SPECIFIC RESPONSIBLE ENVIRONMENTAL BEHAVIOR AMONG BOATERS ON THE CHESAPEAKE BAY: A PREDICTIVE MODEL PART II

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This paper examines predictors of boater behavior in a *specific behavior* situation, namely the percentage of raw sewage discharged from recreational vessels in a sanitation pumpout facility on the Chesapeake Bay. Results of a multiple regression analysis show knowledge predicts behavior in specific issue situations. In addition, the more specific the behavior indicator, the better predictive ability that indicator will have on behavior.

Introduction

Responsible environmental behavior (REB) is defined as any individual or group action aimed to do what is environmentally right to help protect the environment (Sivek & Hungerford, 1989/90). This behavior involves a conscious awareness of environmental problems among individuals or groups of people while demonstrating an understanding and sensitivity of the importance for a quality environment. In addition, the knowledge of action skills to effectively partake in REB are necessary for an individual to actively participate in pro-environmental action (Hines et al., 1987; Marcinkowski, 1988; Hungerford and Volk, 1990).

The purpose of this paper was to present findings for Part II of a model of responsible environmental behavior. Part I of the model, which focused on the relationship between four socio-demographic variables, three general environmental variables, and general responsible environmental behavior, was presented at the 1993 NERR conference. This paper examined predictors of a *specific responsible environmental behavior*, namely the percentage of raw sewage Maryland boaters discharged from recreational vessels in a sanitation pumpout facility on the Chesapeake Bay. According to Heberlein and Black (1976), more specific measures of behavior are stronger indicators of specific behavior than are general measures of behavior. Several specific-issue variables were used to test Heberlein and Black's specificity claim by using indices such as knowledge of water pollution issues, awareness of the consequences of raw sewage on water quality, personal commitment to resolve water pollution issues, and situational factors that constrain sewage pumpout station usage.

Methods

Data were collected during fall, 1992, through mail surveys sent to a stratified random sample of owners of vessels 22 feet or larger in Maryland. The instrument included measures of knowledge of water pollution issues, awareness of the consequences of raw sewage on water quality, personal commitment to resolve water pollution issues, situational factors that constrain sewage pumpout station usage, and specific responsible environmental behavior (percentage of raw sewage boaters discharged). A total of 291 surveys were returned, representing a 41 percent response rate. In order to assess nonresponse bias, phone interviews were conducted with a random sample of nonrespondents (N=30). Of those phone survey respondents who recalled receiving a mail survey last fall (54%; N=19), 63 percent were classified as *nonusers* based on their reason for not completing the survey, i.e., they did not go boating in 1992. Another 61 respondents did not meet criteria necessary for analysis in this study and were eliminated from the sample (Cottrell, 1993).

Results

The uniqueness of those boaters surveyed in this study was likely due to the random stratification process used to sample registered boat owners with 22 foot boats or larger in Maryland. Of the boat types reported, 56 percent were power boats and 44 percent were sailboats. The average boat length was 31 feet. The mail survey went to registered boat owners. Ninety-seven percent of this sample were males with an average age of 50, while 78 percent were married. Thirty-six percent have children living at home (Cottrell, 1993).

This group represents a well educated, affluent, conservative, white collar segment of the population. For instance, 63 percent have a college degree, including 39 percent who participated in post graduate work. More than 30 percent of the respondents had an earned income of more than $100,000 in 1992, followed by 35 percent between $60,000 and $99,999. The median income earned was approximately $70,000 as compared to $30,000 in a study of boaters at large in Miami, Florida (Noe and Snow, 1990) and a median range of $30,000 to $40,000 for boaters in a Delaware study (Falk et al., 1985). There was a significant positive correlation between income and education. In reference to political affiliation, 51 percent were Republicans in comparison to 22 percent Democrat. Another 23 percent of the boaters were independents. Subsequently, 56 percent were conservative and 22 percent were liberals. Pertaining to occupational status, more than 60 percent of the total respondents were white collar workers. To illustrate, 31 percent reported a professional occupational status while 21 percent indicated that they were in management. Another nine percent were in a business related occupation (Cottrell, 1993). These boaters were relatively experienced with an average of 21 years experience and 77 percent perceived themselves as advanced or expert boaters. This group went boating an average of 35 times per year on the Chesapeake Bay. As number of days boating on the bay increased, both boat length and perceived skill level increased. Years experience and boating skill level increased with age.

