ENVIRONMENTAL EDUCATION AS A CATALYST FOR BEHAVIOR CHANGE: A STUDY OF THE EFFECTS OF *COASTWATCH MAGAZINE* ON SUBSCRIBER ENVIRONMENTAL KNOWLEDGE AND BEHAVIOR

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Abstract.—Environmental degradation resulting from human habits and behaviors has become an increasingly important issue in contemporary society. One organization working to encourage coastal environmental sustainability is North Carolina Sea Grant, which publishes the educational magazine *Coastwatch*. It is NC Sea Grant's desire that coast-related environmental information in *Coastwatch* will encourage behaviors favoring sustainability. During the summer of 2006, researchers at East Carolina University conducted a survey with 800 *Coastwatch* subscribers. This study examined reader characteristics and preferences as well as levels of reported increased knowledge and behavior change among subscribers. The results of this study show a positive relationship between increases in knowledge and changes in behavior regarding 11 separate coastal issues.

1.0 INTRODUCTION

Environmental degradation resulting from human habits and behaviors has become an increasingly important issue in contemporary society. Negative environmental impacts of human development and behavior may include depletion of plant and animal life and deterioration of land, air, and water resources. As many people in America and in the global community place a high value on these resources, environmental protection and sustainability have become important topics of government policy and legislation. This can be seen through numerous laws and regulations mandating protection of wildlife, habitats, and the natural environment. Unfortunately, while various legislative acts have been successful in protecting certain specific resources, environmental degradation continues as a result of the public's actions and behaviors (e.g. loss of habitat resulting from overdevelopment or destructive recreational habits, litter/pollution, introduction of invasive species). In response to this degradation, some organizations have started to encourage the general public to adopt sustainable habits and behaviors. One such organization is North Carolina Sea Grant, which attempts to educate the public on a variety of coastal issues through its outreach publication, *Coastwatch*.

The NC Sea Grant outreach mission states that "the sustainable use of coastal and marine resources benefits all citizens of North Carolina" (NC Sea Grant, 2007). In order to encourage sustainable use of coastal resources, NC Sea Grant publishes six issues of *Coastwatch* per year. Each issue covers a variety of topics including commercial and recreational fisheries and habitats, seafood technology, community and people profiles, coastal laws and legislation, development issues, water quality issues, and marine science. It is NC Sea Grant's desire that educating the public on these issues will encourage positive behavior change among *Coastwatch* readers and others interacting with the coastal environment.

Much existing literature supports the assumption that increases in environmental knowledge will lead to changes in behavior that favor sustainability (Maibach, 1993; Milfont et al., 2006; Schnelle et al., 1980). However, linkages between reported awareness and behavior change have been stronger in some studies and contexts than others. For example, Milfont et al. found that information about different types of

environmental concerns may affect different cultural groups in different ways. Therefore, knowledge of the audience is an important factor to consider when choosing between strategies for encouraging behavioral changes that favors sustainability.

The purposes of this study were to identify characteristics of *Coastwatch* subscribers, examine subscriber preferences for different article formats, examine the extent to which *Coastwatch* creates awareness among its subscribers, and examine the relationship between perceived increased awareness and behavioral changes that focuses on greater environmental sustainability.

2.0 METHODS

NC Sea Grant provided researchers at East Carolina University with a list of 1400 *Coastwatch* subscribers and their contact information. From this list, a random sample of 800 subscribers was selected for this study. During the summer of 2006, mail-back questionnaires were sent to the 800 subscribers using a modified Dillman total design method (Dillman, 1978). A total of 513 questionnaires were returned (64 percent response rate).

Subscribers included in the sample were asked numerous questions in order to gain an understanding of reader characteristics. These questions included whether or not they own property along the NC coast, how often they visit the NC coast during different seasons, and birth year, sex, and education level of primary reader.

