MISS Impact Study/Evaluation

Traci L. English-Clarke, Ph.D.

November 7, 2022

Table of Contents

Introduction

Minorities in Shark Science (MISS) is an organization that was founded in 2020 to increase the numbers of gender minorities of color in shark science. Their mission seems to be twofold: to highlight the work of gender minorities of color who are already in shark science, and to diversify the field of shark science. They do this by creating opportunities for gender minorities of color to gain and sustain interest in the field, and to acquire the experience that they need to succeed and grow their careers in shark science. To help MISS identify gender minorities of color who are in or interested in shark science as well as people who do not fall into this category but would like to assist in MISS's mission, they offer two levels of membership: MISS members and Friends of MISS (FOM).

MISS offers several different programs of their own for people in all stages of development, including a summer camp for youth (the MISS Sleep Away Summer Camp), residential fellowships for young adults that are offered in partnership with a variety of shark science organizations, a weekend workshop for young adults to give them experience on a boat doing shark research. They also offer a pop-in weekend science program (the Science by the Sea program for middle schoolers, high schoolers, and families), a science fair preparation program (the Science by the Sea Emerging Scholars program for middle and high schoolers), an online class for learners in K-12 and beyond, a year-long online program to provide support for those who are having difficulty breaking into marine science (the Diversifying Ocean Research program). Lastly, they offer a mentorship program for pairs of MISS members at varying stages in their careers. All of these programs are free to participants, funded by MISS fundraising efforts and partnerships with interested organizations. Some programs for adults—typically those with a residential component—provide participants with a stipend so that they can continue to support themselves and their families while they are participating in these vital experiences.

This study aims to identify the impact that MISS has already had on the field of shark science and on those who are interested in breaking into the field or are currently pursuing degrees in marine science with the intent to study sharks. They have only been in existence for two years, so their impact at this point is not expected to have increased the number of Ph.D.'s or professors in the field—both of which take many years to accomplish. However, through their outreach and the programs they have offered in the last two years, they have reached a lot of individuals and organizations. Thus, I was asked to perform a study to determine the impact they have had thus far.

Executive Summary

This report contains findings from the impact study of Minorities in Shark Science (MISS). This study included surveys of participants from a selection of MISS programs (summer camp, the MISS workshop, and MISS Fellows), as well as members of MISS/Friends of MISS (FOM) and members of the American Elasmobranch Society (AES), along with interviews with staff at organizations that have partnered with MISS to provide fellowships for MISS members. All data for this study was collected and analyzed during the summer and fall of 2022. Surveys were administered via paper (summer camp and AES members) and electronically (AES members, MISS workshop, MISS fellows, MISS members/FOM); pre-post surveys were administered to summer campers and to current MISS Fellows because the timing of their programs allowed for this. Interviews were conducted via Zoom video calls. The primary purpose of the study was to determine the impact that MISS has had thus far on the field of shark science and on the individuals who have participated in MISS programs. Overall, the feedback from all sources was very positive.

About 73% of summer campers rated the camp at an 8 or higher (out of 10), and no campers rated it below a 7. Science identity increased for about 1/3 of campers during the camp. Additionally, for a large proportion of students, their sense of belonging and social marine science network both increased over the course of the summer camp: they felt less alone and less like an outsider in science settings. Many students also reported an increase in feeling like they had made connections with marine scientists during the camp. It is worth noting that 10th graders' ratings seemed to decrease when other students' ratings increased; I was unable to determine the reason for this, as the sample was too small to do further testing.

AES members overwhelmingly reported that MISS is having a positive impact in multiple ways:

1. They have increased the number of minorities pursuing shark science,

2. increased respondents' exposure to issues of diversity in shark science,
3. helped them to be an ally for racial and gender minorities in shark science
4. helped them to perceive diversity and inclusion in a positive way
5. as a result of MISS's activities, they were more likely to try to increase diversity at their organization

Additionally, AES members largely thought that there need to be more racial minorities in shark science and that racial diversity is important in shark science. A majority of participants thought that it was important to have people with nontraditional gender identities in shark science, but participants were pretty evenly split on whether they thought sexual orientation has an impact on one's perspective on shark science research. As for the reasons they gave for why more racial minorities are needed in shark science, participants' responses raised 4 emergent themes: equity (everyone who is interested in shark science should have equal opportunities to succeed), representation (all people should be able to see themselves in shark scientists), representativeness in population/balance (the proportion of races in shark science should reflect society), and broadening perspectives/diversity in ideas (people from diverse backgrounds have different ideas and ways of approaching problems, and the field can benefit from these diverse perspectives). A small group of participants who gave equity reasons emphasized that no particular group was "needed" in the field, which suggests that this orientation could easily overlook the specific perspectives that racial minorities can bring to the field, and it nullifies the impact of the historical exclusion of certain groups (i.e., youth disinterest in shark science and/or families discouraging an interest in marine science as a career).

Almost all MISS Members/FOM respondents chose to renew their membership/FOM status this year. Reasons given for not renewing were that the respondent was not/no longer in shark science and that the respondent did not think they had time or money to contribute to being a MISS member this year. A very large majority of respondents perceived that MISS has had a positive impact on the field,

increasing the number of opportunities for racial minorities and for gender minorities in shark science, making shark science a more welcoming field for racial minorities and for gender minorities, and eliminating barriers to success in the field for women and for racial minorities. Very large percentages of respondents also indicated that they think MISS has increased the number of gender minorities in shark science and the number of minorities pursuing the field. Additionally, more than 90% of respondents agreed that MISS has increased many scientists' awareness of racial and gender issues that affect shark science. More than ¾ of participants indicated that MISS has had a positive impact on them personally, increasing their exposure to issues of diversity in shark science, helping them to be an ally for racial and gender minorities in the field, helping them to perceive diversity and inclusion in a positive way, and causing them to be more likely to try to increase diversity at their organization.

MISS Workshop participants perceived that the MISS workshop increased their self-confidence, their sense of belonging in marine science, and their interest in a career in marine science and in shark science. Ninety percent of workshop survey participants indicated that due to the workshop, they feel more like a marine scientist and like a shark scientist than they did before, 70% strongly agreed. All respondents indicated that their self-confidence in marine science and shark science had increased because of the workshop, and that their sense of belonging in marine science had increased. More than ¾ of respondents indicated that their sense of belonging in shark science had increased. All respondents indicated that their desire to pursue a career in marine science and shark science had increased, and 80-90% of respondents indicated that they felt like they could be successful as a woman or gender minority of color in marine science and in shark science. Seventy to eighty percent of respondents indicated that they have additional opportunities in marine science and in shark science as a result of the workshop. Sixty percent of respondents indicated that they had built meaningful, lasting relationships with marine scientists and shark scientists, and 90% of respondents indicated that they would recommend the workshop.

All of the 2021 MISS Fellows had a very high science identity, with all ranking themselves within the highest 3 science identity statuses on the single-item science identity measure and all Fellows rating both items on the two-item science identity measure as very true—for science, marine science, and shark science. Fellows sense that the field of shark science is not welcoming to the groups they belong to, but they have social supports that help them to feel personally welcome, as well as people to whom they can turn for support and guidance within the field. All Fellows indicated that the fellowship increased their self-confidence in marine science and shark science, that they had built meaningful, lasting relationships with marine scientists and shark scientists. Most Fellows indicated that their sense of belonging in marine science and in shark science had increased. All or most Fellows reported that as a result of the fellowship, they feel more confident that they can be successful as a woman or gender minority of color in marine science and shark science, and that they feel more like a marine scientist and a shark scientist than they did previously. Additionally, all Fellows indicated that due to the MISS fellowship, their desire to pursue a career in marine science and in shark science had increased. All of the 2021 Fellows indicated that they had additional opportunities to pursue further education, programs, and/or jobs in marine science due to the fellowship, but 40% were neutral about this question as related to shark science opportunities.

The 2022 MISS Fellows' science identities varied more than the 2021 MISS Fellows' science identities did; they started out relatively high but not nearly as high as the 2021 Fellows'. These science identities increased during the fellowship for about 45% of Fellows and stayed the same for about 33% of Fellows. Fellows' intent to participate in additional shark science field experiences and lab experiences increased during the fellowship, as well as their plans to take additional classes or attend lectures about shark science. Almost all of these Fellows thought that the MISS fellowship opened up opportunities for them to pursue further education, programs, and/or jobs related to marine science, and about ¾ of Fellows thought the same for opportunities in shark science. The Fellows who initially felt at least

somewhat unwelcome in marine science or in shark science felt more welcome after the fellowship. Additionally, after the fellowship, almost all Fellows indicated that they felt at least somewhat welcome in the field of shark science. Likewise, Fellows' sense of feeling included in marine science and shark science settings increased during the fellowship and their sense of being an outsider in marine science settings decreased. In response to a question about what they got out of the fellowship, Fellows tended to mention several common aspects: experience, connections, mentors, learning about shark science, learning about career options, and gaining clarity on which career options are best for them. All respondents indicated that they would recommend the fellowship, saying that it was a great experience and citing the insights they gained about themselves and about shark science, the connections they made with peers and scientists, and their learning about the different possible career paths within marine science.

The partners primarily described the culture of shark science as historically white and male but said that it is gradually changing to include more women and racial minorities. This change is expected to take several years because of the length of time it takes for young people to move through the various stages it takes to earn a degree, obtain the requisite experience, and become a shark scientist. Over time the upper echelon of white males is aging out of the field and retiring, so eventually the more diverse cohort will move into those upper-level positions. The partners had very positive impressions of the MISS Fellows, saying that they are wonderful, amazing, incredible women. They perceived that the MISS Fellows had transformative, life-changing experiences during their fellowships and can now see themselves pursuing careers in the field. They reported that the Fellows' confidence increased, and that they developed skills and built personal connections, both of which will help them gain access to jobs and other opportunities in the field. All partners said that they would like to host MISS Fellows in the future. One organization had an issue with their Fellows, in that the fellows were not focused enough when they were out on the boat; they were being silly and the partner would have preferred that they

be serious so that they could ensure that they were learning the skills that they need to succeed in shark science. The partner staff person said that the organization struggled with this because they were glad the students were making connections with each other and had developed a camaraderie, so they were unsure of how and when to step in and correct it. All of the partners expressed amazement that MISS has been able to do so much in such a short time, and many did not have any suggestions for improvement. However, the international partners suggested opening up the membership of MISS to people in other minority groups who have similar experiences in the field to the target group but do not fit the required characteristics of MISS members.

Method

This report draws on surveys of MISS summer camp participants, American Elasmobranch Society (AES) members, MISS Members and Friends, MISS workshop participants, MISS Fellows (2021 and 2022), and interviews with staff from partner organizations that partnered with MISS to host the MISS Fellows. It was determined that it would not be logistically feasible to include other MISS programs, such as the Gill Guardians program or the Science at the Sea programs, due to various factors such as timing, having a different participant composition for each session, or occurring solely online.

Participants

Summer camp survey participants included 13 students aged 12-17 entering grades 8-freshman year of college. They were surveyed via paper surveys at the beginning and end of the residential summer camp. While there were 15 summer camp participants, only 13 completed both the pre- and post-camp surveys. 20% identified as boys, 46.7% identified as girls, and 20% identified as nonbinary/gender queer. 6.7% identified as transgender. They were a racially diverse sample: 5 students were White/European-American, 1 student was Black/African American/African/Afro-Caribbean, 1 student was Black and Hispanic/Latinx/Chicanx, 1 student was Asian, 1 student was Asian and White, 2 students were Hispanic/Latinx/Chicanx, and 1 categorized themselves as other (specified Black and White).

American Elasmobranch Society (AES) members were surveyed due to MISS's outreach and training offered to the organization. AES is a large shark science association that pulls its members primarily from North and South America but from other countries as well; MISS collaborates with AES to run workshops, equity and inclusion training, etc. AES holds an annual conference/meeting that is attended by shark scientists and those interested in shark science (including college and graduate students). AES members were surveyed via paper surveys at the AES meeting and electronically via a link

that was posted in an AES newsletter. Participants only filled out the survey once. There were a total of 30 participants, 50.0% of whom identified as men and 46.7% of whom identified as women (one person did not respond to this question). None of the participants identified as transgender. Most participants (80%) were from the USA, but others were from Canada, Mexico, South Africa, Spain, and Switzerland (3.3% each). The sample is largely racially homogeneous, with 80.0% White/European-American/European respondents, 6.7% of respondents indicating that they are White and Hispanic/Latinx/Chicanx, 6.7% of respondents indicating that they are Hispanic/Latinx/Chicanx, and 3.3% Pacific Islander/native Hawaiian respondents. The majority of AES member participants are aged 25-34 (46.7%), with a sizeable group of ages 35-49 (25.0%) and a few aged 18-24 (10.7%), 50-64 (10.7%), and 65+ (3.6%). AES member participants' education levels ranged from college graduate (24.1%) to Master's degree (34.5%) to Doctoral or Professional degree (41.1%).

I surveyed 202 MISS members and Friends of MISS during the summer of 2022 via an online survey that they filled out as a part of their membership renewal/nonrenewal process. Friends of MISS are organizations or individuals of any race and gender who want to help in MISS's mission, whereas MISS members are racial and gender minorities themselves (or are parents/guardians of racial and gender minority individuals who are under 18 years old). All MISS members and FOM are either in the field of shark science or are interested in the field. Of the respondents, 157 were MISS members and 41 were Friends of MISS (FOM); one person indicated that they were an observer/inactive participator, one person said they used to be a member, and another was unsure about their status, while one person did not answer this question. MISS Members and FOM were very diverse in various ways, as 1.0% identified as between ages 50 and 64, 15.8% were between ages 35 and 49, 41.1% were between ages 25-34, 37.1% were between the ages of 18 and 24, and 3.0% were under age 18. While 3.5% identified as Arab/Middle Eastern, 14.4% identified as Asian (including South Asian and East Asian), 15.8% identified as Black/African/African-American/Afro-Caribbean, 19.3% identified as Hispanic/Latinx/Chicanx, 1.0%

identified as Native American/Aleutian Native/Indigenous, 1.0% identified as Pacific Islander/Native Hawaiian, 20.3% identified as White/European-American/European, and 21.5% identified as a combination of two or more of these racial groups. Additionally, 2.5% identified as men, 91.6% identified as women, 5.0% identified as nonbinary/gender queer, 0.5% identified as gender fluid, and 0.5% identified as female embodied/nonbinary. Only 1.5% identified as transgender, although 36.6% identified as part of the LGBTQ+ community, while 8.9% indicated that they were "maybe" part of the LGBTQ+ community.

MISS workshop participants (2021 and 2022) were surveyed after their workshop experience, in the summer of 2022. Ten participants responded to the online survey, five from each year that the workshop has been offered (2021 and 2022). At least nine of the participants were from the USA (one neglected to answer that question), all ten identified as women, and none identified as transgender. Their ages varied; 50.0% were between 18 and 24, 30.0% were between the ages of 25 and 34, and 20.0% were between the ages of 35 and 44. All participants had attended college for some length of time; 30.0% had attended college but had not yet attained a degree, and 70.0% were college graduates but had not yet attained a graduate degree of any kind. They were very racially diverse, as 10.0% identified as Black/African American/African/Afro-Caribbean, 30.0% identified as Hispanic/Latinx/Chicanx, 10.0% identified as Native American/Aleutian Native/Indigenous, 20.0% identified as Asian and White, and 30.0% identified as Black and White.

Five prior MISS Fellows (2021) were surveyed during the summer of 2002. These Fellows were slightly racially diverse, with 20.0% Black/African American/African/Afro-Caribbean and 80.0% Hispanic/Latinx/Chicanx. All of the Fellows identified as women, and none identified as transgender. Twenty percent of the Fellows were ages 18-24, 60.0% were 25-34, and 20.0% were ages 35-44. All of the Fellows were college graduates, and 40.0% of them were currently in graduate school (or entering in the fall).

Twelve current fellows (2022) were surveyed at the beginning and end of their fellowship in the summer of 2022, but one neglected to complete the pre-fellowship survey, so there is complete data from eleven 2022 MISS fellows. I have included data for all twelve of the fellows when possible. Of these participants, 100.0% identified as women and none as transgender. 9.1% were Asian, 63.6% were Black/African American/African/Afro-Caribbean, 9.1% were Hispanic/Latinx/Chicanx, and 18.2% were a mixture of racial groups. About 91% (90.9%) of the fellows were between the ages of 18 and 24, and 9.1% were between the ages of 25 and 34. Eighteen percent (18.2%) had finished high school, 18.2% had attended some college, 54.5% were college graduates, and 9.1% had a Master's degree. More than 72% (72.7%) were currently in college or graduate school.

I also interviewed 9 staff members from 7 partner organizations during September and October of 2022, speaking primarily with the founder/director, the director of education, or the intern coordinator at each organization. The MISS Fellows completed their fellowships at these partner organizations. The partner interviews lasted from 30 to 60 minutes; while most were individual interviews, one was a joint interview with two people who worked at the same organization. The following organizations were represented: Oceans Research (in South Africa), Bimini Biological Field Station (in the Bahamas), Atlantic White Shark Conservancy (in Massachusetts), Love the Oceans (in Mozambique), Rookery Bay Estuarine Reserve (in Florida), New College of Florida (in Florida), and Havenworth Coastal Conservation (in Florida).

Survey protocol

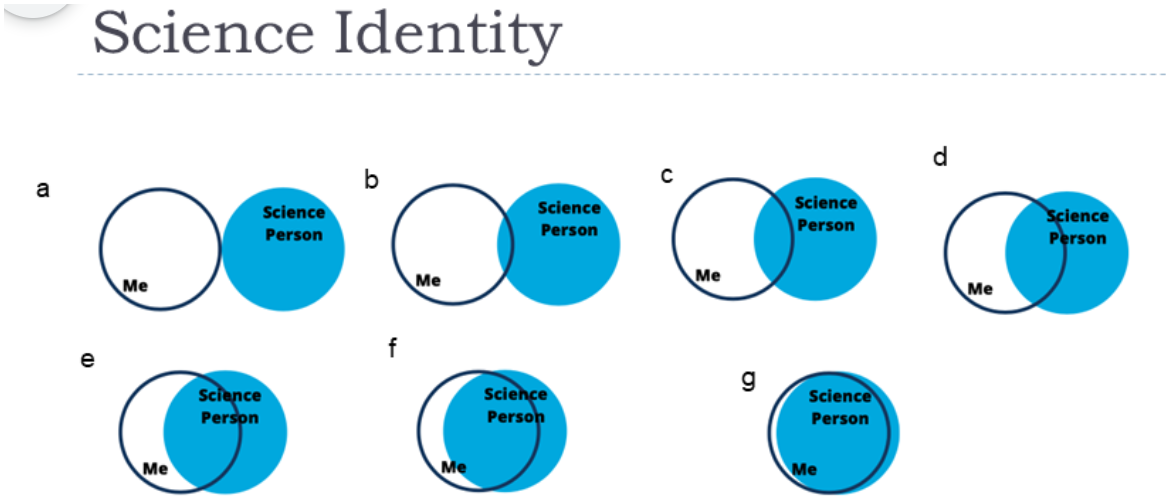
Each subgroup of survey participants was given a different survey; thus, different surveys were created for AES members, MISS Members and Friends of MISS (FOM), summer camp participants, 2021 MISS Fellows, 2022 MISS Fellows, and MISS workshop participants. The surveys for AES members and MISS Members and FOM were significantly shorter than the surveys for the other groups to minimize the

time burden and maximize the likelihood that they would complete the survey. 2022 MISS Fellows' pre- and post-fellowship surveys included many of the same questions to ascertain changes over the course of the fellowship.

Surveys included mostly closed-ended questions with a few open-ended questions. Closed-ended questions were primarily in the form of 5- or 7-choice Likert-type scales, and addressed concepts such as science identity, marine science identity, shark science identity, sense of belonging, social networks, interest in marine science career, interest in marine science graduate school, intent to take additional marine science classes, and other related concepts. Surveys for AES members and MISS Members/Friends of MISS included questions about how they found out about MISS, how and why they interacted with MISS, and what they thought about MISS; these surveys did not include questions about science identity, sense of belonging, or social networks. They included several closed-ended questions about their perception of MISS's impact on the participant and on shark science, perceptions of the importance of racial, gender, and sexual orientation diversity in shark science, as well as other perceptions of the field of shark science.

