the social power of a norm as “a function of the interaction between the cognitive component and the emotional component” (the obligation, and the sanction, respectively). Normative behavior is a conscious consideration of the personal/social costs and benefits of a behavior associated with the obligation (Blake and Davis, 1964). The expected costs or benefits are sanctions and are a function of the perceived certainty and severity of punishment or reward (Grasmick et al., 1991). In Heywood’s (2002) norm power model, obligation is the core cognitive component and intensity of sanctions is the core emotional component (Figure 1). Intensity reflects, “the strength of potential sanctions by others for...conduct in a given situation” (Jackson, 1965, p. 244), where sanctions can be positive (reward, benefit) or negative (punishment, cost). Sanctions are the key element of social norms that enhances the likelihood of following obligations (Heywood, 2011).

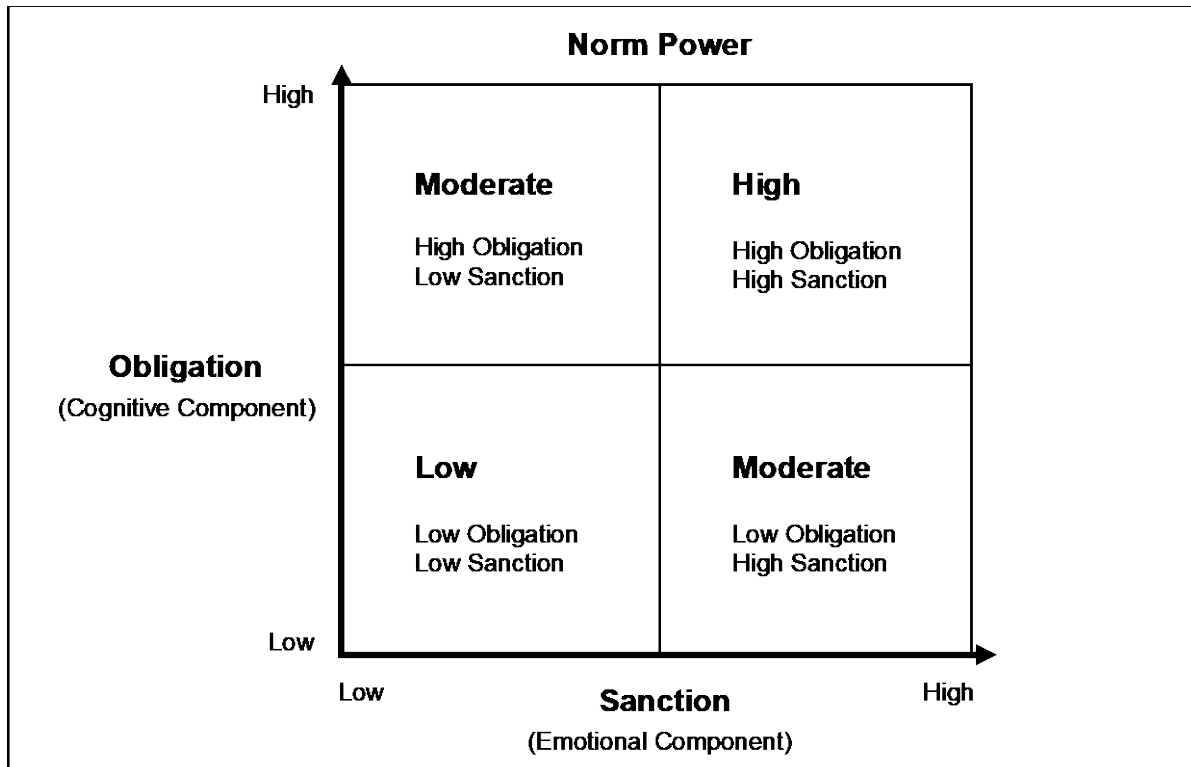


Figure 1. Conceptual model of norm power based on obligation and sanction.

Managers can use norm power to monitor desirable behaviors and identify undesirable behaviors. High norm power indicates that a behavior is self-regulated and enforced within social settings. Moderate

norm power indicates that a behavior may need monitoring. Behaviors with low norm power indicate the potential need for management action or formal sanctions. To increase the intensity of norm power, communication strategies can target messages to promote a greater sense of obligation or increase concern over informal sanctions. Heywood (2002) used norm power to examine the extent to which park visitors were obligated to never litter, and how embarrassed they would feel if others saw them litter. Consistent with other studies (e.g., Donnelly et al., 2000; Kim and Shelby, 1998), the littering norm was prevalent and highly powerful among park visitors. Collectively, these studies suggest that “no littering” is a powerful norm that effectively reduces littering behavior. Littering is a self-regulated behavior enforced among a recreation group and is relevant to management actions.

2. Research Questions

This study examined the norm power of a series of obligation and informal sanction evaluations of snorkelers and SCUBA divers recreating on coral reefs in the Florida Keys. Based on the norm power model (Heywood, 2002), as the level of an individual’s obligation to comply with a norm increases, so does the level of informal sanction (embarrassment) felt if that norm is violated. This model is especially important considering the number of tourists who visit the Florida Keys’ coral reefs to participate in snorkeling and SCUBA diving. While both diving and snorkeling provide underwater recreation experiences, each activity necessitates a different level of skill and commitment. Since SCUBA diving requires extensive certification training, divers are expected to feel more strongly about behavior obligations and informal sanctions than snorkelers, resulting in higher norm power. Considering the forces that influence reef behaviors, this study examined three research questions:

1. Does the level of behavioral obligation differ between snorkelers and SCUBA divers?
2. Does the level of informal sanction (embarrassment) differ between snorkelers and SCUBA divers?
3. Does the level of norm power differ between snorkelers and SCUBA divers?

