MONITORING THE VISITOR EXPERIENCE AT BUCK ISLAND REEF NATIONAL MONUMENT

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This paper examines relationships between visitor density levels and perceptions of crowding at a Caribbean coral reef. Reef visitors were more likely to report that the quality of their experience was enhanced, rather than reduced, by their encounters with other visitors. Perceived crowding was related to visitors' previous experience and the location of encounters with other visitors as well as various density-related measures.

Introduction
Buck Island Reef National Monument is a small undeveloped island adjacent to St. Croix in the U.S. Virgin Islands. One of the main attractions at Buck Island is an "underwater trail" designed by the Park Service to allow visitors to snorkel through coral formations and view marine life guided by interpretive signs. The trail can only be reached by boat. Although both private and commercial boaters frequent the trail, the typical user buys a space on a commercial outfitter's sailboat or motorboat and is ferried the eight miles from St. Croix to one of eleven moorings at the trail just off Buck Island. There, visitors snorkel on and near the trail for an hour or more and then move to the beach for a picnic or sunbathing before returning by boat to St. Croix.

This paper is derived from a study commissioned by the National Park Service to examine the quality of the visitor experience at Buck Island Reef. Park management expressed the view that current conditions were generally acceptable, but they were worried about future impacts resulting from growing numbers of tourists visiting the area. The main objective of the study was to document current conditions in order to provide a baseline against which future changes could be assessed. Accordingly, the study measured selected indicators of quality in the visitor experience and examined the relationships between these indicators and various density-related and background variables.

Study Methods
The data set used for this paper was derived from a 1988 survey of visitors to Buck Island Reef National Monument. Data were gathered from over 1,000 visitors through a self-administered questionnaire completed during their return boat trips from Buck Island. Various measures of visitor density and perceived crowding were employed, the most novel of which was perceived "busyness." This term was used at the request of Park Service staff who preferred it to the value-laden term, "crowding". In light of the experimental nature of this variable, an additional indicator was employed to measure perceived crowding. Visitors responded to the question, "Please circle the number that best describes how the visitors you encountered at Buck Island affected your overall experience?" Response categories ranged from "increased my enjoyment" (1) to "no effect" (5) to "reduced my enjoyment" (9). This allowed for not only negative (i.e. crowded) responses but also responses from visitors whose overall enjoyment was actually increased by the others they encountered. This measure has been used in previous studies (Ditton, Fedler, and Graefe 1983; Drogin, Graefe, and Titre 1990) as an alternative measure of crowding that avoids the possible confounding effects of using the word, "crowding," yet measures the perception of crowding in a manner consistent with the term's conventional definition.

Respondents were categorized into three groups based on their responses to the 9-point "influence of others" scale. Those responding with one through four were grouped into an "increased enjoyment" group, those responding with a five ("no effect") were classified as a "neutral" group, and those responding six through nine were grouped into a "decreased enjoyment" (crowded) category. One-way analysis of variance tests were employed to determine if these groups varied significantly in terms of variables related to perceived visitor densities and selected aspects of visitors' experience levels and types of trips. These same predictor variables were then entered into a multiple discriminant function analysis in an attempt to predict membership in the three groups. A further analysis was carried out after collapsing the three groups into two by combining the increased enjoyment group with the neutral group to form a single "noncrowded" category. Minimum Wilk's Lamda was used as the selection criteria for entry of variables into the discriminating function.

Results
Consistent with the original perceptions of park staff as well as the results of many previous studies, few of the Buck Island visitors felt crowded. Only 10% of the 1,083 respondents reported that the others they encountered decreased their enjoyment. Fifty-seven percent reported that others had no effect on their experience and 33% experienced increased enjoyment as a result of the others they encountered.

There were significant differences among the three groups in terms of all five density-related variables considered (Table 1). Interestingly, those who reported that their enjoyment had been increased by the others they encountered reported having significantly more people on their boats than those from the crowded and neutral groups. On the other hand, the crowded group reported seeing significantly more snorkelers on the trail and perceived the beach and the trail to be significantly "busier" than both the group whose enjoyment had been increased by others and the neutral group. The crowded group also reported seeing significantly more boats moored at the trail than the increased enjoyment group.

Three of the four experience and trip-related variables also produced significant differences among the three groups. The crowded group had significantly more snorkeling experience than the other two groups and was more likely to have visited the island before. Those whose enjoyment was increased tended to visit the island for significantly longer periods of time (more full-day trips as opposed to half-day excursions) than did the neutral group. The neutral group was slightly older than the other two but not significantly so (Table 1).

