New England Aquarium Volunteers:
Influencing Factors of Emerging Environmental Stewards

Introduction

The ocean holds some of the most diverse and ecologically important ecosystems in the world; however, in recent years its composition has changed and marine biodiversity has become increasingly threatened due to climate change (Hansen et al. 2006). Many marine ecosystems cannot cope with even miniscule changes to their environment, therefore, a rise in average ocean temperature, for example, can have damaging ecological effects (Hansen et al. 2006). It is imperative that marine environments are protected for the preservation of the world's biodiversity and economy, therefore efforts to mitigate these effects are needed. Some institutions have established such efforts to aid conservation work themselves; zoos and aquariums have stepped away from their historic roled-urrsfuacoariucuerneavothar and

where the natural behavior of animals, rather than

human entertainment, but rather as 'animal ambassadors' working to inspire conservation (Ibid.).

Animal ambassadors are defined by AZA to be, “an animal whose role includes handling and/or training by staf

volunteer operations can be to foster pro-environmental behaviors in volunteers, and some institutions aim to take advantage of this possibility.

Literature Review

There is a complex relationship between volunteers' motivations for volunteering, attitudes towards the environment, knowledge and adoption of conservation behaviors (Chase and Levine, 2017). Pre-existing knowledge is found to be the most common motivator for volunteering (Seymour et al. 2018) and values are cited to be the key predictor of pro-conservation or pro-environmental behaviors (Schuttler et al. 2018). Despite the complicated nature of motivations for volunteering and pro-environmental behaviors, some organizations operate under the assumption that volunteers automatically become environmental stewards simply by showing up to work.

We define successful programs as those that have inspired

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One of the most commonly cited determinants of adopting pro-conservation behaviors is demographic information and environmental background. Findings suggest that socioeconomic status and education to be the major drivers of behavioral change within volunteers (Chase and Levine 2017). Age and gender have also been found to significantly influence pro-conservation behavior (Seymour et al. 2018).

Citizen Science is a program design that allows people without experience in the environmental field to participate in the collection and analysis of scientific field data pertaining to the natural world for research projects. This type of program has been utilized in many volunteer programs and in some cases, the outcomes of such involvement have been explored. For example, in a study analyzing post-involvement attitudes of a group of Citizen Science volunteers in San Diego, California, Charleston, South Carolina, volunteers were involved in tasks monitoring resources concerning, biodiversity, sea turtles, coastlines, and water quality (Chase and Levine, 2017). Findings from 306 survey responses (with a limited demographic makeup: respondents were 90% white, 40% had a graduate degree, and over half had an annual household income of over $100,000,), suggest younger volunteers with little to no environmental background were more likely to report they would change their attitudes and decision-making after volunteering (Ibid.).

In another study of Citizen Science volunteers, results indicated socioeconomic status as a key determinant for pro-environmental practices. Specifically, these findings suggest that for volunteers with a lower education and socioeconomic status, adopting pro-environmental behaviors is best done when it also helps them save money (Seymour et al. 2018). Specifically, volunteers living in the most economically deprived communities experienced the most

significant behavior changes that had an economic aspect, such as travel and energy usage (Ibid.). Other scholars found scientific background to be a key motivator for pro-environmental behaviors. For example, Crall and colleagues (2012), explain that those with scientific background already had strong pro-environmental behaviors. Contrarily, those with little scientific background or environmental knowledge had stronger changes in pro-environmental behaviors (Crall et al., 2012).

Asah and Blahna (2013) analyzed survey results from a group of 329 urban conservation volunteers and categorized motivations to volunteer into two groups, affective and normative. Their findings suggest affective commitments were often more social and personal and grounded in motivations, such as, socializing with other volunteers. Similarly, in a 2018 study of 1,500 Japanese forest conservation volunteers spanning a number of organizations, affective, non-environmental correlations were found to corresponded with non-environmental takeaways from volunteering (Takase et al. 2018). Specifically, the primary motivation for volunteering among was the "improvement of personal physical well-being," and their primary takeaway was exercise (Takase et al., 2018, 1). Another study conducted on 16 organizations in the British and Irish Association of Zoos and Aquariums reported motivations to be personal and social, including a desire to: increase knowledge and skills; create friendships and a new network (Smith et al. 2018). Asah and Blahna (2013) found environmental motivations to volunteer fell under normative commitments, meaning that volunteers' environmentally-based reasoning for volunteering was founded in an obligatory feeling. On the contrary, The Cleveland Zoo conducted a similar study concluding, volunteers see environmental motivations as an affective

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animals, or their specific subject of work (e.g., animals, New England beaches, the Charles River, etc.), were deemed to have the most “charisma” and attracted the most volunteers, (64% of volunteers chose to work with mammals) (Ibid., 317). Animal charisma is especially applicable to volunteer work in zoos and aquariums as the subject of almost all of the work done with these two institutions involve animals. Essentially, this study found that volunteers who felt increasingly connected with the animal they worked with while volunteering, they may be more likely to adopt pro-conservation behaviours, similar to the concept of affective commitment as stated above.

