

## **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 role as living museums of natural science in order to contribute towards the global effort of promoting environmental conservation (Ballantyne et al. 2007).

In the early 19th century, zoos and aquariums were mostly made up of menageries or living natural history cabinets, displaying animals in cages to demonstrate the taxonomic diversity of life (Rabb, 1994). At the turn of the 20th century, they evolved into living museums where the natural behavior of animals, rather than their phenotypic characteristics, became the purpose of their captivity (Ibid.). Today, many zoos and aquariums, such as those who belong to the American Association of Zoos and Aquariums (AZA), no longer view animals as assets for 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 staff or volunteers for interaction with the public and in support of institutional education and conservation goals” (AZA Board of Directors, 2011). By having an animal ambassador in an observable habitat, visitors create a relationship with a previously unfamiliar species. Toward this end, many aquariums have designed exhibits to initiate encounters, such as touch tanks where visitors can physically interact different marine animals (Rowe & Kisiel, 2012). At such exhibits, charismatic relationships can be formed between visitors and animals (Ibid.). Such a connection can potentially create a space for pro-environmental behaviors to emerge (Ballantyne et al., 2007).

This drive to involve aquarium patrons in the effort to preserve marine ecosystems is developed further by the establishment of volunteer programs. Aquarium volunteers give their time to help mitigate conservation threats, such as through beach cleanup events. In this type of volunteer work, volunteers can reduce the amount of debris found on coastal environments. Anthropogenic debris can lead to the death of marine organisms via animal consumption or entanglement; therefore this type of work is imperative towards the preservation of marine species (Critchell et al. 2015). For example, sea turtles often mistake discarded plastic bags as jellyfish, leading to the potentially lethal consumption of floating debris (Carr, 1987). Such volunteer experiences can also lead to environmental stewardship through the adoption of pro-environmental behaviors, attitudes and knowledge, outside of zoo and aquarium walls. Ideally, conservation volunteers would act as environmental stewards both through their volunteer work and in their daily lives. In other words, one outcome of conservation-oriented

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 their volunteers to adopt pro-conservation behaviors, attitudes and knowledge, defined by a positive correlation between volunteering and changes concerning the environment. For example, changes in shopping habits (Seymour et al. 2018, p. 80), reduced consumption, a newfound desire to protect resources, a greater appreciation of local wildlife, and political engagement (Ibid., p. 5; Chase and Levine, 2017). Such evidence demonstrates that environmental projects have the potential to inspire positive change in people and the environment.

### **What Drives Adoption of Pro-Conservation Behaviors?**

*Demographics and Background as a Driver of Change*

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).

### *Motivations for Volunteering as a Driver of Change*

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

commitment. After their work, a majority of volunteers reported they were more likely to purchase organic foods, purchase items that help third world countries, and donate more than \$100 to a conservation cause (Bixler et al., 2013, 63). Open-ended responses to survey questions suggested that volunteers feel more connected and fulfilled with their work due to their role in fulfilling the Zoo's conservation mission, suggesting volunteers resonated with the mission of the zoo and changed their conservation behaviors accordingly (Ibid).

### *Volunteer Experience as a Driver of Change*

Schuttler and colleagues (2018) explore the concept of "extinction of experience." This theory describes how "conservation attitudes and behaviors are dependent on one's connection to the natural world" (405). In response to the call for those in urban areas to reap the benefits of more interaction with nature, Citizen Science created Nature-Based Citizen Science (NBCS) programs that help increase feelings of connection with the natural world (Schuttler, 2018). Schuttler and colleagues (2018) analyzed information from 289 papers discussing the impacts of NBCS programs spanning a variety of conservation programs. Results suggest NBCS inspires connection to nature where the most positive changes increased "interest in science and the environment" and "behavior and stewardship" (Ibid., 407).