3. Materials and Methods

The data used in this analysis were collected as part of a larger study for the Florida Reef Resilience Project (FRRP) conducted in 2006. While the data may be dated, the data were appropriate to use to address the research questions and advance theory.

3.1. Sampling

A representative sample of snorkelers and SCUBA divers was obtained through in-person intercepts in the Florida Keys. Intercept sampling began in June, 2006 and occurred for approximately one week of each month during a 13-month period. The interviewers collected names and addresses from snorkelers and SCUBA divers to later send them a mail questionnaire. The south eastern side of the Florida Keys (location of coral reef tract) was segmented into three regions: the Lower-, Middle-, and Upper-Keys. Within each region, three zones were included in the sampling area: inshore, mid-channel, and reef margin/fore-reef zones. These three zones were defined as ocean-side of the Florida Keys' island chain from shore to 30 meters of water.

Onsite intercepts were conducted both at the reef sites and on land to ensure that sampling coverage included individuals who access coral reefs on private and rented boats, as well as those using commercial tour companies. In the inshore, mid-channel, and reef margin/fore-reef zones, individuals were intercepted on the water during day-long boat "patrols" and asked to participate in the study. On-land intercepts were scheduled around the departure and arrival times of commercial boats, and occurred on the docks before and after snorkeling or diving trips. Snorkelers and divers on commercial boats not visiting coral reefs (e.g., wreck trips) were ineligible to participate in the study. Because the length of the Florida Keys exceeds 100 miles, sampling trips alternated between the Upper Keys and the Middle/Lower Keys. Once intercepted, divers and snorkelers were asked to participate in a mail questionnaire by providing their name and mailing address. One name and mailing address was collected from each group, specifically from the individual with the most recent birthday.

3.2. Questionnaire Design and Implementation

The questionnaire was developed in collaboration with the FRRP working group. This article focused on variables pertaining to behavioral obligations and informal sanctions. Basic demographics (e.g., gender, age, race, ethnicity, income, residence) were also examined. Individuals who were identified during the onsite intercepts were mailed a questionnaire in three waves following the Dillman Tailored Design Method (Dillman et al., 2014). All study participants received a packet containing (a) a cover letter thanking them for their participation and ensuring confidentiality, (b) questionnaire, and (c) postage-paid business reply envelope. One week after the first mailing, a follow-up postcard was sent to all recipients. Three weeks after the initial mailing, recipients who had not yet returned their questionnaire were sent a second complete packet of materials. For this mailing, the questionnaire packet was identical to the first, except the language in the cover letter was slightly altered to further emphasize the importance of their participation. Five weeks after the initial mailing, all non-respondents were sent a third and final packet of materials, with a cover letter emphasizing the importance of their participation.

3.3. Measures of Norm Power

Obligations and informal sanctions were measured for 12 different coral reef behaviors (Table 1). Surveyed respondents rated the extent to which they believed all snorkelers (or SCUBA divers) have an obligation to do 12 different behaviors while snorkeling (or SCUBA diving) at a coral reef in the Florida Keys. Each obligation statement was measured on a 7-point bi-polar scale ranging from “1 = strong obligation to never do” to “4 = no obligation either way” to “7 = strong obligation to always do”. For purposes of analysis, six “negative” behavior obligation statements (e.g., operate boats in shallow reef areas, touch marine mammals) were reverse coded to represent “positive” behavior obligations.

Embarrassment was used to represent informal sanctions (Heywood, 2002). Following the obligation statements, respondents indicated how embarrassed they would feel if others saw them behaving in a way inconsistent with each of the 12 obligations (Table 1). Each embarrassment statement was measured on a 5-point, unipolar scale ranging from “1 = not at all embarrassed” to “5 = extremely embarrassed.”

Table 1

Twelve coral reef behavior obligations and informal sanctions (embarrassment) measured in the survey of snorkelers and SCUBA divers in the Florida Keys.

<u>Obligations</u> ^a	<u>Informal Sanctions (Embarrassment)</u> ^b
A. Maintain buoyancy control	A. Lost buoyancy control
B. Tell others not to touch corals	B. Touched corals with your hands
C. Operate boats in shallow reef areas *	C. Operated a boat in a shallow reef area
D. Feed fish *	D. Fed fish
E. Swim close to marine mammals *	E. Swam close to marine mammals
F. Touch marine mammals *	F. Touched marine mammals
G. Pick up garbage from the sea floor	G. Left garbage on the sea floor
H. Operate boats at least 100 ft. from a dive flag	H. Operated a boat too close to a dive flag
I. Take pieces of dead coral *	I. Took pieces of dead coral
J. Break off pieces of live coral *	J. Broke off pieces of live coral
K. Leave shells in original conditions on a reef	K. Removed shells from a reef
L. Tell others not to anchor boats on coral	L. Knowingly anchored a boat on coral

^a Obligations were measured on a 7-point bi-modal scale (1 = strong obligation to never do, 4 = no obligation either way, 7 = strong obligation to always do);

^b Embarrassment was measured on a 5-point unipolar scale (1 = not at all embarrassed, 3 = moderately embarrassed, 5 = extremely embarrassed).

* Obligation values were reverse coded.