To examine science identity, I first used a single-item measure (based on McDonald et al, 2019[1]) that aims to capture the degree to which one's sense of self overlaps with one's image of a science person. Fellows were shown an image of seven sets of overlapping circles (pictured below) and were asked to select the one that best represented their science identity. In my descriptions of science identity, I refer to changes from one status to another as "steps," as when one person's identity shifted from a "c" to an "e," for example, I describe it as increasing by two steps. The higher the letter, and therefore the greater the part of the "Me" circle the "Science Person" circle takes up, the higher the science identity.

[1] McDonald, M., Zeigler-Hill, V., Vrabel, J., and Escobar, M. (2019). A single-item measure for assessing STEM identity. *Frontiers in Education*, 4(78), 1-15.



For 2022 MISS Fellows and summer camp participants, this was measured on the pre- survey as well as the post- survey to ascertain change during the program.

I used a second measure of overall science identity that involved two closed-ended items ("I can see myself as a scientist" and "Science is a good field for me"), on a scale from 1 (not at all true) to 7 (very true of me).[2] I created a new variable that summed these two items and created an additional variable that assessed the change between the sum of items on the pre-fellowship survey and on the post-fellowship survey. Marine science identity and shark science identity were measured using modified versions of the two above items, and analysis of these items was performed in the same way, by creating summary variables and then variables that calculated the difference between pre- and post-fellowship scores.

Additional survey items are described in the body of the report; fellows were asked to rate their agreement with various statements on a scale of 1 (not at all true) to 7 (very true of me) or to indicate their agreement on a scale of 1 (strongly disagree) to 5 (strongly agree). Due to the small numbers of

[2] Seyranian. V., Madva, A., Duong, N., Abramzon, N., Tibbets, Y., and Harackiewicz, J. (2018). The longitudinal effects of STEM identity and gender on flourishing and achievement in college physics. *International Journal of STEM Education*, 5(40), 1-14).

participants on each survey and the small numbers of participants—and minimal variation—in each category on demographic variables such as race and gender, I tended to limit my analysis of closed-ended items to frequencies of responses (and pre-post changes in these frequencies when appropriate). For open-ended items that asked about participants' experiences, I identified themes in the responses and reported on the most common themes, also presenting quotes whenever possible to let the participants speak for themselves.

Interview protocol

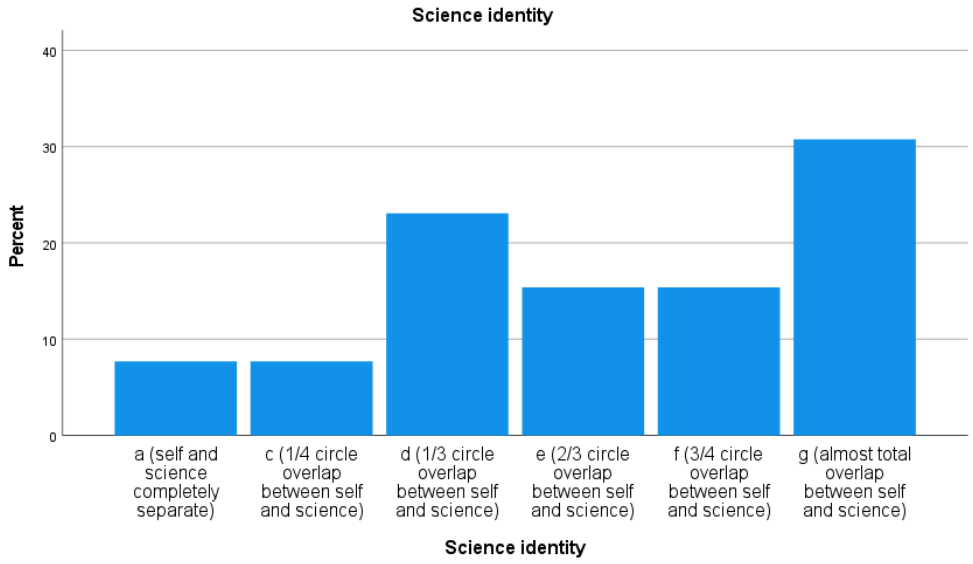
In the 30 to 60-minute interviews, I asked the partner staff members about their impression of the MISS Fellows, the ways in which they partner with MISS, the ways in which MISS engages with shark science, and their perceptions of the culture of shark science and of marine science. I also asked about their perceptions of MISS, the impact that MISS is having on shark science, and their ideas for how MISS could have an even greater impact. In reviewing the interview transcripts, I read over each interview, identifying quotes that pertained to each of the above topics; I then coded each quote in terms of themes mentioned and arranged them thematically within those groupings.

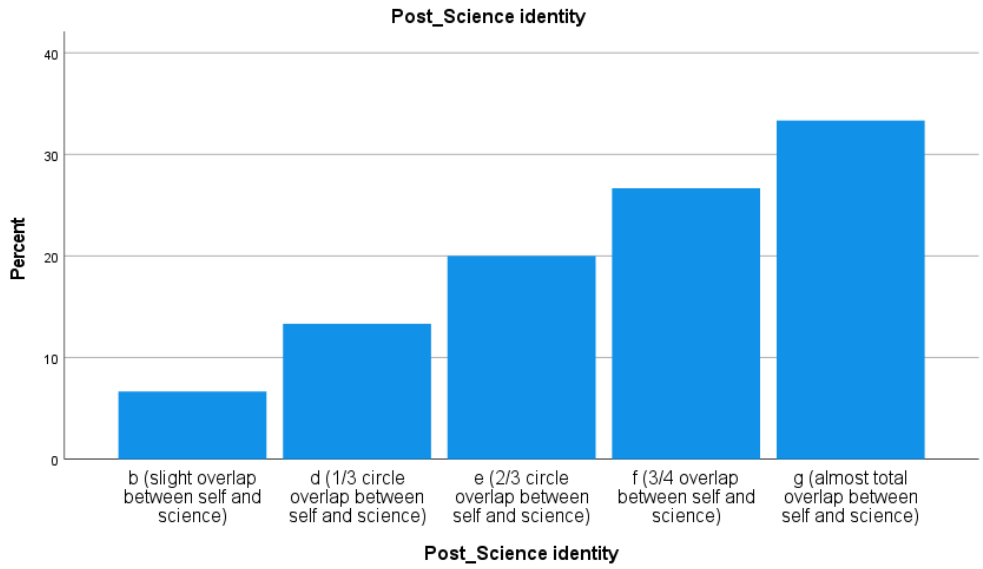
Findings

Summer Camp

Science identity

Many summer camp participants' science identity started off quite high and ended up even higher. In the first graph below, notice that one student rated their science identity as completely separate from the rest of their identity, and one student rated theirs as overlapping only about ¼. However, in the second graph, no students rated their science identity and self as completely separate, and the percent of students in each of the three highest science identity integration categories increased. When using a difference variable to calculate the difference between each student's pre- and post-camp science identity rating, it turns out that for about 30% of participants, their science identities increased during the course of the summer camp. Science identity stayed the same for nine of the participants, but for four of them, their science identity increased by one or two steps (there are a total of 7 statuses). No students indicated that their science identity decreased during summer camp.





Change in science identity (summer camp)

		Frequency	Valid Percent	Cumulative Percent
Valid	0	9	69.2	69.2
	1	3	23.1	92.3
	2	1	7.7	100.0
	Total	13	100.0	
Missing	System	2		
Total		15		

Students' sense of belonging and social marine science network both increased over the course of the summer camp. Additionally, the sense that preparing for a career in marine science would be very expensive for their family decreased. While ratings changed somewhat on the other concepts (such as interest in a shark science career or in marine science course-taking), they were more balanced, meaning that an increased interest in a shark science career for 4 students was balanced out by a decreased interest by 3 students, for example.

Sense of belonging/comfort level

When indicating how much they felt alone in science settings, 33.3% of students indicated that they felt less alone by the end of camp, while 26.7% of students' ratings stayed the same from the beginning to end of summer camp and 13.4% felt more alone at the end of camp. Students also rated whether they felt like an outsider in science settings: while 26.7% stayed the same, 46.7% felt like less of an outsider, and 13.3% felt more like an outsider in science settings. When indicating how comfortable they feel speaking in science settings, 46.7% of students felt more comfortable speaking in science settings at the end of summer camp, and while 20% of campers indicated that they felt less comfortable, 20% of students' ratings stayed the same.

By the end of summer camp, students predominantly felt more like they would be accepted (20%), supported (26.7%), and successful (33.3%) if they pursued a career in marine science. As with the other items, one or two students felt less like they would be accepted, supported, or successful in this endeavor, and a large group of students gave the same ratings for these questions at the end as at the beginning of summer camp (60.0%, 53.3%, and 60.0%, respectively). But of the students whose ratings changed on these items, the majority changed in a positive direction.

Change: I would feel accepted if I pursued a career in marine science.

	N	%
-1.00	1	6.7%
.00	9	60.0%
1.00	2	13.3%
2.00	1	6.7%
Missing System	2	13.3%

Change: I would feel supported if I pursued a career in marine science.

	N	%
-1.00	1	6.7%
.00	8	53.3%
1.00	3	20.0%
2.00	1	6.7%
Missing System	2	13.3%

Change: I would feel successful if I pursued a career in marine science.

	N	%

-1.00	1	6.7%
.00	9	60.0%
.50	1	6.7%
2.00	1	6.7%
3.00	1	6.7%
Missing System	2	13.3%

To attempt to determine the reasons behind differences in sense of belonging, I performed ANOVAs for each of the questions on this scale, by age, grade in school, and science identity. Several of the ANOVAs indicated that there were significant differences between the sense of belonging items and grade in school, such that the mean of 8th graders´ sense of belonging was higher than that for 10th graders. Significant differences were found for the grade levels listed on the items below, using the Tukey post-hoc test, which was more conservative than either the LSD or Bonferroni post-hoc tests. The first grade level group listed in each row has a higher mean than the second grade level group listed in that row.

Statement	**Mean difference**	**Sig. level**
Pre - I feel welcome in marine science.		
8th grade – 10th grade	2.667	0.004
12th grade – 10th grade	2.667	0.004
College freshman – 10th grade	2.500	0.013
Post - I feel welcome in marine science.		
8th grade - 10th grade	1.733	0.036
college freshman – 10th grade	2.400	0.013
Pre - I feel like I would be accepted if I pursued a career in marine science.		
8th grade – 10th grade	1.667	0.028
Post - I feel like I would be accepted if I pursued a career in marine science.		
8th grade – 10th grade	1.867	0.011
College freshman – 10th grade	2.200	0.010
Pre - I feel like I would be supported if I pursued a career in marine science.		
8th grade – 10th grade	1.867	0.019
college freshman – 10th grade	2.200	0.016

These results suggest that the entering 10th graders who participated in the summer camp felt less welcome in marine science than did either entering 8th graders or entering college freshmen; they

also felt less like they would be accepted and supported (compared to 8th graders) if they pursued a career in marine science. It is possible that there was some characteristic of these entering 10th graders that caused them to feel less welcome and less accepted. However, because of the small number of students in each grade level, this finding should not be generalized to suggest that most 10th grade students have a lower feeling of being welcome and accepted in marine science than do most 8th graders or entering college freshmen.

Perception of cost

Of the students who rated the statement on affordability of getting the skills and experiences they would need to become a marine scientist, 53.3% of the ratings stayed the same over time, whereas 26.7% agreed less, meaning that they saw it as more affordable by the end of camp than they had at the beginning of summer camp.

Change: It would cost my family a lot of money for me to get the skills and equipment needed to be a marine scientist.

		N	%
-1.00		4	26.7%
.00		8	53.3%
1.00		1	6.7%
Missing	System	2	13.3%

Marine Science Network

In response to the question of whether they were friends with a marine scientist, participants largely agreed more that they were friends with a marine scientist by the end of the summer camp;

while 40.0% of students' ratings stayed the same, 57.4% of students' ratings increased; on a 5-point scale, more than 25% of the ratings increased by 3 or 4 points (going from disagree or strongly disagree to strongly agree).

Change: I am friends with a marine scientist.

	N	%
.00	6	40.0%
1.00	1	6.7%
2.00	2	13.3%
3.00	3	20.0%
4.00	1	6.7%
Missing System	2	13.3%

When rating their agreement with the statement that they knew someone to ask for suggestions if looking for a future marine science opportunity, only 26.7% of students' ratings stayed the same as at the beginning of summer camp; 40.0% felt more like they knew someone to ask than they did at the beginning of camp, although 20.0% felt less like they knew someone to ask. Similarly, 36.9% felt more like they had a mentor in marine science, compared to 26.7% whose ratings stayed the same and 13.4% who felt less like they had a mentor in marine science.

Change: If looking for a future marine science opportunity, I know someone to ask for suggestions.

	N	%
-1.00	3	20.0%
.00	4	26.7%
1.00	3	20.0%
2.00	3	20.0%
Missing System	2	13.3%

Change: Someone in my life acts as a mentor to me in marine science.

	N	%
-2.00	1	6.7%
-1.00	1	6.7%
.00	4	26.7%
.50	1	6.7%
1.00	2	13.3%
2.00	2	13.3%
3.00	2	13.3%
Missing System	2	13.3%

Overall Ratings/feedback

Summer camp participants rated the camp very highly; on a scale of 1 to 10 (10 being the best), 40% rated it a 9 or 10, 33.3% rated it as an 8, and 13.4% rated it either a 7 or 7.5. Seven was the lowest rating given. Many campers said that their least favorite part about camp was the bugs (7 campers), the heat/lack of AC (8 campers), and showers/bathrooms (7 campers), with water (3 campers) also a popular answer. For two of three campers, it was unclear whether "water" referred to the water in the bathrooms or being out on the water (on the boat). Only one participant listed their least favorite part about camp as something having to do with the work they were doing, "stress of presenting/building ROV." One participant said that they didn't see any sharks, and another said that they wished the campers had some outside free time every day.

Campers' favorite parts about camp revolved around shark fishing/tagging (7 campers), friendships/the people (5 campers), and the games they played (2 campers), while individual others mentioned the crabs and building the ROV's and AUV's.

AES Members

How members found out about MISS

Almost all (96.7%) AES member participants had heard about MISS before taking the survey. They found out about MISS through AES (27.6%), through social media (53.3%), through a marine science or shark research institution (6.9%), and/or through a friend, family member, or colleague (34.5%). Several participants indicated that they had heard about MISS through multiple sources. A majority of participants have interacted with MISS; 60.0% indicated that they had, while 10.0% said that they had possibly interacted with MISS.

Racial and other diversity in Shark Science

Respondents were generally of the impression that scientist racial and gender diversity is vital for shark science. When asked whether they thought there need to be more racial minorities in shark science, 86.7% said yes, while 6.7% said maybe and 3.3% said no. Respondents overwhelmingly agreed that it is important to have a racially diverse group of people doing shark research (76.7% strongly agreed and 16.7% agreed, while 6.7% were neutral). They varied more in their opinions about the need to have people with nontraditional gender identities in shark science (66.7% strongly agreed and 6.7% agreed, but 23.3% were neutral and 3.3% disagreed.) When asked to rate a statement that there are currently enough people of color in shark science, 60.0% indicated that they strongly disagreed, whereas 30.0% disagreed, and 10.0% were neutral. Participants were pretty evenly split on whether they thought sexual orientation has an impact on one's perspective on shark science research. While 43.3% thought it did have an impact (10.0% strongly disagreed and 33.3% disagreed with the statement, "One's sexual orientation has no impact on one's perspective on shark science research."), 36.6% thought it did not have an impact (3.3% agreed and 33.3% strongly agreed), and 30.0% were neutral.

On an open-ended question, respondents were asked to give a reason why they did or did not think that more racial minorities were needed in shark science. Participants' responses raised 4 emergent themes; equity, representation, representativeness in population/balance, and broadening perspectives/diversity in ideas. One response vaguely referenced the historical lack of diversity in shark science and says that this is not good for the field but doesn't specify why this is the case: "The field is historically not diverse which is not in the best interest of the field and the people who do the science." It is unclear whether this participant was unsure why this was not in the best interest of the field and the scientists, or whether they simply did not write this detail on the survey.

The reasons that cited equity emphasized that there should be equal opportunities for all who want to pursue shark science; four of the 26 responses were of this type. One example of this is, "Creating fair opportunities for everyone and build a field of people with different backgrounds, knowledge, etc." Two responses that emphasized the idea that minorities (or any particular group) are not "needed" in shark science fell into this group, as they also focused on the idea that opportunities to do shark science should be open to all who want to do shark science. According to one participant, "I don't think there needs to be any particular group in shark science, but I am very supportive of anyone of any race being in shark science if they wish and want to support those folks." Another participant said, "NEED to be? That's not the same as SHOULD be with respect to equal opportunities for all who would LIKE to study sharks." By focusing on making shark science opportunities equally available to all who are interested, this perspective can easily overlook the particular perspectives that racial minorities can bring to the field, as well as the historical exclusion of certain groups (which can result in fewer people from those groups expressing an interest in studying sharks).

Seven of the responses referred to the idea that shark science should look more like society as a whole and should thus be representative of the population rather than being dominated by one group or

another. One respondent said, “Because they are underrepresented compared to the percentage in society and it limits the diversity of the field.” Another said, “To be honest, too many older white men who make the rules in the field.” A third said, “To better reflect national demographics.” These responses, much like the equity responses, are focused on the optics of the field rather than what is lacking when these other populations are excluded or missing.

One response referenced representation, the idea that younger generations should be able to see themselves in the people who are in the field. “I think more representation is incredibly necessary as they provide unique perspectives on science and also help to inspire younger generations to live their dreams.” This response also referred to broadening perspectives, the idea that diversity is helpful because it brings diverse ideas to the field.

The majority of the responses (15/26, or 57.7%) referred to diversity as useful and important because it adds new perspectives to the field. Three of these responses referred to other themes as well (equity and representativeness). One respondent gave examples of what is lacking when certain perspectives are missing in shark science. “I believe that cultural diversity brings a lot of new ideas and innovations to the table. In addition, there are many people with a lot of potentials. Furthermore, there are many people from areas where a lot of research is needed, areas with ‘poor data situations’. There are regions where shark science is carried out by foreigners, unaware of the social, political, and economic context, and very often do not invite natives to participate.” This participant suggests that in these cases, the field would benefit greatly from listening to the voices of people from the areas where the shark science research is being carried out. Other participants gave similar reasons, such as, “The foundation of science is asking and answering new questions. Diversity is integral to progress and excellence in science, because people’s backgrounds influence their question development and approach to answering them.” Another participant stated, “Diversity is key to the achievement of shark science

and this field desperately needs to engage with BIPOC communities and scientists who have historically (and presently) been excluded."

These response themes are complementary in some ways, in that they represent different sides of the same coin; they are all reasons to ensure that racial minorities have a presence in shark science. However, the equity statements that declare that no group is "needed" in the field are somewhat troubling, in that they reflect a lack of awareness about perspectives that are missing in the field or about the benefits of including people from certain groups or backgrounds. This is one area about which MISS could communicate with AES members, giving specific examples to help them understand the benefits of including diverse perspectives (and the deficits that exist when these perspectives are excluded).

Perception of MISS's Impact

Respondents overwhelmingly perceived MISS as having a significant positive impact on diversity in shark science. A large majority of AES member participants agreed that MISS has increased the number of minorities pursuing shark science (26.7% strongly agree, 53.3% agree, and 20.0% neutral). A whopping 80.0% agreed, 50.0% strongly, that MISS has increased their exposure to issues of diversity in shark science (6.7% disagreed with this statement, and 13.3% were neutral). A majority also perceived that MISS has helped them to be an ally for racial and gender minorities in shark science (33.3% strongly agreed, 36.7% agreed, 13.3% neutral, 10.0% disagreed, and 6.7% strongly disagreed). Participants agreed even more strongly with the statement that MISS has helped them to perceive diversity and inclusion in a positive way (50.0% strongly agreed, 20.0% agreed, 20.0% were neutral, while 6.7% disagreed and 3.3% strongly disagreed). Lastly, participants also largely felt that as a result of MISS's activities, they

were more likely to try to increase diversity at their organization, with 50.0% strongly agreeing, 16.7% agreeing, 23.3% neutral, 6.7% disagreeing, and 3.3% strongly disagreeing.

