

# ARE THE KEYS LOVED TO DEATH? A STUDY OF DIVER SPECIALIZATION LEVELS AND PREFERENCES IN THE FLORIDA KEYS

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**Abstract.**—This paper presents research conducted for the Florida Reef Resilience Program on nonresident recreational SCUBA divers in three zones of the Florida Keys. When divers were segmented into specialization subgroups for analysis, divers in different subgroups tended to use different geographic locations. These results suggest differences in user preferences; yet when social norms such as perceived crowding were included in the analysis, there were no significant differences across specialization levels. Nonresident divers may be motivated by nonsocial drivers, which has important implications for recreation management decisions and strategies that are based on social carrying capacity. Results also suggest that nonsocial factors such as resource conditions may have an important influence on selection of dive locations and satisfaction with the diving experience.

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## 1.0 INTRODUCTION

Natural resource managers make management decisions based on institutional mandates that have both ecological and social components, providing the basis for integrated resource management (Weinstein et al. 2007). Recreationists' goals and social preferences for different aspects of 'the experience,' along with biological and ecological considerations, guide most coastal and coral reef management strategies and actions. Integrating social and biological research findings across the system helps achieve a more focused understanding of reef use, perceptions, impacts, and health (Mascia 2003). Motivations for user preference have long been incorporated into *terrestrial* resource management (Manfredo et al. 2009), allowing managers to adopt or adapt strategies that balance use with conservation efforts. This study aims to provide this kind of

information to managers of the *marine* resource system of the Florida Keys.

The Florida Keys attracts millions of visitors annually. Identifying the drivers behind visitors' geographic or site choices can help to determine social carrying capacity. The Keys are sometimes said to be 'loved to death,' implying that managers have not been successful in balancing resource protection with recreational demands. Coral cover has declined dramatically over the last 12 years, including an overall loss of 44 percent of hard coral species at quantitatively surveyed monitoring stations throughout the Keys (Waddell and Clark 2008). The threats facing the Florida Keys reefs are both biophysical (rising sea levels and temperatures) and anthropogenic (overfishing, anchor damage, and coastal development). It is therefore important to look at recreation and resource use patterns in the Keys in order to understand the public's needs more completely.

Integrating biophysical assessments of resource conditions with social preferences may help to determine whether there is an ecological component to coral reef use levels. This study aims to investigate whether social drivers can be combined with visitor perceptions of ecological conditions to help guide management actions within the reef system. By using conceptual frameworks such as specialization theory and normative theory, we hypothesize that the satisfaction of the most highly specialized user groups must be the basis for determining carrying capacity to fully achieve management mandates.

## 2.0 METHODS

The data used in this analysis are a subset from the Florida Reef Resilience Program (FRRP) umbrella project (described in Loomis et al. 2008a, 2008b, and 2008c). One of the main purposes of FRRP was to integrate biological and social data to support management strategies and actions and to generate feasible management alternatives. To assist with these efforts, the Keys were subdivided into Lower, Middle, and Upper Keys to allow comparisons throughout a

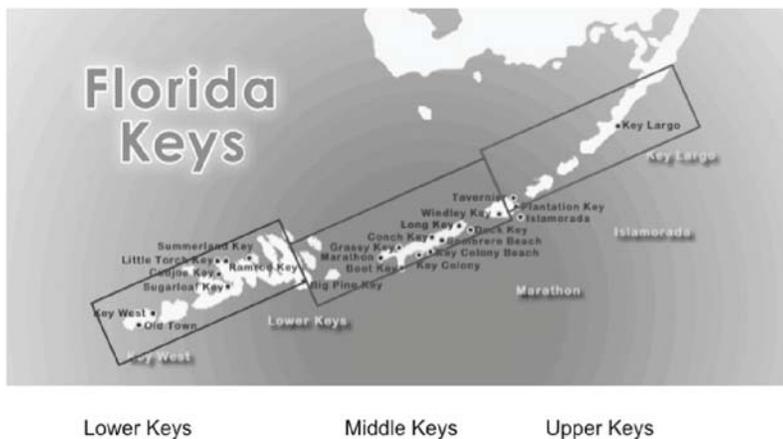


Figure 1.—Zonation of the Florida Keys for all FRRP data collection efforts.

large geographical area (Fig. 1). The divisions were determined by the FRRP working group before data collection began and were used in both biophysical and social investigations. The divisions were based upon natural breaks in islands, tidal flow, and biophysical characteristics (see sidebar). Every attempt was made to ensure that a representative sample of divers was collected from each geographic area.