Norm power was operationalized as a function of the strength of an obligation and the strength of its corresponding sanction. Mean values were distributed onto a four-quadrant grid to illustrate low, moderate, and high levels of norm power based on Heywood's (2002) norm power model with the embarrassment scale on the x-axis and obligation scale on the y-axis (Figure 1). High norm power (Quadrant I) existed when there was a strong obligation (values > 4) and a strong feeling of embarrassment (values > 3); moderate norm power (Quadrants II and IV) existed when there was strong obligation (values > 4) and weak feeling of embarrassment (values ≤ 3), or weak obligation (values ≤ 4) and strong embarrassment (values > 3); and low norm power (Quadrant III) existed when there was both weak obligation (values ≤ 4) and weak sanction (values ≤ 3). For purposes of statistical analysis, a norm power variable was created for each of the 12 items by multiplying evaluations for obligation (values 1 – 7) by the corresponding evaluations for embarrassment (values 1 – 5). The product consisted of a range of values for low norm power (values 1 – 14.9), moderate norm power (values 15 – 23.9), and high norm power (values 24 – 35). Independent samples *t*-tests were used to test for statistical differences between

snorkeler and SCUBA diver mean obligations, informal sanctions, and norm power. Statistical differences were considered significant at $p \leq .05$ and Cohen's d indicated the effect size (Cohen, 1988). A d of .20 was considered a minimal relationship, .50 was a typical relationship, and .80 was a substantial relationship (Vaske, 2019).

4. Results

A total of 3,092 SCUBA divers and snorkelers were intercepted onsite in the Florida Keys; of these, 225 declined to participate in the study resulting in an initial sample of 2,867 divers and snorkelers. Of this initial sample, 114 questionnaires were returned as non-deliverable, yielding an effective sample size of 2,753. A total of 1,595 completed questionnaires were returned (58% response rate). Of this total, the majority (94%, $N = 1,496$) of the respondents were non-residents of Florida. Due to the limited number of Florida resident respondents, the analysis focused on non-residents; 548 self-identified as snorkelers and 869 self-identified as SCUBA divers. The remaining individuals did not answer both sets of obligation and embarrassment questions, and could not be included in the norm power analysis.

Among the snorkelers, respondents were about evenly distributed between males (53%) and females (47%), reported an average age of 41, and self-identified as white (88%). About three-quarters (74%) reported a household income of \$45,000 or greater. Snorkelers indicated an average of seven years of diving experience and spent an average of three days per year snorkeling on or around coral reefs in the Florida Keys. They also indicated that they are most likely to snorkel from a variety of different types of boats, relying heavily on commercial ventures for direct access to snorkeling sites.

Among the SCUBA divers, the average age was 43. Respondents were predominantly male (73%) and self-identified as white (94%); more than 80% reported an annual household income of \$45,000 or greater. On average, SCUBA divers had eight years of diving experience, and typically spent nine days per year diving on or around coral reefs in the Florida Keys; most were likely to dive from for-hire dive boats.

4.1. Obligations

SCUBA divers and snorkelers shared similar obligations on 10 of the 12 behavior items (Table 2). There were, however, statistically significant differences in two of those items. SCUBA divers expressed a higher obligation than snorkelers to pick up garbage from the sea floor and to maintain buoyancy control ($p < .001$), and the Cohen's d effect sizes were minimal to typical ($d = .298$ to $.502$). The highest obligation among SCUBA divers was to maintain buoyancy control, followed by high obligations to not break off pieces of live coral, to tell others not to touch corals, to tell others not to anchor boats on coral, to not take pieces of dead coral, and to pick up garbage from the sea floor. The highest obligation among snorkelers was to not break off pieces of live coral, followed by high obligations to tell others not to touch corals, to maintain buoyancy control, to not take pieces of dead coral, and to tell others not to anchor boats on coral.

Table 2

Non-resident snorkeler and SCUBA diver mean obligations for different behaviors at a coral reef in the Florida Keys.

Obligation Statements	Snorkelers		SCUBA Divers		t	p	$M_1 - M_2$	d
	M_1^a	SD	M_2^a	SD				
A. Maintain buoyancy control	6.35	1.11	6.79	0.70	-9.04	<.001	-0.44	-.502
J. Not break off pieces of live coral*	6.67	1.25	6.62	1.43	0.76	.446	0.05	.042
B. Tell others not to touch corals.....	6.40	1.16	6.48	1.07	-1.44	.149	-0.08	-.079
I. Not take pieces of dead coral*	6.25	1.32	6.12	1.32	1.82	.068	0.13	.101
L. Tell others not to anchor boats on coral	6.09	1.81	6.25	1.58	-1.74	.081	-0.16	-.096
G. Pick up garbage from the sea floor.....	5.65	1.64	6.08	1.31	-5.41	<.001	-0.43	-.298
F. Not touch marine mammals*.....	5.94	1.48	5.92	1.48	0.23	.817	0.02	.013
H. Operate boats at least 100 ft. from a dive flag	5.76	2.03	5.95	2.04	-1.74	.081	-0.19	-.097
C. Not operate boats in shallow reef areas*	5.95	1.77	5.87	1.64	0.81	.421	0.08	.045
K. Leave shells in original conditions on a reef	5.78	2.04	5.76	1.93	0.17	.863	0.02	.010
D. Not feed fish*	5.61	1.50	5.58	1.47	0.36	.720	0.03	.020
E. Not swim close to marine mammals*	4.99	1.49	4.95	1.44	0.53	.594	0.04	.029

^a Mean values of obligations measured on a bi-polar 7-point scale (1=strong obligation to never do, 4=no obligation, 7=strong obligation to always do).