While most studies focus on one volunteer program, Lorimer's 2010 study included environmental volunteers participating in 324 international conservation projects to explore the importance of "nonhuman charisma," a concept comprising the ecological and aesthetic aspects of a species and the affective responses with humans. Nonhuman charisma played a role in attracting volunteers to different volunteer programs that could provide inferences for how various experiences can influence behavioral adoption (317). Projects that worked closest with

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 six 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'



exhibit. Finally, the volunteer opportunity with the lowest level of commitment is involvement in the ‘Live Blue Service Corps’ (LBSC). This opportunity has no minimum time requirement and the level of involvement is more flexible. LBSC opportunities, for example, include local community beach clean-ups at Revere Beach (Revere, MA) or providing visitor education services in the ‘Edge of the Sea’ exhibit..

It is the mission of the New England Aquarium to “Protect the Blue Planet” and it is the hope that the NEAq can succeed in this ultimate mission through interactions with their visitors, volunteers, and their conservation efforts beyond the aquarium walls. The NEAq recognizes the global ecological importance of marine ecosystems, therefore, their conservation efforts and programs, volunteer or otherwise, are made as impactful as possible. As Ballantyne and colleagues (2007) note, without volunteer efforts, many environmental organizations could not succeed in their missions to promote conservation work in the field. In addition, the New England Aquarium hopes that their volunteers become environmental stewards and “Protect the Blue Planet” in their daily lives. If a ‘Classic Corps’ volunteer is involved with an opportunity feeding of Little Blue Penguins (*Eudyptula minor*), for example, they could develop a relationship with the individuals they work with and could therefore change their personal behavior to better reduce the anthropogenic threats to Little Blue Penguins in the wild. These behavioral changes could include cutting up plastic soda can rings that can often lead to the entanglement and suffocation of many marine birds and mammals (Laist, 1997).

## **Methods**

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.

*Table 1:*

### Descriptive Statistics of NEAq Respondents

<b>Demographic and Background</b>	<b># NEAq Volunteers Respondents (%)</b>
<b>Sex</b>	
Female	148 (79.1 %)
Male	39 (20.9 %)
<b>Age</b>	
18-24	45 (24.1%)
25-34	52 (27.8%)
35-44	19 (10.2%)
45-54	26 (13.9%)
55-64	24 (12.8%)
65-74	20 (10.7%)
75+	1 (0.5%)
<b>Conservation, Biology, or Environmental studies background</b>	
Yes	68 (36.2%)
No	105 (55.9%)
Other related	15 (8.0%)

<b>Demographic and Background</b>	<b># NEAq Volunteers Respondents (%)</b>
<b>Highest level of education attained</b>	
Some high school	2 (1.1%)
High school diploma	3 (1.6%)
Some college	30 (16.2%)
Associate’s degree	5 (2.7%)
Bachelor’s degree	91 (49.2%)
Graduate degree	36 (19.5%)

Professional degree	7 (3.8%)
Doctorate degree	9 (4.9%)
Trade/technical school	1 (0.5%)
Prefer not to answer	1 (0.5%)
<b>Length of time volunteering</b>	
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%)
<b>Program</b>	
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%)

*This table shows the primary descriptive statistics of all NEAq respondents to the outlined survey described in Methods.*

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 they interacted with during volunteering

(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) ( $\beta = -0.3241257$ ).

The most statistically significant variable was involvement in *trail maintenance* 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) ( $\beta = -0.802711$ ). For the dependent variable LEARN, or how much one learned related to the science of the subject of their volunteer involvement, involvement in volunteer opportunities concerning *educational skills* in the LiveBlue Service Corps (i.e. Edge of the Sea volunteer or Marine Mammal Education volunteer) was the most statistically significant, where there was a 12.39% increase in LEARN ( $\beta = 0.6199787$ ).

When concerning how much one’s behavior, instead of attitude, changed towards the resource of their volunteer involvement (BEHRES) it was participation in *other* activities in the Classic Corps program specifically that proved to be the most statistically significant. Participation in these sorts of activities is associated with a 15.95% increase in BEHRES ( $\beta = 0.7973072$ ). The most significant variable in BEHENV regression was the motivation to

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) ( $\beta = 0.223368$ ). 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.