In reference to the relationship between sociodemographics and the pool of specific issue variables, as age increased an awareness for the consequences of raw sewage on water quality decreased (Cottrell, 1993). Power boaters were more aware of the consequences of dumping raw sewage than were sailboaters. Boaters with an earned income between $40,000 and $79,999 in 1992 were the most aware of the consequences of raw sewage discharge on water quality. More educated, affluent, older boaters were less likely to use a sewage pumpout station than were boaters on the lower end of the socioeconomic scale. Meanwhile, powerboaters (72%) reported pumping a greater percentage of waste in a pumpout station than sailboaters (44%).

A two-step process was used in the operationalization of several indices for analysis in this study. A factor analysis was carried out to examine four scaled variables. Those scales were knowledge about environmental issues related to water pollution, personal commitment to resolve water pollution, awareness of consequences of water pollution, and situational factors that constrain boater use of sewage pumpout stations (Cottrell, 1993). Next, Cronbach alpha was utilized to test the internal consistency of each index. A perceived knowledge of water pollution issues index was computed as the mean of responses to four statements. The level of reliability was acceptable (Cronbach Alpha = .84). Measurement of personal commitment to resolve water pollution problems was accomplished by computing the mean of responses to five related statements. The intercorrelation of the five items resulted in an overall reliability of .78. Next, the combined

strength of two factors identified in a factor analysis provided an internally consistent scale (Cronbach Alpha = .77) to measure boater awareness of consequences of raw sewage discharge on water quality. This scale consisted of six items probing the general degree of awareness about the harmful effects raw sewage has on health and water quality. Finally, to assess those situations that might constrain or enhance boater use of sewage pumpout stations, a situational factors index was created as the sum of statements specifically related to the use of a sewage pumpout station. This scale had the highest level of reliability (Cronbach Alpha = .86) of all the indices examined.

An attempt was made to develop an index to measure boater knowledge of the laws pertinent to raw sewage disposal. The reliability of those items in the scale were to low, thus all three items were used as separate independent variables in the multiple regression analysis (Table 1).

Table 1. Reliability statistics for the knowledge about the laws index (n=230).

Knowledge of Law Statement	Item Mean[a]	Standard Deviation	Corrected Item-Total Correlation	Alpha If Item Deleted
How far offshore must you be before you can legally discharge human waste at sea?	.69	.47	.38	.32
How far offshore on the Chesapeake Bay must you be before you can legally discharge human waste?	.60	.49	.33	.40
Which one of these organizations is responsible for enforcing dumping at sea violations?	.70	.46	.27	.50
Overall Index[b]	2.0			.51

[a] Scores for these items were coded 0=incorrect and 1=correct.
[b] Range = 0 - 3

Drawn from a previous study of sewage pumpout station use on a national level (Price Waterhouse, 1992), specific responsible environmental behavior, the primary dependent variable in this study, was concerned with what boaters do with their marine sewage (percentage of waste discharged in a sewage pumpout station). Determined from a three part question, this item asked respondents to approximate in 1992 how much raw sewage they discharged into the water more than three miles off-shore (WASTE1), into the water less than three miles off-shore (WASTE2), or by pumping into a sanitation pumpout facility on-shore (WASTE3). Percentages add up to 100 percent. Waste3, percentage of human waste pumped in a sanitation pumpout facility, represents SREB. Approximately nine percent of the raw sewage discharged from recreational vessels in this study was reportedly pumped directly into water more than three miles offshore (WASTE 1). Meanwhile, 31 percent was discharged directly into the water less than three miles from shore (WASTE 2), thereby reflecting illegal behavior. Fifty-nine percent of the waste was reported to be pumped into a sanitation facility (WASTE 3) which indicates appropriate behavior (Table 2).

Table 2. Average waste discharged by Maryland boaters.

	N=210
WASTE 1: Discharged directly more than 3 miles offshore	9.5%
WASTE 2: Discharged directly Less than 3 miles offshore	31.4%
WASTE 3: Discharged by using a sanitation pumpout facility	59.1%
	100.0%

A multiple regression analysis showed eight predictors of specific responsible environmental behavior (% of waste pumped in a pumpout station) which collectively explained 46 percent of the total variance (Table 3). Three background variables (education, $B=-.231$, $p<.0..$ '; boat length, $B=-.246$, $p<.001$; and years of boating experience, $B=-.248$, $p<.001$) were negatively related to sewage pumpout station usage. Environmental concern, representing a pool of general environmental variables, was a moderate predictor $(B=-.173; p<.01)$. Four specific issue predictors included knowledge of water pollution issues $(B=.140; p<.05)$, knowledge of the law about dumping on the bay $(B=.281; p<.001)$, knowledge of the law about dumping at sea $(B=-.133; p<.05)$, and awareness of the consequences of raw sewage on water quality $(B=.426; p<.001)$.