Overall, it seems that the AES members surveyed were in agreement with MISS' goal of bringing more racial minorities into the field of shark science. They felt as though MISS had helped them to gain an awareness of the issues around diversity in shark science and had helped them to serve as allies to people of color in shark science. They also perceived that MISS was making a significant impact on the field. However, it is worth noting that the survey respondents represent a very small fraction of AES membership overall; there may be a number of AES members who have no awareness of MISS at all, or who do not think their goals are worthwhile. Additionally, it seems that at least a few members—who agree at least somewhat with MISS's goals—who may not fully understand what is missing from the field if there are very few racial minorities in shark science. To increase their visibility and help these members to fully understand their reasons for trying to increase the numbers of racial minorities in the field, MISS may want to do additional educational outreach to AES members.

MISS Members and Friends of MISS

In all respects, MISS members and Friends of MISS (FOM) were mostly very positive in their feedback regarding the impact that MISS has already had on the field of shark science. While there were a few participants who were neutral about various questions, there was a small but consistent contingent that strongly disagreed with every question about MISS's impact on the field or on the survey participants themselves. Regardless of this small pool of dissenters, however, MISS was seen by an overwhelming majority of participants as impactful in a variety of positive ways.

Diversity in shark science

When asked if they agreed with the statement "It is important to have a racially diverse group of people doing shark research," 91.1% strongly agreed and 4.0% agreed, while 0.5% said they were neutral about this statement and 4.0% strongly disagreed. When asked how they felt about the statement, "The field of shark science still has a long way to go towards being diverse and inclusive," 94.5% of respondents agreed, and 4.0% disagreed. In the face of the overwhelming belief of MISS members that shark science is not diverse or inclusive enough, there seems to be a small group of MISS members or FOM who believe that the field of shark science is diverse enough and that it does not have a problem with inclusivity.

MISS increasing opportunities

Ninety-three percent of respondents agreed that MISS has increased the number of opportunities for racial minorities in shark science. Only 4.0% of respondents disagreed, and they did so strongly; 9.0% felt neutral about this issue. Likewise, 87.0% of respondents agreed that MISS has increased the number of opportunities for gender minorities in shark science. Again, 4.0% of respondents disagreed or strongly disagreed and 9.0% felt neutral about this statement.

MISS increasing number of minorities in the field

Eighty percent of respondents agreed that MISS has increased the number of gender minorities in shark science, while 87.5% indicated that MISS has increased the number of minorities (generally) pursuing the field. In both cases, 3.5% strongly disagreed, and between 9.0 and 16.5% felt neutral.

Creating a more welcoming field

Almost 95% of respondents indicated that MISS has made shark science a more welcoming field for racial minorities. 89% indicated that MISS has made shark science a more welcoming field for gender minorities. In both cases, between 3.5 and 4% strongly disagreed, with between 1.5 and 7.5% remaining neutral.

Eliminating barriers and increasing awareness

Over 85% of respondents agreed that MISS has helped to eliminate some of the barriers to success for women in shark science. Again, 4.0% strongly disagreed and 9.0% felt neutral about it. Ninety percent of respondents agreed that MISS has helped to eliminate some of the barriers to success for racial minorities in shark science. As before, 3.5% strongly disagreed, and 6.5% felt neutral. Almost 92% of respondents agreed that MISS has increased many scientists' awareness of racial and gender issues that affect shark science. While 4.5% were neutral about this statement, 3.5% strongly disagreed.

Personal Impact

Respondents were asked four questions about ways that MISS may have impacted them directly. In response to the statement, "MISS has increased my exposure to issues of diversity in shark science," 86.5% of participants agreed, while 7.8% were neutral and 5.8% disagreed. More than 86% of participants agreed that MISS has helped them to be an ally for racial and gender minorities in shark

science; 10.0% felt neutral about this statement and 3.7% strongly disagreed. Almost 88% agreed that MISS has helped them to perceive diversity and inclusion in a positive way. 8.9% felt neutral, and 3.6% strongly disagreed with this statement. In response to the statement, "As a result of MISS's activities, I am more likely to try to increase diversity at my organization, 83.6% of participants agreed, while 12.5% were neutral and 3.6% strongly disagreed.

In light of the large proportion of the survey sample that is comprised of MISS members, the overwhelmingly positive responses to these questions on personal impact suggest that most of these MISS members—gender minorities of color themselves—perceive MISS as helping them to be allies for other gender minorities of color in the field. These respondents felt that they gained more from their interactions with MISS than increased networks, support, and opportunities for themselves; they saw MISS as informing them about issues of diversity, helping them to perceive diversity and inclusion positively, helping them to be an ally for other racial and gender minorities, and helping them to find ways to increase diversity on an organizational level. In other words, they perceived that MISS was helping them to be the change they wanted to see in the field, a change that could benefit not only them but also racial and gender minorities coming behind them.

The response from MISS members and Friends of MISS to each of these questions was overwhelmingly positive, which suggests that a significant majority of the people in MISS's network are very happy with what MISS has accomplished and that they continue to believe that MISS is having a major impact on the field of shark science. The presence of a small but steady contingent of respondents who strongly disagreed with each question, however, suggests that some of the people who received the survey do not think that MISS's goal is worthwhile and do not believe that MISS is having an impact in the way that they intend to. It seems likely that the same people strongly disagreed with each question, given that it seems to be approximately the same percentage strongly disagreeing with each question.

To try to determine whether strongly disagreeing with every question was related to any other group membership, such as race, gender, or LGBTQ+ status, I performed one-way ANOVAs for these questions. However, they did not show significant differences between groups (even when combining the nontraditional gender options so that there were enough responses in each group to perform the analysis). As such, it is unclear why these respondents strongly disagreed with each of these items. Looking directly at the data, it is clear that the same five people indicated that they strongly disagreed with every statement (a few others strongly disagreed with one statement here or there). All were women; two were Asian, two were White, and one was Latinx. Those five respondents all indicated that they wanted to renew their MISS membership or Friends of MISS status, one indicated that they were involved in MISS because of "unique opportunities," and another indicated that they were passionate about shark science and thought that the work MISS was doing was helpful for underrepresented communities. In light of these other responses, it is possible that they marked "strongly disagree" in error; perhaps they were not careful when reading the options on the survey.

Renewing membership/FOM status with MISS

Only 3.0% of respondents chose not to renew their MISS membership/FOM status; 97.0% wanted to renew. Each of those who chose not to renew gave reasons for doing so; either they were not/no longer in shark science or they didn't have enough money and/or time to be actively involved in MISS. The most popular type of reason, not being in shark science, was given by 2/3 of non-renewers. As one person wrote, "Put plainly, I'm not a shark scientist. I'd rather just donate to MISS every once in a while than continue to have this membership." The other reason, insufficient money/time, was given by 1/6 of non-renewers. One participant wrote that she did not want to renew "because I now have college to worry about and I would like to save my money for necessities and being a MISS member is currently not a necessity for me. I also wouldn't be able to participate in events because I have school." As a

college student of color, this participant would likely be able to benefit from MISS's programs, but they did not perceive that they had time or money to put towards being a member.

Why members/FOM choose to interact with MISS

Respondents were asked open-ended questions about how they interact with MISS and why they do or do not interact. Most responses to the question of why they interact mentioned the opportunities that MISS provides, as well as the support provided for minorities in the field. Many of the respondents said that they felt alone in the field from a racial and gender standpoint, and that MISS is a safe space that helps them to feel a sense of community.

> For the longest time I felt very lonely within my major being one of two POC students in most of my classes. I also had a deep passion and love for sharks and research and a lot of the representation on shows like shark week and in documentaries are predominantly white. So when I discovered MISS on twitter I was super excited to see women like me in the field doing amazing research and providing opportunities to gain hands-on experience in the field. I immediately fell in love and joined. – respondent MAQ

> MISS, for me, is a very safe, inspiring, and supportive platform. Not just to learn about sharks and rays, but also a space where I get to learn and exchange experiences with regard to academia and research. – respondent MHS

> Because it's a space for people like me that otherwise always feel like the odd ones out. – Respondent MEJ

Several respondents mentioned that they wanted to benefit from the advice and guidance of others who are already succeeding in shark science; they also wanted to have access to hands-on experience to help them as they embark on their career journey in the field.

> I want to make friends [in] the field and gain experience in preparation for returning to school for a Master's degree. I want to be a professor and recognize that I need as much experience and advice as possible to reach my goal. – Respondent MBM

> I have an affinity towards shark science but I always told myself I could never break through. I thought that I need all this prior experience, have had a big connection with

> sharks in my childhood to be able to enter the shark science field but MISS has helped me realize that I can be welcomed in the shark science field at any stage in my life. My graduate program is not shark focused but I have huge aspirations into being involved in shark related research in the future and MISS allows me to still be able to get opportunities outside of the reach of my grad program. – respondent MZC

As you see from the previous quote, sometimes people internalize the negative messaging they hear, themselves doing the job of detractors who try to convince racial and gender minorities that they have no place in shark science or cannot succeed in the field. MISS has helped this respondent to break through those internalized barriers and to gain access to opportunities in shark science.

A large portion of the responses were focused on trying to help racial and gender minorities to succeed in the field, not because the respondent would benefit personally from these efforts, but because they wanted to invest in diversifying the field and in helping those who have been historically excluded.

> To hopefully be able to recruit graduate students in the near future. – respondent MFC

> I am an ally and want to increase diversity in shark science. – respondent MEE

> I believe that MISS has a critical objective and is doing a great job making visible the minorities that work in shark science. I believe MISS is creating more opportunities for a more inclusive science, and I hope to be part of this change. – respondent MBG

> I think it is incredibly important to offer any support I can to those who may be unfairly disadvantaged. I believe in representation and this field (shark science) is important to me. – respondent MDR

These respondents want to elevate the field by creating diversity within it and by supporting the racial and gender minorities that are trying to enter and succeed in the field. Other respondents cited an assortment of aspects of MISS that they like and deem useful.

> I think the networking and support that MISS provides for early career researchers is really important. It has been my experience that graduate school can be lonely and isolating and it is important for ECR to ensure they have multiple networks of people (i.e. not just grad student orgs at their universities), but larger orgs can be hard to break into/intimidating/not as welcoming. I think MISS's active media engagement is

> important for science communication (I have seen a diversification in the kinds of people interviewed by non-science publications) and helps platform novel researcher (sic) by young/under-supported researchers. I think the research training/opportunities provided by MISS are likely really impactful for the students who participate and I really like that the opportunities are not limited to citizens (…I've seen talented students struggle to find opportunities because of that unnecessary limitation). I like that MISS provides networking/support at conferences as well. I like that FOM offers me an opportunity to directly engage with other researchers in productive ways, via things like office hours. I find that more established orgs tend to assume that researchers can just "network" their way into getting mentorship/career advice, and I like that MISS makes these experiences goal-oriented and explicit, which I think makes them more productive and efficient. I feel that, as I am graduating soon and will (hopefully) begin a policy-based career, FOM will make it easier for me to find ways to support the shark research community and uplift students over older science organizations (SCB, ESA, etc). – respondent MZH

Thus, it seems that people of color interact with MISS to gain experience, advice, and guidance on their path to a career in shark science. They also interact with MISS to gain access to their community, a safe space with like-minded people who are interested in or working in shark science and are willing to support racial and gender minorities in their endeavors in the field. Allies interact with MISS because they want to help diversify shark science and provide the types of support that they need to succeed in the field.

Overall, the MISS members and friends of MISS felt strongly that MISS has had a large positive impact on the field of shark science as well as on individuals. For each item, at least 48.0% strongly agreed, with a minimum of 73.5% of the respondents answering in the affirmative (however strongly) every time. The respondents cited different reasons for interacting with MISS based on their status (as racial or gender minorities or not); racial and gender minorities were looking for a community of people like them, a safe space to learn about shark science, and opportunities to gain hands-on experience in the field. Non-racial and gender minorities seemed to interact with MISS because they wanted to increase diversity as well as to support racial and gender minorities in the field.

MISS Workshop

Because workshop participants were only surveyed after the workshops ended and were surveyed between one and 12 months after their workshop experience, I will focus here on items which have a higher likelihood of reflecting outcomes of the workshop. Several survey items asked participants to rate their agreement with statements about the increase of various constructs or ideas "as a result of the MISS workshop." The frequencies of responses to these items can inform us about the outcomes that participants attribute to the workshop experience as opposed to other factors in their lives before or after the workshop. Since there are only ten participants, and they cannot be categorized into groups of greater than 1 or 2 people for many of the independent variables, I will primarily limit my quantitative analysis to these frequencies.

Overall, the results are very promising, with participants indicating that the MISS workshop largely increased their self-confidence, their sense of belonging in marine science, and their interest in a career in marine and shark science. There was a lot less consensus regarding whether the MISS workshop had provided them with lasting relationships with marine or shark scientists as well as access to other opportunities in marine science or shark science. Responses to items having to do with marine science and shark science were often quite similar.

All but one of the participants (90.0%) indicated that because of the MISS workshop, they feel more like a marine scientist than they did before, with the remaining participant neutral about this statement. 70.0% strongly agreed that they felt more like a marine scientist as a result of the workshop. Similarly, all but one of the participants (90.0%) indicated that as a result of the MISS workshop, they feel more like a shark scientist than they did before, but the remaining participant disagreed with this statement. 70.0% strongly agreed that they felt more like a shark scientist.

All of the participants indicated that their self-confidence in both marine science and shark science increased as a result of the workshop, with 60.0% strongly agreeing and 40.0% agreeing in both

cases. Additionally, all participants indicated that their sense of belonging in marine science has increased, with 50.0% agreeing and 50.0% strongly agreeing. 80.0% indicated that their sense of belonging in shark science had increased (50.0% strongly agreeing and 30.0% agreeing), and 20.0% were neutral about this statement. Likewise, all participants indicated that as a result of the MISS workshop, their desire to pursue a career in marine science has increased (70.0% strongly agree, 30.0% agree). The results were similar for desire to pursue a career in shark science, with 60.0% strongly agreeing and 40.0% agreeing. Participants were slightly more split with regard to feeling like they can be successful as a woman or gender minority of color in marine science and shark science, with 90.0% agreeing (strongly agreeing or agreeing) for marine science and 80.0% agreeing (strongly agreeing or agreeing) for shark science.

Participants varied in terms of their perception of being afforded additional opportunities because of the workshop. While 80.0% indicated that they have additional opportunities in marine science due to their participation in the workshop, 20.0% were neutral. When it comes to opportunities in shark science, however, 70.0% agreed, 20.0% were neutral, and 10.0% disagreed. While this is still overwhelmingly positive, they are less positive than the other results. This suggests that opportunities were not universally afforded to participants, especially shark science opportunities. There could be various reasons for this, including whether participants seemed interested in continuing to pursue marine science or even the potential perceived fit between the scientist with the opportunity and the workshop participant. Regardless, it is an area to examine further.

As a result of the MISS workshop... [I have additional opportunities to pursue further education, programs, and/or jobs related to marine science.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	2	20.0	20.0	20.0
	Agree	3	30.0	30.0	50.0
	Strongly agree	5	50.0	50.0	100.0

	Total	10	100.0	100.0	

As a result of the MISS workshop... [I have additional opportunities to pursue further education, programs, and/or jobs related to shark science.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	10.0	10.0	10.0
	Neutral	2	20.0	20.0	30.0
	Agree	1	10.0	10.0	40.0
	Strongly agree	6	60.0	60.0	100.0
	Total	10	100.0	100.0	

Participants also varied in terms of their perception of having built meaningful, lasting relationships with marine or shark scientists. 60.0% of participants indicated that they had built these types of relationships with marine scientists, and 40.0% were neutral about this statement. Unlike for many of the other statements, only 20.0% strongly agreed that they had built meaningful relationships with marine scientists.

As a result of the MISS workshop... [I have built meaningful, lasting relationships with marine scientists.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	4	40.0	40.0	40.0
	Agree	4	40.0	40.0	80.0
	Strongly agree	2	20.0	20.0	100.0
	Total	10	100.0	100.0	

As a result of the MISS workshop... [I have built meaningful, lasting relationships with shark scientists.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	4	40.0	40.0	40.0
	Agree	4	40.0	40.0	80.0
	Strongly agree	2	20.0	20.0	100.0

Total	10	100.0	100.0	

The results were exactly the same for building meaningful, lasting relationships with shark scientists. Although the results on their face are positive, this is likely an area that could use some improvement, as this question looks at an aspect of the support that MISS is trying to provide for people entering the field and people in the early stages of their careers.

Recommending the workshop

Of the ten workshop participants who responded to the survey, all but one said that they would recommend the workshop to others; the lone dissenter responded maybe. The participant who was hesitant to say that she would recommend the workshop indicated that she would recommend it because it was a wonderful experience but said that she experienced some issues after the workshop was finished—she contacted someone asking about some difficulties she was having and never heard back from them, causing her to question the commitment to supporting workshop participants afterwards.

> I absolutely would recommend a workshop to others. It was a really fun experience and I would do it again just for fun. (If I was in Miami I would be at every Drag and Tag event!) On top of that I learned a ton, got to watch amazing people do amazing work, and gained confidence that I could be a part of a team doing this work. I have a lot of respect for everyone involved and I am glad to continue to support MISS so other future shark scientists can have this experience. My only hesitation in recommending would be from after the workshop. I felt that during the workshop we made some great connections and met some great people. We were told so many times that if we had issues or concerns, we could reach out to anyone to talk about them. But, when I was struggling within my program I reached out a couple times and in some cases wasn't responded to. To be clear, I'm not at all angry or offended by it. I have nothing but respect for everyone involved and totally understand how overwhelming life can get. And who knows where emails/messages sometimes end up. I was just hoping that the sense of community being built was another thing to rely on while working my way through my program and it doesn't feel like it has been yet. So I would absolutely recommend the experience, but I do think that the community has some room to grow. :) – Respondent WJ

This participant very much enjoyed the workshop but was a bit disappointed in the (lack of) response she got from the community regarding her issues with her program. This seems to be an opportunity for the MISS community to figure out ways to ensure that someone responds even if the person who was originally contacted doesn't have enough time to respond at that moment.

Those who said they would recommend the workshop without hesitation cited reasons including that they have gotten more opportunities in shark science because of the workshop, it made them feel more confident about their capabilities to succeed in the field, and they really enjoyed being around other women of color who were working in or interested in shark science.

> It was such a great experience for me! I've literally had so many opportunities made available to me because of this workshop. I wouldn't have gotten the opportunity to participate in the summer research with my college had it not been for this program. It also was so healing being surrounded by WOC who are very active in the shark science field. It made me so much more comfortable and confident being a part of and participating in the field. – Respondent WH

Another participant mentioned the support system provided by the workshop, and the assistance, motivation, and confidence that it provided for her at a time when she greatly needed all of these aspects.

> The workshop came in the perfect time of my life where I was feeling really unmotivated to keep pursuing a career in marine biology and was everything I needed in terms of getting excited about my aspirations and love for sharks again, making friends and colleagues in the shark world, getting really invaluable advice and support when applying for graduate schools, and overall just being a really supportive and welcoming environment that gave me confidence again. I'd recommend it to anyone interested in anything marine science regardless of their background. – Respondent WB

In addition to these effusive comments that depicted aspects of the workshop as "healing" and "everything I needed," several of the respondents described the workshop with words such as "great," "invaluable," or "life-changing," even if they did not provide many details about the experience. They also referred to the skills that they learned and the experience of getting to tag sharks—regardless of their prior level of experience in the field. One participant said that the workshop was "very helpful for

people just starting out in shark/marine science," suggesting that the workshop was appropriate and helpful for anyone interested in marine science and shark science, not just those who had already done significant coursework or had already had some hands-on experience in the field.