Table 1. Density level, experience, and trip-related variables by how visitors encountered affected overall experience.[1]

	Increased Enjoyment	Neutral	Decreased Enjoyment	F Value
		Effect on Experience		
Density-Related Variables				
Number of people on boat	21.92[a]	19.43[b]	19.16[b]	7.88***
Number of other boats at mooring	4.49[b]	4.67[ab]	5.28[a]	4.43*
Number of snorkelers seen on trail	19.63[b]	19.29[b]	24.45[a]	5.17**
How "busy" the trail felt[2]	4.82[b]	4.77[b]	6.06[a]	23.81***
How "busy" the beach felt[3]	3.61[b]	3.62[b]	5.43[a]	52.97***
Experience and Trip-Related Variables				
Snorkeling experience level[4]	1.69[b]	1.77[b]	2.05[a]	12.89***
Prior visits to Buck Island[5]	.20[b]	.20[b]	.30[a]	3.90*
Visitor's age[6]	2.52	2.64	2.60	1.31 ns
Length of trip[7]	1.52[a]	1.44[b]	1.48[ab]	3.66*
Sample Size	358 (33%)	616 (57%)	109 (10%)	

* $p<.05$; ** $p<.01$; *** $p<.001$

Means with different superscripts are significantly different at the .05 level.

[1] Variable coded on a 9-point scale ranging from "increased my enjoyment" (1) to "decreased my enjoyment" (9).
[2] Variable coded on a 9-point scale ranging from underwater trail was "not at all busy" (1) to "extremely busy" (9).
[3] Variable coded on a 9-point scale ranging from beach was "not at all busy" (1) to "extremely busy" (9).
[4] Variable coded as "beginner" (1), "intermediate" (2), and "advanced" (3).
[5] Variable coded as "no previous visits" (0) and "have visited before" (1).

Multiple discriminant analysis was employed in an attempt to predict the membership of these three groups. How busy the beach felt was the most powerful predictor variable followed by the visitors' level of snorkeling experience. Overall, seven of the nine variables entered the discriminant function (Table 2). However the predictive value of the resulting function was quite weak. Less than 45% of the cases were successfully classified into their correct groups. The group whose enjoyment was reduced due to the influence of others (i.e. the crowded group) was more likely than the other two groups to be classified correctly (64 percent versus 35 percent and 52 percent for the neutral and increased enjoyment groups, respectively).

Table 2. Results of discriminant analysis classifying visitors into increased enjoyment, neutral, and decreased enjoyment groups.[1]

Classification Variable	Discriminant Coefficient	Wilk's Lamda
How busy the beach felt	.852	.932***
Snorkeling experience level	.322	.920***
Number of people on boat	-.179	.912***
Length of trip	-.194	.908***
Number of snorkelers seen on trail	.229	.904***
Visitor's age	.058	.901***
Prior visits to Buck Island	.121	.898***

*** $p<.001$

CLASSIFICATION RESULTS

Actual Group	n	Predicted Group Membership		
		Increased Enjoyment	No Effect	Decreased Enjoyment
Increased Enjoyment	363 (33%)	51.5%	24.2%	24.2%
No Effect	633 (57%)	37.3%	35.2%	27.5%
Decreased Enjoyment	112 (10%)	17.9%	17.9%	64.3%

Percent of Total Cases Correctly Classified: 43.5%
N=1,108

[1] Includes only significant variables included in discriminant function.

Because the initial analysis revealed few differences between the increased enjoyment and neutral groups, these two were combined into a single "noncrowded" category for additional analysis. Two of the statistically significant relationships from the three-group analysis became non-significant when the cases were grouped into only crowded and noncrowded categories. Now, the crowded and noncrowded groups did not differ significantly in terms of number of people on their boats or the length of their trips (Table 3). However, after combining the increased enjoyment and neutral groups, the predictive power of the discriminant function was dramatically improved. Seventy percent of the visitors were correctly classified into their appropriate crowded or noncrowded categories (Table 4). Of the five variables entering this discriminant function, the "busyness" of the beach and snorkeling experience level remained the most powerful predictors of group membership.