* Obligation values are reverse coded.

4.2. Embarrassment (Informal Sanctions)

Snorkelers and SCUBA divers indicated similar levels of embarrassment if others saw them leave garbage on the sea floor, anchor a boat on a coral reef, or break off pieces of live coral. These three behaviors also had the highest levels of embarrassment rated by snorkelers and SCUBA divers. Statistically significant differences were found between the two groups in their level of embarrassment on 9 of the 12 sanction items ($p < .05$), all with relatively minimal effect sizes ranging from $d = .123$ to $.300$ (Table 3). Of those, snorkelers indicated higher levels of embarrassment on seven items, whereas SCUBA divers had higher levels of embarrassment on two items. Snorkelers would feel more embarrassed than SCUBA divers would feel if others saw them touch coral, operate a boat in a shallow reef area, feed fish, swim close to a marine mammal, touch a marine mammal, take pieces of dead coral, or remove shells from a reef. SCUBA divers, on the other hand, would feel more embarrassed for displaying loss of buoyancy control or operating a boat close to a dive flag.

Table 3

Non-resident snorkeler and SCUBA diver mean embarrassment evaluations for 12 different behaviors at a coral reef in the Florida Keys.

Embarrassment Statements	Snorkelers		SCUBA Divers		<i>t</i>	<i>p</i>	<i>M</i> ₁ - <i>M</i> ₂	<i>d</i>
	<i>M</i> ₁ ^a	<i>SD</i>	<i>M</i> ₂ ^a	<i>SD</i>				
L. Knowingly anchored a boat on coral.....	4.84	0.56	4.83	0.60	0.38	.705	0.01	.021
J. Broke off pieces of live coral.....	4.81	0.65	4.83	0.64	-0.73	.468	-0.02	-.040
G. Left garbage on the sea floor.....	4.78	0.69	4.76	0.68	0.30	.762	0.02	.017
H. Operated a boat close to a dive flag.....	4.49	0.87	4.59	0.77	-2.22	.027	-0.10	-.123
K. Removed shells from a reef.....	4.32	1.05	4.01	1.27	4.67	<.001	0.31	.258
C. Operated a boat in a shallow reef area.....	4.24	1.00	3.98	1.12	4.54	<.001	0.26	.250
B. Touched corals with your hands.....	4.08	1.08	3.75	1.14	5.44	<.001	0.33	.300
I. Took pieces of dead coral.....	4.04	1.16	3.73	1.31	4.57	<.001	0.31	.252
F. Touched marine mammals.....	3.46	1.43	3.22	1.49	2.99	.003	0.24	.165
A. Lost buoyancy control.....	3.07	1.23	3.30	1.17	-3.46	<.001	-0.23	-.193
D. Fed fish.....	3.20	1.48	3.02	1.43	2.35	.019	0.18	.130
E. Swam close to marine mammals.....	2.65	1.40	2.39	1.37	3.47	<.001	0.26	.192

^a Mean values of embarrassment were measured on a 5-point unipolar scale (1=not at all embarrassed, 2=somewhat embarrassed, 3=moderately embarrassed, 4=very embarrassed, 5=extremely embarrassed).

4.3. Norm Power

Norm power was calculated for all 12 behavior items as the product of the obligation score (1 – 7) and the corresponding embarrassment score (1 – 5) ranging from 1 to 35. Overall, the mean norm power scores among snorkelers and SCUBA divers ranged from 12.76 to 32.21 (Table 4). Snorkelers and SCUBA divers differed in norm power on 10 of the 12 behavior items ($p < .05$), all with relatively minimal effect sizes ranging from $d = .118$ to $.309$. The only two items where the groups did not differ were to tell others not to anchor boats on coral and not break off pieces of live coral. Both snorkelers and SCUBA divers had a high obligation to do those two behaviors, and would feel extremely embarrassed if others saw them violate those norms. Where significant mean differences were found, snorkelers reported a stronger norm power for 7 of the 10 behavior items. Norm power was higher among SCUBA divers than among snorkelers for obligations to maintain buoyancy control, to pick up garbage from the sea floor, and to operate boats at least 100 ft. from a dive flag.

Table 4
Norm power of non-resident snorkelers and SCUBA divers in the Florida Keys.

Norm Power Statements	Snorkelers		SCUBA Divers		<i>t</i>	<i>p</i>	<i>M</i> ₁ - <i>M</i> ₂	<i>d</i>
	<i>M</i> ₁ ^a	<i>SD</i>	<i>M</i> ₂ ^a	<i>SD</i>				
J. Not break off pieces of live coral	32.21	7.56	31.98	8.19	0.52	.603	0.23	.029
L. Tell others not to anchor boats on coral	29.67	9.55	30.37	8.66	-1.40	.163	-0.70	-.077
G. Pick up garbage from the sea floor.....	27.08	9.00	29.07	7.78	-4.35	<.001	-1.99	-.241
H. Operate boats at least 100 ft. from a dive flag ..	26.15	10.91	27.57	10.76	-2.35	.019	-1.42	-.132
B. Tell others not to touch corals.....	26.38	8.97	24.65	9.01	3.49	<.001	1.73	.193
I. Not take pieces of dead coral.....	25.83	9.99	23.64	10.72	3.80	<.001	2.19	.210
K. Leave shells in original conditions on a reef	25.61	11.62	23.98	11.90	2.50	.013	1.63	.138
C. Not operate boats in shallow reef areas	25.58	10.32	23.95	10.31	2.84	.005	1.63	.158
F. Not touch marine mammals	21.66	11.41	20.00	11.61	2.61	.009	1.66	.145
A. Maintain buoyancy control	19.90	9.23	22.62	8.55	-5.52	<.001	-2.72	-.309
D. Not feed fish	19.32	11.52	17.98	11.18	2.14	.033	1.34	.118
E. Not swim close to marine mammals	14.34	10.14	12.76	9.76	2.89	.004	1.58	.160

^a Mean norm power = Obligation * Embarrassment.