To gain an understanding of subscriber preferences for article types, participants were asked to indicate how often they read various types of articles on a scale from 1 (I never read them) to 5 (I always read them). The types of articles included in this line of questioning include Book Market, Editor's Letter, Legal Tides, How-to features, People Profiles, Seafood and Recipes, Coastal/Marine Recreation, Coastal Tidings (Briefs), Places/Community Profiles, History, Nature, Science, and Coastal Issues and Controversies.

NC Sea Grant also wanted to understand how *Coastwatch* articles have increased subscribers' knowledge on a variety of issues. To measure increased understanding of coastal issues, participants were asked to rate their own level of increased understanding of various environmental issues on a scale from 1 (little or no increased understanding) to 3 (considerable increased understanding). Participants were asked to rate their level of increased understanding on 11 issues including NC Sea Grant outreach, NC Sea Grant research, legal and policy issues, seafood safety and product development, fisheries, aquaculture, coastal water quality issues, coastal communities and heritage, coastal development issues, coastal ecosystems and habitats, and coastal erosion and storm effects.

In a very similar line of questioning, participants were asked to rate their level of behavior change regarding the same 11 coastal issues. Again, a scale from 1 (little or no behavior change) to 3 (considerable behavior change) was provided to allow respondents to rate how much *Coastwatch* has encouraged them to take action or change their behavior regarding coastal issues. As *Coastwatch* articles favor sustainable habits and behaviors, reported behavior change is assumed to be positive for the environment, a possible limitation of this study.

3.0 RESULTS

3.1 Subscriber Characteristics

Many of the subscribers had extensive experience within the NC coastal plain. In fact, 63 percent indicated that they owned property along the NC coast. Respondents who did not report owning property along the NC coast indicated that they typically visited the NC coast an average of 8.15 times per year (Range = 75, median = 4). Not surprisingly, the most popular seasons of visitation were summer and fall. The average birth year of respondents was 1943, indicating that the average respondent was about 64 years old. About 74 percent of the respondents were male and 26 percent were female. The average number of years of completed schooling was 16.5 years; 90 percent of respondents indicated that they had completed 13 years of schooling or more.

3.2 Subscriber Preferences for Article Types

To gain an understanding of the popularity of various types of articles, participants were asked to indicate how frequently they read different types of articles presented in *Coastwatch* on a scale from 1 (I never read them) to 5 (I always read them). The results of this line of questioning are presented in Table 1.

As Table 1 depicts, all of the average rankings for the various article types are above 3, indicating that the average subscriber at least reads stories within each category sometimes. The results show that the four most-read categories are coastal issues/controversies, science, nature, and history with average rankings of 4.4, 4.3, 4.3, and 4.3 respectively. The least-read category was book market with an average ranking of 3.3. However, the differences in the averages between these categories are not great, and all of the averages fall between 3.3 and 4.4 on the scale.

3.3 Increased Understanding of Coastal Issues

Subscribers were given a set of 11 issues that are covered in *Coastwatch* articles, and asked to rate how much *Coastwatch* has improved their understanding of each issues on a scale of 1 (little or no increased understanding) to 3 (considerable increased understanding). The results of these questions are presented in Table 2.

The average response for each issue was between 2 and 3, indicating that the average respondent improved his or her understanding of each issue by a moderate and considerable amount as a result of reading *Coastwatch*. The issues with the highest reported amounts of increased understanding were coastal erosion and storm effects, coastal ecosystems and habitats, coastal development issues, and coastal communities and heritage.

3.4 Changes in Behavior Regarding Coastal Issues

Subscribers were then given the same set of 11 issues that are covered in *Coastwatch* articles and asked to rate how much *Coastwatch* has encouraged them to take action or change their behavior regarding each issue on a scale of 1 (little or no behavior change) to 3 (considerable behavior change). The results of these questions are presented in Table 3.

