Into the Deep (En lo Profundo)

Summative Evaluation 2022

INFORM
EVALUATION & RESEARCH

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Into the Deep (En lo Profundo)
Summative Evaluation Key Takeaways

Overall Experience

- Eight out of ten visitors rated the exhibition as excellent or outstanding.
- The experience of seeing live animals from the deep sea was especially satisfying for many visitors.

Time spent and thoroughness of use

- Visitors moved relatively quickly through *Into the Deep (En lo Profundo)* and interacted with a limited number of exhibition components.
- Visitors spent the most time in the Midwater and Seafloor zones.
- While overall diligence rates were low, many components–particularly large tanks and displays–were viewed by high percentages of visitors.
- Visitor dwell times were longest at a mix of large and small components.
- Engagement behaviors were most frequently observed at larger exhibition features or elements designed for interactivity.
- Roughly one-quarter of visitors interacted with a staff member or volunteer.

Cognitive outcomes

- Visitors most often left the exhibition with a new understanding of the deep sea and the unique animals within it.
- Visitors also reported leaving the exhibition with feelings of awe, curiosity, or concern about the deep sea.
- Visitor takeaways reflect the exhibition's big idea and, to a lesser extent, the exhibition's main messages.
- Visitors most often reported taking messages away from the Midwater and Seafloor zones.
- The primary conservation message visitors took away is the impact of plastic on the deep sea.
- Visitors most often took away conservation information from the illuminated display of plastics and the Midwater Survival game.

Affective outcomes

- Visitors typically associated deep-sea animals with positive descriptions or emotions.
- Data suggest that for some visitors, *Into the Deep (En lo Profundo)* elicited expressions of empathy for deep-sea life.

Purpose of this Evaluation

In Spring 2022, Monterey Bay Aquarium opened its new exhibition, *Into the Deep (En lo Profundo)*. The 7,000+ square-foot exhibition showcases characteristics of the deep sea and the animals that live there. The exhibition also highlights the deep-sea research being carried out by the Monterey Bay Aquarium Research Institute (MBARI), as well as the effect of plastics on deep-sea life. The Aquarium hired Inform Evaluation & Research (Inform) to carry out a summative evaluation of *Into the Deep (En lo Profundo)*. The evaluation aimed to answer the following questions in three key areas:

Time spent and thoroughness of use

1. How long are visitors spending in the exhibition?
2. Where are they spending their time? What are the most well-used and underused exhibits?
3. What are visitors doing while here? What types of engagement behaviors do they display? To what extent are they interacting with staff or volunteers?

Cognitive outcomes

1. What messages are visitors taking away?
2. Where are they getting those messages?
3. Are any messages related to deep-sea conservation issues?
4. Is there any relationship between the retention of conservation messages and the exhibits that best integrate conservation, animals, and science?
5. Is there any relationship between the retention of conservation messages and interaction with an MBA staff member or volunteer?

Affective outcomes

1. Is the exhibition inspiring empathy for these animals?
2. Is there any connection between experiencing empathy for the animals and feeling that it is important to protect the deep sea?
3. Is there any relationship between experiencing empathy for the animals and interacting with an MBA staff member or volunteer?

Methods

The Aquarium's multifaceted interests for the summative evaluation warranted a combination of qualitative and quantitative data collection to ensure breadth of describing the visitor experience while adding depth of insight into what visitors gain from the exhibition. We included both traditional and alternative methods (e.g., empathy observations, card sort interviews) to ensure that the evaluation was just as dynamic as the exhibition and visitor experience. In total, data were collected from more than 1,400 unique visitors both at the Aquarium and via post-visit survey requests. The evaluation methods are summarized in Table 1. A detailed description of the methods, including demographics and instruments, is included in Appendix A.

Table 1: Summary of Methods for Evaluation of *Into the Deep (En lo Profundo)*

Method	Sample Size	Overview
Timing and tracking (on site)	n=156	Timing and tracking was used to understand how visitors moved through the exhibition, where they chose to spend their time, and what types of behaviors they exhibited.
Visitor intercept interviews (on site)	n=121	Visitor intercept interviews at the exhibition exit were used to investigate cognitive and affective outcomes. The interviewer was fluent in English and Spanish. Qualitative analysis of interview data used open coding to identify themes and trends.
Post-visit survey (virtual)	n=802	In late August 2022, a post-visit survey was sent via email to all guests that visited the Aquarium between June 25-Aug. 22, 2022. The survey was available in English and Spanish. The survey investigated cognitive and affective outcomes, and included closed and open-ended measures. Analysis used descriptive and inferential statistics, and open coding.
Empathy interviews (on site)	n=130	To investigate empathy-related outcomes visitors may have taken away from the exhibition, we used a card sort activity and interview. Visitors were shown an image of a deep-sea animal and were asked to select words from a list that best matched how they felt about that animal. Follow-up interview questions were used to probe why visitors selected each word. Visitors were interviewed both within the exhibition and at other locations in the Aquarium.
Empathy observations (on site)	n=209	We used a modified version of the visitor observation tool developed by the Measuring Empathy Collaborative Assessment Project (MECAP). The tool included more than 30 expressions of empathy and related emotions that can be observed in visitors. Observations took place in four different areas of the exhibition.

Remainder of This Report

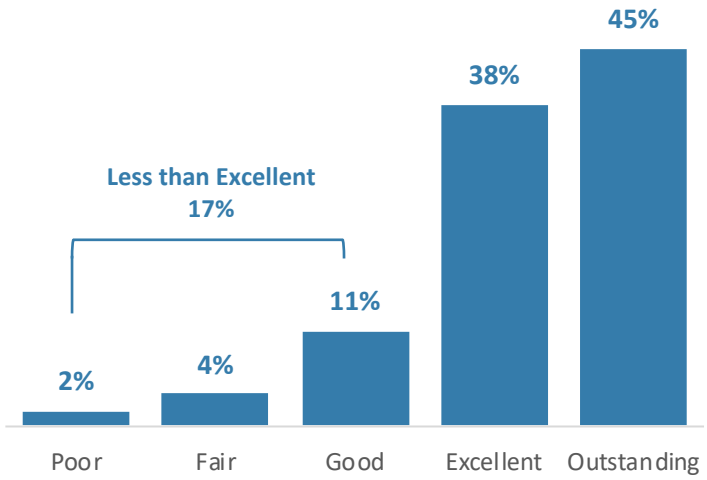
The rest of this report is divided into five sections. The first four sections summarize findings related to (1) the overall visitor experience; (2) timing and tracking; (3) cognitive outcomes; and (4) affective outcomes. An additional section presents a brief summary of findings from a series of survey questions that focused on the online exhibition that accompanied *Into the Deep (En lo Profundo)* on the Aquarium website. These questions were not part of the original scope of work for this evaluation, but were added at the request of the online exhibition team in order to provide them with insightful data about their efforts. The report concludes with points for the Aquarium to consider as it refines the exhibition and prepares for future projects.

Section 1: Overall Visitor Experience

Finding #1: Eight out of ten visitors rated the exhibition as excellent or outstanding.

The post-visit survey used the Overall Experience Rating (OER)[1] to ask visitors to rate their overall impressions of *Into the Deep (En lo Profundo)*. The vast majority of visitors rated the exhibition as outstanding (45%, n=361) or excellent (38%, n=308).

Figure 1: Visitors reported a highly positive overall experience with their visit to *Into the Deep (En lo Profundo)*. (n=802)



The OER for *Into the Deep (En lo Profundo)* was on par with or above OER data from other zoo and aquarium exhibitions for which we could find comparable data. For example, Denver Zoo reported 90% outstanding or excellent for its *Stingray Cove* in 2021, and 52% outstanding or excellent for its *Grizzly Bear* exhibition in 2018. Shedd Aquarium reported 85% superior (outstanding) or excellent for its *Washed Ashore* exhibition in 2017, and 94% superior or excellent for its *Underwater Beauties* exhibition in 2018.

Survey respondents were also asked to explain their rating on the OER scale. Responses suggest that visitors were especially satisfied with learning about unique animals, feeling a sense of awe that the exhibition evokes, and learning about deep-sea life and exploration. A detailed summary of the most frequent explanations visitors provided for their OER rating, along with illustrative quotes, can be found in Appendix B.