Separate from these mean differences, both groups reported “moderate to high” norm power for all 12 behavior items (see distribution of norm power in Quadrants I and II, Figure 2). Both snorkelers and SCUBA divers felt a “moderate to strong” obligation to always acquiesce with each behavior and

would feel “very to extremely” embarrassed if others saw them violating those behaviors. Both groups exhibited the highest norm power regarding obligations to never touch coral, break live coral, or anchor boats on coral reefs. The level of norm power to not swim close to marine mammals was “moderate” in strength (Quadrant II, Figure 2) among snorkelers and divers. Both groups were highly obligated not to swim near marine mammals, but if others saw them doing this, they would feel little embarrassment (low sanction). This type of behavior was the least powerful norm when compared to the other behavior items distributed in Quadrant I (high norm power). None of the 12 behavior items were distributed in Quadrants III or IV, further illustrating the absence of low norm power or moderate norm power created by high feelings of embarrassment.

All 12 behaviors were held with a moderate to high sense of obligation and varied in levels of embarrassment felt if that behavior norm was violated (Figure 2). Since the range of behavioral obligations (*y*-axis) and sanctions (*x*-axis) were only present across Quadrant I and parts of Quadrant II, the levels of norm power for snorkeling and SCUBA diving behaviors were further examined at a magnified scale. An additional analysis provided a closer view of the norm power distribution, particularly across levels of embarrassment. The second analysis was based on the actual range of norm power data values (which included scores of 12 – 33) as compared to the theoretical range (which included scores of 1 to 35). The second analysis (Figure 3) shows a magnified scale of the behaviors segmented into three sections of norm power: “moderate” norm power, “borderline-high” norm power, and “high” norm power. Moderate norm power is the product of “low (4.0 – 5.4)” obligation and “slight (2.0 – 2.9)” embarrassment; borderline-high norm power is the product of “high (5.5 – 7.0)” obligation and “moderate (3.0 – 3.9)” embarrassment; and high norm power is the product of “high (5.5 – 7.0)” obligation and “high (4.0 – 5.0)” embarrassment.