What participants gained from the workshop

When asked what they got out of the workshop, participants cited hands-on field experience, confidence, a sense of belonging/community, a better understanding of the field of shark science, career and life advice, peers, mentors, and motivation. They described feeling increasingly sure of their desires to pursue a career in shark science, as well as receiving guidance in doing so.

> I got a lot [out] of the MISS workshop, including experience and knowledge. I wanted to break into shark/marine science so bad but wasn't sure how, and they helped me figure it out. I now have a plan of going into Shark conservation and hopefully more will come soon. – Respondent WD

This participant used the workshop as an exploratory opportunity; by talking with the scientists and fellow participants, she developed a plan to start pursuing her dream. Another participant emphasized the confidence boost that she received through the workshop. This enabled her to view her dreams of becoming a shark scientist as a real possibility, despite her deeply ingrained societal preconceptions about how shark scientists look and act.

> The MISS workshop provided me with the power to know that I really could achieve the "crazy" goals I had in my head about being a proponent and advocate for sharks through science and as a scientist. There is this sad societal perception of what a scientist, in general, is supposed to look like. Sadly, even amongst women there is a perceived look or behavior for what a "woman scientist" should be like, and the "look" for a shark scientist is even more siloed. MISS enhanced my confidence to pursue my goals/dreams and helped break the socially developed barrier in my head that I had to behave or look a certain way to be accepted, wherein now my expectation is to question, and then educate, those who implicate archaic "rules" onto woman in science. – Respondent WJ

One participant seemed accustomed to having to alter her behaviors to some degree to fit in within the field, especially because of her identity as a queer woman of color. In the MISS workshop, she was able to be herself and was treated well—in addition to enjoying the hands-on experience.

> I got hands-on experience that can never be replaced or replicated. Getting into the field is always a valuable experience. Additionally, for once, I wasn't the only brown queer girl in a learning environment. It was nice to be able to fully be myself and never have to worry about being treated poorly by my fellow participants and the leaders. – Respondent WA

Another participant focused her response on the specific skills that she learned and gained experience with; along with a confidence boost and improved résumé, she also seemed to gain a greater understanding of the field and of the various possibilities within it.

> Gained a lot of hands-on experience handling and working up sharks. I also gained experience working with a team to effectively and efficiently work up the sharks. I learned how to assemble and utilize both a long line and drum line. I learned how they spin blood for future uses in research. It was really nice and help (sic) make me more comfortable applying to internship and research experiences outside of MISS. It was also really good seeing how many diverse research opportunities there are in shark science outside of spatial ecology. – Respondent WH

The workshop participants were all very positive about the workshop; the only negative feedback had to do with access to opportunities after the workshop and with the perception that participants had built meaningful, lasting relationships with marine scientists and shark scientists. It can be difficult to build meaningful, lasting relationships over a weekend-long workshop! However, if MISS wants the workshop to be a source of meaningful, lasting relationships that participants can build with marine and shark scientists, it might be worthwhile to brainstorm with workshop staff about ways to continue the connections they make over that weekend so that they become lasting and meaningful.

2021 MISS Fellows

Science identity

The 2021 MISS Fellows have a very high science identity. With the one-item science identity measure, they all placed themselves in the highest three statuses: e, f, and g. One-third of these fellows rated themselves at an e, which indicates a 2/3 circle overlap between self and science, 16.7% rated themselves at an f, which indicates a ¾ circle overlap between self and science, and another one-third rated themselves at a g, which indicates almost total overlap between self and science. Using the two-item measure of science identity, all five of the Fellows assessed that the statements "I can see myself as a scientist" and "Science is a good field for me" were very true. The same was the case for both the marine science/scientist version and the shark science/scientist versions of the statements.

Feeling welcome in science/marine science/shark science

Fellows responded to three statements about feeling welcome in science, marine science, and shark science, and the results differed somewhat. While "I feel welcome in science" was rated as somewhat true (a 5 on a 7-point scale) by 60.0% of the respondents, 20.0% were unsure and 20.0% indicated that this was mostly not true (a 2 on a 7-point scale). "I feel welcome in marine science" was rated as somewhat or mostly true (a 5 or 6 on a 7-point scale) by 40.0% of respondents, with 40.0% unsure and 20.0% indicating that it was somewhat not true (a 3 on a 7-point scale). Respondents seemed to feel more welcome in shark science, as 60.0% of responses were positive, and no responses were negative.

I feel welcome in science.

		Frequency	Percent	Cumulative Percent
Valid	(mostly not true)	1	20.0	20.0
	not sure	1	20.0	40.0
	(somewhat true)	3	60.0	100.0
	Total	5	100.0	

I feel welcome in marine science.

		Frequency	Percent	Cumulative Percent
Valid	(somewhat not true)	1	20.0	20.0
	not sure	2	40.0	60.0
	(somewhat true)	1	20.0	80.0
	(mostly true)	1	20.0	100.0
	Total	5	100.0	

I feel welcome in the field of shark science.

		Frequency	Percent	Cumulative Percent
Valid	not sure	2	40.0	40.0
	(somewhat true)	1	20.0	60.0
	(mostly true)	1	20.0	80.0
	very true	1	20.0	100.0
	Total	5	100.0	

Feeling more welcome in shark science than in science generally or marine science broadly may be due to participation in the Fellowship and in MISS, as one major goal of the organization and of the fellowship is to make racial and gender minorities feel welcome and supported in shark science (as opposed to marine science or science generally).

A good fit

Respondents also responded to three statements having to do with feeling like the field was a good fit for them. All of the participants indicated that the statements, “I feel like science is a good fit for

me," "I feel like marine science is a good fit for me," and "I feel like shark science is a good fit for me" were very true for them, which is the highest rating.

Belonging in science/marine science/shark science

There were three statements having to do with feeling like they belong in science, marine science, and shark science. For the items regarding science and marine science, 80.0% of respondents indicated that these statements were very true, and 20.0% indicated that the statements were either somewhat true or mostly true. For the item regarding shark science, however, 100.0% of the respondents indicated that the statement, "I belong in the field of shark science" was very true for them.

Fellows responded to two questions regarding whether they were friends with a shark scientist and a marine scientist. Regarding being friends with a shark scientist, 80.0% strongly agreed and 20.0% agreed. Regarding being friends with a marine scientist, 100.0% strongly agreed. This suggests that the connections they have made—including as part of their fellowships—have resulted in stable, long-term friendships that can help them to navigate the fields of shark science and marine science.

Fellows also responded to two questions regarding whether they know a shark scientist and a marine scientist who knows and values their work. All respondents agreed or strongly agreed that they personally know a shark scientist who knows and values their work (60.0% of respondents strongly agreed and 40.0% agreed). Similarly, 100.0% of respondents strongly agreed that they know a marine scientist who knows and values their work. These connections, like friendships with a shark scientist and marine scientist, may have been forged during their fellowships, and can help them to find opportunities and to get good career advice.

Culture of shark science

Despite feeling welcome in shark science and feeling like they have supports in the form of friends and scientists who value their work, Fellows had rather negative feelings about the culture of shark science. When asked to rate their agreement with the statement, “The field of shark science is welcoming to people who look and sound like I do,” 80% of respondents disagreed, while 20.0% were neutral. No Fellows responded positively to this question. The statement, “The field of shark science is welcoming to members of all racial minority groups” received a similarly negative response, with 80.0% of respondents disagreeing or strongly disagreeing and 20.0% remaining neutral.

The Fellows’ view of gender relations in shark science was not positive either. In response to the statement, “Female shark scientists are valued in their field,” only 20% of respondents agreed and 20.0% were neutral; 60.0% disagreed or strongly disagreed.

Rate_[Female shark scientists are valued in their field.]

		Frequency	Percent	Cumulative Percent
Valid	strongly disagree	1	20.0	20.0
	disagree	2	40.0	60.0
	neutral	1	20.0	80.0
	agree	1	20.0	100.0
	Total	5	100.0	

Fellows also perceived that male shark scientists are given more respect than female marine scientists, with 100% of Fellows agreeing or strongly agreeing that they are. As 80% of Fellows strongly agreed with this statement, they seem very sure that gender inequality is a problem in shark science.

Rate_ [Male shark scientists are given more respect than female marine scientists.]

		Frequency	Percent	Cumulative Percent
Valid	strongly agree	4	80.0	80.0
	agree	1	20.0	100.0
	Total	5	100.0	

In the same vein, Fellows largely felt as though the field of shark science was not welcoming to people with nontraditional gender identities, as 60.0% indicated that this was the case, and 40.0% were neutral.

Rate_[The field of shark science is welcoming to people who have nontraditional gender identities.]

		Frequency	Percent	Cumulative Percent
Valid	strongly disagree	1	20.0	20.0
	disagree	2	40.0	60.0
	neutral	2	40.0	100.0
	Total	5	100.0	

Shark science and the community

Fellows were split on whether shark science currently explores problems that affect their communities, but most of them thought that a career in shark science would enable them to give back to their communities. Sixty percent of respondents indicated that they did not think shark science currently explores problems that affect their community, but 40.0% indicated that they did. On the other hand, 80% disagreed or strongly disagreed with the statement, "A career in shark science would not enable me to give back to my community," whereas 20.0% were neutral. This suggests that most Fellows perceive that pursuing shark science as a career would enable them to give back to their community, even if it did not necessarily allow them to explore problems that affect their community.

Impact of MISS Fellowship

The fellows typically agreed or strongly agreed with many of the questions that asked about outcomes that they attributed to the MISS Fellowship. They indicated that the fellowship increased their self-confidence in marine science (80% strongly agreed, 20% agreed) and in shark science (80% strongly agreed, 20% agreed).

Fellows also indicated that due to the fellowship, they have built meaningful, long-lasting relationships with both marine scientists (80% strongly agreed, 20% agreed) and with shark scientists (100% strongly agreed).

As a result of the MISS fellowship... [I have built meaningful, lasting relationships with marine scientists.]

		Frequency	Percent	Cumulative Percent
Valid	agree	1	20.0	20.0
	strongly agree	4	80.0	100.0
	Total	5	100.0	

As a result of the MISS fellowship... [I have built meaningful, lasting relationships with shark scientists.]

		Frequency	Percent	Cumulative Percent
Valid	strongly agree	5	100.0	100.0

Fellows reported that the fellowship increased their sense of belonging in marine science (80% strongly agreed, 20% agreed). Fellows were less positive about the Fellowship's impact on their sense of belonging in shark science; 60.0% strongly agreed with the statement that their sense of belonging in shark science had increased because of the MISS fellowship, while 20.0% agreed and 20.0% were neutral.

As a result of the MISS fellowship... [My sense of belonging in marine science has increased.]

		Frequency	Percent	Cumulative Percent
Valid	agree	1	20.0	20.0
	strongly agree	4	80.0	100.0
	Total	5	100.0	

As a result of the MISS fellowship... [My sense of belonging in shark science has increased.]

		Frequency	Percent	Cumulative Percent
Valid	neutral	1	20.0	20.0

	agree	1	20.0	40.0
	strongly agree	3	60.0	100.0
	Total	5	100.0	

They also indicated that because of the fellowship, they feel more confident that they can be successful as a woman or gender minority of color in marine science (80% strongly agreed, 20% agreed). The results were similar but slightly less positive regarding their confidence that they can be successful as a woman or gender minority of color in shark science, as 20.0% were neutral and 80.0% strongly agreed with this statement.

Fellows reported that as a result of the fellowship, they feel more like a marine scientist than before (100% strongly agreed), and they also feel more like a shark scientist than before (100% strongly agreed). Fellows also agreed that due to the MISS fellowship, their desire to pursue a career in marine science and in shark science had increased (for each of these two items, 80.0% strongly agreed and 20.0% agreed).

Likewise, they signaled that because of the fellowship, they had additional opportunities to pursue further education, programs, and/or jobs in marine science (60% strongly agreed, 40% agreed). However, the Fellows were a lot more neutral about the statement, "As a result of the MISS fellowship, I have additional opportunities to pursue further education, programs, and/or jobs related to shark science," with 40% of the Fellows rating themselves "neutral," 20% agreeing, and 40% strongly agreeing.

As a result of the MISS fellowship... [I have additional opportunities to pursue further education, programs, and/or jobs related to marine science.]

		Frequency	Percent	Cumulative Percent
Valid	agree	2	40.0	40.0
	strongly agree	3	60.0	100.0
	Total	5	100.0	

As a result of the MISS fellowship... [I have additional opportunities to pursue further education, programs, and/or jobs related to shark science.]

		Frequency	Percent	Cumulative Percent
Valid	neutral	2	40.0	40.0
	agree	1	20.0	60.0
	strongly agree	2	40.0	100.0
	Total	5	100.0	

While these Fellows' perceptions of the field are quite negative (male shark scientists given more respect than females, females aren't valued, they don't feel like the field is welcoming to members of all racial minority groups, people with nontraditional gender identities, or people who look and sound like the Fellows), they themselves feel mostly welcome in the field of shark science and they all consider themselves to be friends with a shark scientist. They largely do not think shark science currently addresses problems in their community, but they do think that the field would enable them to give back to their community. In other words, they sense that the field is not welcoming to the groups they belong to, but they have social supports that help them to feel personally welcome. Additionally, they have people who they can turn to for support and guidance within the field. The fellowship increased their desire to pursue a career in marine science and shark science, so their negative perceptions of the field likely will not prevent them from pursuing such a career.

When asked what they got out of the fellowship, the 2021 Fellows mentioned skills, community support, confidence, friendships, and empowerment. I have included three excerpts below.

> I never would have thought that I was capable enough or good enough or smart enough to work in a very white male dominated field that shark science is today. But this fellowship gave me a once in a lifetime opportunity that allowed me to exercise my knowledge in shark science. It showed me that it is possible for a women [sic] of color to excel in this field. And even though there might be obstacles or challenges along the way, I know that there is a community of amazing female shark scientists supporting me and cheering me on. – Respondent F1C

This Fellow received a confidence boost from the fellowship; because of the fellowship, she saw that women of color can excel in shark science, despite barriers that they might encounter. And to help her cope with the obstacles, there is a community of shark scientists pulling for her and giving her support.

> A sense of belonging and empowerment. I feel better equipped within the marine sciences realm not only due to the learning experience, but the strong community support received within MISS itself. I now understand I am not alone being a female and minority in science. I will continue to persevere and pursue this career with the guidance and reassurance, I now have a community of individuals just like me. – Respondent F1A

This Fellow also noted the community of people like her that are pulling for her and giving her support; she also referenced the confidence boost and skills that she gained from the experience.

> I received the ability to focus on the internship work. I live [far away] so I do not know that I would have been able to even accept the internship without the MISS fellowship. In addition, I gained research skills, knowledge, confidence, and connections that helped me continue on with graduate school. I would not be in graduate school at all if I had not received the MISS fellowship and I definitely would not feel confident pursuing shark science or marine science at all as a career. – Respondent F1E

Noting the financial benefit, this Fellow realized that she would not have been able to have this experience were it not for the fellowship. She mentioned the skills, confidence, and connections that she received, as well as the biggest boost of all; these connections, skills, and confidence enabled her to attend graduate school and to pursue marine science or shark science as a career.

Fellows were also asked whether they would recommend the fellowship; all of them said that they would, citing the "incredible opportunity," the ability to experience one's "dream career without having to pay a lot of money," and the support system.

> I would recommend the MISS Fellowship as this learning experience goes beyond the physical skills acquired. A strong support system is needed within every individual's life, especially in a career where injustice and inequality is prevalent, MISS is exactly my support system. – Respondent F1A

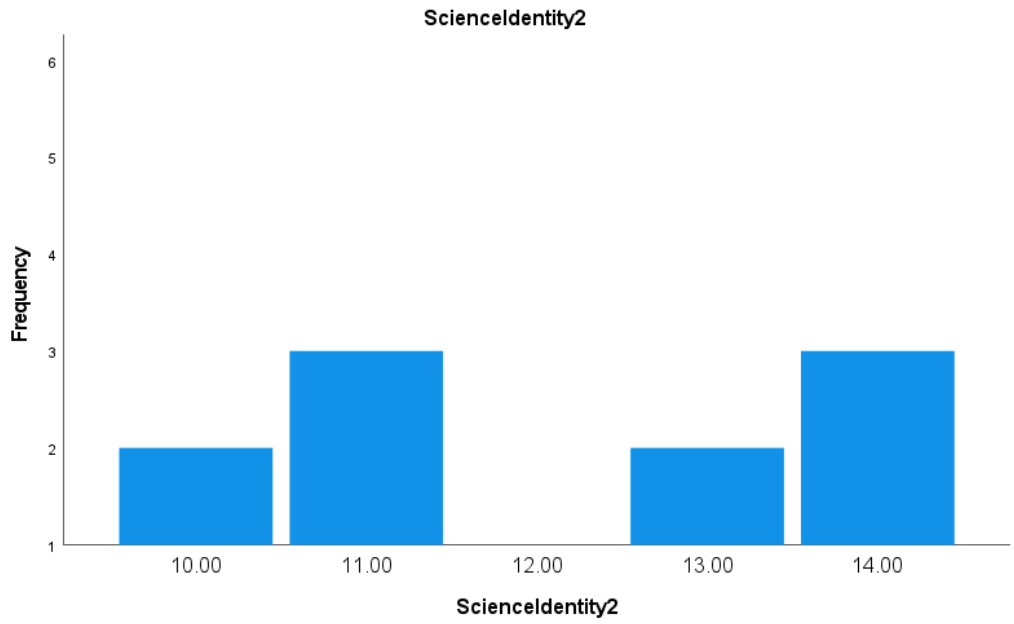
The 2021 Fellows had very positive perceptions of the impact of the fellowship. They tended to agree that because of the fellowship, they felt more like a marine scientist and a shark scientist, their self-confidence in marine science and shark science increased, their sense of belonging in marine science and shark science increased, they built meaningful, lasting relationships with marine and shark scientists, their desire to pursue a career in marine and shark science increased, they gained opportunities to pursue further education, programs, and/or jobs related to marine science and shark science, and they felt more confident in their ability to succeed as a woman or gender minority of color in marine and shark science. Because one or two of the Fellows seemed to give lower ratings on the items regarding the fellowship having increased their sense of belonging in shark science and gaining additional opportunities in shark science, these are highlighted as potential areas for MISS to work on.

2022 MISS Fellows

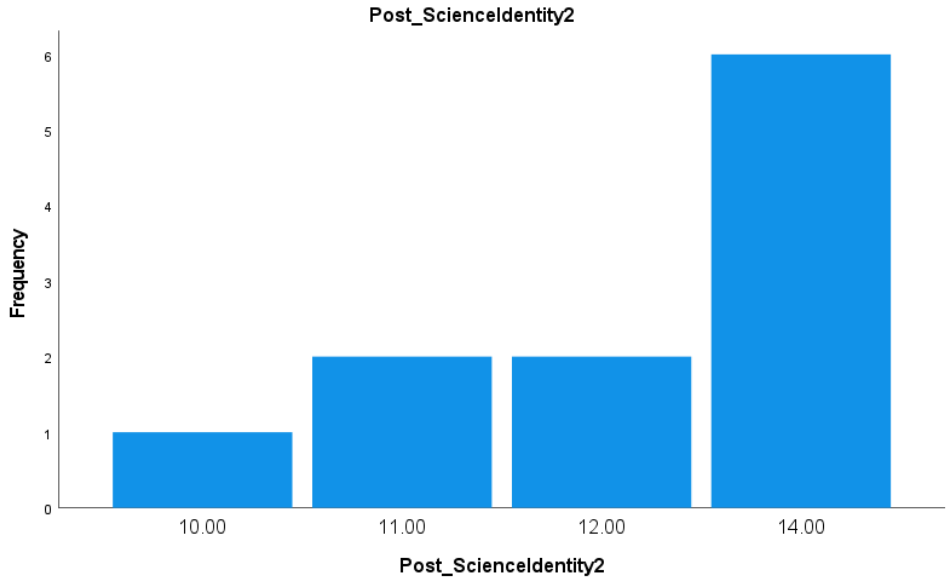
Science Identity

The 2002 MISS Fellows varied quite a bit in their pre-Fellowship science identity, using the single-item measure. Pre-fellowship, 27.3% rated themselves at a c (1/4 circle overlap between self and science), 9.1% rated themselves at a d (1/3 circle overlap), 45.5% rated themselves at an e (2/3 circle overlap), and 9.1% each rated themselves at an f (3/4 circle overlap) and g (almost total overlap between self and science). Over the course of the fellowship, their science identities shifted such that they became stronger. Post-fellowship, 9.1% rated themselves at a c, 18.2% rated themselves at a d, 27.3% rated themselves at an e, 27.3% rated themselves at an f, and 18.2% rated themselves at a g. Looking at the change in science identity per person for the single item measure, science identity stayed the same for 36.4% of Fellows; while it decreased by one step for 18.2% of Fellows, it increased by one step for 27.3% of Fellows, by two steps for 9.1% of Fellows, and by 4 steps by 9.1% of Fellows. Thus, the change in science identity (measured by the single-item measure) for the majority of Fellows was positive.