Data were collected from anglers, divers, and snorkelers in the Florida Keys between June 2006 and July 2007 via a mail survey. To ensure a representative sample, names and addresses were collected through intercepts of people participating in a diving activity. Intercepts took place during approximately 1 week of each month during the 13-month study period. Students from the University of Massachusetts conducted the intercepts both in the

water and on land throughout the Florida Keys on weekdays, weekends, and holidays throughout the year. To maximize response rates for the survey, materials were sent out using the Dillman (1978) and Dillman et al. (2009) Total Design Method. These efforts resulted in a response rate of 57.9 percent and an overall sample size of 1,590. This paper uses data only from nonresident divers (N = 875).

The 16-page survey instrument was developed cooperatively with members of the FRRP working group over 4 months. Questions covered a variety of human dimensions concepts related to snorkel and dive norms, motivations, expectations, accomplishments, satisfaction, equipment expenditures, levels of media interaction, attitudes towards coral reef use, and evaluations of biological conditions. Basic demographic data included

#### Sidebar. Subdivisions of the Florida Keys

##### *Upper Keys*

The Upper Keys sub-region extends from just south of Biscayne National Park down to Lower Matecumbe Key. The islands of the Upper Keys are close together, forming a nearly continuous chain that limits tidal water exchange between the Atlantic Ocean side of the islands and the Florida Bay side. The Gulf Stream also frequently loops in close to this sub-region. The combination of these factors usually results in very good visibility.

##### *Middle Keys*

The Middle Keys sub-region trails southwest from the Upper Keys sub-region encompassing the area from the south end of Lower Matecumbe Key to Bahia Honda Key. The Middle Keys are widely separated, allowing major tidal flow between islands from Florida Bay and the Gulf of Mexico to the Atlantic Ocean.

##### *Lower Keys*

The Lower Keys sub-region extends west from Bahia Honda Key out past Key West but stopping shy of the Marquesas Keys. This area has many more and much wider keys with island orientation in a northwest to southeast direction. These wide land expanses have shallow bays between keys, slowing tidal water flow. There are a few deep water passes that allow more tidal flow.

**Table 1.—Number of nonresident divers in each specialization category**

	Least specialized	Moderately specialized	Highly specialized	Very Highly specialized	Totals
N	30	217	378	250	875
% of Total	3.4	24.8	43.2	28.6	100.0

respondents' gender, age, race, ethnicity, income, and place of residence. The survey instrument also included questions to incorporate and test specialization theory based around the four social world dimensions of orientation, experiences, relationships, and commitment (Ditton and Loomis 1992). The specialization index developed and validated by Salz et al. (2001) was used to categorize nonresident divers into meaningful subgroups. Initially four specialization levels ranging from low to high were used, as suggested by the theory. However, the number of nonresident divers in the least specialized category (30) was too small to provide robust results. Subsequently only nonresident divers that fell into the 'moderate,' 'high,' and 'very high' specialization categories were used for the analysis (n = 845; Table 1). The concentration of divers at the higher levels of specialization implies both dedication to, and investment in, the sport of diving.