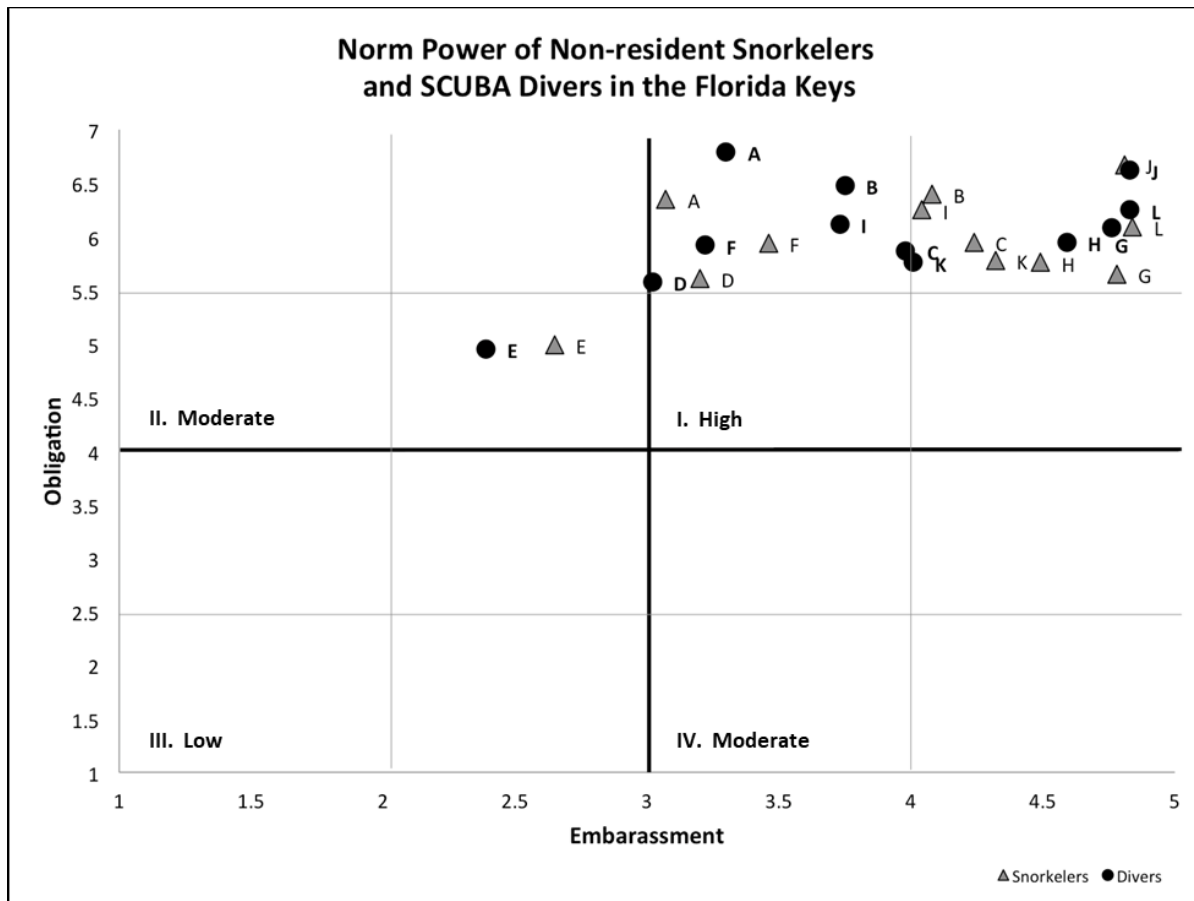


Figure 2. Norm power model based on non-resident snorkeler and SCUBA diver obligation and embarrassment evaluations; Obligation measured on a 7-point bi-modal scale (1 = Strong obligation to never do, 4 = No obligation either way, 7 = Strong obligation to always do); Embarrassment measured on a 5-point unipolar scale (1 = Not at all embarrassed, 3 = Moderately embarrassed, 5 = Extremely embarrassed). Quadrant I = high norm power, Quadrants II = moderate norm power, Quadrant III = low norm power, and Quadrant IV = moderate norm power. A = Maintain buoyancy control, B = Tell others not to touch corals, C = Operate boats in shallow reef areas, D = Feed fish, E = Swim close to marine mammals, F = Touch marine mammals, G = Pick up garbage from the sea floor, H = Operate boats at least 100 feet away from dive flag, I = Take pieces of dead coral, J=Break off pieces of live coral, K = Leave shells in original locations on a reef, L = Tell others not to anchor boats on coral.

Behaviors in Quadrant I, which aggregated furthest away from Quadrant II (y-axis), exhibited the highest amount of norm power (Figure 3). These behaviors with “high” norm power demonstrated both high obligation and high levels of embarrassment. For both snorkelers and SCUBA divers, these behaviors included obligations to not take pieces of dead coral, to leave shells in original conditions on a reef, to tell others not to anchor boats on coral, to operate boats at least 100 ft. away from a dive flag, and to pick up garbage from the sea floor. If any of those behaviors were violated and seen by others, snorkelers and SCUBA divers would feel “very” or “extremely” embarrassed.