[1] The Overall Experience Rating is a validated measure of peoples' overall satisfaction with an experience and has been shown to have strong utility for zoos, aquariums, and museums. See Pekarik, A. J., Schreiber, J. B., & Visscher, N. (2018). Overall experience rating–measuring visitor response in museums. *Curator: The Museum Journal*, 61(2), 353-365.

For those visitors who gave the exhibition an OER of "less than excellent" (17%, n=133), the most frequent criticism focused on crowd levels (8.2%, n=50), the perceived limited variety of animals on display (8.2%, n=50), and the balance between interpretation and live animals (4.8%, n=29).

> *"It was amazing to see such unique animals. My only wish was that there could have been more exhibits. The videos are great, but seeing more in person would be better."*

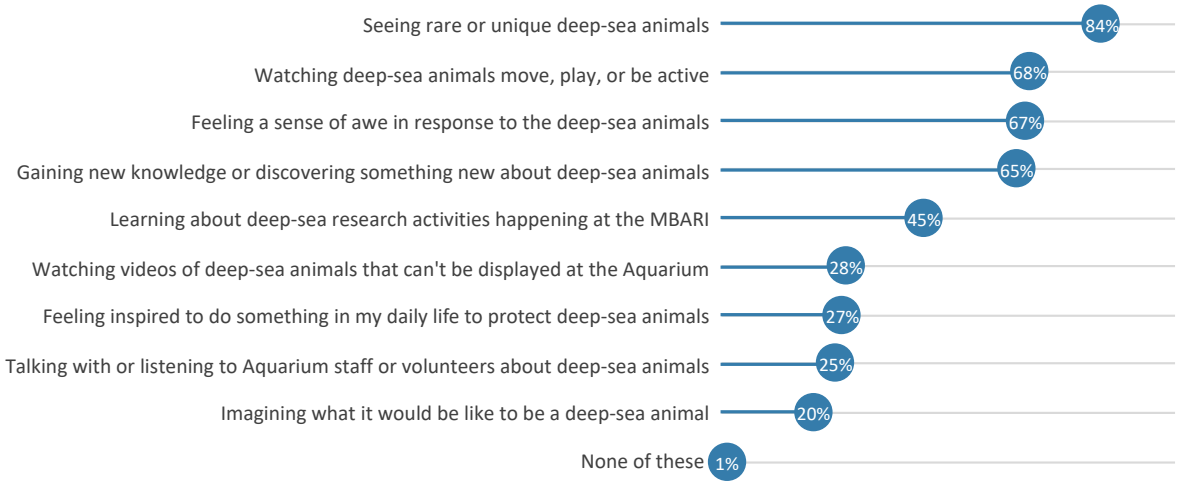
> *"It was neat and exciting to see for the first time, but it had way less marine life than I thought it would have had. I know that it is hard to bring animals up from the deep."*

> *"The exhibit is great. Personally, I was expecting much more animal exhibits. The interactive screens and activities are cool, but I want to see the animals!"*

Finding #2: The experience of seeing live animals from the deep sea was especially satisfying for many visitors.

In the post-visit survey, visitors were asked to choose from a list any experiences that were "especially satisfying" during their visit to *Into the Deep (En lo Profundo)* (Figure 2). Once again, the opportunity to see unique animals from the deep sea topped the list. Visitors also felt satisfied by the feelings of awe they experienced and learning about deep-sea life and research.

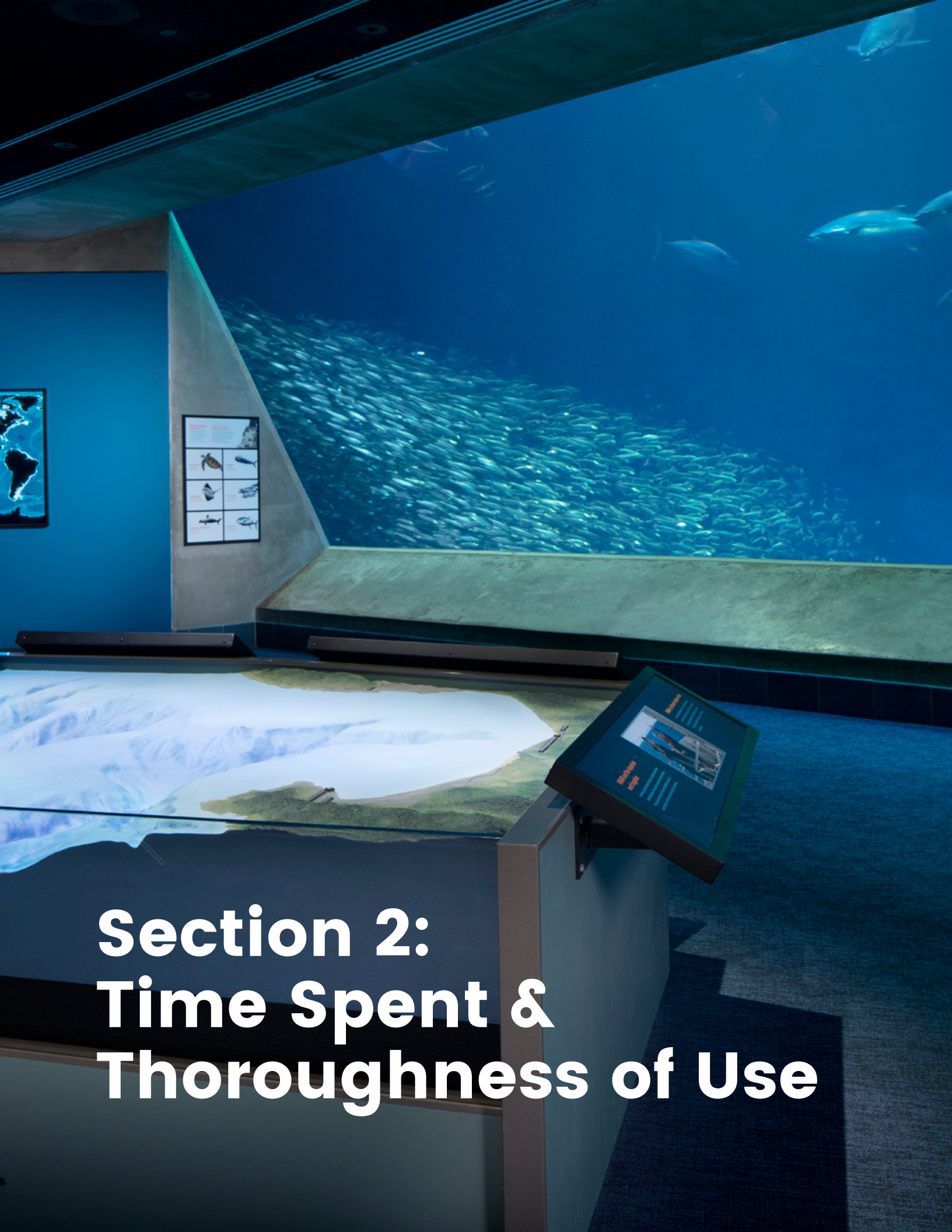
Figure 2: Seeing unique animals, watching animal behavior, feeling a sense of awe, and gaining new knowledge were especially satisfying experiences for a majority of visitors. (n=796)



Using an open-ended format, the survey also asked visitors to describe "what stood out" for them during their visit. Roughly half of the respondents specifically mentioned the Japanese spider crabs (25.6%, n=164), Giant isopods (14.2%, n=91), or Jellyfish (11.4%, n=73). In addition to just enjoying seeing and learning about these animals, some visitors also mentioned that it was "mind blowing" to be able to see deep-sea animals in real life.

> *"I am fascinated by deep sea creatures, and it was unreal to see them in person. Also, being able to touch a deep-sea isopod was incredible."*

> *"The whalefall exhibit [stood out]. I could come face to face with life I'd only ever seen on TV before."*



Section 2: Time Spent & Thoroughness of Use

Finding #1: Visitors moved relatively quickly through *Into the Deep (En lo Profundo)* and interacted with a limited number of exhibition components.