### 3.0 RESULTS

Respondents were asked to indicate how many SCUBA divers, snorkelers, and boats they considered it acceptable to see at a time at a dive site. Figures 2, 3, and 4 show the norm curves for the acceptable number of divers, snorkelers, and boats, respectively. The peaks of the curves are directly above the most acceptable number of encounters (on average). For resource managers and others interested in social carrying capacity, the critical piece of information is where each curve crosses the neutral point on the acceptability scale (anything above 0 is acceptable, and anything below 0 is unacceptable). For this study, the average maximum number of acceptable encounters per category was 12 SCUBA divers, 14 snorkelers, and eight boats. Note that each encounter category was tested separately, so no conclusions can be drawn from the data about how many encounters with a combination of divers, snorkelers, and boats might be acceptable.

*Expectations* for how many other users divers might see at a time—which is different from what is considered to be acceptable—varied across the sample. Eighty-seven percent of nonresident divers expected to see 10 or fewer snorkelers (mean = 5.44), 77 percent expected to see 10 or fewer other SCUBA divers (mean = 8.98), and 97 percent expected to see 10 or fewer boats (mean = 3.54). Only 60 percent reported actually seeing 10 or fewer snorkelers (mean = 14.00) while 94 percent reported seeing 10 or fewer SCUBA divers (mean = 4.44) and 82 percent reported seeing 10 or fewer boats (mean = 6.80). The average numbers of divers, snorkelers, and boats actually seen are marked with arrows on Figures 2, 3, and 4.

Crowding is a subjective negative evaluation of use levels that occurs when a recreationist perceives that others are interfering with his or her own activities. In general, nonresident divers in this study experienced little perceived crowding. Approximately 24 percent of all respondents felt “not crowded at all” during their most recent trip (mean = 3.17) on a scale of 1 to 9 with 9 being the most crowded, whereas only 1 percent felt extremely crowded. This result suggests that nonresident divers are generally satisfied with current use levels. It also suggests that adjustments in management decisions to allow higher levels of use in some areas may have some effect on future levels of perceived crowding. Perceived crowding was also analyzed by geographic subdivision (Table 2).

The satisfaction that individuals derive from various aspects of their trip can be better understood by studying their pre-trip expectations, what actually occurred during the trip, and how satisfied they were with the experience afterward. Respondents were asked to rate their satisfaction levels with various aspects of their diving experience (e.g., “healthy reef,” “large fish,” and “visibility”) on a 5-point Likert scale ranging from extremely negative through a neutral point to extremely positive. Table 3 displays the mean values for some of

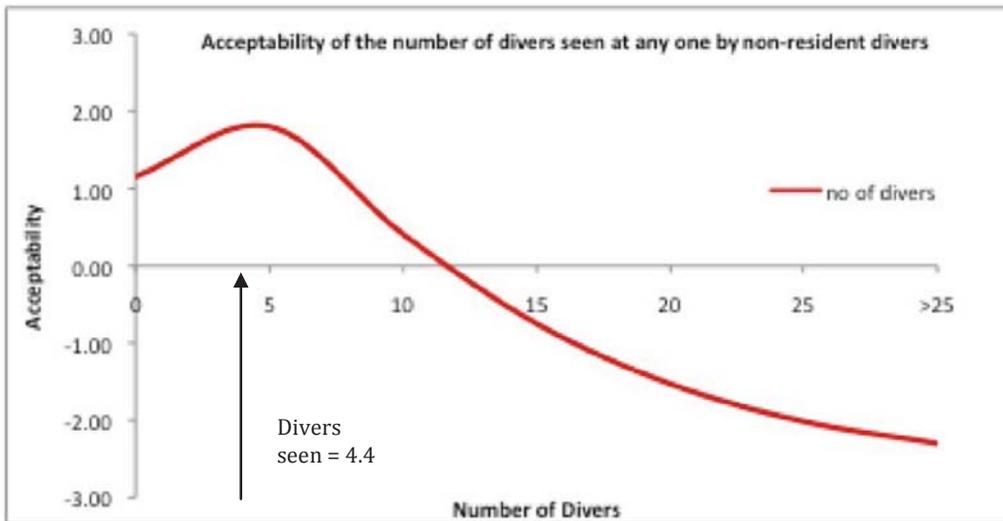


Figure 2.—Norm curve for the acceptability of encountering other divers.