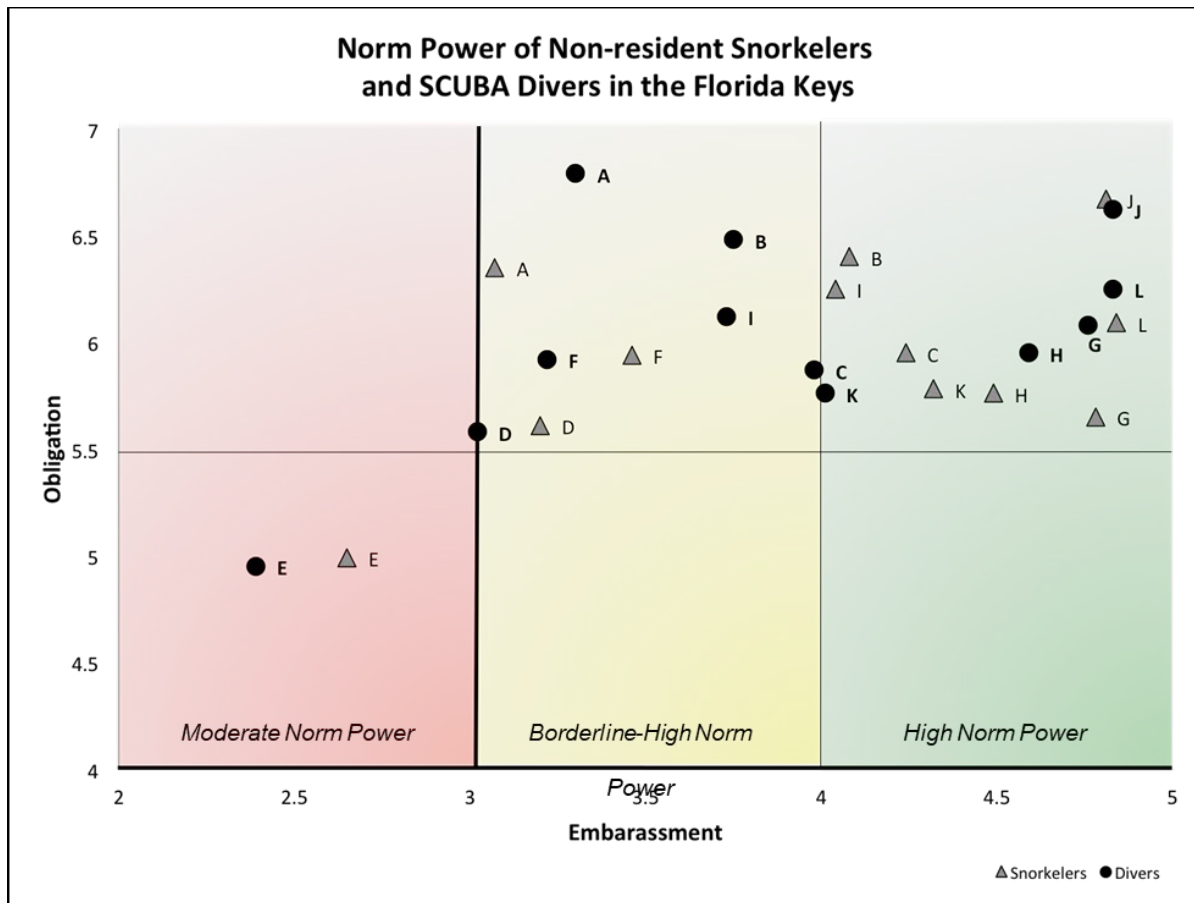


Figure 3. Close-up of non-resident snorkeler and SCUBA diver behavior items in Quadrants I and II of the norm power model; A = Maintain buoyancy control, B = Tell others not to touch corals, C = Operate boats in shallow reef areas, D = Feed fish, E = Swim close to marine mammals, F = Touch marine mammals, G = Pick up garbage from the sea floor, H = Operate boats at least 100 feet away from dive flag, I = Take pieces of dead coral, J=Break off pieces of live coral, K = Leave shells in original locations on a reef, L = Tell others not to anchor boats on coral.

While most values of snorkeling and SCUBA diving behaviors were distributed in Quadrant I and demonstrated “high” norm power, several of those behaviors (i.e., A, D, F) aggregated closer to Quadrant II than others (Figure 3). Behavior items approaching the y-axis of Quadrant II (3 = moderate embarrassment) had somewhat lower norm power, as demonstrated by higher obligations and lower levels of embarrassment. For both snorkelers and SCUBA divers, these “borderline” norm power behaviors included obligations to maintain buoyancy control, to not feed fish, and to not touch marine mammals. If any of those three behaviors were violated and seen by others, snorkelers and SCUBA divers would feel “moderately” embarrassed. SCUBA divers also exhibited borderline norm power to tell others not to touch corals, operate boats in shallow reef areas, or take pieces of dead coral. Snorkelers, however,

exhibited “high” norm power for those same three behaviors and would feel “very” embarrassed if they were seen doing those actions.

5. Discussion

Social norms for acceptable and unacceptable behaviors are informally regulated among members of a recreation group, and the strength of norm power can vary between activity types. The norm power results suggested that snorkelers and SCUBA divers feel highly obligated to engage in behaviors that do not harm coral reef resources, and would feel embarrassed if they were seen violating social standards for those behaviors. Both groups reported similar norms for behaviors in coral reefs, but there were differences in the power of those norms between groups (Cruz et al., 2000; Lapinski and Rimal, 2005).

The most powerful norms held among snorkelers and SCUBA divers were associated with behaviors that directly help to maintain the quality of coral reefs, including not breaking off live coral, picking up garbage from the sea floor, not anchoring boats on coral, and not touching coral. For the latter behavior, norm power was high among snorkelers but borderline-high among SCUBA divers. Both groups were highly obligated to tell others not to touch corals, but snorkelers would feel more embarrassed than SCUBA divers if they were seen touching corals. There was a similar pattern in norm power of their obligation to not take pieces of dead coral. While there was a high obligation to do all 12 behaviors in coral reefs, the amount of norm power was distinguished by the level of embarrassment (informal sanction) felt if seen violating that behavior norm. For nine of those behaviors, there were statistically significant differences between snorkelers and divers in their levels of embarrassment. These results suggest that highly felt sanctions play a role in influencing reef behaviors. Differences in norm power levels may be due to behavior norms that have become more internalized among divers than among snorkelers. This suggests that divers comply with the norm because of their internal standards rather than the anticipated consequences for non-compliance (Etzioni, 2000).

Both groups also had high norm power to operate boats away from a dive flag and to maintain buoyancy control, but the norm power was stronger among SCUBA divers than among snorkelers. Although both snorkelers and SCUBA divers may recognize the importance of these two behaviors, these

actions may be more relevant to SCUBA divers who must be more conscious of buoyancy, both for their personal safety and for coral protection. Obligations to maintain buoyancy control had borderline-high norm power. For both snorkelers and divers, the strength of embarrassment was lower than the strength of obligation. Other behaviors that had borderline-high norm power were obligations to not feed fish and to not touch marine mammals. Borderline norm power indicates that the power of these behaviors could be boosted by increasing informal sanctions. Accordingly, these behaviors should be monitored and formal sanctions or management interventions (e.g., marine spatial zoning, permits, or fines) may be necessary to avoid degradation of natural resources and ecosystem services.

Lowest norm power was shown for swimming close to marine mammals. Both snorkelers and SCUBA divers expressed low obligation and low embarrassment for this behavior. This relatively low level of norm power may exist because in the context of coral reefs in the Florida Keys, snorkelers and divers seldom have the opportunity to swim close to a marine mammal. Thus, the prevalence of this norm is low and undeveloped. However, if this is a desired behavior from the social and/or management perspective, low norm power indicates the need to instill a greater sense of obligation and increase sanctions informally or formally. This particular behavior may be more relevant to other types of marine habitats, such as seagrass areas where manatees are more likely to be encountered by marine recreationists.