The average response for each issue with respect to behavioral changes was between 1 and 2, indicating that the average respondent was encouraged to take action and/or change their behavior on each issue between a small or nonexistent amount and a moderate

Table 1.—Popularity of article types

I read the following stories:	1 Never	2 Rarely	3 Sometimes	4 Often	5 Always	Avg
Book market	5.9%	17.8%	33.0%	22.9%	20.4%	3.3
Editor's letter	3.1%	11.4%	30.4%	25.9%	29.2%	3.7
Legal tides	3.9%	9.2%	27.2%	30.6%	29.1%	3.7
How-to features	1.5%	8.4%	25.9%	34.3%	29.9%	3.8
People profiles	1.0%	6.0%	26.0%	37.1%	29.8%	3.9
Seafood and recipes	2.4%	8.0%	20.4%	27.6%	41.6%	4.0
Coastal/marine recreation	1.0%	2.9%	19.1%	37.8%	39.2%	4.1
Coastal tidings (briefs)	1.0%	2.7%	15.1%	39.0%	42.1%	4.2
Places/community profiles	1.0%	2.7%	12.6%	44.7%	39.1%	4.2
History	1.2%	2.5%	12.7%	37.2%	46.4%	4.3
Nature	0.4%	2.5%	10.4%	38.7%	48.1%	4.3
Science	0.6%	2.1%	14.7%	36.0%	46.6%	4.3
Coastal issues/controversies	0.6%	1.2%	8.4%	40.1%	49.7%	4.4

Table 2.—Increased understanding of coastal issues

Issue	1 Little or no understanding	2 Moderate understanding	3 Considerable understanding	Avg
NC Sea Grant outreach	13.4%	50.2%	36.4%	2.23
Legal and policy issues	8.6%	55.8%	35.6%	2.27
NC Sea Grant research	10.0%	50.1%	39.9%	2.30
Seafood safety and product development	4.3%	49.7%	46.1%	2.42
Aquaculture	4.0%	46.5%	49.5%	2.45
Fisheries	2.1%	47.7%	50.2%	2.48
Coastal water quality issues	1.3%	41.6%	57.1%	2.56
Coastal communities and heritage	1.9%	39.0%	59.1%	2.57
Coastal development issues	2.1%	33.9%	64.0%	2.62
Coastal ecosystems and habitats	2.1%	33.8%	64.1%	2.62
Coastal erosion and storm effects	1.9%	31.5%	66.7%	2.65

Table 3.—Behavior change regarding coastal issues

Issue	1 Little or no behavior change	2 Moderate behavior change	3 Considerable behavior change	Avg
NC Sea Grant outreach	68.2%	26.7%	5.1%	1.37
NC Sea Grant research	65.2%	27.9%	6.9%	1.42
Aquaculture	60.0%	30.7%	9.3%	1.49
Legal and policy issues	59.8%	28.7%	11.5%	1.52
Fisheries	55.0%	31.8%	13.2%	1.58
Seafood safety and product development	49.1%	36.6%	14.4%	1.65
Coastal communities and heritage	46.9%	38.2%	14.9%	1.68
Coastal water quality issues	38.9%	41.9%	19.2%	1.80
Coastal development issues	39.7%	38.8%	21.5%	1.82
Coastal ecosystems and habitats	39.7%	37.9%	22.4%	1.83
Coastal erosion and storm effects	39.8%	35.8%	24.4%	1.85

amount as a result of reading *Coastwatch*. Like the previous line of questioning, the issue with the highest average response was coastal erosion and storm effects, followed by coastal ecosystems and habitats, coastal development issues, and coastal water quality issues.

3.5 Relationship between Understanding and Behavior

The relationship between reported increased understanding/awareness and behavior change was examined using both Pearson r correlation and one-way ANOVA with Scheffe post hoc tests. Positive correlations existed between increased understanding and behavior change for each of the 11 issues examined. All correlations fell between .2 and .4 and were significant at the .005 level. Mean scores for increased understanding and behavior change were compared for each coastal issue using one-way ANOVA tests. The results of these comparisons are presented in Table 4.