Who Creates Environmental Stewards?

Experiential volunteering and environmental knowledge do not always lead to the explicit adoption of pro-conservation behaviors. Citizen Science’s “Flying Beauties” project employs local people in the Philippines to collect photographs and record data to provide information on rice ecosystems (Dem et al. 2018). While this project was advertised to “engage volunteers to learn and improve their knowledge about ecosystem functions,” it was criticized as a masked way to reap the benefits of unpaid labor (Ibid., 727). While one of the primary learning outcomes of the volunteer work did include “learning about the functions of species,” it also included “showing talents” and “use of cameras” (Ibid., 730). Therefore, it is difficult to conclude whether education can change any pre-existing opinions. However, there is a benefit of unpaid labor as it can lead to education, learning and the development of new skills.

The New England Aquarium would immensely benefit from understanding how behavioral adoption predictors relate to one another in order to improve the likelihood of creating environmental conservationists in their volunteer population. The goal of this study is to

investigate what aspects, if any, of volunteer programs at NEAq are the most successful at creating environmental stewards. Additionally, this study will explore which volunteer experiences correlate with pro-conservation behaviors and attitude changes.

Background

The New England Aquarium (NEAq), founded in 1969 has an average of 1.3 million visitors each year that come to observe thousands of marine and freshwater fish, reptiles, and mammals. In the Aquarium's largest exhibit, the Giant Ocean Tank, there are over thousands of individual animals that call this 200,000-gallon tank home (New England Aquarium website). The NEAq runs programs concerning marine research, rescue, and rehabilitation in order to promote conservation work; however, many of their efforts would not be possible without the help of over 1,000 active volunteers.

Internships at the aquarium require a commitment of one, full-length workday per week for a minimum period of sixth months. Intern responsibilities vary, and include responsibilities ranging from collaborating with the marketing and administrative teams, to the interpretation of marine mammal behavior. Interpretation responsibilities at the NEAq are vital to understanding emotional well-being of 'ambassador' California sea lions, for example, because without a healthy lifestyle these 'ambassadors' cannot effectively inspire conservation and should not therefore be in captivity (AZA Board of Directors, 2011).

Another volunteer opportunity at the NEAq is the 'Classic Corps' program. 'Classic Corps' volunteers have the same commitment requirements as unpaid interns. Involvement in the 'Classic Corps' can include such opportunities as food preparation for the 'Penguin Colony'

To determine any associations between the adoption of pro-environmental changes and volunteer aspects, we distributed a survey via email using FormAssembly (a survey distribution software used by the New England Aquarium) to the active New England Aquarium volunteer base, which comprises 1,017 volunteers. We received 189 responses. We analyzed our data using quantitative methods. We compiled numerical data from sociodemographic information (i.e. age, number of years volunteering at aquarium, level of education, household income, members of the household, and hours volunteered in the last year). For questions that do not require a numerical response, we coded responses so that they, along with numerical responses, could be used to run multi-linear regressions in Stata in order to map a clear understanding of the association between pro-conservation changes and volunteering. Stata is a statistical computing system that can be used in quantitative analysis to run multi-linear regression models. For this type of research, regression analysis is the most effective as it "both quantifies how the variables are related and can tell us whether the relationship is statistically significant (Kanazawa, 2018, 122). Using Stata, the survey data can be analyzed to assess various statistical trends that can lead to insights for the NEAq. These insights can provide information about which volunteer variables are the most statistically significant.

The survey consisted of five distinct sections. A socio-demographic section included six multiple choice responses. In the next section, drawing on questions from Chase and Levine (2017), we asked five multiple choice questions regarding volunteer characteristics towards the environment, for example; to what extent do you agree or disagree with this statement: "Since starting to volunteer, my attitudes towards the environment in general has changed significantly." These questions included an open-ended response if the respondent wished to include more

information. We did not use the open-ended response information in our statistical evaluation. The third section asked 23 questions with Likert-type responses about motivations to volunteer (Asah and Blahna 2013). We did so in order to understand how these factors influence adoption of pro-conservation behaviors and attitudes. Finally, we included an appreciation and engagement section for the New England Aquarium to actively use in any future development of their programs. This section comprised nine questions that are a mix of multiple choice, open-response, and Likert-style.