The typical visitor spent approximately 13 minutes viewing *Into the Deep (En lo Profundo)* (See Figure 3) with a Sweep Rate Index (SRI) of 539. To calculate SRI for an exhibition, the square footage is divided by the average total time spent for a tracked sample of visitors. A lower sweep rate means that visitors spent more time in the exhibition and were engaged in more learning-related behaviors. For comparison, Table 2 compares the SRI for *Into the Deep (En lo Profundo)* against SRI data from evaluations of other exhibitions at the Aquarium.

Figure 3: How much time did visitors spend in *Into the Deep (En lo Profundo)*?

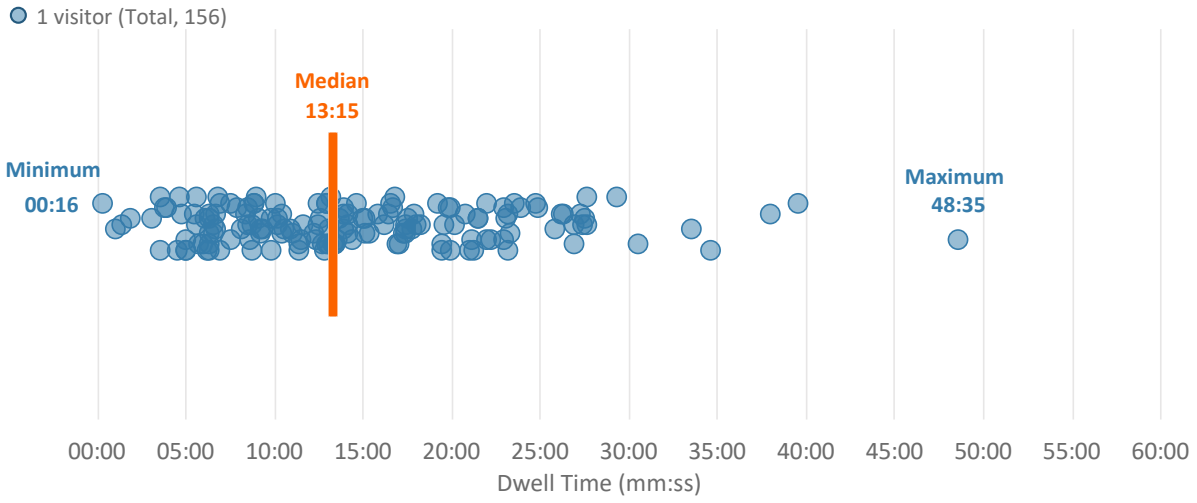


Table 2: SRI for Exhibitions at Monterey Bay Aquarium

Exhibition	Year Evaluated	SRI
Into the Deep (En lo Profundo)	2022	539
Wild About Otters	2013	354
Sharks: Myth & Mystery	2006	357
Jellies: Living Art	2004	490

The exhibition also had a low rate of "diligent visitors," with just 1% of visitors considered to be diligent. Diligent visitors are those that stop[2] at 50% or more of an exhibition's components. The average number of stops for visitors to *Into the Deep (En lo Profundo)* was 12.5 (21.5% of the 58 exhibition components).

While Serrell[3] suggests that museum exhibitions should aim for an SRI below 300, a few factors may have contributed to *Into the Deep (En lo Profundo)*'s higher SRI and low diligence rate:

- Serrell notes that smaller exhibitions tend to be explored more fully. At more than 7,000 square feet, *Into the Deep (En lo Profundo)* is considered to be a large exhibition.
- Few exhibitions are used "thoroughly" as measured by diligence rates. Serrell notes that those exhibitions have "relatively fewer" elements. With nearly 60 components, *Into the Deep (En lo Profundo)* is considered to have a large number of components.
- While 13 minutes might not appear to be a very long dwell time, in a meta-analysis of timing and tracking data, Serrell found that the average museum exhibition visit lasted roughly 20 minutes. It is also important to keep in mind that *Into the Deep (En lo Profundo)* is just one part of the visitor experience at the Aquarium. The average visitor spends 157 minutes at the Aquarium for their entire visit. This suggests that 10% of the typical visitor experience at the Aquarium was spent within *Into the Deep*.
- Timing and tracking data suggest that crowds may have negatively impacted the time spent in the exhibition. Roughly one-third of the timing and tracking observations were carried out when crowd levels were rated by the observer as "high" (on a low-medium-high scale). Similarly, survey data also suggest that for nearly 1 in 10 visitors, crowds had some effect on the quality of their experience.

Finding #2: Visitors spent the most time in the Midwater and Seafloor zones.

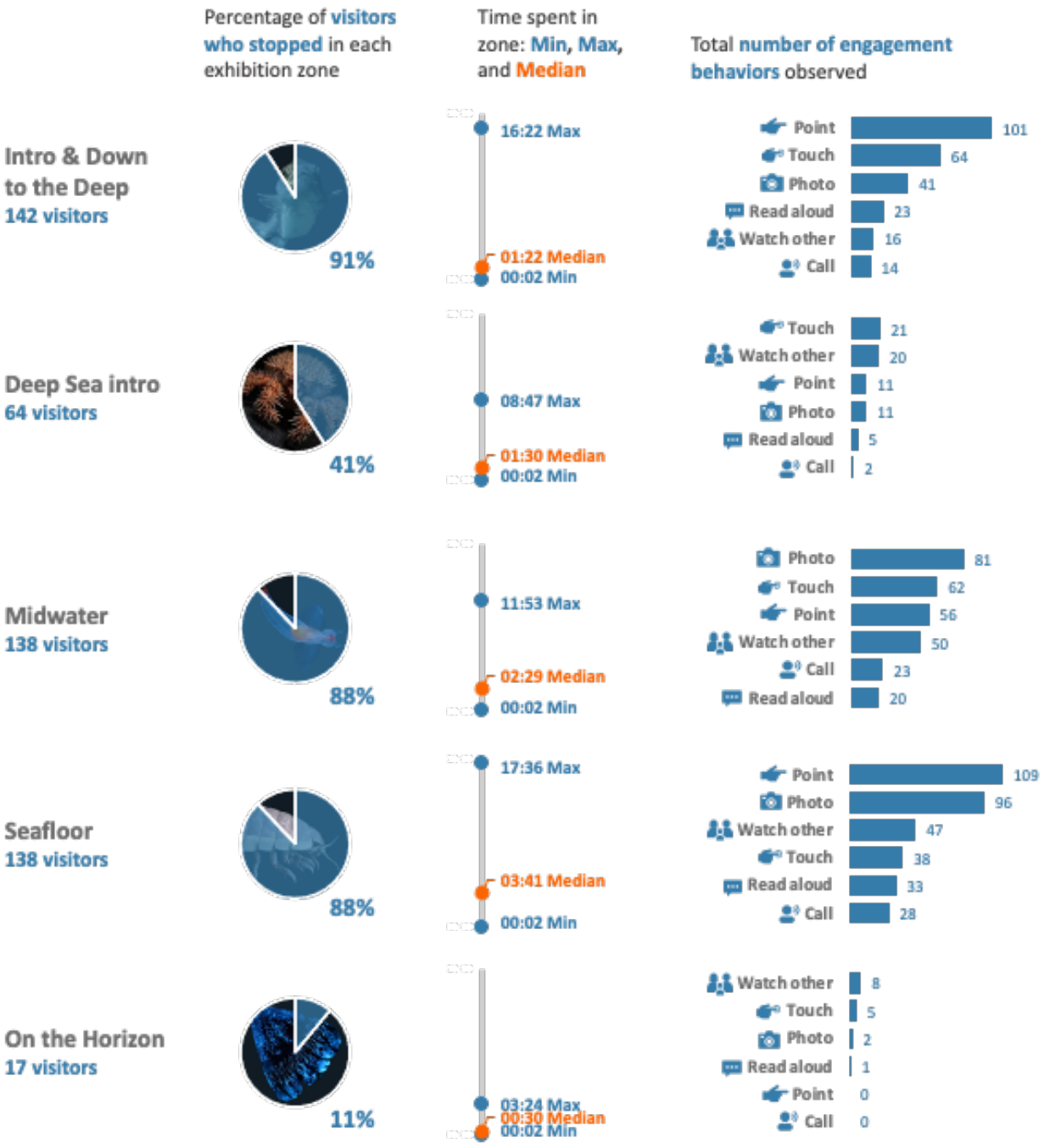
Figure 4 summarizes the number of visitors who stopped in each of the five exhibition zones, the amount of time they spent there, and engagement behaviors they displayed in each zone. The Intro/Down to the Deep, Midwater, and Seafloor zones were most highly attended to, with roughly nine out of 10 visitors making at least one stop in each of those zones. The Seafloor zone had the longest median dwell time at 3:41, while the Midwater median dwell time was 2:29. On the Horizon had the lowest level of visitor activity, with just 17 visitors (11%) attending to any of the components in that zone and a median dwell time (for visitors who stopped) of just 30 seconds. For a further breakdown of visitation patterns, Appendix C contains detailed data for attention and dwell time for individual components within each exhibition zone.