Mean behavior change scores of respondents who indicated experiencing a considerable increase in awareness of a coastal issue were significantly higher than mean behavior change scores of respondents who indicated experiencing little or no increased awareness of the issue. In other words, those indicating a higher

Table 4.—One-way ANOVA results

Behavioral item	Awareness Change: Little or no awareness	Moderate awareness	Considerable awareness	f	Significance
	Mean Behavior Change Scores				
Fisheries	1.11	1.37	1.83*	25.12	.000
Aquaculture	1.07	1.30	1.71*	24.379	.000
Coastal development issues	1.29	1.58	1.96#	14.134	.000
Erosion and storm effects	1.00	1.60	2.00*	16.956	.000
Seafood safety and product development	1.15	1.50	1.90*	21.774	.000
NC Sea Grant research	1.07*	1.32*	1.62*	19.998	.000
NC Sea Grant outreach	1.04*	1.28*	1.62*	27.255	.000
Coastal communities and heritage	1.25	1.46	1.86#	17.460	.000
Legal and policy issues	1.06*	1.39*	1.87*	34.002	.000
Water quality issues	1.00	1.56	2.02*	25.498	.000
Ecosystems and habitats	1.10	1.46	2.06*	38.814	.000

*mean is statistically different then both other categories at .05 level
#mean is statistically different than only moderate awareness category at .05 level

level of increased awareness were more likely to report changes in behavior than those indicating a lower level of increased awareness.

4.0 DISCUSSION AND CONCLUSIONS

The results of this study support the assumption that environmental knowledge is a precursor, or at least a correlate, to environmental behavior change. While the results did show a significant positive relationship between increases in knowledge and changes in behavior, the mean scores for behavior change were substantially lower than the mean scores for increased understanding: respondents indicated that they increased their knowledge between a moderate to considerable amount on all coastal issues, while they indicated changing their behavior on these same issues between a nonexistent to moderate amount. One possible explanation for this difference may have to do with the sample. As *Coastwatch* is a product that subscribers must pay for, it is likely that many subscribers had a pre-existing interest or investment in coastal resource management and sustainability. As a result, it may be likely that these subscribers already had knowledge of sustainable coastal practices and exhibited positive coastal behaviors prior to their subscription dates. Thus, a large change in behavior as a result of reading *Coastwatch* may not be a realistic outcome of the magazine for readers with a previous interest in coastal sustainability.

Subscribers were most likely to read articles on coastal controversies, science, nature, history, and community profiles. As might be expected, the coastal issues with the highest reported amounts of increased knowledge and behavior change seem to fall under the umbrella of these same categories (erosion and storm effects, ecosystems and habitats, development issues, water quality issues, and coastal communities and heritage). These results suggest that people may be more likely to learn about and change their behavior regarding issues that are most interesting or appealing to them.

Further research focusing on the relationship between environmental knowledge and behavior might be enhanced by refining and better developing instruments to measure both baseline and subsequent behavior changes. Longitudinal research using panel data on this subject might provide a better understanding of cause and effect relationships.

5.0 CITATIONS

Dillman, D.A. (1978). **Mail and telephone surveys - The total design method.** New York: John Wiley and Sons.

Maibach, E. (1993). **Social marketing for the environment: Using information campaigns to promote environmental awareness and behavior change.** Health Promotion International, 8(3), 209-224.

Milfont, T.L., Duckitt, J., & Cameron, L.D. (2006). **A cross-cultural study of environmental motive concerns and their implications for pro-environmental behavior.** Environment and Behavior, 38(6), 745-767.

North Carolina Sea Grant (2007). **Outreach efforts overview.** Retrieved 05 April 2007, from http://www.ncseagrant.org/index.cfm?fuseaction=page&filename=outreach_efforts.html

Schnelle, J., McNees, M., Thomas, M., Gendrich, J. & Beagle, G. (1980). **Prompting behavior change in the community: Use of mass media techniques.** Environmental Behavior, 12(2), 157-166.