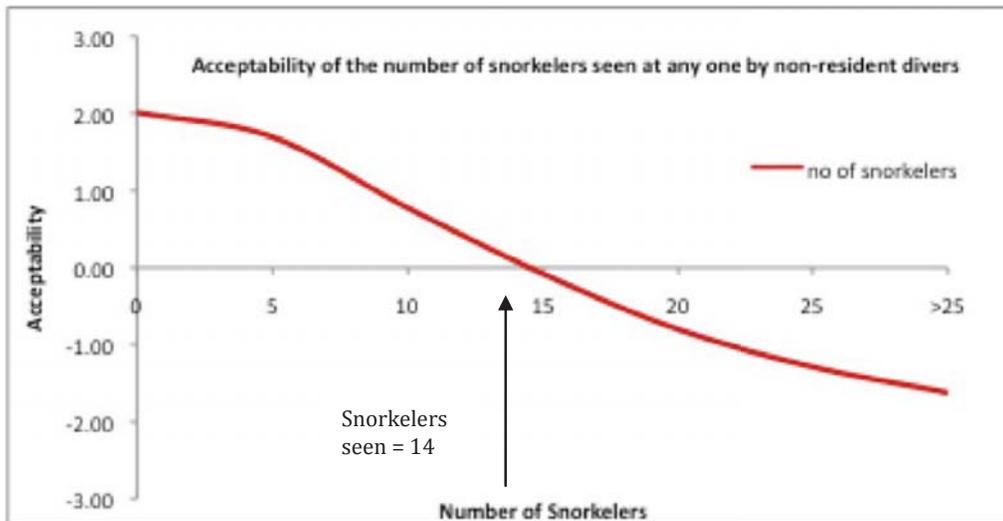


Figure 3.—Norm curve for the acceptability of encountering snorkelers.

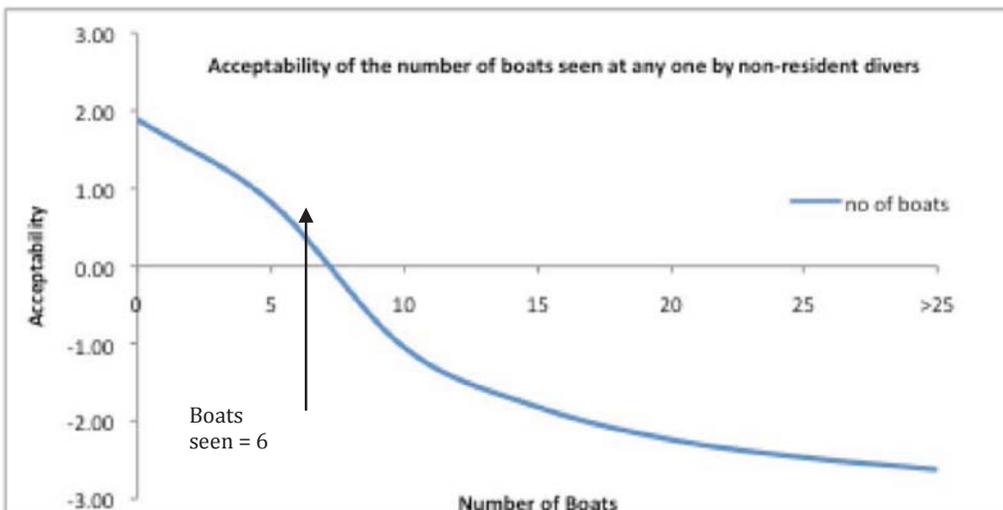


Figure 4.—Norm curve for the acceptability of encountering boats.

**Table 2.—Diver distribution and perceived crowding by zone**

	Lower Keys	Middle Keys	Upper Keys	Overall
Percentage of nonresident divers	23.9%	16.5%	59.6%	100%
Perceived crowding level*	3.1	2.9	3.5	3.2

\* On a scale of 1 to 9, with 9 being the most crowded.