[2] For this evaluation, a visitor was considered to "stop" or "attend to" when they spent two or more seconds looking at or interacting with an exhibition component. A visitor was not required to physically stop at an exhibit in order to be considered "attending" to it.

[3] Serrell, B. (2020). The Aggregation of Tracking-and-Timing Visitor-Use Data of Museum Exhibitions for Benchmarks of "Thorough Use." *Visitor Studies*, DOI: 10.1080/10645578.2020.1750830

Figure 4: Attention, Dwell Time, and Engagement Behaviors in Exhibition Zones

156 visitors were tracked through the exhibition. Attention, dwell time, and engagement behaviors were noted within each exhibit zone and at specific exhibit elements. This figure represents zone-level findings.



Finding #3: While overall diligence rates were low, many exhibition components–particularly large tanks and displays–were viewed by high percentages of visitors.

Despite the low visitor diligence rate for the overall exhibition, many of the exhibition components were attended to by large percentages of visitors. Table 3 summarizes the 10 exhibition components that were visited by the largest percentage of visitors to *Into the Deep (En lo Profundo)*. Typically, these were some of the larger features of the exhibition. (Please refer to the Timing and Tracking instrument/map on Page 43 for specific locations of each exhibition component.)

Table 3: Most visited exhibition components.

Zone	Component	# who stopped	% who stopped
Seafloor	Whalefall	127	81.4%
Intro & Down to the Deep	Open Sea Window	113	72.4%
Intro & Down to the Deep	Topographic Map	95	60.9%
Midwater	Bioluminescence Room	80	51.3%
Seafloor	Isopod Tank	80	51.3%
Midwater	Bloody-belly Comb Jelly Tank	78	50%
Midwater	Freestanding Kreisel Tank	78	50%
Seafloor	Seafloor Diorama	78	50%
Midwater	Freestanding Cylinder Tank	70	44.9%
Seafloor	Isopod Touch	69	44.2%

Finding #4: Visitor dwell times were longest at a mix of large and small exhibition components.

While the visitor diligence rates were highest for larger exhibition features, timing and tracking data suggest that the longest visitor dwell times were at a wider range of exhibition components (i.e., a mix of large and small exhibition components). For example, the Midwater Survival game had the longest median dwell time of any component at 1:24. Larger tanks such as Whalefall and Open Sea also generated longer dwell times. Interestingly, exhibition components designed to facilitate interactivity such as spinners and the touch tank also produced some of the longest dwell times. Additionally, components in the Deep Sea Intro zone--one of the least visited zones--featured some of the longest median dwell times. This suggests that for visitors who did choose to stop in the Deep Sea Intro zone, they found the components there to be engaging.

Table 4: Top 10 exhibition components by median dwell time.

Zone	Exhibition Component	Median Dwell Time
Midwater	Midwater Survival Game	01:24
Seafloor	Whalefall	01:15
Deep Sea Intro	Animal Spinner (closest to entrance)	01:03
Intro & Down to the Deep	Open Sea Window	00:57
Seafloor	Isopod Touch	00:53
Deep Sea Intro	Window Tank	00:50
Intro & Down to the Deep	Global Deep Map	00:48
Midwater	Bloody-belly Comb Jelly Tank	00:46
Intro & Down to the Deep	MBARI Spinners	00:43
Deep Sea Intro	Video (right-hand side of gallery entrance)	00:42

Finding #5: Engagement behaviors were most frequently observed at larger exhibition features or elements designed for interactivity.

Timing and tracking data provided further evidence of visitor engagement in *Into the Deep (En lo Profundo)*. Observation data (Figure 5) found that visitors frequently pointed and took photos at "major" exhibition components such as large tanks (e.g., Whalefall) and the topographic map near the beginning of the exhibition. Similarly, visitors often touched or interacted with exhibition components such as the topographic map, spinners, and the Midwater Survival game. The lowest total number of engagement behaviors were observed in the Deep Sea Intro and On the Horizon zones. (A full breakdown of engagement behaviors by each exhibition component can be found in Appendix C) Overall, engagement behavior data for *Into the Deep (En lo Profundo)* are similar to data from an evaluation of Denver Zoo's exhibition *The Edge* (tigers). A study from 2017 found that 35% of visitors to *The Edge* took or posed for a photo, 41% physically interacted with signs or perforated walls, and 38% read at least one sign in the exhibition.

Interestingly, more visitors were observed watching someone else (likely someone else in their party) play the Midwater Survival game (n=25) compared with actually playing the game (n=21). This suggests that even if someone in a visitor group did not play the game themselves, they may still have been exposed to the main message of the game.

Figure 5: Engagement Behaviors by Total Exhibition Visitors

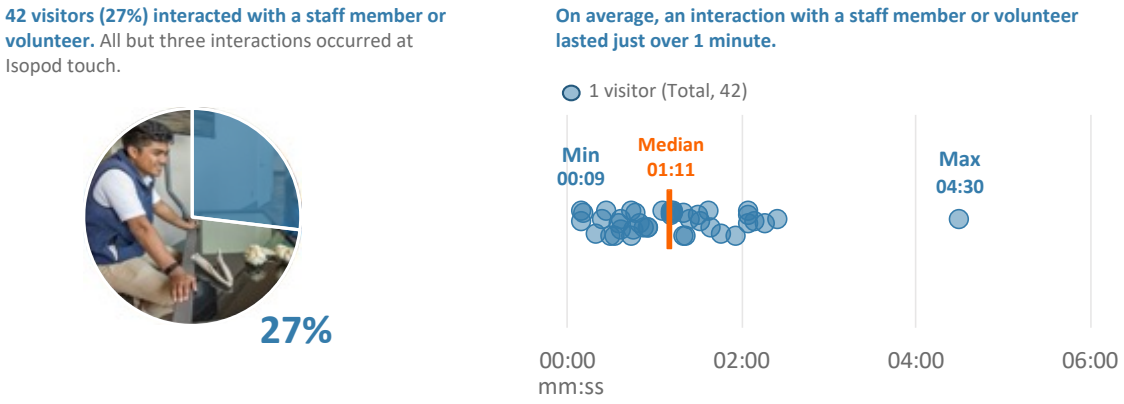
These data represent the proportion of all visitors tracked (n=156) who displayed engagement behaviors in an exhibit zone.

	Pointed to something	Called to someone	Read aloud	Took photo/video	Touched/ Interacted	
Intro & Down to the Deep	44%	8%	12%	22%	32%	7%
Deep Sea Intro	7%	1%	3%	7%	12%	12%
Midwater	23%	12%	8%	28%	32%	24%
Seafloor	40%	15%	13%	34%	22%	24%
On the Horizon	-	-	1%	1%	3%	4%

Finding #6: Roughly one-quarter of visitors interacted with a staff member or volunteer.

Figure 6 summarizes the visitor interactions observed during timing and tracking data collection. Roughly one-quarter of visitors interacted with a staff member or volunteer, and nearly all of these interactions took place at the Giant isopod touch station[4]. At just over one minute, the median interaction time makes volunteer/staff interaction one of the longer experiences within *Into the Deep (En lo Profundo)*. (Only the Midwater Survival game and Whalefall had longer dwell times. See Table 4.)

Figure 6: Visitor Interactions with Staff or Volunteers in *Into the Deep (En lo Profundo)*?