Using the two-item measure of science identity (ScienceIdentity2), the Fellows' science identities varied similarly. Each item is on a 7-point scale, so the maximum value for the combined two-item science identity is 14 and the minimum is 2. On the pre-fellowship survey, the combined scores range from 10 to 14; 27.3% of Fellows rated themselves as a 14 and 18.2% rated themselves as a 13.

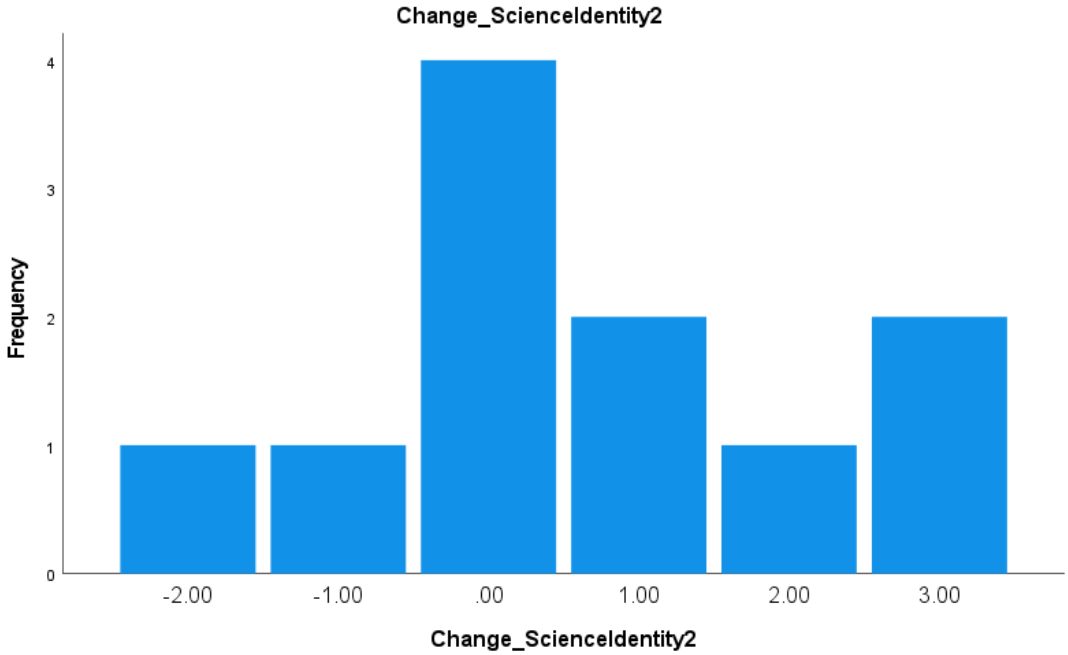


On the post-fellowship survey, the scores also ranged from 10 to 14, but the distribution was shifted towards the higher end of the scale.



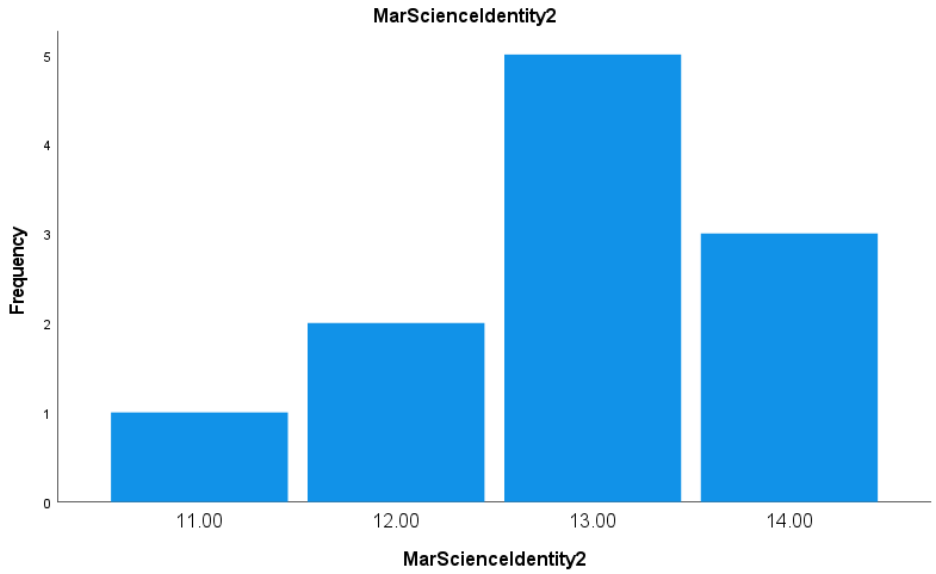
This adds even more evidence that the Fellows' science identities became more positive over the course of their fellowship. When looking at the change in this combined variable between the pre-fellowship

survey and the post-fellowship survey, it becomes clear that for one-third of participants, their science identity did not change; however, the science identities of almost 42% of participants increased, and the science identities of about 17% of participants decreased.

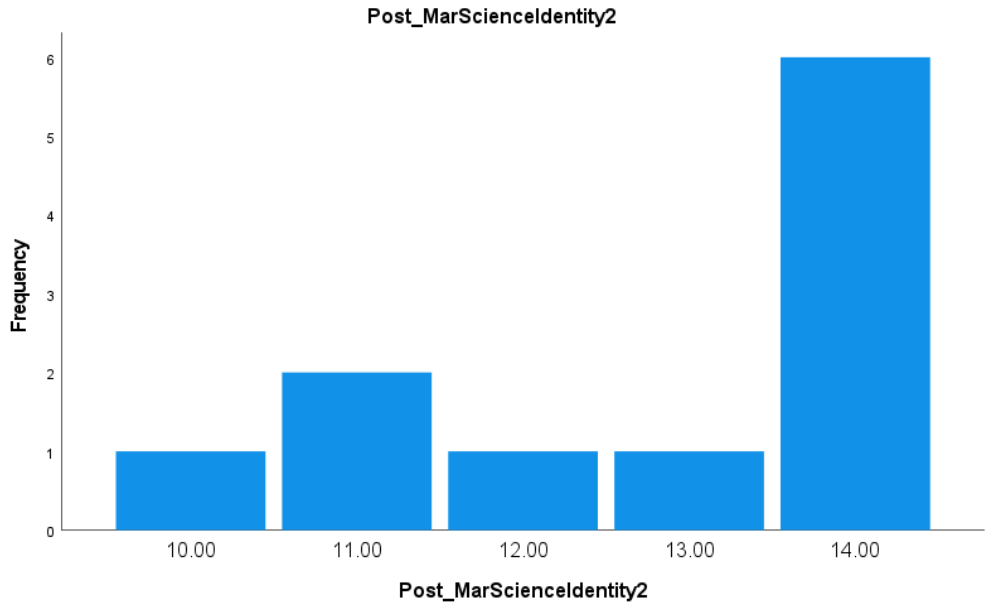


Marine Science Identity

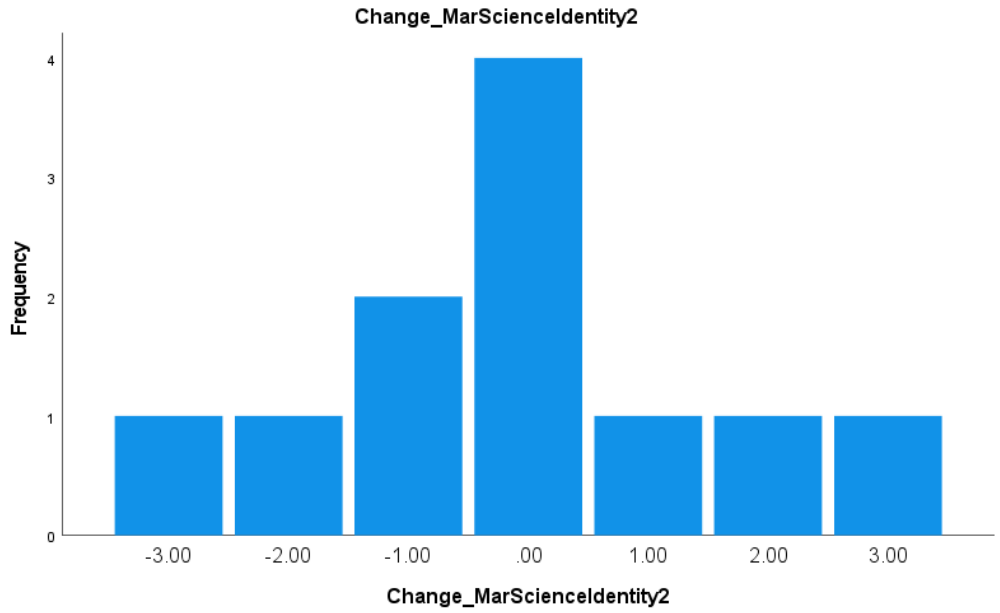
The Fellows' marine science identity started out quite high, ranging from 11 to 14 on a scale of 1 to 14, with 45.5% rating themselves at a 13 and 27.3% rating themselves as a 14.



Their post-fellowship marine science identity ranged from a 10 to a 14, but with 9.1% rating themselves as a 13 and 54.5% rating themselves as a 14. This suggests that although a few participants' marine science identities decreased over the course of the fellowship, a few participants' marine science identities increased during the fellowship.

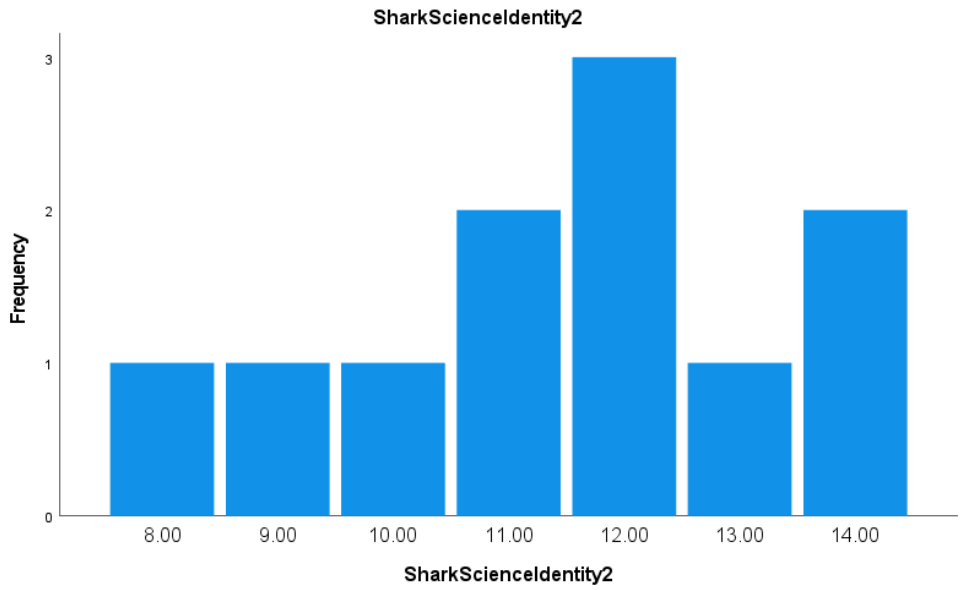


Looking at the bar graph for the change variable gives us a clearer picture of the shift in marine science identity. While 36.4% of participants' marine science identity remained the same during the fellowship, 27.3% of participants' marine science identity increased and 36.4% of participants' marine science identity decreased over the course of the fellowship. Some of these shifts were fairly large, which suggests that perhaps the fellows learned a lot about marine science during the fellowship and became more aware of ways in which it did and did not align with other parts of their identities.

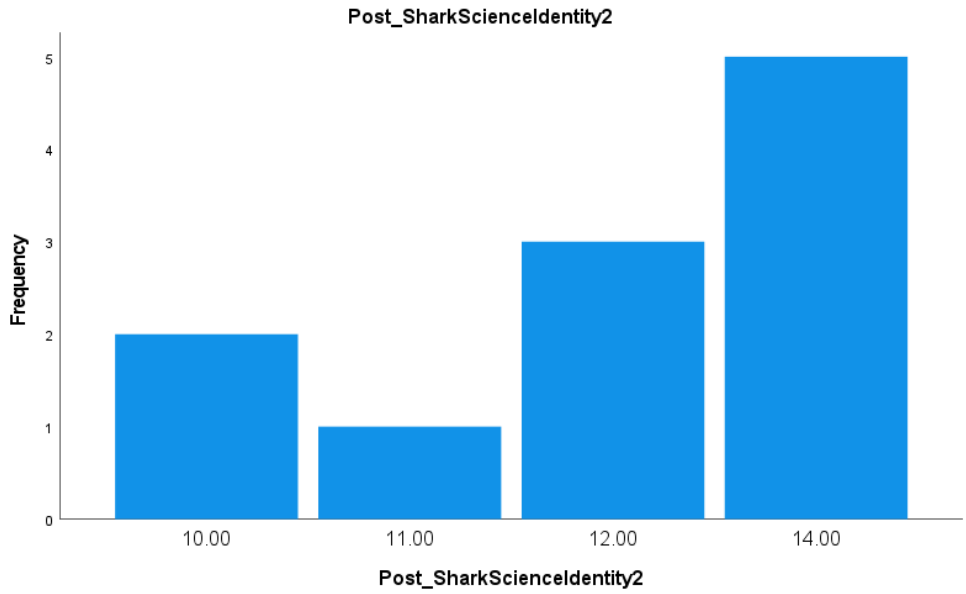


Shark Science Identity

Participants' pre-fellowship shark science identities were a bit more varied than their science and marine science identities, in that shark science identities using the two-item measure ranged from 8 to 14; the minimum value seen with science and marine science was 10 or 11. While 18.2% rated themselves as a 14, 27.3% rated themselves as a 12, with 18.2% rating themselves as an 11.

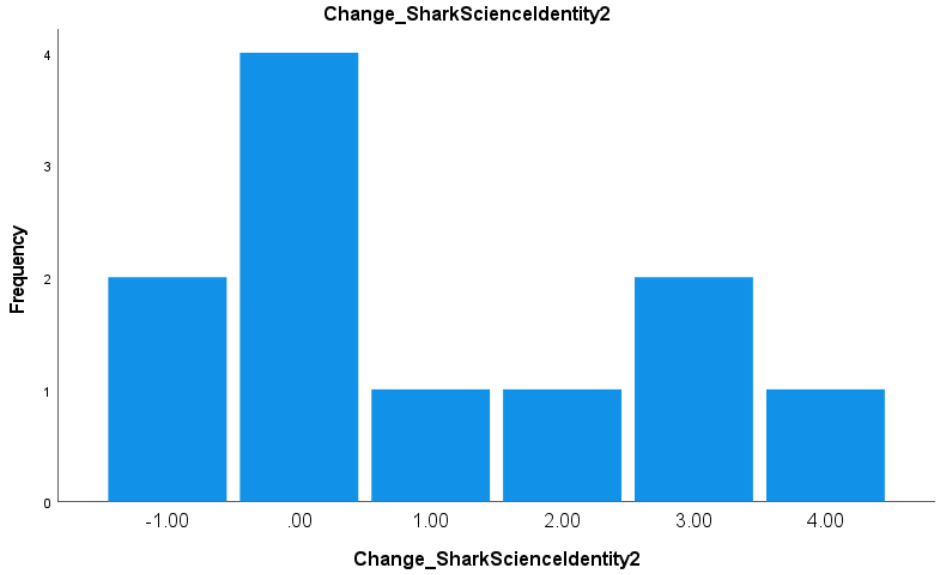


After the fellowship, however, the minimum rating was 10, with 18.2% rating themselves as a 10, 9.0% rating themselves as an 11, 27.3% rating themselves as a 12, and 45.5% rating themselves as a 14. This suggests that the shark science identities increased over the course of the fellowship.



The bar graph representing the change in science identity scores over the course of the fellowship gives an even clearer picture of how Fellows' science identities changed. Only two participants' shark science

identity decreased, and by one point each; the others all either stayed the same (36.4%) or increased by varying amounts (45.5%).



This increase is likely due to their fellowships exposing them more to the field of shark science, giving them hands-on experience of what it is like to be involved in shark science research. A large proportion of the fellows may have concluded that they really like shark science and that they think they would like to pursue it further.

Interest/intent to pursue science further

When beginning their fellowships, all of the Fellows already intended to participate in additional shark science field experiences and lab experiences. However, over the course of the fellowship, several Fellows strengthened their plans to do so. Pre-fellowship, 45.5% of participants strongly agreed that they planned to participate in additional shark science field experiences. Post-fellowship, 80.0% of participants strongly agreed with this statement.

Rate_ [I plan to participate in additional shark science field experiences.]

		Frequency	Percent	Cumulative Percent
	agree	6	54.5	54.5
	strongly agree	5	45.5	100.0
	Total	11	100.0	

Post_Rate: [I plan to participate in additional shark science field experiences.]

		Frequency	Valid Percent	Cumulative Percent
Valid	agree	2	20.0	20.0
	strongly agree	8	80.0	100.0
	Total	10	100.0	
Missing	System	1		
Total		11		

Additionally, pre-fellowship, 54.5% of participants strongly agreed that they planned to participate in additional shark science lab experiences. Post-fellowship, 90.0% of participants strongly agreed with this statement.

Rate_ [I plan to participate in additional shark science lab experiences.]

		Frequency	Percent	Cumulative Percent
Valid	agree	5	45.5	45.5
	strongly agree	6	54.5	100.0
	Total	11	100.0	

Post_Rate: [I plan to participate in additional shark science lab experiences.]

		Frequency	Valid Percent	Cumulative Percent
Valid	agree	1	10.0	10.0
	strongly agree	9	90.0	100.0
	Total	10	100.0	
Missing	System	1		
Total		11		

Likewise, before the fellowship, 54.5% of participants strongly agreed that they planned to take additional classes or attend lectures about shark science; 36.4% agreed, and 9.1% were not sure. After the fellowship, 70.0% of participants strongly agreed with this statement, 30.0% agreed, and no participants were unsure (one person did not respond to this statement).

Rate_ [I plan to take additional classes or attend lectures about shark science.]

	Frequency	Percent	Cumulative Percent

Valid	not sure	1	9.1	9.1
	agree	4	36.4	45.5
	strongly agree	6	54.5	100.0
	Total	11	100.0	

Post_Rate: [I plan to take additional classes or attend lectures about shark science.]

		Frequency	Valid Percent	Cumulative Percent
Valid	agree	3	30.0	30.0
	strongly agree	7	70.0	100.0
	Total	10	100.0	
Missing	System	1		
Total		11		

There were questions on the survey about whether fellows would like to go to graduate school to study marine science and shark science, but the pre- and post-fellowship responses were very similar for both questions. All of the difference in the responses could be accounted for by one to three participants who did not answer those questions on the post-fellowship survey. Thus, it is unclear whether the fellowship brought about any real difference in intention to go to graduate school for marine science or shark science.

Opportunities brought about by the fellowship

Most of the Fellows agreed (36.4%) or strongly agreed (54.5%) that the MISS fellowship opened up opportunities for them to pursue further education, programs, and/or jobs that are related to marine science. Likewise, most of the Fellows agreed (45.5%) or strongly agreed (27.3%) that the MISS fellowship opened up opportunities for them to pursue further education, programs, and/or jobs that are related to shark science. However, one Fellow strongly disagreed with this statement as it relates to both marine science and shark science, and two Fellows felt unsure about this statement as it relates to shark science.