Table 3. Density level, experience, and trip-related variables by how visitors encountered affected overall experience.[1]

	Increased or Neutral (Noncrowded)	Decreased Enjoyment (Crowded)	F
	Effect on Experience		
Density-Related Variables			
Number of people on boat	20.37	19.16	1.51 ns
Number of other boats at mooring	4.60	5.28	7.59**
Number of snorkelers seen on trail	19.41	24.45	10.25**
How "busy" the trail felt[2]	4.79	6.06	47.49***
How "busy" the beach felt[3]	3.62	5.43	106.02***
Experience and Trip-Related Variables			
Snorkeling experience level[4]	1.74	2.05	22.20***
Prior visits to Buck Island[5]	.20	.30	7.81**
Visitor's age[6]	2.60	2.60	0.00 ns
Length of trip[7]	1.47	1.48	0.00 ns
Sample Size	974 (90%)	109 (10%)	

* p<.05; ** p<.01; *** p<.001
N=1,083

[1] Variable coded on a 9-point scale ranging from "increased my enjoyment" (1) to "decreased my enjoyment" (9).
[2] Variable coded on a 9-point scale ranging from underwater trail was "not at all busy" (1) to "extremely busy" (9).
[3] Variable coded on a 9-point scale ranging from beach was "not at all busy" (1) to "extremely busy" (9).
4 Variable coded as "beginner" (1), "intermediate" (2), and "advanced" (3).
5 Variable coded as "no previous visits" (0) and "have visited before" (1).

Conclusions

Overall, visitors' feelings about how the others they encountered affected their enjoyment were not surprising. Ten percent of the Buck Island visitors reported being crowded while 33% reported increased enjoyment and the majority (57%) reported that others had no affect at all on their enjoyment. Using the same 9-point scale, Ditton, Fedler and Graefe (1983) found similar proportions among river floaters on the Buffalo River in northern Arkansas (22% reported decreased enjoyment, 27% increased enjoyment, and 51% felt their trip was unaffected by the others they encountered). The fact that even fewer Buck Island visitors reported crowding than did users of the Buffalo River may be related to the Buck Island visitors' expectations. The Buffalo River is floated by small groups in rafts, canoes, and kayaks while Buck Island is generally accessed by commercial "head boats" that often carry twenty or more people at a time. Such a visitor certainly expects to be in contact with others and may adjust other trip expectations accordingly (Heberlein et al. 1979 and Schreyer and Roggenbuck, 1978).

Table 4. Results of discriminant analysis classifying visitors into noncrowded and crowded groups.[1]

Classification Variable	Discriminant Coefficient	Wilk's Lamda
How busy the beach felt	.883	.933***
Snorkeling experience level	.266	.925***
Number of snorkelers seen on trail	.209	.922***
Number of previous visits	.166	.920***
Length of trip	-.163	.918***

*** p<.001

CLASSIFICATION RESULTS

Actual Group	n	Predicted Group Membership Noncrowded	Crowded
Noncrowded	1,011 (90%)	70.3%	29.7%
Crowded	115 (10%)	33.0%	67.0%

Percent of Total Cases Correctly Classified: 70.0%
N=1,126

[1] Includes only significant variables included in discriminant function.

Another consistency between the Buck Island results and those obtained using the same scale at the Buffalo River is the finding that the neutral and increased enjoyment groups were very similar. The dramatic improvement in the predictive power of the two-group discriminant function over the three-group function is an indication of how similar these two types of users were. In other words, the three-group discriminant function had a very difficult time distinguishing between increased enjoyment users and neutral ones. Those whose enjoyment was increased by the others they encountered and those who reported that others had no affect on their enjoyment clearly had a great deal in common, with only two significant differences emerging between these two groups. Consistent with other studies, however, both of these groups were different from those who experienced crowding.

As has been found in previous studies, the experience level of Buck Island users and their experience with the setting itself were significantly related to how the presence of others affected their enjoyment (e.g., Vaske et al. 1980 and Nielsen et al. 1977). Members of the crowded group were significantly more experienced as snorkelers and with Buck Island than members of either of the other two groups. These findings again are consistent with those obtained at the Buffalo River and may indicate that more experienced users are either more sensitive to the presence of others or that conditions in the area had changed since their previous visits or perhaps an interaction of these two effects.