In the visitor survey and interviews, however, the percentage of visitors who said they interacted with a volunteer was higher than in the timing and tracking data. For example, 54.5% (n=66) of visitors interviewed and 39.7% (n=317) of visitors surveyed said they had interacted with a volunteer or staff member. The discrepancy between timing and tracking and interview/survey data might be influenced by two factors. First, when visitors were asked in interviews and the survey to describe their volunteer/staff interactions, they sometimes referenced engaging with a volunteer or staff member in other parts of the Aquarium–not in *Into the Deep (En lo Profundo)*. Therefore, it is likely that the timing and tracking data are a better representation of actual visitor-volunteer/staff interactions. Second, the survey sample included a higher proportion of Aquarium members, who might have been more likely to engage with volunteers in the first place due to their familiarity with and commitment to the Aquarium.

[4] During the data collection period for this evaluation, volunteers were present at the Giant isopod touch station only. The Aquarium plans to have additional volunteers available within the exhibition space in the future. This increased volunteer presence would likely shift the data and findings presented here.

When asked what they did or discussed with volunteers or staff members, most visitors described learning more about the animals on display. Table 5 summarizes the topics of visitor-volunteer/staff interactions based on survey responses. Unsurprisingly, given that most visitor interactions observed during timing and tracking took place at the Giant isopod touch station, more than half of visitors surveyed said they had talked about the Giant isopods.

Table 5: Focus of Interactions with Volunteers or Staff (n= 261)

Topic	# of interactions	% of interactions
Giant Isopod	147	56.3%
Other Animals	36	13.9%
General	16	6.1%
Exhibition Life Support Systems	15	5.8%

Finally, for visitors who interacted with a volunteer at the Giant isopod touch station, they generally appreciated having the volunteer present even if they did not formally interact with them. For those who did interact with the volunteer, visitors found the volunteers to be helpful, knowledgeable, and friendly. A number of visitors commented on the fact that the volunteer helped ease their concerns about touching the Giant isopods. One visitor noted that "[the volunteer] helped me get past the icky-big-bug prejudice."

Section 3: Cognitive Outcomes

Finding #1: Visitors most often left the exhibition with a new understanding of the deep sea and the unique animals within it.

In both the visitor survey and intercept interviews, visitors were asked using an open-ended question to share a new idea they learned while visiting *Into the Deep (En lo Profundo)*. In intercept interviews, 43% (n=52) of visitors shared a fact or realization about the deep sea or its animals. Primary themes included:

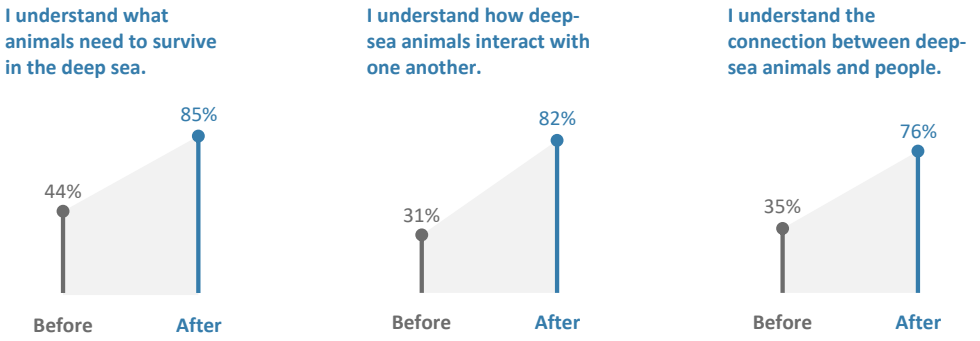
Animal facts (names, size, adaptations, etc.)
"I was surprised at the size of some of the creatures, and that they were so large. I think I already knew that when a whale dies, it sinks to the bottom, creatures get at it. But I didn't know to what degree."

Characteristics of the deep ocean
"I learned there is so much going on in the depths of the ocean, and it is not just teaming with life on the surface only."

Related conservation issues, particularly plastics
"It struck me that they said there were plastic particles even that deep. I think you know in the back of your mind what it's [plastic] done to the oceans. But to see it at that depth is like, oh, that's scary. I hope we can help what's out there."

Evidence of this new understanding of the deep sea and life within it was also found in survey respondents' answers to a series of retrospective pre-post questions. Visitors were asked how much they would have agreed or disagreed (on a five-point scale) with a series of statements before visiting the exhibition, and how much they agreed or disagreed with the same statements after visiting. Figure 7 shows the change in percentage of respondents who agreed or strongly agreed with each of three statements related to deep sea life before vs. after their visit. Using a paired *t*-test, all of these changes were found to be statistically significant ($p<0.001$). Appendix D provides detailed results of these statistical tests.

Figure 7: Visitors self-reported statistically significant changes in their understanding of deep-sea life *before* vs. *after* their visit to *Into the Deep (En lo Profundo)*. Charts show percentages of visitors rating agree/strongly agree with each statement. (n=796)



Finally, the survey and interview data suggest that smaller numbers of visitors are taking away new understandings related to a few other specific ideas or concepts related to the deep sea. These included:

- **Light.** Visitors described learning about bioluminescence and how light works in the deep ocean.
- **Exploration.** Visitors expressed being "blown away" by how much of the deep ocean is unexplored, and some referenced MBARI's efforts.
- **Life Support.** Visitors were intrigued by the science behind the exhibition—how animals were cared for and the life support systems that make the exhibition possible.

Finding #2: Visitors also reported leaving the exhibition with feelings of awe, curiosity, or concern about the deep sea.

In addition to a new understanding of the deep sea and deep-sea life, visitors also reported new feelings of awe, curiosity, or concern about the deep ocean as a result of their visit to *Into the Deep (En lo Profundo)*. In intercept interviews, 30% of visitors (n=36) described feelings of awe that the exhibition provoked, and 12.4% (n=15) said the exhibition made them curious to learn more about deep-sea life. Finally, 17.4% (n=21) described new feelings of concern for the deep sea and deep-sea life based on their visit to *Into the Deep (En lo Profundo)*.

> *"I guess I never really thought about how enormous it is, the deep water areas on this planet. Because you don't think about them in your day-to-day life. If*

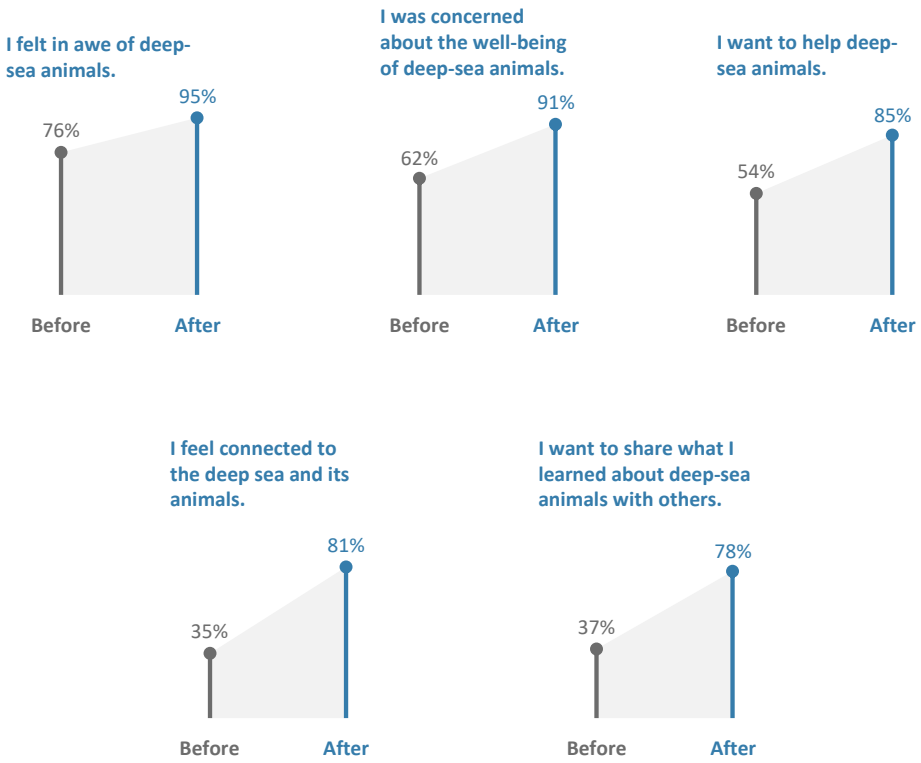
you think about the ocean, it's what we see outside the window right now. It's the bay, what touches us. And it's so much bigger than that."