Post_The MISS fellowship opened up opportunities for me to pursue further education, programs, and/or jobs related to marine science.

		Frequency	Percent	Cumulative Percent
Valid	strongly disagree	1	9.1	9.1
	agree	4	36.4	45.5
	strongly agree	6	54.5	100.0
	Total	11	100.0	

Post_The MISS fellowship opened up opportunities for me to pursue further education, programs, and/or jobs related to shark science.

		Frequency	Percent	Cumulative Percent
Valid	strongly disagree	1	9.1	9.1
	neutral	2	18.2	27.3
	agree	5	45.5	72.7
	strongly agree	3	27.3	100.0
	Total	11	100.0	

As this result is similar to the result on this question for the 2021 Fellows and the workshop participants, it may be worthwhile to determine why most fellows and workshop participants are perceiving additional opportunities being available to them but a few others are not.

Sense of belonging

For some Fellows, their sense of feeling welcome in marine science increased during the fellowship. Prior to the fellowship, 72.8% of fellows felt at least somewhat welcome in marine science; after the fellowship, 72.8% of fellows still felt at least somewhat in marine science. However, while 18.2% of fellows felt beforehand that they were at least somewhat unwelcome in marine science, none of them felt that way after the fellowship; the most negative reaction to the sentence post-fellowship was “not sure.”

I feel welcome in marine science.

		Frequency	Percent	Cumulative Percent
Valid	not at all true (1)	1	9.1	9.1

	(somewhat not true) (3)	1	9.1	18.2
	not sure (4)	1	9.1	27.3
	(somewhat true) (5)	2	18.2	45.5
	(mostly true) (6)	3	27.3	72.7
	very true (7)	3	27.3	100.0
	Total	11	100.0	

Post_I feel welcome in marine science.

		Frequency	Percent	Cumulative Percent
Valid	not sure (4)	3	27.3	27.3
	(somewhat true) (5)	1	9.1	36.4
	(mostly true) (6)	3	27.3	63.6
	very true (7)	4	36.4	100.0
	Total	11	100.0	

The same is true for feeling welcome in the field of shark science. Whereas 18.2% of respondents responded negatively to "I feel welcome in the field of shark science" pre-fellowship, there were no negative responses after the fellowship had concluded; the most negative response was "not sure." However, the responses were actually more positive as well, as pre-fellowship, 72.8% of respondents indicated that this sentence was at least somewhat true for them, but post-fellowship, 91.0% of respondents felt this way.

I feel welcome in the field of shark science.

		Frequency	Percent	Cumulative Percent
Valid	(mostly not true) (2)	1	9.1	9.1
	(somewhat not true) (3)	1	9.1	18.2
	not sure (4)	1	9.1	27.3
	(somewhat true) (5)	2	18.2	45.5
	(mostly true) (6)	3	27.3	72.7
	very true (7)	3	27.3	100.0
	Total	11	100.0	

Post_I feel welcome in the field of shark science.

		Frequency	Percent	Cumulative Percent
Valid	not sure (4)	1	9.1	9.1
	(somewhat true) (5)	3	27.3	36.4
	(mostly true) (6)	2	18.2	54.5
	very true (7)	5	45.5	100.0
	Total	11	100.0	

This suggests that the fellowships caused the Fellows to feel more welcome in the field of shark science (and marine science as well, to a lesser extent).

In response to the statement, "When I am with others in marine science-related settings, I feel included," 90.9% of respondents agreed before the fellowship, and 9.1% felt unsure. After the fellowship, however, 45.5% of respondents strongly agreed, 45.5% agreed, and 9.1% felt unsure. When given the statement, "When I am with others in shark science-related settings, I feel included," 54.6% of respondents agreed or strongly agreed pre-fellowship, 36.4% were unsure, and 9.1% disagreed. Post-fellowship, 90.9% agreed or strongly agreed, while 9.1% disagreed. In other words, although most of the Fellows felt included in marine science and shark science settings before their fellowships, afterwards they felt even more included than they felt before.

Rate_ [When I am with others in marine science-related settings, I feel included.]

		Frequency	Percent	Cumulative Percent
Valid	neutral	1	9.1	9.1
	agree	10	90.9	100.0
	Total	11	100.0	

Post_Rate - [When I am with others in marine science-related settings, I feel included.]

		Frequency	Percent	Cumulative Percent
Valid	not sure	1	9.1	9.1
	agree	5	45.5	54.5
	strongly agree	5	45.5	100.0
	Total	11	100.0	

Rate_ [When I am with others in shark science-related settings, I feel included.]

		Frequency	Percent	Cumulative Percent
Valid	disagree	1	9.1	9.1
	neutral	4	36.4	45.5
	agree	5	45.5	90.9
	strongly agree	1	9.1	100.0
	Total	11	100.0	

Post_Rate - [When I am with others in shark science-related settings, I feel included.]

		Frequency	Percent	Cumulative Percent
Valid	disagree	1	9.1	9.1
	agree	6	54.5	63.6
	strongly agree	4	36.4	100.0
	Total	11	100.0	

Additionally, in response to the statement, "I feel like an outsider in marine science settings," 18.2% of respondents agreed before the fellowship, and 9.1% were unsure, while 72.8% disagreed or strongly disagreed. After the fellowship, however, 90.9% of respondents disagreed or strongly disagreed, while 91.9% were unsure; no respondents agreed. In essence, participating in the fellowship helped to counteract Fellows' feelings of being outsiders in marine science settings, even if they previously didn't really feel like outsiders.

Post_Rate - [I feel like an outsider in marine science settings.]

		Frequency	Percent	Cumulative Percent
Valid	strongly disagree	2	18.2	18.2
	disagree	8	72.7	90.9
	not sure	1	9.1	100.0
	Total	11	100.0	

Post_Rate - [I feel like an outsider in marine science settings.]

		Frequency	Percent	Cumulative Percent
Valid	strongly disagree	2	18.2	18.2
	disagree	8	72.7	90.9
	not sure	1	9.1	100.0
	Total	11	100.0	

When given the shark science version of this statement, "I feel like an outsider in shark science settings," 45.5% of respondents indicated that they either agreed or strongly agreed on the pre-fellowship survey; 36.4% disagreed or strongly disagreed. On the post-fellowship survey, however, no Fellows agreed with this statement, and 81.9% disagreed. About 18% of respondents indicated that they

were neutral about the statement on both surveys. This indicates that over the course of the fellowship, many Fellows came to feel less like outsiders in shark science settings.

Rate_ [I feel like an outsider in shark science settings.]

		Frequency	Percent	Cumulative Percent
Valid	strongly disagree	1	9.1	9.1
	disagree	3	27.3	36.4
	neutral	2	18.2	54.5
	agree	4	36.4	90.9
	strongly agree	1	9.1	100.0
	Total	11	100.0	

Post_Rate - [I feel like an outsider in shark science settings.]

		Frequency	Percent	Cumulative Percent
Valid	strongly disagree	4	36.4	36.4
	disagree	5	45.5	81.8
	neutral	2	18.2	100.0
	Total	11	100.0	

Network in marine science/shark science

Although all of the respondents indicated that they were friends with a marine scientist before the fellowships started, a few of the respondents agreed more strongly after the fellowship was finished. Before the fellowship, 54.5% indicated that they strongly agreed with the statement, "I am friends with a marine scientist." After the fellowship, 81.8% indicated that they strongly agreed. Thus, even though they gave a positive answer before the fellowship, a few of the Fellows developed friendships during the fellowship that caused them to feel more strongly positive about the friendships that they had developed with marine scientists.

Rate_ [I am friends with a marine scientist.]

		Frequency	Percent	Cumulative Percent
Valid	agree	5	45.5	45.5

	strongly agree	6	54.5	100.0
	Total	11	100.0	

Post_Rate - [I am friends with a marine scientist.]

		Frequency	Percent	Cumulative Percent
Valid	agree	2	18.2	18.2
	strongly agree	9	81.8	100.0
	Total	11	100.0	

On the pre-fellowship survey, 54.6% of respondents agreed or strongly agreed that they were friends with a shark scientist, and 45.5% disagreed or strongly disagreed. However, after the fellowship, 72.7% of respondents agreed or strongly agreed, while only 18.2% disagreed. This indicates that the fellowships likely did a good job of encouraging positive relationships between participants and scientists.

Rate_ [I am friends with a shark scientist.]

		Frequency	Percent	Cumulative Percent
Valid	strongly disagree	2	18.2	18.2
	disagree	3	27.3	45.5
	agree	3	27.3	72.7
	strongly agree	3	27.3	100.0
	Total	11	100.0	

Post_Rate - [I am friends with a shark scientist.]

		Frequency	Percent	Cumulative Percent
Valid	disagree	2	18.2	18.2
	not sure	1	9.1	27.3
	agree	1	9.1	36.4
	strongly agree	7	63.6	100.0
	Total	11	100.0	

Before the fellowship, 81.9% of the respondents agreed or strongly agreed that they personally knew a marine scientist who knows and values their work. One respondent (9.1%) strongly disagreed,

and another (9.1%) was unsure. After the fellowship, this already positive aspect improved for a few of the respondents: 91.0% of respondents agreed or strongly agreed that they personally know a marine scientist who knows and values their work, and no respondents disagreed. Only one respondent (9.1%) indicated that they were unsure. Additionally, the percentage of respondents strongly agreeing went from 45.5% pre-fellowship to 63.6% post-fellowship. This indicates a definite improvement over the course of the fellowship.

Rate_ [I personally know a marine scientist who knows and values my work.]

		Frequency	Percent	Cumulative Percent
Valid	strongly disagree	1	9.1	9.1
	not sure	1	9.1	18.2
	agree	4	36.4	54.5
	strongly agree	5	45.5	100.0
	Total	11	100.0	

Post_Rate - [I personally know a marine scientist who knows and values my work.]

		Frequency	Percent	Cumulative Percent
Valid	not sure	1	9.1	9.1
	agree	3	27.3	36.4
	strongly agree	7	63.6	100.0
	Total	11	100.0	

In terms of personally knowing a shark scientist who knows and values their work, on the pre-fellowship survey only 45.5% indicated that they knew such a shark scientist of this type. However, on the post-fellowship survey, 63.7% of respondents indicated that they have this type of connection with a shark scientist. As with the increase in being friends with a shark scientist, this seems to indicate a positive outcome of the fellowships.

Rate_ [I personally know a shark scientist who knows and values my work.]

		Frequency	Percent	Cumulative Percent
Valid	strongly disagree	2	18.2	18.2
	disagree	4	36.4	54.5
	agree	4	36.4	90.9
	strongly agree	1	9.1	100.0
	Total	11	100.0	

Post_Rate [I personally know a shark scientist who knows and values my work.]

		Frequency	Percent	Cumulative Percent
Valid	disagree	2	18.2	18.2
	not sure	2	18.2	36.4
	agree	3	27.3	63.6
	strongly agree	4	36.4	100.0
	Total	11	100.0	

Before the fellowship, 18.2% of Fellows indicated that there was not someone in their life who serves as a mentor to them in marine science, and 81.8% indicated that there was. After the fellowship, however, while the percentage of Fellows who indicated that they had a mentor in marine science stayed the same, no Fellows indicated that there was nobody in their lives who played this role; two Fellows (18.2%) indicated that they were unsure about this, which is an improvement. Additionally, although 54.5% of respondents agreed and 27.3% strongly agreed with this statement pre-fellowship, the reverse was the case after the fellowship: 54.5% strongly agreed and 27.3% agreed. This suggests that some of the Fellows felt even more strongly about the fact that they had a mentor in marine science than they did before the fellowship.

Rate_ [Someone in my life serves as a mentor to me in marine science.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	1	9.1	9.1	9.1
	disagree	1	9.1	9.1	18.2
	agree	6	54.5	54.5	72.7
	strongly agree	3	27.3	27.3	100.0
	Total	11	100.0	100.0	

Post_Rate - [Someone in my life serves as a mentor to me in marine science.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not sure	2	18.2	18.2	18.2
	agree	3	27.3	27.3	45.5
	strongly agree	6	54.5	54.5	100.0
	Total	11	100.0	100.0	

Prior to the fellowship, 45.5% of the Fellows expressed that they had a mentor in shark science, 27.3% indicated that they did not have such a mentor, and 27.3% were unsure. After the fellowship, 81.8% of the Fellows indicated that they had a mentor in shark science, only 9.1% expressed that they did not have such a mentor, and only 9.1% were unsure. Additionally, pre-fellowship, only 18.2% strongly agreed that they had a shark science mentor, whereas post-fellowship, 63.6% strongly agreed. This increase is striking and is likely due to the increased exposure to shark scientists during the fellowship.

Rate_ [Someone in my life serves as a mentor to me in shark science.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	2	18.2	18.2	18.2
	disagree	1	9.1	9.1	27.3
	neutral	3	27.3	27.3	54.5
	agree	3	27.3	27.3	81.8
	strongly agree	2	18.2	18.2	100.0
	Total	11	100.0	100.0	

Post_Rate - [Someone in my life serves as a mentor to me in shark science.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	disagree	1	9.1	9.1	9.1
	not sure	1	9.1	9.1	18.2
	agree	2	18.2	18.2	36.4
	strongly agree	7	63.6	63.6	100.0
	Total	11	100.0	100.0	

Words from the Fellows

Gains from the fellowship

In response to a question about what they got out of the fellowship, Fellows tended to mention a few common aspects: experience, connections, mentors, learning about shark science, learning about career options, and gaining clarity on which career options are best for them. Individual fellows mentioned travel, personal development, confidence, learning how a non-profit begins and thrives, making connections between the field experience and the degree, and developing the skills to work as a team.

> I got tons on hands on experience doing hands on research on sharks, rays, and bony fish in the field. I also made a lot of very valuable connections with people in shark science and I'm incredibly grateful for that. I was also able to learn about all the options available to me at this stage in my career. It was very important for me to hear about the various paths that my mentors took to get to where they are today because I'm at a very pivotal point in my academic career. - Respondent L

> I was given exposure to the field of shark science which previously had not been completely open to me. I was able to talk and network with people who are in the forefront of the shark science field. This not only opened my mind to a possible career in shark science, this experience also solidified my drive to pursue a career in marine science as a whole. – Respondent C

> I [gained] extremely valuable field experience and lifelong connections with fellow marine scientists. I developed several skills and the ability to work as a team. – Respondent B

Aspects that Fellows enjoyed

Fellows enjoyed a variety of aspects of their fellowships, including Shark Con, the field days where they got to work up sharks, being on the boat, meeting people (peers and mentors/scientists) that they would not have had the opportunity to meet otherwise, experiencing mentorship and positive affirmations from scientists, up-close and personal experiences with sharks, practicing the various skills that they learned, and being in a new place and expanding their worldview.

Aspects that could be improved

In terms of aspects that could stand to be improved, a few Fellows mentioned that there was a transportation issue, in that these Fellows had to drive a lot to get to the various places that they needed

to go during their fellowship. Since gas is expensive, this was a large and unexpected expense. Additionally, not all of the Fellows had a car, so they relied on each other for transportation.

I think there were several aspects that weren't planned well but I think some of it was a result of us being the first cohort for the ECP fellowship. I also think that transportation needs to be accounted for because all of us spent a lot of money on gas making sure we could get to and from all the places we needed to be for the fellowship. – Respondent L

I enjoyed most everything that we did, the only thing that I think could've been an issue was it would have been extremely difficult to get around and get groceries if some of the other fellows did not have a car. We had limited access to the new college truck, so I do not think we would be able to use that for everything if we had needed to. – Respondent K

Two Fellows mentioned the desire to have prior knowledge or information about what they were going to be doing (such as an itinerary) so that they could learn some things in advance instead of in the moment. Respondent H wrote, “I would have wanted an itinerary for the different research projects I was working on so that I could be better prepared on the jobs instead of learning day of!” Respondent I had a similar issue, with some additional suggestions including having more access to Jasmin: “The organization of the camp and prior knowledge of a few tasks. I would figure out the travel arrangements throughout the fellowship and maybe balance the work with the lab days. Also just being able to have more access or "feel" like we have open communication with Jasmin. I wish I could've talked to her more and got more advice and just got to know us more.”

One fellow mentioned that the bugs and heat at the MISS summer camp location (one of the sites where they went as part of their fellowship) made it much less pleasant that it would have been otherwise. As Respondent J wrote, “I would change the location for the summer camp. I feel like the heat/bugs took away from the experience not just for myself but for the campers as well.” As the summer campers mentioned the bugs and heat as well, this comment should be incorporated into future plans if possible.

Would Fellows recommend the fellowship and why

All but one of the 2022 Fellows indicated that they would recommend the fellowship. (The remaining Fellow did not answer that question.) Most of the Fellows said that it was a great experience and wrote about the connections they made with peers and scientists, the insights they gained, and the exposure to different career paths within marine science.

This fellowship offered me a unique opportunity to gain exposure to the world of shark science, while also challenging my own career aspirations. I think that any person interested in marine science would benefit in one way or another from this incredible experience. – Respondent C

It is a dive into a different section of marine biology. When I first saw my first…shark with them I nearly cried because it was so beautiful and they were able to erase my misconception and free that I had about such creatures. The more you broaden your horizons with knowledge, the more you realize that being afraid of such creatures stem from misinformation. This fellowship is awe-inspiring and those pursuing a marine biology career should dabble in other part of that science. – Respondent G

Having an opportunity to make career connections while also gaining experience and getting paid are hard to find. It was a great experience and I will definitely recommend it to others every chance I get. – Respondent J

Altogether, the 2022 Fellows seemed to really enjoy their fellowships. They perceived that they got a lot out of the experience, and the survey items also suggest that they gained a lot, especially in the areas of sense of belonging and networking and social connections. These types of connections with mentors and peers are critical for the success of racial and gender minorities in fields where there are very few others like them, such as marine science and shark science. Networking and forming strong connections with others in the field can expose them to opportunities for jobs or other experiences and to feel as though the field is a safe space for them. A sense of belonging can help individuals to stay in a career field where they can be productive as well as serve as representation for other racial and gender minorities to show that others can succeed also.

One aspect that stands out as a potential area for improvement is in providing opportunities for future programs, classes, etc. Although many Fellows felt as though the fellowship had provided such opportunities for them, a few disagreed and did not seem to think that they had been given access to additional opportunities after the fellowship.

The Partners

MISS has partnered with a number of organizations that do work in and around shark science. Most of these organizations focus on education, research, and outreach as their goals; they aim to educate post-secondary and graduate students in the skills and knowledge needed to land a job in marine science, to produce research about marine animals (especially but not limited to elasmobranchs), and to reach out to the public to educate them about living safely around and conserving these wonderous and sometimes dangerous creatures. The experiences provided by these organizations are residential, thus participants live together in cottages or small dormitories during the the fellowship. They are also primarily pay-to-play, meaning that participants pay to receive the experience that they offer. In partnering with these organization, MISS is valuing the experience they provide and working with the pay-to-play system while ensuring that female-identified students of color can have access to these experiences, regardless of whether these students have the funds to pay for them on their own.

Culture of Shark Science

Partners described the culture of shark science in somewhat varied ways, based on their proximity to and submersion in it. Some of the partner organizations focus more broadly on marine mammals, or on all animals who inhabit a particular geographical area, while others focus specifically on sharks. Thus, certain staff members of these organizations are deeply ensconced in the field of shark science, while others fit better into the broader field of marine science. Those not central to shark science typically did not feel as though they could speak to the culture of it. Those who considered themselves part of the field, however, indicated that shark science was historically white and male, and has been a tough field for women because of gender bias. However, they indicated that the culture was slowly changing to include more women and more racial minorities.

> We have a handful of people in our field who are caustic and just not good people. Fortunately, many of them are aging out. Several of them are retired now. A couple in particular that were really not kind to young women, didn't feel we had a place in the world being young women. – N.L.