Table 2:

**Levels of Association for Significant Explanatory Variables<sup>1</sup>**

	Attitude towards subject (% change)	Attitude towards environment (% change)	Learn about subject (% change)	Behavior towards subject (% change)	Behavior towards environment (% change)
Husbandry	15.31% <sup>2</sup>				
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%	
<b>Motivation:</b> Connect with community				7.11%	6.44%
<b>Motivation:</b> Learn about work at NEAq		4.81%			
<b>Motivation:</b> 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)
<b>Motivation:</b> Support mission of NEAq	-6.48%	-3.90%			

<sup>1</sup> See Appendix I for extended table with slope and p-values of significant explanatory variables.

<sup>2</sup> Significant at the 89.99% confidence interval.



Motivation: escape everyday life					4.47%
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*Statistically significant findings for each of the analyzed dependent variables at a 90% confidence interval. For a list of independent variable codings - please see attached Appendix.*

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).

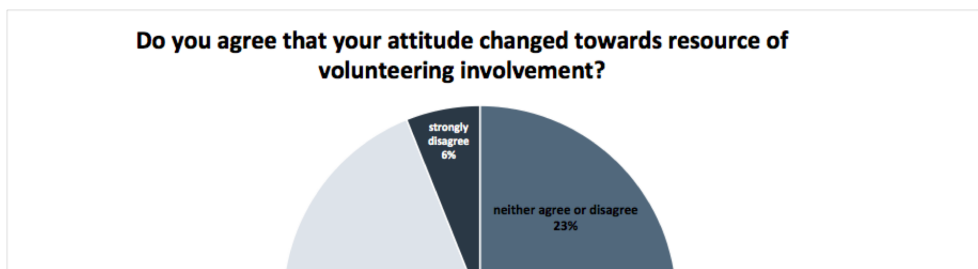
*Table 3:*

**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)
<b>Correlation Value</b>	0.0518	0.1012	0.1277	0.1563	0.1051

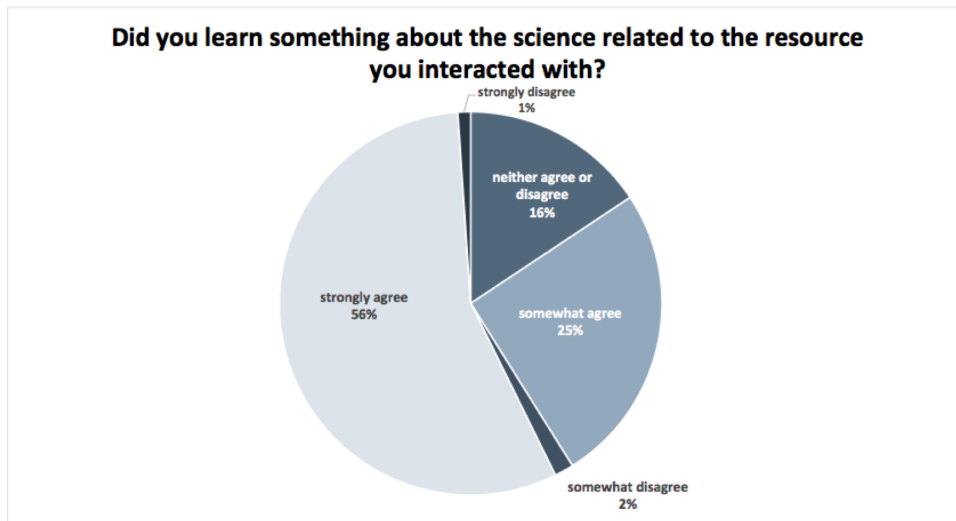
*This table shows the calculated correlation values of Classic Corps involvement (program with highest overall correlation with five outlined dependent variables) with each individual dependent variable.*

*Figure 1:*



*Figure 1: This figure shows the percent of categorical responses to the survey question concerning ATTRES without filtering for any demographic, involvement, or motivation variables.*

*Figure 2:*



*Figure 2: This figure shows the percent of categorical responses to the survey question concerning LEARN without filtering for any demographic, involvement, or motivation variables.*

## **Discussion**

Volunteers who were motivated to fulfill the mission of the New England Aquarium were least likely to change their attitudes. This finding was more significant in relation to the subject of their volunteer work (e.g., animals, New England beaches, the Charles River, etc.), more than their attitudes towards the environment in general. Volunteers involved in trail maintenance were least likely to change their environmental attitudes. Volunteers in teaching roles learned the most about the subject of their volunteer work (e.g., animals, New England beaches, the Charles River, etc.). Volunteers motivated by a desire for a change of pace in their lives were most likely to change their behaviors towards the environment.