"The bioluminescence displays were wonderful, and thinking about being that deep into the darkness made those shimmering lights all the more wondrous."

"The one display of the little animal, looks like a miniature lobster flapping its tail, and how that filters the water, and how that can pick up microplastics. And then that through the food chain can pass microplastic along. And that's cause for concern"

The post-visit survey also provided evidence that the exhibition is generating new feelings of awe, curiosity, and concern. Figure 8 summarizes the statistically significant ($p<0.001$) changes once again found in responses to a series of retrospective pre-post questions focused on awe, curiosity, and concern. Changes of nearly 40 percentage points from pre to post for some statements (e.g., "I feel connected to the deep sea and its animals," "I want to share what I learned about deep-sea animals with others) suggest that *Into the Deep (En lo Profundo)* is generating substantial changes in awareness and understanding.

Figure 8: Visitors self-reported statistically significant changes in awe, curiosity, and concern for the deep sea *before* vs. *after* their visit to *Into the Deep (En lo Profundo)*. Charts show percentages of visitors rating agree/strongly agree with each statement. (n=796)



Finding #3: Visitor takeaways reflect the exhibition's big idea and, to a lesser extent, the exhibition's main messages.

The "big idea" for *Into the Deep (En lo Profundo)* is: "The deep sea is a mysterious environment that teems with life and needs our protection." Visitor survey and interview data suggest that the exhibition is effective at communicating this big idea as follows:

- The awe and curiosity visitors regularly reference, along with mentions of features of the deep sea such as bioluminescence, pressure, and light, reflect their understanding that the deep sea is a **"mysterious environment."**
- Visitors' frequent citations of the variety, size, and features of animals they learned about suggest they understand that the deep sea "**teems with life."**
- Frequent references to the threat posed by plastics suggest that many visitors grasp the idea that the deep sea **"needs our protection."**

Further, Table 6 summarizes the frequency of each theme in data from the visitor survey where visitors were asked to share one new idea they learned from the exhibition. Overall, 79.3% of respondents (n=337) shared an idea that was connected to at least one of the components of the exhibition's big idea.

Table 6: Visitor Takeaways Connected to the Exhibition's Big Idea (n= 425)

Big Idea	# of respondents	% of respondents
Mysterious environment	141	33.2%
Teems with life	114	26.8%
Needs our protection	82	19.3%

Survey and interview data were also analyzed using open coding to determine to what extent visitor takeaways were aligned with the exhibition's main messages. Table 7 summarizes the degree to which each of the main messages emerged in visitor descriptions of what they learned or what stood out for them from their visit to *Into the Deep (En lo Profundo)*.

Table 7: Visitor Takeaways Connected to the Exhibition's Main Messages

Message	Evidence	Discussion
"A vast, mysterious world lies beneath the ocean's surface."	**High**	Many visitors repeatedly describe how they had not previously realized the vast and unique animals that live in the deep sea.
"The Aquarium has a research partner called MBARI that studies the deep sea right here in Monterey Bay."	**Medium**	Some visitors highlighted learning about exploration and new discoveries, but less often cited MBARI specifically.
"The deep sea is a cold, dark, and crushing place to live, yet lots of animals live there."	**Medium**	Some visitors identified the challenges life faces in the deep sea, and by extension the challenges involved in exhibiting deep sea animals.
"The midwater is a vast expanse of open water below the ocean's surface and above the seafloor."	**Low**	Few visitors referenced the midwater by name or described its location.
"The seafloor is a vast muddy expanse studded with unique communities of life."	**Medium**	Some visitors referenced learning about whalefalls and the life they support, though they typically did not discuss the seafloor more broadly.
"A universe of discovery still waits for us in the deep sea."	**Medium**	Some visitors cited the opportunities that still exist for future research and discovery.

Finding #4: Visitors reported taking messages away from the Midwater and Seafloor zones most often.

Respondents to the visitor survey were asked where in the exhibition they remembered encountering the new idea(s) they took away from *Into the Deep (En lo Profundo)*. Of the visitors who responded to this question[5], 152 clearly articulated both a message and the specific

[5] A total of 468 visitors responded to this question. However, 237 of these misinterpreted the question and responded about where they learned about the *exhibition itself* rather than where they learned a specific message. Others shared a new idea, but did not cite a specific location.

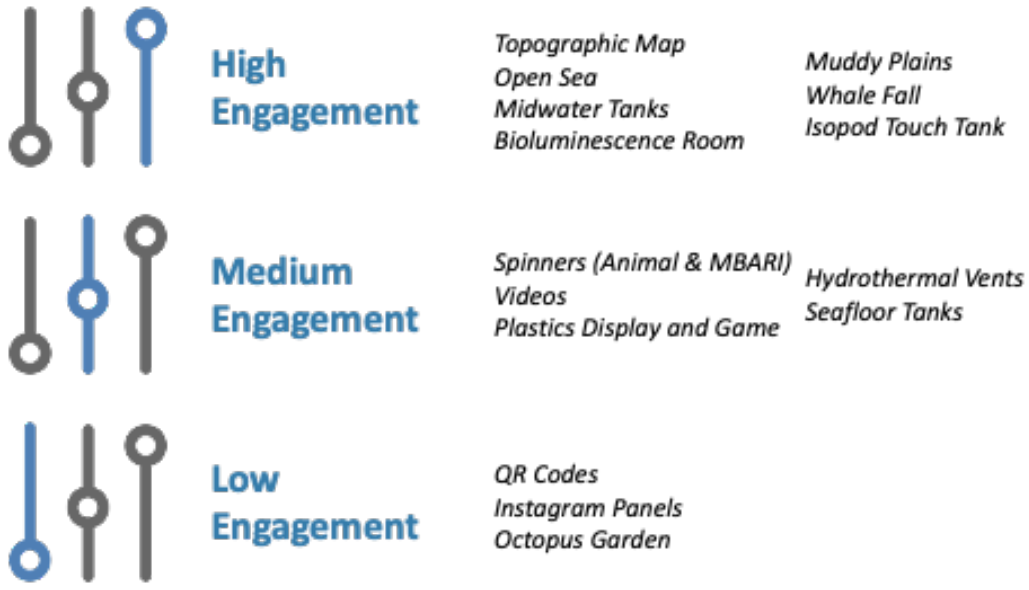
location or component (e.g., volunteer interaction) of the exhibition where they encountered that message. Table 8 summarizes the exhibition locations or experience that visitors said they took away new ideas/messages.

Table 8: Visitor Recall of Key Message Location/Experience (n=152)

Location/Experience	# of respondents	% of respondents
Midwater	46	30.3%
Seafloor	38	25%
All	35	23%
Intro/Down to the Deep	12	7.9%
On the Horizon	2	1.3%
Staff/volunteer Interaction	19	12.5%

These data are also consistent with timing and tracking data in terms of where visitors spent their time, how long they spent there, and the engagement behaviors they exhibited. Timing and tracking data suggest that the following exhibition components (Figure 9) had some of the highest and lowest levels of engagement based on dwell time and behaviors. While we cannot establish a direct correlation between messaging and visitation patterns, we can infer where visitors are spending their time and thus are most likely to take away information.

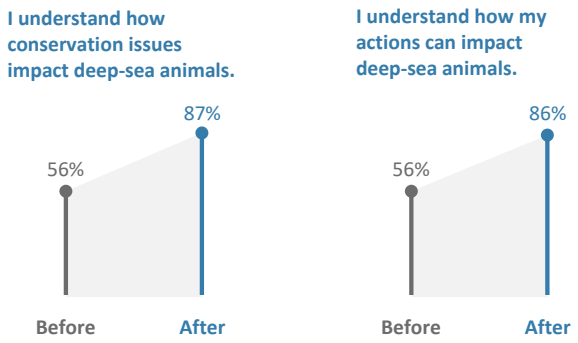
Figure 9: Visitor Engagement Levels Based on Timing and Tracking Data



Finding #5: The primary conservation message visitors took away is the impact of plastic on the deep sea.

In general, the data suggest that *Into the Deep (En lo Profundo)* is effectively conveying conservation messaging to visitors, particularly around the impact of plastic on the deep sea. Three data points, in particular, provide evidence of this. First, Figure 10 summarizes the changes in visitor responses to retrospective pre-post questions focused conservation. These changes were statistically significant ($p<0.001$).