Our response rate was 18.4%. As outlined in Kanazawa (2018), low response rates are common in optional survey studies as respondents don't feel the immediate need to fill out surveys. Additionally, we recognized that the majority of the people who responded to this survey are those who hoped to get an internship or long-term job at the NEAq, which may skew their pre-existing attitude and motivation scale. We acknowledge the potential discomfort in responding to household income and gender. A key limitation is that our survey asked volunteers which roles they filled at the aquarium, we realized in the responses that volunteers filled multiple roles and therefore it was impossible to tell which role most significantly impacted the volunteer's attitudes, behavior, and knowledge.

Another key limitation was that our survey asked respondents if they changed their attitudes and behaviors; it did not specify that these changes were positive, and favored the environment.

Results

The general descriptive statistics of the volunteers responses to the Form Assembly survey instrument can be found in Table 1. Of all respondents, 20.9% were male, while 79.1% were female. The majority of volunteers were between the ages of 25 and 34 (27.8%). Secondly, the majority had achieved an educational level of a Bachelor's Degree (49.2%). Most volunteers had been volunteering for 1-2 years (26.6%). Furthermore, most volunteer respondents were involved with the aquarium through the LiveBlue Service Corps (38.5%).

Dependent variables were established by asking the respondents' agreement level with four statements pertaining to their changes in attitude or behavior towards the subject of their volunteer work (e.g., animals, New England beaches, the Charles River, etc.), as well as the environment in general. This included asking whether the respondent experienced the following changes after volunteering: attitude towards the "subject" of volunteering (ATTRES) (e.g. sea turtles, New England beaches, or marine ecosystems), attitude towards the environment in general (ATTENV), behavior towards the "subject" of volunteering (BEHRES), and behavior towards the environmental in general (BEHENV). The fifth dependent variable was retrieved by asking whether respondents learned about the science related to the subject of their volunteer involvement after volunteering (LEARN). Independent variables included any demographic information, volunteer motivations, volunteer program membership, or types and details of volunteer involvement of a respondent.

As Stata cannot interpret non-numerical figures, the responses for these dependent variables were coded numerically from one to five with one being "Strongly Disagree" and five being "Strongly Agree" (see Appendix I for full codes of options of opinions responses for these

questions). This coding was performing by running search and replace commands for all "Strongly Agree", for example, being replaced with a numerical value of five.

Descriptive Statistics of NEAq Respondents

Demographic and Background	# NEAq Volunteers Respondents (%)
Sex	
Female	1e3

Professional degree	7 **(3.8%)**
Doctorate degree	9 **(4.9%)**
Trade/technical school	1 **(0.5%)**
Prefer not to answer	1 **(0.5%)**
Length of time volunteering	
0-11 months	77 **(41%)**
1-2 years	50 **(26.6%)**
3-4 years	34 **(18.1%)**
5-6 years	8 **(4.3%)**
6-7 years	0 **(0%)**
7-8 years	6 **(3.2%)**
9-10 years	4 **(2.1%)**
10+ years	9 **(4.8%)**
Program	
Classic Corps	67 **(35.8%)**
LiveBlue Service Corps	72 **(38.5%)**
Internships	20 **(10.7%)**
Classic Corps and Liveblue Service Corps	21 **(11.2%)**
Classic Corps and Internships	5 **(2.7%)**
Classic Corps, Liveblue Service Corps, and Internships	2 **(1.1%)**
LiveBlue Service Corps and Internships	2 **(1.1%)**

Sixty five percent of respondents reported their attitudes towards the subject they interacted with while volunteering changed (ATTRES), and 57% of respondents reported that their attitude towards the environment changed (ATTENV). It was also shown that 81% of volunteers responded that they learned about the subject

(LEARN). Furthermore, 62% of respondents reported changing their behavior towards the subject of volunteering (BEHRES), and 68% reported changing their behavior towards the environment in general (BEHENV). More detailed information is available in Appendix I. When concerning the level of change of attitude towards the “subject” one interacted with following volunteering with the aquarium (ATTRES), the motivation to volunteer “to show my support for the mission of the New England Aquarium” (M19) was the most significant explanatory variable. Having this motivation to volunteer is associated with a 6.48% decrease in changes in attitude towards the resource of volunteer involvement following volunteering (ATTRES) (***β*** = -0.3241257).

The most statistically significant variable was involvement in volunteer opportunities in the LiveBlue Service Corps. Participation in trail maintenance volunteering is associated with a 16.05% decrease in changes in attitudes towards the environment (ATTENV) (***β*** = -0.80271

volunteer “in order to get away from the busy demands of everyday life” (M20). Having this motivation to volunteer is associated with a 4.47% increase in changes in behavior towards the environment in general following volunteering (BEHENV) ($\boldsymbol{\beta}$ = 0.223368). While these are the most statistically significant variables of these dependent variables, the remaining statistically significant findings for each dependent variable at the 90% confidence interval for each are shown in Table 2.