Authors Chase and Levine (2017) surveyed Citizen Science volunteers throughout the U.S. is “touted as having tremendous potential to reinforce pro-environmental attitudes and eventually end up fostering increased environmental stewardship,” yet less than 40% of volunteers reported a change in behaviors regarding the resource and the environment as a result of volunteering (Chase and Levine, 2017, 1). The New England Aquarium volunteers were more likely to adopt both new behaviors and attitudes, as well as knowledge, as a result of their volunteer experience. Sixty-five percent of volunteers changed their attitudes and 62% changed their behaviors towards the subject of their volunteer work. Fifty-seven percent changed their attitude and 68% changed their behaviors towards the environment in general. 81% of volunteers learned more about the subject of their volunteer involvement.

Those driven by a motivation to support the mission of the aquarium were the least likely to change their attitudes towards the subject of their volunteering. In addition, those involved in trail maintenance were the least likely to change their attitudes towards the environment. This

contradicts the findings of Schuttler and colleagues (2018), who found that those involved in programs that brought people into nature during their volunteer work (in this case, assisting with scientific research), increased “interest in science and the environment” and “behavior and stewardship” (407). This discrepancy might suggest that it is a different component (perhaps doing research, instead of being in nature,) that is most important in driving volunteers to change their attitudes.

In the case of the New England Aquarium, the volunteer base’s backgrounds might be the reason for this lack of attitude change. Half of respondents that did not change their attitudes towards the environment had a background in conservation, biology or environmental studies, and all (optional) open-ended responses indicated that the lack of change was due to pre-existing positive attitudes towards the environment (i.e., their attitudes did not change because they already possessed positive attitudes prior to volunteering). Similarly, for those who did not change their attitude towards the subject of their work, more than half had relevant backgrounds, and all open-ended responses indicated that their lack of attitude adoption was due to the fact that they already possessed positive attitudes. It is therefore likely that this was the reason these volunteers did not change their attitudes. This would support the findings of Chase and Levine (2017), who found that people with a science background were less likely to change their attitudes and behavior towards the environment after volunteering.

Volunteers that had a teaching role at the aquarium (for example, with Fur Seals, California Sea Lions, or at the Edge of the Sea Touch Tank) were the most likely to learn about the subject of their work. Given volunteers acquire educational skills most effectively when teaching visitors about the animals in their exhibits, we suggest that aquariums may want to

include more opportunities for volunteers to teach visitors if they want their volunteers to increase their knowledge about the animals and exhibits at the aquarium and other subjects of volunteer work (e.g., New England Beaches). For programs with this goal to educate their volunteers, such as the Citizen Science Flying Beauties project in the Philippines, including a teaching component in volunteer roles could be the most successful (Dem et al. 2018).

Asah and Blahna (2013) and Takase et al. (2018) found that social and personal motivations were more important in getting people to volunteer in environmentally focused opportunities, than were purely environmental motivations. Our results take this finding a step further, as we found that those who were motivated to volunteer “in order to get away from the busy demands of everyday life” were the most likely to change their behaviors towards the environment. Therefore, we recommend aquariums market volunteer opportunities as a chance to achieve this type of ‘escape’ for potential volunteers in order create environmental stewards through their volunteer programs.

It is important to note the other significant findings (Table 2). If aquariums want to positively change any volunteers knowledge, attitudes and behaviors, they could pursue volunteer opportunities that are associated with these independent variables. This could include modifying existing volunteer roles (e.g., including a teaching component) or marketing their volunteer programs differently (e.g., as an escape from everyday life).

Our work began to discover what drives these high rates of pro-conservation behaviors, changes in attitude, and learning at the aquarium. Programs that struggle to positively impact their volunteers could conduct a similar study to discover which drivers are most impactful. If more studies are published on this topic, environmental volunteering, and zoo and aquarium

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

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