There are two apparent inconsistencies between the results of this study and previous ones. Both of these differences relate to the densities of other users reported by visitors and how these densities seemed to affect these visitors' experiences. Previous literature has found only a weak and indirect relationship between the density of other users and perceived crowding and satisfaction (e.g. Absher and Lee 1981). The first inconsistency with these previous findings is the result that the increased enjoyment group actually had *more* people on their boats than those who reported being crowded. This might be explained by visitors adjusting their expectations to make the best of the relatively high densities on many of the commercial "head boats." The fact that several of the companies operating these tours serve drinks and other refreshments on their return trips indicates that they recognize the importance of enhancing these social interactions. It may also be true that these tours simply attract customers who are more gregarious in nature or who are at least willing to tolerate the presence of others.

The second unexpected result was the finding that the perceived density of others *on the beach* at Buck Island seemed to be highly related to visitors perceptions of crowding. In fact, "how busy the beach felt" was the single best predictor of how other people affected the visitors' experiences in both the two-group and three-group analyses. Those from the crowded group consistently reported seeing the most people on the beach. This was surprising in that the original concern leading to the study was with crowding on the water and at the snorkeling trail. However, both of these unexpected findings may reflect the theory that recreationists' sensitivity to crowding varies depending on the location of the contacts (Stankey 1973; Badger 1975). In the case of Buck Island, it may also relate to the nature of the overall experience and the specific activities in which visitors engaged.

The typical excursion to Buck Island can be viewed as three separate experiences: the boat trip out and back, the snorkeling experience on the underwater trail, and the experience on the island's beach itself. As mentioned earlier, visitors appeared to regard the boat trips as social experiences where the presence of others often increased their enjoyment. While the crowded group did see significantly more people on the trail and regard it as significantly "busier" than did the other two groups, they seemed to be less sensitive to the density of others on the trail than on the beach. This may suggest that many snorkelers felt safer while underwater if others were present. This is probably particularly true of the many beginner snorkelers who made the trip. However, once visitors arrived at the beach, the safety factor was much less potent and visitors became more sensitive to the presence of others.

Finally, this study suggests several implications for further research. First, it provides additional evidence that measuring a broad range of possible effects that others might have on recreationists' experience is more meaningful than simply focusing on the negative dimension of perceived crowding. Secondly, the findings support the notion that perceived crowding is related to experience level, location of contact, and visitor expectations as well as the numbers of other visitors encountered. Finally, this study shows that our understanding of recreational crowding may be more generalizable than previous studies of backcountry and wilderness users might have led us to believe. This study has shown that visitors to tropical reefs and island beaches appear to perceive the influences of others on their experiences in much the same way as do many other water and land-based recreationists.

From a management standpoint, study results do not suggest the need for any immediate management response since they generally confirmed management's opinion that current conditions were acceptable. The relationships found between perceptions of crowding and the various measures of visitor density at the trail and on the beach imply, however, that these variables should be monitored as use levels change in the future.

Literature Cited

Absher, J. D. and Lee, R. G. 1981. Density as an incomplete measure of crowding. Leisure Sciences. 4(3): 231-247.

Badger, T. J. 1975. Rawah Wilderness crowding tolerances and some management techniques: an aspect of social carrying capacity. M.S. Thesis, Colorado State University, Ft. Collins.

Ditton, R. B., Fedler, A. J., and Graefe, A. R. 1983. Factors contributing to perceptions of recreational crowding. Leisure Sciences. 5(4): 273-288.

Drogin, E. B., Graefe, A. R., and Titre, J. 1990. Factors affecting boating satisfaction: a replication and comparative analysis. In Proceedings of the 1990 Northeastern recreation research symposium;, 1990 February 25-28; Saratoga Springs, NY. Gen. Tech., Rep. NE-145. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station, pp. 167-173.

Heberlein, T. A., Alfano, G., Shelby, B., Vaske, J. 1979. Expectations, preferences and feeling crowded in recreation activities. Paper presented at the annual meeting of the Rural Sociology Society, Burlington, VT.

Nielsen, J. M., Shelby, B., and Haas, G. E. 1977). Sociological carrying capacity and the last settler syndrome. Pacific Sociological Review. 20: 568-581.

Schreyer, R., and Roggenbuck, J. W. 1978. The influence of experience expectations on crowding perceptions and social psychological carrying capacities. Leisure Sciences. 1: 373-394.

Stankey, G. H. 1973. Visitor perception of wilderness recreation carrying capacity. Res. Pap. INT-142. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station.

Vaske, J. J., Donnelly, M. P., and Heberlein, T. A. 1980. Perceptions of crowding and resource quality by early and more recent visitors. Leisure Sciences. 3: 367-381.