> The culture of shark science. [laughs] It is white, it is male, it is an old boys club, it is cowboys, it is macho. That's probably the best picture I can give you of the historical culture. Many of us are working to try to change that. You don't have to look far to find lots and lots and lots of stories of people who have had all sorts of negative experiences. Some of them are still around and fighting back and some have moved on to other places because it's either been so bad, they can't or they're just like, "This isn't worth the fight." It's a personal choice. We've been working, we're all working, we're really working to change that culture. It is tough. When you look around and you see that the senior scientists, they're all male, and most of them are white, yes, it's tough. – Y.E.

> We have a lot of female scientists, I would say, in Marine mammal science. I think the department heads and directors tend still to be more white men, but that is also changing. In this, I'm speaking from America's perspective also, not internationally, because again, that's going to be very different depending where geographically they are located. For shark science… I would probably say the same. I think there's definitely more women being involved in shark science, but when you get to the top of the tier—the directors of programs and such—it seems to still be very white male-dominated. – J.S.

> In terms of who's in it, a lot of it started with White men. That's just not surprising as where we're going to go. I think there's still a lot. The statistics do speak for themselves. It's not just shark science, marine science, science in general, you still have a predominantly White male population.... I will also say, [I think it is] changing. I think there are more women entering the field. There are more women of color entering the field, there are more people of different identities entering the field, but it's slow. We still don't see, because it is slow, that upward progression. – C.M.

All of these partners implied that this change was ongoing. It will likely take several years before the field looks drastically different because of the length of time it takes for young people to progress through the various stages needed to become shark scientists. Over time, the white males who have been at the top of the hierarchy in shark science are aging out of the field and retiring, so in time they will be replaced by a more diverse group of scientists.

> There's a time lag because it, maybe, will take a decade or more to get to your position of being-- from the time you work through undergrad, through a master's degree, through a PhD, through a postdoc, and then get to a faculty position, it can be 10 to 12 years. We're kind of looking, now, if you look at permanent full-time people, it's more representative of what the culture was for internships starting out maybe 10, 15 years ago, 20 years ago. Whereas, if we look at shark science as a whole, the next generation, or the next age group, is much more diverse and well represented, if that makes sense. – T.K.

Shaping the culture of an organization

At some of the partner organizations, I spoke to the education coordinator or education director, who typically was on the periphery of marine science or shark science. The people in these positions are responsible for providing educational experiences for the interns or volunteers who want to get into the field, as well as organizing or providing educational outreach programs and science communication to the public. While they are not technically marine scientists or shark scientists, they have a science background and their work revolves around marine science or shark science nonetheless. One such person recalled informing students who were convinced that they could not be involved in marine science due to low grades in math classes that they could enter careers like theirs that relied heavily on marine science and shark science but did not require one to be a scientist. This is a sector of marine science of which many students were previously unaware: the education sector. Many of these educators have an undergraduate degree in marine science but did not pursue a career in research. (Others are involved in science marketing, for which a degree in science is also needed.)

> I work with a lot of high school students or college students who are looking to get into the field. I think another part of it is that the failure side of getting into this career isn't talked about enough and that I've met a lot of students who are just totally broken down because they're failing their math courses in college. Now they think that their opportunities to work in ocean conservation in some way are going to be done, and so getting them to see…there are other opportunities that you can still be working in this field that you're passionate or you're excited about and trying to showcase some of

> those more in the impact that they have outside of just being a scientist in that sense too. – R.T.

In persuading low-math-performing students that they can still be involved in marine science even if their grades don't qualify them for the small number of research scientist jobs in this competitive field, these organizations are trying to reduce attrition from the field as a whole, which may have the added benefit of retaining underrepresented students in the field. In addition to providing support and encouragement, some of the partner sites are being very intentional to ensure that their students/interns/volunteers feel welcomed and needed in the field; they are trying to create a culture that is welcoming and supportive. This is especially significant, given that female scientists' experiences in shark science may depend heavily on the particular work environment in which they are located.

> There are some [women] who I've seen have had incredibly supportive work environments where they have felt welcome, they have felt safe, they have felt supported where they can thrive and do really great. I've also heard from many women [for whom] it has not been that way, where they were in a lab that was super competitive, and that they felt that they had to be working crazy hours and doing crazy above and beyond things in order to keep their position and where they are or to be able to move on to the next. I definitely think that there are some, as you look more specifically into the shark side of things, there's a lot of differences in the environments, I think, in where people are. – R.T.

Several of the partner organizations are led by women, which is uncommon in the field. These organizations can create their own culture that is supportive in ways that women need, because of their leaders' and founders' experiences in less supportive environments within shark science and marine science. Because of their focus on being welcoming and supportive, female students are drawn to these organizations, and they may prove attractive to racially diverse students as well.

> We are women led, which is rare. We're women led, which is great, and I love-- I do think that we actually end up attracting more women and people who identify as female, because people just see women running stuff, or people who identify as female

> see females running that and then go, well that's maybe a safe space….I think that also lends to creating a more [racially] inclusive environment. – A.G.

Many of the partner sites were formed to provide the hands-on experience that students need to secure jobs in marine science and/or shark science—experience that is often not provided in undergraduate programs or even in graduate school. They were also formed to do research and to do outreach to the public. Exposure to all of these facets of the organization's work allows students to figure out which aspects of marine science or shark science work they like to do and which aspects they don't enjoy or aren't comfortable doing. This is part of their culture, as they consider such exposure to be an essential part of welcoming newcomers and helping them to find their niche in the field.

> I think there's still room for improvement, as in probably any industry of new people, really making sure that we welcome them. "Hey, you're new. What do you need to know? What do you need to do? What do you need?" Kind of thing. Some people don't like working on a boat. Some people are uncomfortable working on a boat on long days.… A lot of women aren't comfortable going to the bathroom on a small boat when there's other people around and that's okay. Like I said, part of your internship is learning what you can do and what you can't do, or what you want to do.
>
> I think there are some aspects that just are part of the job. You have to be on a boat, you have to be on a small boat that doesn't have a bathroom, but you have to go the bathroom or do other feminine things that you have to do during the day sometimes. If you're not comfortable with that, then now you've learned that that's not the job that you want to get.
>
> I try to always take the time to explain why we're doing everything….I really want people to understand why they're doing what they're doing and what the value of it is and all that. Other than just saying, "Go pull that net in," or, "Measure that fish," or whatever it is. [My organization's culture includes] making the most out of every opportunity [that we have] to help them decide if this is what they want to do as a career or not. – N.L.

As can be seen from these partner organization staff members, the culture of shark science is historically white and male and has been unwelcoming to women. However, the field is gaining more female scientists and science educators who are gradually moving up the ranks. The partner

organizations are examples of organizations that are trying to create a culture where incoming students, including female-identified students and students of color, feel welcome and are able to find their niche in the field. The experiences they provide give students the skills they need to succeed and land jobs in the fields of marine science and/or shark science. Through their fellowships, MISS is attempting to diversify the fields of shark science and marine science. Additionally, they are exposing minorities to organizations where they will feel welcome and supported, and where they will be able to form connections that can lead to future opportunities in the field.

Partnership aspects

Most of the organizations partner with MISS in the form of hosting one or more fellowships. But some of the partners mentioned a few other aspects of their partnership, such as recommending MISS to interns who fit their target demographic, an international organization funding local students as MISS Fellows rather than students from the U.S., translating curriculum materials for MISS' Gill Guardians program into a different language, co-hosting and running the MISS Workshop, arranging for MISS Fellows to teach youth in MISS' summer camp, and hosting weekend events for middle school and high school students. Partners seemed open to addition additional aspects to their partnership, although most could not conceive of additional aspects that they would like to add.

Feedback on MISS Fellows

The partners had favorable impressions of the MISS Fellows as a whole, saying that they are wonderful, amazing, incredible women. They perceived that the MISS Fellows had transformative, life-changing experiences during their fellowships and can now see themselves pursuing careers in the field. They reported that the Fellows' confidence increased, and that they developed skills and built

personal connections, both of which will help them gain access to jobs and other opportunities in the field. All of the partners reported that they would like to continue the partnership and host MISS Fellows in the future.

> [The MISS Fellows], they're badass and incredible women who have done wonderful science.…A couple of them have said that their experience has changed their life, and they feel a lot more confident and can see themselves pursuing this field.…There's just this little fire in their eyes now that they've gone through this, and I'm really excited to see where they go. – C.M.
>
> I've been very impressed with them. I could rave on for years about [one Fellow]. She's just outstanding. I'm excited that we have this opportunity for them… I've been really happy so far with the fellows that we've gotten. Their questions, their follow-up after the fact. I'm trying to get all of them jobs or into graduate school or things like that. I've really enjoyed it. – N.L.
>
> Well, I loved her. She was such a joy and just so positive and so excited, which was really incredible just to be able to see how… [at the site], a lot of the work that we do is weather dependent, and things can all of a sudden have to change, especially from the research side, and [she] was just so flexible. We'd have a whole plan that like was going on the water doing this, and we'd have to cancel them. Instead, we're doing *this* and [her response was], "Okay, well, I still get to do something. This is great. We're going to go here, or we're going to go do this." Her positivity just radiated to our interns and our whole team. …Yes, just really positive….I truly felt like it was mutually beneficial. We saw so much growth and confidence building and skill building from her over the [duration of the fellowship]. Then we gained so much as well, and having conversations with her and working with MISS to bring her on in that sense. We really loved having that opportunity to host a fellow. – R.T.

There was only one negative report about some of the Fellows, but it reflected the rapport that the Fellows were developing with each other. The partner noted that the Fellows were joking or playing around on the boat when the partner would have preferred that they pay closer attention to the tasks that were at hand.

> They've been a great group, keen to learn. Sometimes we had a discussion post-fellowship that we sometimes found them to be a little bit unfocused….That was something we struggled with a little bit, is when do we intervene, when do we stop what's going on and say, "Okay, we really-- I love that you're having fun. I love that you're joking around. I love that you're building that relationship, but I also want you really paying attention, focusing, and getting to that point where I have full confidence in you that any environment we threw you in doing any of these types of things that we do here that you're going to be really on the ball." – Y.E.

The partner organization in this case views it as their responsibility to figure out how to address this type of problem if it occurs with any future Fellows. As they thought that the Fellows were eager to learn, and want to encourage the relationship-building, this organization might benefit from creating a few opportunities primarily for future Fellows to have fun together. This way, when the Fellows are on the boat and need to be focused, the partners can emphasize the need to be more serious and attentive in these types of situations.

Overall, the partners really enjoyed hosting the MISS Fellows, and aside from this issue of Fellows' lack of focus, all of the partners spoke of their MISS Fellows in glowing terms. They expressed a desire to host fellows in the future, suggesting that the experience was beneficial for both the partner organizations as well as for the Fellows.

MISS engagement with shark science

Partner organization staff mentioned several ways in which MISS engages with shark science beyond providing opportunities for women and female-identified people of color, including elevating the voices of a growing subgroup in the field, serving as mentors, creating a support system and sense of community, and providing funding so that students and early career researchers can travel for conferences. They also provide trainings and workshops for organizations as well as educational outreach to the public.

Elevating voices

> [MISS] serves as a cohesive voice. Again, some of the older groups that haven't been exposed to as much diversity and difference, it's at least you can have a cohesive voice of like, "Look, this is how many members we have, here are some of the issues that this group of people are raising." It gives a platform for where maybe one or two individual people wouldn't be heard as well, but when you're representing a very significant, now, number of people in the field or interested in the field, hopefully, it gives a bit more

> platform to be heard and included on some of the larger meetings and executive boards and things like that in the group. – T.K.
>
> It's not just, I think, giving things away…, but also just… the visibility they have, the fact that people are talking more and more about these issues, I think that is very important as well. It's not just a donor organization. [It's an] organization that is truly working toward that goal. – R.W.

Both of these partners pointed out the value in raising up within the field the issues of minorities in the field, so that they are heard by a broader audience. As MISS is bringing together these minority voices, they become magnified and more significant to the broader audience; they are not just the voices of individuals but a group whose needs deserve to be considered in decision-making. As individuals their voices have little power as they may not be considered to represent others; as a group, they can gain seats in the leadership of professional organizations and help to shape the culture of the field.

Mentorship/Support System/Community

MISS also serves to mentor students and others who want to enter the field or are early in their careers. Interviewees spoke about the ways in which MISS helped its members to feel safe and welcomed at a shark science conference, gave them opportunities to meet other MISS members and Friends of MISS (people who self-identify as allies) before the conference officially began, and gave them a way to easily identify these people from afar. They also mentioned (though not in much detail) that MISS serves a mentorship role and matches up mentors with mentees and discussed the importance of having the kind of support system that MISS provides through its efforts to form connections with similar and/or supportive others in the field.

> It serves as a mentorship role. It serves as a support system, a group network to help guide students, help foster their interest in those fields, whether it's at a scientific conference, giving support, maybe just making people feel not as intimidated by the setting, things like that. – T.K.

> This last year at our…shark science annual meeting, they did an amazing job of coordinating the MISS members that were there, having social events for them. We had specialized lanyards, Friends of MISS, so that people would know who are the friendly people to go to at the conference.…Then, like I said, had a network of resources. We had hand signals, that if someone was in an uncomfortable situation, they would [perform the hand signal]. That way, any of us, if we saw that, we knew that we needed to go over and break up that situation. Thankfully, I don't think that ever happened. Like I said, we had lanyards on that said we were Friends of MISS so people could come up and ask us questions if they needed or things like that. – N.L.

> They're bringing awareness, they're providing opportunities, and then they're also fostering a sense of community, too, for gender minorities of color, and helping them build relationships. I think that's one of the biggest things as far as people persisting in this field is they need to feel like they're not alone. That's hard when you might be the only woman of color in your whole damn department. That is hard.
>
> If you don't have that sense of community where you're located, at least you have this community of folks where you can talk about the things you're experiencing and get advice, even just have solidarity with others who're having shared experiences. I think that's a huge piece of it as well.… They bring gender minorities of color together for these field experiences. They are bringing folks together at conferences as well...Before things had even really kicked off but most people were in town already, got people together just for pizza in the park. People had a chance to maybe meet each other that hadn't met before.
>
> Also brought in friends of MISS. People who were there like myself where if you're finding yourself in trouble in a situation, you're having an interaction you don't want to be having with somebody, that you've got a way to signal me and I'm just going to step right in and break that up, cut that off right there. [chuckles] Just, "I need to borrow you for a second for something really pressing" [and] pull you right out of there, and we'll end that. It's all about making sure people are finding community and also feeling safe when they're venturing out into the broader scientific community as well. Helping pair people with mentors. There's lots of that going on. – Y.E.

The strategy that the partners mentioned that the MISS members were given to signal that they were in an uncomfortable social situation and needed help is very similar to strategies that women use when going out to a bar or club with a group of friends. Its use in an academic conference situation is brilliant, because it makes use of a strategy that many women and female-identified people are already

familiar with, and instead of relying on the friends' intuition to guess whether the affected person needs rescuing, the affected person gives an unmistakable signal. Additionally, the allies (Friends of MISS) in attendance were given special lanyards that allow MISS members to identify them from a distance so that they can approach them to ask questions, to start up a conversation, or to signal/ask for help. These strategies allow MISS members to feel safe in an environment where they may not know anyone well and enable them to start to build connections with people who are invested in their presence.

In addition to MISS members feeling like part of a community, they can also gain some of the benefits of networking from the relationship that MISS builds with their partner organizations.

> It just helps give more of a foot in the door and connections and things like that. Whether it's right or wrong, whether it's a MISS Fellow or not, if we get a recommendation from someone that we know well at MISS and says, "Hey, here's an applicant of somebody that is interested in doing something." It's a meaningful recommendation, rather than just a student email…" – T.K.

This kind of networking gives MISS members access to opportunities through people they haven't even met and is not dependent on the MISS member reaching out beyond the MISS members and Friends of MISS that they already know. It is not dependent on their prior performance in an internship or other program. They may gain access to opportunities simply because MISS members or staff are advocating for them and pursuing opportunities on their behalf. This is the type of networking enjoyed by students with means or with family friends in marine science and is often out of reach for people of color and others with no direct connection to the field.

Funding

Partners also noted the importance of MISS providing funding to create opportunities that were free to the recipients. Because internships and hands-on experience in the field largely have a pay-to-play structure, financial assistance is essential to be able to ensure that those with scant financial

resources can acquire these same experiences. However, financial limitations also affect students and early career scientists when it comes to attending conferences; they may not be able to afford the registration fees, not to mention travel costs and hotel stays required to attend the conference for a few days. MISS raised money so that they could fund the travel and registration fees that would normally be incurred.

> Raising money for people to be able to go to the conferences. That's always a roadblock for everybody, especially when you're students or early career. You can't afford to go to these conferences. MISS raised money to be able to pay the registration and the travel and the hotel for a lot of these students and early career researchers to be able to go to this meeting, first of all, which is tremendous. – N.L.
>
> They have a lot of educational outreach opportunities to engage students in shark science. They offer those often or I think almost always free. They apply for grants and programming so that they can support students so that students aren't left to carry the burden of finding support to participate. I think that's really a great part of their mission, because I think we just talked about earlier with undergraduate opportunities, that's a huge barrier for students. That just…financial burden is a financial burden, and if you can't afford it, then you won't be able to participate with it.
>
> They [MISS] partner with community support organizations and foundations to support their programs and offer to make them freely available or to provide stipends for students such as this program that we provided this summer where we could actually provide them a stipend for participating. – J.S.
>
> They offer, and this is like really, it's groundbreaking and it's also amazing that someone didn't come up with it before, MISS do scholarships around the world, and offer opportunities to people that potentially may not otherwise have had that opportunity. – A.G.

As stated earlier, MISS is working with the existing pay-to-play system, creating a measure of equity for a population that would normally be shut out of the experiences entirely. As many students (beyond those in the MISS target population) may be unable to afford conference and travel fees, some outside of the MISS target population may feel as though they are shut out from receiving the same financial benefits. However, those who do not qualify for MISS funds are free to search for and receive financial assistance from other sources. In raising funds for this purpose, MISS is merely eliminating this

barrier for their target population, removing the obstacle rather than trying to change the unequal system.

Training for organizations

While MISS works within the system to provide funding for female students and early career members of color, they simultaneously work to change the unequal system through providing training workshops to staff at the partner sites.

> Well, so they do diversity and inclusion training. We've taken the training from Jasmin to better understand things that, maybe, we hadn't been aware of before, so they do engagement from that perspective as well. – T.K.

> One thing that they got me involved into this workshop about gender diversity in the workplace.…It was really an eye-opener, because, in [this country], as I said, we are 20 years behind, and there's not much discussion about that. With race [it is] a different story, because that is ingrained into the [local] culture and society, but gender diversity is still quite a taboo in [this country]. To me, discussing these issues and solution and way to move forward was really enriching for me as well. – R.W.

> For us as an organization, we have come on as a Friend of MISS. There have been different seminars or different workshops that we can attend and look at that, look at is what we're doing for our hiring process, are we doing everything we can to make sure that we are being inclusive, in that sense, or from the language that we use in it to what the program is that in itself? – R.T.

The training that partner organizations receive touches on a variety of topics, including gender diversity and hiring bias, and helps the organizations to be aware of issues or perspectives that they may not have considered. This training is aimed at eliminating bias, increasing diversity within the field, and creating environments and systems that do not weed out certain groups by default or by design. Because of their previous openness to consider these issues, staff at the partner organizations may use this

training to improve their hiring and selection practices and to improve their interactions with different others at their sites as well as in other facets of their lives.

Science communication/outreach

In addition to the funding, training, the community and support system, networking opportunities, and elevating the voices of this small but growing contingent, the partners mentioned that MISS has been instrumental in using outreach programs and science communication to make themselves and other women of color in shark science visible as role models for others, particularly youth.