High norm power values suggest that norms for appropriate behaviors in coral reefs are stable and self-regulated among snorkelers and SCUBA divers. Since members of each group share these rules for behavior, snorkelers or divers tend to feel a sense of obligation based on those norms and as one faces sanctions imposed by other members of the group (Cruz et al., 2000; Dunning, 2017; Vaske and Whittaker, 2004). This information is relevant to the communication and management of desirable behaviors to reach conservation goals for coral reef ecosystems because it indicates the sense of stewardship, normative regulation, and behavioral compliance that exist within a group. The results also suggest that these norms are legitimized among snorkelers and divers. Norms that are widely shared by most members of society often become legal mandates complete with formal sanctions for noncompliance

(Heywood, 2002). The types of behaviors measured in this survey are reef behaviors regulated by the U.S. National Marine Sanctuaries Act (1972) and enforced by management in the Florida Keys National Marine Sanctuary. High norm power indicates that snorkelers and divers hold standards for behaviors consistent with formal institutionalized norms, and that these norms have likely become internalized as part of the individual's motivational system (Blake and Davis, 1964). These behavior norms should be monitored over time and additional studies would determine whether norm power levels are changing for any of these types of intended behaviors. While the data used in this analysis were collected in 2006, the implications of the results are relevant to modern coral reef conservation issues. The implications are that snorkelers and divers who demonstrate high norm power for coral reef behaviors may be more likely to exhibit those behaviors, serve as stewards for coral reef conservation, or assist in spreading awareness of responsible behaviors among new snorkelers or divers. It may also be possible that individuals who demonstrate high norm power may be more inclined to participate in stewardship activities such as citizen science or volunteer coral restoration activities that are developing throughout the Florida Keys.

The snorkelers and divers in this study were non-residents of Florida. The power of normative behaviors in coral reefs is important for managing tourists who may be less familiar with the local environment, rules and regulations. As part of the Florida Keys National Marine Sanctuary's Blue Star Program, there are at least 30 dive/snorkel operators committed to promoting responsible snorkeling and diving behaviors. Blue Star operators remind customers during pre-dive/pre-snorkel briefings of how fragile coral is and to "look, but don't touch." Such messages are meant to encourage reef conservation awareness and may have an effect on obligation evaluations, feelings of embarrassment, and norm power for "appropriate" coral reef behaviors. Results here, however, suggested that norm power was stronger among snorkelers than SCUBA divers for 7 out of 12 behaviors. This was somewhat surprising given the intensive training required for SCUBA diving certifications that emphasizes responsible diving behaviors. The diving industry has a large presence in the Florida Keys, and is active in marine conservation initiatives and in providing diving-related resources (e.g., magazines, websites, organizations, events). Some of these initiatives focus on marine debris, which may have an influence on SCUBA divers having

stronger norm power than snorkelers for picking up garbage from the sea floor. For example, Project Aware developed the Dive against Debris program and Alert Diver has promoted messages such as “pick up a bottle that has just arrived at the bottom but leave a bottle in which a creature has made a home.” Future research could examine the influence of the Blue Star Program, dive briefings, or other communication and outreach strategies on reef etiquette and standards for behavior (Camp and Fraser, 2012; Krieger and Chadwick, 2013). Research could also examine other types of social norms or standards for acceptable resource conditions, such as levels of coral bleaching, live coral cover, fish abundance or diversity, to establish a link between behaviors and biophysical conditions or to define appropriate levels of use at a coral reef site that could be monitored long term. A variety of normative data would be valuable in informing conservation actions and need for coral restoration efforts.

Management may benefit from considering how normative messages can be incorporated into communication and outreach targeting snorkelers and divers or in training and certification requirements. Messaging strategies may consider a focus on establishing a sense of obligation and sanction among those who are not familiar with behavior norms in the Florida Keys, and why certain behaviors are important for coral reef conservation and sustainability of snorkeling and diving experiences. If resource managers hope to increase obligations or informal sanctions, communication strategies, such as those based on Petty and Cacioppo’s (1986) Elaboration Likelihood Model (ELM), could help managers target specific user groups and frame outreach messages that are relevant to the way people in those groups think about specific issues. The ELM recognizes that people often lack the motivation and ability to carefully consider technical information, let alone change their behaviors. A more recent model, the Extended-ELM, accounts for the processing and persuasive effects of different genres of messages with varying levels of intent (Ott et al., 2020; Slater, 2002). Norm-based persuasive messages as well as variations in the types of normative information (descriptive or injunctive) or how one communicates can influence social responses and behaviors to a significant degree (Cialdini et al., 2006; Lapinski and Rimal, 2005; Smith et al., 2006).

6. Conclusion

Coastal-marine resource managers are challenged to balance recreational use in coral reefs with the protection of reef resources. An understanding of norm power can be useful in monitoring desirable behaviors and informing when certain behaviors need to be addressed. This study examined non-resident snorkelers and SCUBA divers, their evaluations of obligations and embarrassment, and their norm power based on those two concepts. Overall, snorkelers and divers demonstrated high norm power to self-regulate and enforce desirable behaviors among themselves. These high norm power behaviors suggest compliance with current regulations and resource management goals in the Florida Keys which aim to reduce human impacts to corals. However, management interventions that target lower norm power behaviors among non-resident snorkelers and divers may still be needed to avoid degradation of reefs over time. Management agencies often seek to educate the public, but education is more than simply providing information. Even if a person is receptive to additional knowledge, this does not guarantee a short- or long-term change in attitude or behavior (Bright and Barro, 2000). As an alternative, managers might consider communication strategies that utilize targeted normative messages to motivate individuals to behave in ways consistent with the normative standard. Because social norms are self-correcting, norm power can enhance a sense of obligation and sanction that promotes environmental stewardship and conservation behavior.

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