Levels of Association for Significant Explanatory Variables[1]

	Attitude towards subject *(% change)*	**Attitude towards environment** *(% change)*	**Learn about subject** *(% change)*	**Behavior towards subject** *(% change)*	**Behavior towards environment** *(% change)*
Husbandry	15.31%[2]				
Museum Operations	49.89%				
Gardening	15.61%				
Trail Maintenance		-16.05%		-17.62%	5.91%
Education skills			12.40%		
Hours				2.55%	
Other (Classic Corps)				15.95%	
Motivation: Connect with community				7.11%	6.44%
Motivation: Learn about work at NEAq		4.81%			
Motivation: to show community I care				4.74%	
	Attitude towards subject *(% change)*	**Attitude towards environment** *(% change)*	**Learn about subject** *(% change)*	**Behavior towards subject** *(% change)*	**Behavior towards environment** *(% change)*
Motivation: Support mission of NEAq	-6.48%	-3.90%			

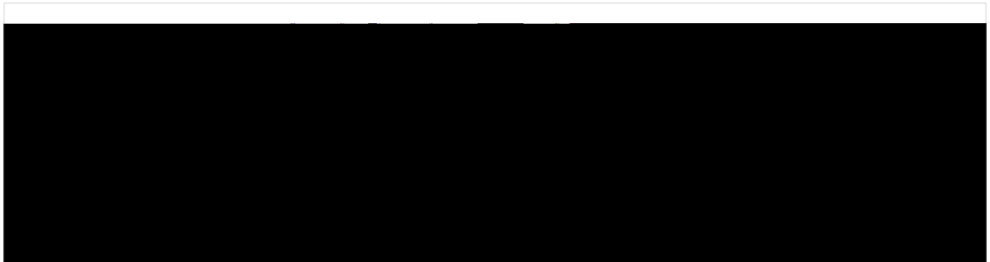
[1] See Appendix I for extended table with slope and p-values of significant explanatory variables.
[2] Significant at the 89.99% confidence interval.

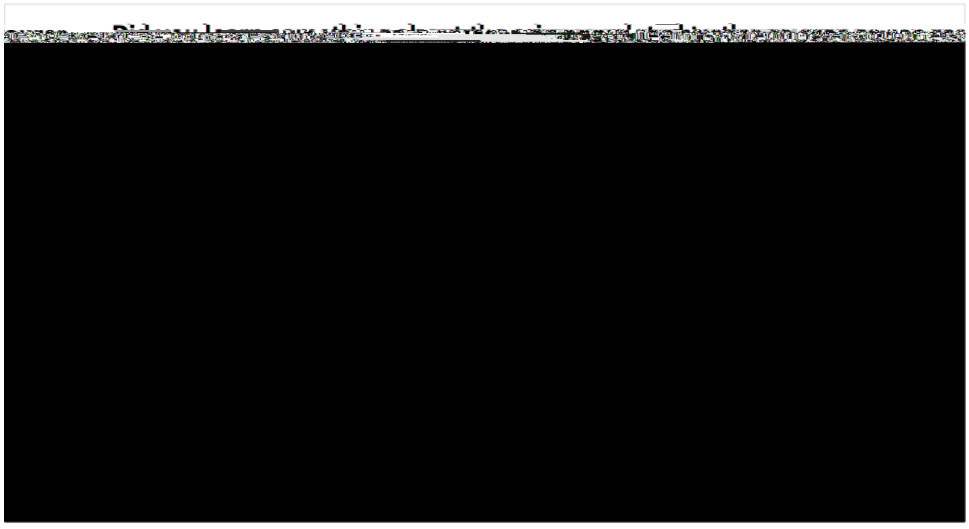
Motivation: escape everyday life					4.47%

Correlations analyzing the relative association between the five dependent variables (ATTRES, ATTENV, LEARN, BEHRES, BEHENV) and the explanatory variables of Classic Corps, Liveblue, and Internship were also performed. In all correlation calculations, involvement in Classic Corps had the strongest positive correlation with the positive change in the five dependent variables (Table 3).

Correlation of Classic Corps Volunteers and Dependent Variables

	Attitude towards subject (ATTRES)	**Attitude towards environment (ATTENV)**	**Learn about subject (LEARN)**	**Behavior towards subject (BEHRES)**	**Behavior towards environment (BEHENV)**
Correlation Value	0.0518	0.1012	0.1277	0.1563	0.1051





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volunteering in particular, could be improved to create more effective environmental stewards out of all volunteers around the globe.

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