**Table 3.—Mean satisfaction scores with resource condition by zone (all divers)**

	Lower Keys	Middle Keys	Upper Keys	P-Value
Healthy reef	3.09	3.38	3.64	0.000
Easy diving	3.37	3.68	3.82	0.000
Undamaged reef	3.03	3.26	3.51	0.000
Marine life	3.47	3.64	3.91	0.000
Large fish	3.12	3.13	3.53	0.000
Live coral	3.28	3.51	3.73	0.000
Visibility	3.28	3.51	3.73	0.000
Unique underwater formations	3.21	3.31	3.56	0.000

Means shaded the same color are not significantly different ( $\alpha = 0.1$ ) using Tukey's test. Scores were on a scale of 1 to 5, where 1 = extremely negative and 5 = extremely positive.

the items that can be linked to resource condition; these particular findings are presented to highlight differences that may explain the obvious geographic preference for the Upper Keys noted in Table 2.

Results were then cross-examined by the specialization level categories discussed above. Diver distribution was determined by geographic subdivision and by specialization level. In general, more highly specialized divers are both more resource-dependent and more likely to conform to regulations (specialization proposition numbers 6 and 4; Ditton and Loomis 1992). Therefore, the most highly specialized divers are generally used as the management benchmark. With this in mind, satisfaction with resource condition was then recalculated for just the most highly specialized divers (Table 4).

#### 4.0 DISCUSSION AND CONCLUSIONS

The data show that divers in different specialization groups tend to favor different geographic regions of the Keys (Chi-square  $p = 0.000$ ,  $N = 875$ ). Further investigation shows that the Upper Keys are the most crowded, in terms of both perceived crowding and actual use levels. However, when data from all locations were taken together, there were no significant differences

with regard to crowding among divers in different specialization levels. In other words, the most specialized divers are not more likely to perceive crowding even though they are more likely to dive in places with higher use levels. This finding suggests that use levels in the Keys are generally not high enough for crowding to affect divers' satisfaction with the diving experience, even at the locations with the highest use levels. For recreation managers, the implication is that social carrying capacity of a location or area should not be the sole driver of management decisions. Although FRRP has explored alternate factors such as behavioral norms and access, ever-changing social conditions such as the economic downturn have created a need for further investigation.

Significant differences exist between both perceived and actual resource quality throughout the Keys, as shown in both this study and a separate biophysical investigation by Waddell and Clarke (2008). The Upper Keys attracted the most highly qualified divers and received the best satisfaction ratings among nonresident divers in this study. Significant differences were reported when comparing the Lower and Middle Keys condition with that of the Upper Keys on seven of the eight attributes. Although these differences were less significant when

**Table 4.—Most-specialized divers' satisfaction with resource condition**

	Lower keys	Middle keys	Upper keys	P-Value
Healthy reef	2.97	3.40	3.57	1.014
Easy diving	3.84	3.89	3.93	0.860
Undamaged reef	2.90	3.23	3.36	0.096
Marine life	3.58	3.69	3.87	0.167
Large fish	3.19	3.06	3.46	0.116
Live coral	3.29	3.54	3.67	0.144
Visibility	3.39	3.34	3.73	0.055
Unique underwater formations	3.36	3.34	3.53	0.482

Means shaded the same color are not significantly different ( $\alpha = 0.1$ ) using Tukey's test. Scores were on a scale of 1 to 5, where 1 = extremely negative and 5 = extremely positive.

analyzing the results of just the most specialized divers, it does suggest that the Lower Keys may be falling victim to the 'loved to death' phenomenon.

This study highlights the need to look more closely at recreational users' values regarding acceptable ecological conditions. This focus may allow managers to determine whether, and where, high recreational use levels can be concentrated to conserve natural resources at other sites. Managers also need to know in advance whether recreationists would be willing to support such measures, and they need to understand what is important and acceptable to different user groups to reduce the possibility of major conflicts over use.

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