Figure 10: Visitors self-reported statistically significant changes in their understanding of deep-sea conservation *before* vs. *after* their visit to *Into the Deep (En lo Profundo)*. Charts show percentages of visitors rating agree/strongly agree with each statement. (n=796)



Second, when asked directly about threats to the deep ocean, nearly two-thirds (65.3%, n=79) of visitors interviewed identified microplastics. While most already knew that plastics were harmful, they did not realize the extent of their impact and that plastic pollution could reach such depths.

> *"I didn't realize just how even that deep is being affected by the plastic pollution and everything. Seeing that life and seeing how it's being affected by plastics, and it could be found that deep, is an eyeopener."*

> *"I didn't realize how easily plastic could be confused with the plankton that are also living in the ocean."*

Third, when asked more generally to describe one new idea they learned while visiting *Into the Deep (En lo Profundo),* nearly 15% (n=60) of survey respondents described a conservation takeaway. More than half (51.7%, n=31) focused on plastic.

Finding #6: Visitors most often took away conservation information from the illuminated display of plastics and the Midwater Survival game.

In intercept interviews, the majority of visitors (73.3%, n=88) commented on the threat of plastics to life in the deep sea.[6] Of these, nearly one-third (30.7%, n=27) said they saw plastics messaging at the microplastics display (snow) and 17% (n=15) referenced the Midwater Survival game.

> *"One of the exhibits in there showed the little specks of plastic, and when you lit it up, you could see the plastic in there. And it just makes you think about what the animals are having to deal with and eat.... It was beautifully done."*

> *"I'm much more aware of my single-use plastics after my kids played the interactive games."*

While not heavily used in timing and tracking observations, a few visitors (n=4, 4.5%) commented on the water bottle refill station. Overall, given the high recall of overall plastic messaging and strong recall of the associated locations (along with the earlier finding that the Midwater Survival game had the highest median dwell time (1m:24s) of any component in the exhibition), the data suggest that these exhibition components are effectively conveying a conservation message.

Table 9: Visitor Engagement Location with Plastics Messaging (n=88)

Exhibition Component	# of Interview Respondents	% of Interview Respondents
Microplastics display (snow)	27	30.7%
Midwater survival game	15	17.0%
Water bottle station	4	4.5%
Midwater (no specific component specified)	3	3.4%
Food web interpretive	1	1.1%
Could not recall a specific location	38	43.2%

[6] This figure is slightly higher than the percentage reported in Finding #4 for visitors who identified plastic as a threat to the deep sea. In this finding (#5), we have included visitor mentions of plastics at any point during the interview vs. visitor responses to a specific question about threats to the deep ocean.

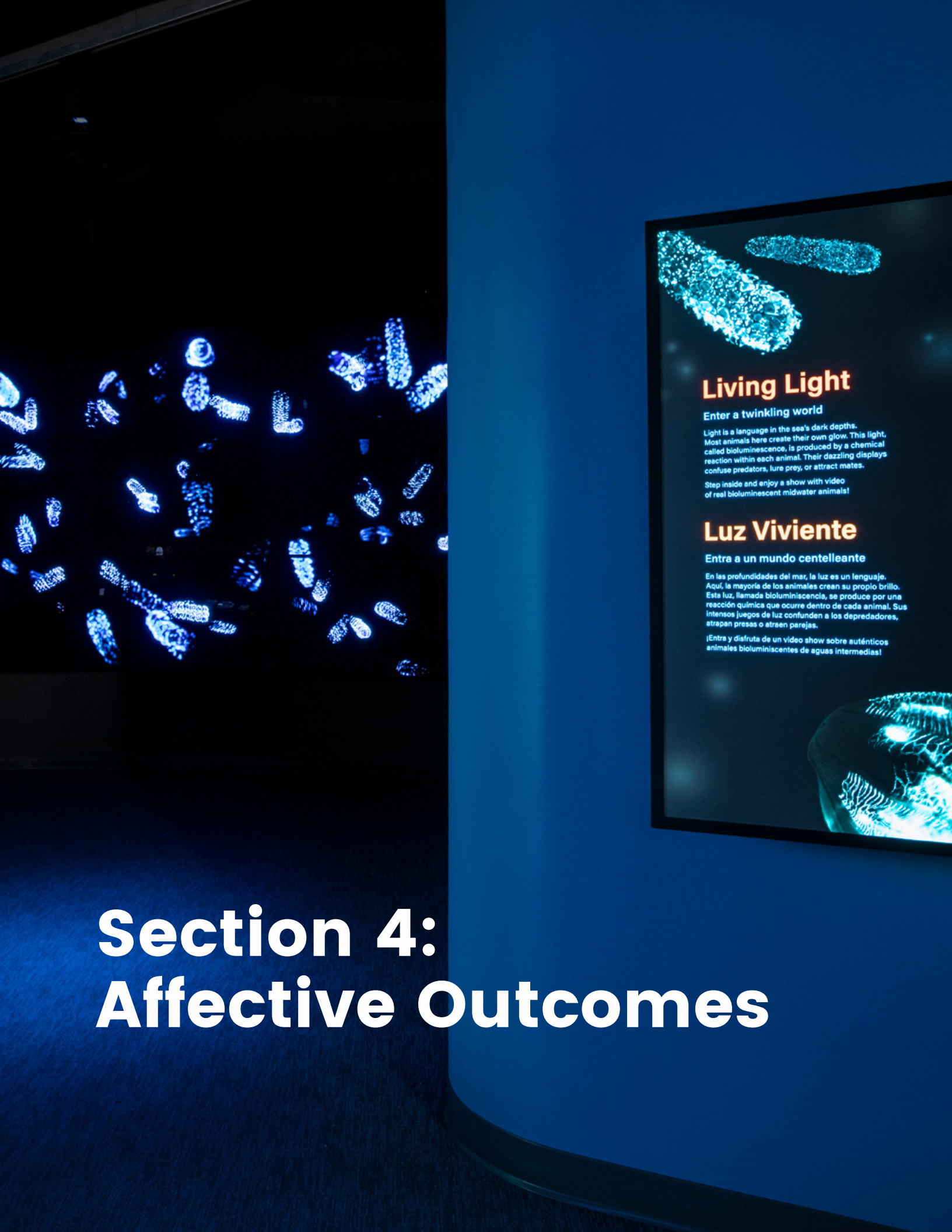
Finding #7: At present, there does not seem to be a relationship between retention of conservation messages and staff/volunteer interactions.

In the timing and tracking study, of the 42 visitors (26.9%) who were observed interacting with a staff member or volunteer, all but three of those interactions took place at the Giant isopod touch tank. Survey data suggest that the most common topics discussed at the touch tank were animal facts and instructions for touching the isopods.

In the survey, 39.7% of respondents (n=317) said they had interacted with a staff member or volunteer. Of these, 261 described what they discussed with the volunteer or staff member. Just 1.9% (n=5) of visitors who interacted with a volunteer or staff member said they had discussed anything conservation-related.

This finding is limited by the fact that during the data collection period, volunteers were stationed within the exhibition at the Giant isopod touch tank only. The Aquarium originally anticipated having volunteers stationed throughout the exhibition during the evaluation period, and plans to increase the volunteer presence within *Into the Deep (En lo Profundo)* in the future.

Overall, this finding suggests that conservation messaging during interactions with staff and volunteers could be possible with increased volunteer presence at relevant areas of the exhibition and with specific volunteer training and/or instructions.



Section 4: Affective Outcomes

Finding #1: Visitors typically associated deep-sea animals with positive descriptions or emotions.

Analysis of the card sort responses and subsequent interviews revealed that the majority of visitors expressed positive feelings about deep-sea animals. The terms “interesting,” “beautiful,” and “important" were the most frequent words associated with the deep-sea animal images shared during the empathy card sort. Table 10 depicts the full range of counts for descriptors selected for the deep-sea animal images. There were minimal differences depending on the animal shown or where in the Aquarium the activity took place.