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Table 3. Results of multiple regression of background variables, general environmental variables, specific issue variables, general responsible environmental behavior, and situational factors on specific responsible environmental behavior (n=177).

Independent Variables	Dependent Variable Specific Responsible Environmental Behavior Regression Model	
	r	Beta
Background Variables		
Income	-.144	-.030
Age	-.147***	-.014
Stand on Political Issues	-.063	-.015
Education	-.170*	-.231***
Boat Length	-.333***	-.246***
Boat Skill Rating	-.122	-.068
Years Experience	-.202**	-.248***
Days Boating On Bay	.065	.028
General Environmental Variables		
Environmental Concern	.028	-.173**
Verbal Commitment	-.032	-.089
Knowledge of Ecology	-.011	-.063
Specific Issue Variables		
Knowledge of Water Pollution	.194**	.140*
Knowledge of Dumping On Bay	.193**	.281***
Knowledge of Dumping Offshore	-.155*	-.133*
Knowledge of Enforcement	-.120	-.067
Awareness of Consequences	.447***	.426***
Commitment to Issue Resolution	.108	-.032
Other Variables		
General Responsible Environmental Behavior	.100	-.031
Situational Factors	.333***	.115
R^2 Entire Model		.455***

*** Significant at .001
** Significant at .01
* Significant at .05

Table 3 summarizes the results of a multiple regression invoked to determine the contribution of nineteen independent variables, which are categorized into four dimensions, in explaining the variation in the amount of raw effluent pumped into a sewage dump station (SPS). Three background variables, one general environmental variable, and four specific issue variables accounted for 46 percent of the variance in the amount of sewage discharged on shore. Neither general responsible environmental behavior nor situational factors contributed to the model, although the situational factors scale was significant and positively correlated with SREB. An awareness of the consequences of dumping raw sewage ($B=.416$; $p<.001$) in the bay was the most important indicator of SREB followed by knowledge of the law about dumping on the bay ($B=.281$; $p<.001$), years boating experience ($B=-.248$; $p<.001$), boat length ($B=-.246$; $p<.001$), education ($B=-.231$; $p<.05$), environmental concern ($B=-.173$; $p<.01$), knowledge about water pollution ($B=.140$; $p<.05$), and knowledge of the law about dumping offshore ($B=-.133$; $p<.05$), respectively.

Conclusions

Eight predictors of specific responsible environmental behavior (SREB), as reflected by the percentage of waste discharged in a sewage pumpout station, were determined. The combination of all eight predictors accounted for 46 percent of the total variance explained. Several background variables, initially hypothesized to have an indirect positive effect, were found to have a direct relationship with SREB; however, a negative influence was noted for education, boat length and years experience on SREB. Of the general environmental variables, originally hypothesized to have an indirect positive effect, environmental concern had a direct inverse influence on SREB. The specific issue category of variables was found to have the strongest influence on SREB. For instance, knowledge of water pollution, knowledge of no discharge on the bay, and awareness of consequences each had a direct positive effect; while knowledge of the law about discharge offshore was found to inversely effect SREB. Surprisingly, neither general responsible environmental behavior (GREB) nor situational factors when combined with the other variables in the model influenced the percentage of waste pumped in a sewage pumpout station. GREB represented respondent reports to ten "true-false" items. Each of the statements represented a specific action taken towards an environmental issue. On a scale of one to ten, the mean response was 4.9; that is, on average, boaters reported participating in five out of ten pro-environmental actions. It was proposed that general pro-environmental behavior would directly and positively influence specific issue responsible behavior. That was not the case in this study.

With regard to situational factors, the composite of five statements, in essence, measured a convenience scale of sanitation pumpout station use. As expected, this scale was significantly and positively correlated with SREB, yet it was not found to predict SREB when the direct effect was controlled by the other variables in the regression model. On a bivariate basis, as boaters level of agreement about the convenient use of an SPS increased, they were more likely to use a sewage pumpout to discharge a greater percentage of waste after a boating trip.

In summary, results show knowledge predicts behavior in specific issue situations. In addition, to support Heberlein and Black's (1976) specificity claim, this study showed that the more specific the indicator was in relation to the actual behavior being measured, the stronger predictive ability that indicator will have on behavior.

Implications

Implications for marina management are that as boat length increases, boat owner perceptions of the convenience of sewage pumpout station usage decreases, thus they are less likely to use a pumpout station. Findings in this study indicate that mobile pumpout stations may be an alternative solution to encourage further use. Secondly, knowledge variables in this study proved to be good predictors of pro-environmental behavior. Continual public education about SPS locations and the benefits derived from not discharging in the Bay might encourage further SPS usage.

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