> They have a lot of educational outreach opportunities to engage students in shark science. They offer those often or I think almost always free…. At the same time, then, as I said, there's the fellowship program, I know that they've had youth week-long workshops and seminars or programs. I know there have been other programs down in Florida working with the field school, that they're providing those opportunities. – J.S.
>
> Then I've seen the MISS leaders increasing in science communication, increasing presence of people of color in shark science…. My feed is different now on Instagram because of that. I think they've done a really, really good job in such a short amount of time…. I think they've done a really fabulous job of making, I don't want to say a household name for themselves, but they are a staple, as far as I'm concerned, like a non-negotiable of shark science now." – C.M.
>
> They're also working to make sure that people who are not part of the community are seeing diverse faces in shark science as well, participating in-- I really don't like Shark Week, but—National Geographic Shark Fest and Shark Week. I'm not a big fan of those programs, but I recognize that a lot of people do watch them. They're participating in those and making sure that kids who are watching at home are not just seeing White men on TV. I think it's hard as a kid to think that you can be something where you've never seen somebody who looks like you doing that thing ever. – Y.E.
>
> People always say, "I can't see me being in the field of shark research, because again, going back to Discovery Channel, all I see is a white man on Discovery Channel so maybe there's not a place for me in shark science." The four MISS founders are showing this next generation, "Yes, there is a place for you in shark science. I'm here, I'm doing it. There is a place for you." They're being that role model of showing the younger generation that there is a place for them, but then they're also providing the resources for them to be able to get the experience, the foot in the door, meeting people,

> mentoring people, and building this infrastructure that allows for that to happen safely and coordinated. Just doing a tremendous job. – N.L.

In creating a variety of educational outreach opportunities for young people, college students, and others interested in breaking into the field of shark science, MISS is providing both hands-on experiences that increase interest and skills in shark science research and diverse representation. By making themselves and other women of color visible on TV and podcasts, and in person when running the various outreach programs offered, they show young people and others that shark science is not only available as a career field to white men, but to people who look like the MISS founders (and to anyone who does not fit either description). MISS is conveying to all people that shark science is an option, and that because they, as African American women, made it into the field and are successful, others can do the same.

Suggestions for Improvement and for Greater Impact

The partners were very complementary of the multifaceted way in which MISS has been able to address so many issues within shark science, especially in such a short time. When asked about MISS's impact on shark science, partners listed many of the same aspects that they had noted when asked about how MISS interacts with the field of shark science: elevating the concerns of this small but growing group of people who are pointing out bias in the field, creating networks and connecting with organizations to create opportunities, creating a sense of community and a support system for women of color in the field, offering hands-on opportunities for youth and others who are interested in shark science, engaging in science communication that encourages kids to stay interested in science, and representation: highlighting the diversity that already exists in shark science and changing the perception of what a shark scientist looks like.

While thoroughly impressed with what MISS has accomplished so far, some of the partners had suggestions for MISS on how they can have an even greater impact.

Expansion

The international partners suggested opening up the membership of MISS to people in other minority groups who have similar experiences in the field to the target group but don't fit the required characteristics of MISS members.

> Some people in the field that I've spoken to, like students or whoever, whether it's at conferences or just in general, have felt that they would like to be in MISS, and they felt that they weren't able to be in MISS because they did not check the demographic of MISS, so… if we're promoting inclusivity, which is a very good thing, it is somewhat-- not off putting, I don't know the right word, but it's sometimes counterintuitive that certain people wouldn't be able to join because-- even though they are a minority, they're not the minority that that group is.
>
> We've had people that I've spoken to, whether it's females, but they're, maybe, are a white female, but they're still a minority in their group, or whether it's an African-American male who's also trying to get into the field or a Spanish male or a male from another group, or something like that. They equally feel like, "Oh, this is a challenging field. There's not much representation." - T.K.

Because issues related to the intersection of gender and race are often far more complex than those related to gender or race alone and because MISS currently focuses on the needs of gender minorities of color who are subject to multiple, compounded layers of discrimination in the field, MISS may not want to open their membership to white women or to men, regardless of which country they are from. Currently, people of all genders and races who share the mission of increasing diversity and

inclusion within shark science are welcome to apply to become Friends of MISS, by which they can gain access to the MISS network.

However, addressing the specific needs of males that are from underrepresented racial groups may be worth considering at some point (if not by MISS, then perhaps by a group of like-minded people who are invested in increasing the number of racial minority men in shark science). A related suggestion was that rather than expand the definition of who is included under MISS's umbrella, MISS could establish local branches in places with racial group populations who are the majority in terms of population but are severely underrepresented in shark science; the inclusion criteria in these branches could reflect the issues specific to the local population while supporting individuals who are racial minorities but not gender minorities, or vice versa.

> We've had interns from all around the world, from very developing countries, countries where there's never been a shark scientist of any sex or race or anything in their country before. That's, from my perspective, and I don't want to mitigate anything, but it's almost like the MISS members in the US already have a bit of a support network. If there's a minority male from a country that's literally never had a shark scientist before to not be able to join a group like that, to just find some support network, any support network of people that have been through, even if it's not the exact same challenges, a similar challenge. I think that's where it could be improved. - T.K.

> Even starting to expand MISS, have a MISS branch here—and then there are [local] women of color, maybe ones that we partner [with], they're the ones that get hired. Give them the jobs that don't exist, and actually build sustainable futures in that field. – C.M.

> I think, really, the word needs almost like branches of MISS, MISS [this country], MISS US, that model that could be replicated. Not the same, because obviously, each country is different, and each country has got different problems, different positions where they are but that kind of approach that could be replicated…. I would be willing to support it as much as we could or can to make a similar study, for example, in [this country], where the situation is different, the problems are different…the approach of MISS could be adapted to address the [local] problem. – R.W.

While MISS is not designed to address all the problems of all groups who could be considered minorities in shark science, the idea of forming branches in different countries to address the needs of

the local community may be a viable idea, especially since it seems that even in some countries with a majority-Black population, shark science is primarily done by white, foreign scientists.

Communication

Two communication-related suggestions were given by partners. One such suggestion is to inform partners about the former MISS Fellows' current positions and career moves in case the partner organizations lose touch with the Fellows and don't maintain personal relationships with them.

> We've only had two MISS Fellows, so I guess longer term of like-- We stay in touch, personally, but also maybe an update of here's how that fellowship helped them, here's what they're doing now. In case we don't stay in touch on a personal level or more broadly, like a newsletter that goes out to everyone saying, "Oh--" I guess like an annual or semi-annual newsletter, similar to what I send to grant funders. I'll send out an update of what's going on. I think they do have some newsletters that are, maybe, more tailored or maybe some looking ahead, like here's what's going to happen, here's how we're trying to spread, on the horizon type, things. – T.K.

MISS may be planning to send out a newsletter of this sort to funders, but at least one of the partners would like to receive this kind of communication as well.

The second communication-related suggestion has to do with ongoing and follow-up communication with partners about any important issues that arose during the fellowship. One of the partners mentioned that their Fellow had a medical issue during the fellowship, and while the partner communicated with MISS about it and was told that MISS would handle it, they would have appreciated receiving some follow-up communication letting them know that the issue was fully taken care of and that the paperwork that the partner had submitted was sufficient. This is the type of task that would be easily taken care of if MISS had more full-time staff. The partner acknowledged that a lack of dedicated, full-time staff was probably the reason that they did not hear back and did not perceive MISS negatively because of it.

Training

One area in which some of the partners named for improvements was training. Partners are required to attend MISS training regarding diversity and inclusion before their Fellow arrives. Due to the politicized nature of this type of instruction in today's political climate, some of one partner's staff had never considered these issues before, so the partner was glad for the training they had received and expressed a desire for it to continue. The partner suggested expanding the training regarding justice and inclusion (some state governments are disallowing this type of training on a government level, so they are not receiving it anywhere else).

> One thing that they did that definitely deserves recognition is, I was required to attend a webinar-type meeting about JEDI-type stuff, justice, inclusion, all those different letters that mean different things to different people. It was really helpful because working for the state of Florida, we're not getting that. I was one of the only people here that was getting that information. Because it was recorded, I shared it with my team and I said, "Look, these are things-- We learned all about implicit bias and stuff that happens every day, but we don't call it that," right?.... I said, "I want you guys to know this because when we get this intern, we need to make them feel welcomed beyond the hospitality we would normally do." Like I said, we didn't know what the minority was, or whatever, and so we want to be super inclusive no matter what, and so we all took that, and then everyone was like, "This was amazing in my everyday life. These are things that our agency should be sharing with us." That's a political conversation.

A partner recalled wondering whether MISS provides Fellows with any training regarding expectations and how to act during the fellowship—similar to what the partners take—before they do their fellowship and learning that they had no organized training on this topic.

> We didn't know if the student also has some kind of, "This is how you behave, these are the expectations." We found out that they do not. It was interesting that we learned how to be an ally, and we got trained in trans language and stuff like that, but the student themselves was not given any kind of, "When you work for an agency, you should be expected to do these things." We did that training internally. I think almost like a pre, "Before you go, this is what we're hoping," and then the post. I think that could be powerful, but I don't know what the questions would be, or content, or who would teach it or whatever. – R.P.

The partner did not explicitly say that the Fellow(s) that came to their site would have particularly benefitted from receiving such training, but their comment implies that perhaps their past experience with interns and fellows had led them to believe that all Fellows would benefit from a frank discussion about expectations and behavior at a marine science or shark science organization before the start of their fellowship.

Another aspect of training that partners would like to see developed is some sort of workshops or roundtables with MISS to figure out ways in which partner organizations limit opportunities for some students and things they could do differently to not exclude these groups of students. This was conceived in terms of not just this particular partner organization, but also in terms of possibly holding workshops for multiple organizations together.

> I think one of the things I think that could be great is [that] we would love to learn more of how we work as an organization and what we do. What are more ways in which we can be aware of? I've learned a lot through having conversations with Jasmin of even our internship program being a 12 to 14-week commitment she was like, "Well, for a lot of people that they can't do that, they can't spend that much time away from home that would, you're knocking out a whole pool of candidates right in that." In that conversation, I learned a lot from her and how that, then we're not creating opportunities for everyone because of just the length of time, what our program is. I think more conversations like that or more of those, I don't know if that's an evening, maybe it's a roundtable or a workshop but actually looking at here are ways in which a lot of programs are run, here are ways that you can make those programs more accessible. Here are ways, because it was if I hadn't had that conversation, I wouldn't have gotten that information. I haven't seen I think a lot of the other programs, so I guess that's looking at like, organizational culture and practices or models if MISS has more recommendations on that side of it, and how we can make changes to our programs to be more accessible. I would love to see some more workshops on that type of thing. – R.T.

Collaboration

Some of the ideas that the partners offered had to do with collaborating with others. One such idea was that they could partner with other sites or with MISS members (in the same way that one of the other sites does, by posting on the Slack channel to offer to collect data for MISS members) or to collaborate in some way with other sites or with postgraduate students. One international partner suggested "to start having the people that provide webinars at MISS, maybe we could work together, and I can get them to present at a [local] university so that we can be the conduit for MISS to reach also further interest [within this country] at the university level." (R.W.) Another partner suggested using the network of MISS members to virtually share information about shark science research and opportunities around the world and at various partner organizations. This partner said, "let's give a talk to the MISS members or have them here and teach our interns what are all these other opportunities that are out there. Take advantage of, I guess, the more virtual world" (C.M.).

This same partner suggested creating collaborations where the organization would collect data for MISS members or Fellows in a different country, and the MISS member or Fellow would analyze the data and use it for graduate work or for publications.

> Another thing, in terms of future collaboration with MISS, one thing that even though it doesn't involve the physical coming here, for example, one other possible collaboration I see is that a MISS program in--I don't know, just making an example, in Nebraska, come up with a project that we could, here in [this country], collect the data for, and the data can be used from that person in Nebraska for a graduate study or something like that….It's where we provide data, and the MISS Fellow analyzes it and graduates with it and publishes it. – R.W.

Another collaborative idea had to do with creating additional opportunities for graduate students (the current focus is on undergrads), such as serving as dissertation committee members for MISS members or exposing them to related ideas in labs that are focused on organisms that are not sharks, in the service of helping students to find their place in the field.

> I think maybe [providing opportunities and support] for graduate students as well. We're very undergrad focused. All of my students are undergrads, but I can certainly work with

> other students…. I can't directly be somebody's advisor for a graduate degree, but I can be on the committee. [crosstalk]… I think there are some ways to engage there as well maybe for students who have an opportunity. They can get into a lab somewhere that isn't necessarily a shark lab, but they maybe look at some of the same types of ideas and questions and different organisms. You can bring the minds together that way to make a support system for the student to really find their niche, especially if they're not able to find, say, a graduate advisor in shark science that they would necessarily want to work with, right? – Y.E.

In the same vein of supporting people early on in their career, one partner suggested that as people move up in the field and start their careers in the field, MISS might be able to assist them in finding opportunities to publish and to be included in projects and publications that are often awarded/given to groups of White men, as often even White women are shut out of these opportunities.

> I think one of the challenges is going to be making sure that people are getting opportunities in some of the collaborative projects that are coming together. Again, I'm frustrated when I see things go by and I see funds awarded and I look, and it's an entire group of White men. I think, "Okay, there are all these people in places that are working on the same things and you could have partnered with them, but you didn't." Because so many of the members are students currently, I don't know if that's necessarily a thing they need to engage in just yet, but I suspect down the line as they're moving into becoming early career folks-- They do have certainly some folks who are postdocs so maybe there is a place for that now to be. I'm not sure the right way to go about doing it, but to try to make sure that those connections are happening. They're showcasing things on social media about what people are working on and what their area of expertise is and that stuff but I don't know. Like I said, I don't have a great solution, but I could see that as being a continued barrier moving forward. It's been a barrier for White women, so I suspect it's going to be even more a barrier for women of color. – Y.E.

This partner was unsure of how MISS could go about encouraging others to utilize their resources to ensure that they provide publication and research project opportunities to MISS members. However, she referenced a very specific challenge for MISS to address going forward.

The suggestions offered for increasing MISS's impact—or for general improvement—are varied and diverse, and range from expansion to training, communication, and collaboration. The suggestions regarding training, communication, and collaboration are rather specific and can likely be easily

addressed in the next year or two if MISS desires. While the expansion ideas seem to be reflective of a long-term plan that may or may not be shared by the MISS founders, they certainly provide an opportunity for MISS to have a global, rather than localized or primarily national, impact. As the international partners have highlighted, the dearth of minority women (and sometimes minority men) in shark science is not a problem limited to the U.S., but is a global problem; however, there can be different factors involved in different countries, depending on their history regarding racial and gender-based inequality. If MISS is interested in pursuing expansion in this way, the international partner organizations might be able to provide some guidance.

Recommendations

Summer camp

- Bugs was one of the top complaints. If it is not possible to select a less buggy location next time, one suggestion might be to include camp-wide insect repellant applications at regular intervals, or to institute the use of some sort of insect repellant/zapping system in sleeping and working areas. As some people are naturally more attractive to bugs such as mosquitos than other people are, what is a mild annoyance to some campers can pose a real problem for other campers—and having had less experience with it, middle and high schoolers are less equipped to deal with this problem than are adults. Having no good way to cope with biting/stinging bugs could potentially turn some youth off from pursuing marine science as a career; making them aware of the ways in which marine scientists cope with bugs—and reminding them to be proactive when needed—might help to keep some youth in the pipeline.
- Heat and lack of air conditioning was another common complaint. While there is no air conditioning on research vessels, and it often is nonexistent at field station sleeping accommodations, campers can be encouraged to bring solutions to make themselves more comfortable, such as cooling towels or cooling neck wraps, insulated water bottles, etc. There are tips available online to cool down the body naturally; these can be posted in sleeping quarters and suggested to campers if they complain about being too warm.
- Showers/bathrooms were another top complaint topic. Without more details, any suggestions I could make might be irrelevant. However, it might be worthwhile to take stock of the bathrooms and showers with an eye towards what middle school and high school students would find objectionable and to see if any improvements can be made. Alternatively or in addition, it might be helpful to fully prepare the campers beforehand in terms of what they should expect and offer concrete suggestions for coping with the particular inconveniences that exist.

AES members

- The equity statements that declare that no group is “needed” in the field are somewhat troubling, in that they reflect a lack of awareness about perspectives that are missing in the field or about the benefits of including people from certain groups or backgrounds. This is one area about which MISS could communicate with AES members, giving specific examples to help them understand the benefits of including diverse perspectives (and the deficits that exist when these perspectives are excluded).
- Since the respondents are such a small proportion of AES members, it might be worthwhile to continue a broad outreach—or targeted outreach—to communicate with a larger group of AES members. It is impossible to know how representative of AES this small sample is. It is, however, encouraging that these results are so positive.

MISS members/friends of MISS (FOM)

- Since one college student decided not to renew her membership due to not feeling like they had enough time or money to be an active member (their parent had signed them up while they were in high school), MISS might want to emphasize to college students the ways in which they can be involved from a distance, even if they have little time and/or only have money for necessities.

Workshop

- As there seemed to be uneven access to community and to additional opportunities after the workshop, MISS should likely focus here on trying to ensure that all participants have access to additional opportunities and advising participants on how to leverage their connections to gain access to opportunities. Because some people are not naturally as good at networking or as confident in their social skills as others, some participants may need to be given advice on how to do this, to gain the confidence to ask, and the assurance that they should ask about opportunities. Another relevant focus should be to ensure that all participants have strategies to use when their network connections do not respond. MISS should also emphasize to all of its members the importance of responding when someone reaches out to them for advice, even if just to let them know that they have a lot going on and it may be a while before they can get back to them.

2021 MISS Fellows

- One or two of the Fellows have lower ratings on the fellowship having increased their sense of belonging in shark science and gaining additional opportunities in shark science. It might be worthwhile for MISS to examine the reasons for differential access to these opportunities, and to try to address them in future cohorts.

2022 MISS Fellows

- While many of the Fellows perceive that the fellowship gave them access to additional opportunities in shark science and marine science, a few did not or were neutral about this. This finding came up for the 2021 MISS Fellows and for the workshop participants as well, so it is worth investigating further to find out what is causing a few of the

participants in each group to not feel like they have the additional opportunities that most of the participants perceive as a result of participating in the MISS programs.

Partners

- One partner expressed that their Fellows were not focused enough in situations where they needed to be serious and listen. They had developed a camaraderie, which was perceived positively, but they were a little too silly when the partner needed them to be serious. It might be worthwhile for that site to create some opportunities for their Fellows to have fun together outside of the fellowship; that way, the staff can emphasize the difference between the settings and what is expected and needed on the boat vs. in a more casual, fun setting.

Conclusion

All of the feedback from the various sources point to MISS having had a very positive impact on the field of shark science so far. MISS members and Friends of MISS gave very positive feedback, as did the AES members surveyed and the program participants: summer campers, MISS Workshop participants, 2021 MISS Fellows, and 2022 MISS Fellows. Objective measures of science identity and sense of belonging increased, along with feeling welcome in shark science and marine science. Most program participants indicate an increase in their self-confidence in shark science and marine science, as well as an increase in desire to pursue marine science and shark science. Through these programs, participants have been able to build community and social networks of peers and marine and shark scientists. Workshop participants and Fellows are extremely grateful for the experience, community, and support provided by these programs and describe them as life-changing and invaluable.

Through their fundraising and partnering efforts, MISS gives gender minority individuals of color the opportunity to access these essential experiences regardless of whether they have the financial resources to pay for them. By providing these experiences, MISS is helping to diversify shark science and marine science, as anyone is unlikely to be hired for jobs in the field if they do not have hands-on experience. Racial and gender minorities are unlikely to stay in the field if they do not feel supported or if they do not have personal connections that give them access to opportunities and jobs, which is why the networking and support system that MISS is building is so important. As such, MISS should work on trying to ensure that their program participants have equal/increased access to opportunities in shark science and marine science after their current program is finished, as there seemed to be a consistent thread—across programs—of a small number of participants who were unable to access additional opportunities afterwards.

Partners, MISS members, and Friends of MISS perceive MISS's efforts as having already paid off, having a positive impact on the field, on shark science organizations, on current shark scientists' awareness of issues of diversity and inclusion, and on them in their efforts to be allies to racial and gender minorities in the field. Partner organizations seem to be very happy with the Fellows they have had and are eager to host more Fellows in the future. On all accounts, MISS seems to be having their desired impact, and it seems that the partner organizations, MISS members, and Friends of MISS are looking forward to seeing their continued impact on the field, especially as the racial and gender minority individuals move up through college and graduate school and into careers in the field.