In addition to the descriptors, visitors were interviewed to further elaborate on their selections. Visitors commonly referenced physical features and behaviors for indicators of the words they chose to describe how they felt. For example, visitors commented on whether an animal had eyes or a face as an indication of whether it was friendly or not. On occasion, visitors would also reference other contextual factors that can be presumed to be picked up from the interpretation within *Into the Deep (En lo Profundo)* or interaction with a volunteer at the Giant isopod touch station. For example, when visitors chose the word “important,” they would often describe the role of the animal in the bigger ecosystem, such as the Giant isopods acting as scavengers on the seafloor.

Table 10. Representative Quotes for Descriptors (n=130)

Descriptors	Count	Representative Quotes
Ugly	15	*“I chose ugly because it looks kind of mad, because of this little part right here. And it’s interesting because one antenna looks shorter than the other and he has lots of legs. And it’s important because why would it be there if it wasn’t?”* (Giant isopod)
Beautiful	68	*“Just kind of the simplicity of it is beautiful. There’s not really a lot to it. I find it beautiful because of how it’s see-through, and you can see its personality almost.”* (Predatory tunicate)
Unfriendly	23	*“It looks scary because it’s red. So that’s why I think unfriendly, but it’s really interesting looking too.”* (Bloody-belly comb jelly)
Friendly	28	*“It just didn’t move. It was like a friendly animal you were able to touch and be around.”* (Giant isopod)
Important	31	*“It’s important because we need things at the bottom of the ocean to scavenge and pick stuff up. Interesting because we haven’t seen it before. Beautiful, like, that color doesn’t happen in nature.”* (Bloody-belly comb jelly)

Interesting	92	*"I think it's interesting just because a lot of sea creatures look very peculiar compared to your typical fluffy animals. Unfriendly because it looks very boney, spiky. Crabs can pinch, and that can hurt."* (Japanese spider crab)
Boring	4	*"It looks like it just stands there."* (Bloody-belly comb jelly)
No personality	6	*"I chose no personality because they don't have human faces, so it's hard to read them. But they're friendly because we got to pet them. And they're interesting because they're just bizarre and old and awesome."* (Giant isopod)
Lots of personality	23	*"Lots of personality, because I feel like it's Disney animation. It would be very sassy."* (Bloody-belly comb jelly)
Similar to me	9	*"I picked [similar to me] because it's unusual and intimidating like me."* (Sea angel)
Not similar to me	22	*"It looks like it's living in water, and so it's physically, structurally, visually very different from me, lives in a very different environment. I think it's important that we learn from it and especially with all the stress going on in the ocean. Interesting [because] I've never seen it before and it's cool looking. I'm an engineer, and it looks like it's really well engineered."* (Giant isopod)
Sad	9	*"I'd say sad because he's by himself."* (Bloody-belly comb jelly)
Happy	23	*"Just kind of happy and floating there. It's real pretty."* (Predatory tunicate)
Healthy	19	*"Well, probably because I'm a doctor and so I think health. It seems logical to me. It looks like they're moving. It looks like it's vibrant, so it's healthy."* (Sea angel)

Finding #2: Data suggest that for some visitors, *Into the Deep (En lo Profundo)* elicited expressions of empathy for deep-sea life.

For the purposes of this evaluation, empathy was defined as "a **stimulated emotional state** that relies on the ability to **perceive**, **understand** and **care** about the experiences or perspectives of another person or animal."[7] Survey and interview data from this evaluation provide initial evidence that for some visitors, *Into the Deep (En lo Profundo)* stimulated empathy for deep-sea life. Data suggest that visitors took away a new understanding about the experiences of deep-sea life, and in many cases demonstrated an emotional response to deep-sea life as evidenced by expressions of awe and curiosity. Data also suggest that this new understanding and emotional response triggered feelings of care for deep-sea life, particularly in relation to the challenges of life in the deep sea and the human-generated threat of plastic pollution.

To better understand the relationship between *Into the Deep (En lo Profundo)* and empathy, we provide a closer look at three aspects of the empathy definition cited above.

Stimulated emotional state

Visitors to *Into the Deep (En lo Profundo)* frequently expressed feelings of awe, wonder, and curiosity in response to their exhibition experience.

> *"It's a wonder to see these creatures in person and learn about something we're still discovering so much about."*

> *"I grew up in Monterey, and I'm always amazed when I see something new that I haven't seen before. We have this amazing canyon right in front of our house, and we know so little about it. Every time we learn something new, I have to be there to see that."*

Additional evidence that the exhibition is stimulating emotions in visitors comes from empathy observations conducted in *Into the Deep (En lo Profundo)*. The highest empathy-related behaviors observed were those that demonstrated interest or curiosity toward an animal (87.6%, n=183). Behaviors that demonstrated appreciation or respect for an animal were observed in 61% (n=127) of visitors. Detailed empathy observation data can be found in Appendix E.

It is possible that this stimulated emotional state is an indicator of positive empathy, which Young, Khalil, and Wharton define as "the motivation to help sustain or extend a positive state

[7] Young, A., Khalil, K., and Wharton, J. (2018). Empathy for animals: A review of the existing literature. *Curator,* 1-17.

of being for another by empathically sharing positive feelings such as joy, playfulness, satiation, positive social relationships or rest with the animal" (p. 4).

At the beginning of this evaluation, members of the exhibition team at the Aquarium questioned whether empathy was even possible for deep-sea life because it is so foreign or "other." Based on the feelings of awe and wonder the exhibition often evoked, it would appear that encountering this "otherness" for the first time may actually have enabled visitors to connect with deep-sea life.

> *"[It's] important because it's so different as a species to us, and so that's obviously got a lot of scientific value, there's a lot going on there."*

Young, Khalil and Wharton, in reviewing research by Myers, suggest that "more time spent with [an] animal increases a person's understanding of and empathy towards that animal." (p. 7) For most visitors to *Into the Deep (En lo Profundo),* this was their first encounter with deep-sea life, and time spent with these animals in the exhibition may therefore have helped increase visitor understanding and empathy toward them.

Perceive and understand

In interviews and responses to open-ended survey questions, many visitors to *Into the Deep (En lo Profundo)* were able to describe a new understanding of deep-sea life. They also cited learning about the harsh conditions and human-induced threats facing deep-sea animals. Further, findings from the retrospective pre/post survey questions discussed earlier in this report also suggest that visitors left the exhibition with an increased understanding of deep-sea life.

Some visitors even provided evidence of "perspective taking," an important aspect of empathy. Perspective taking for *Into the Deep (En lo Profundo)* visitors typically related to the threat deep-sea animals face from microplastics.

> *"If you're up on land in the woods, in the open, most animals can probably tell the difference between food and plastic, but not these animals. They were just scooping it all up. They had no way to differentiate what was food and what was not."*

> *"I don't know exactly the risks that it's under, but plastic falling down to the bottom of the ocean is basically a threat. It might think it's food."*

Further evidence of visitors perceiving and understanding comes from empathy observation data. For example, 22% (n=46) of visitors were observed behaving in ways that demonstrated they understood the needs of an animal being observed (e.g., verbalized the needs of the animal, compared their own needs to those of the animal), and 15.3% (n=32) displayed behaviors that demonstrated they recognized the animal as an individual with their own agency (e.g., commented on animal's independent movements, used pronouns/personal name for animal).

Care

Survey and interview data suggest that *Into the Deep (En lo Profundo)* elicited compassionate empathy in some visitors. Compassionate empathy (also called empathic concern) is the ability to sense and be motivated to improve the life of another being. Indeed, visitors frequently discussed how deep-sea life is under threat from plastic pollution. In interviews, for example, the vast majority of visitors recognized the threat of plastics to deep-sea animals. In many cases, recognizing this threat also stimulated feelings of care in visitors.

> *"I didn't realize just how even that deep is being affected by the plastic pollution and everything. Seeing that life and seeing how it's being affected by plastics, and it could be found that deep, is an eyeopener."*

Further evidence of visitors expressing feelings of care and concern come from empathy-focused interviews conducted as part of this evaluation. Visitors were presented with an image of a deep-sea animal (Bloody-belly comb jelly, Giant isopod, Japanese spider crab, Predatory tunicate, or Sea angel) and asked how much they were concerned for the well-being of that animal. More than half of the respondents (55%, n=30) expressed concern for the animals, with the remainder expressing no concern or indifference. Table 11 depicts this spread of concern accompanied by representative quotes. Interestingly, the representative quotes for "not concerned" suggest the important role an exhibition like *Into the Deep (En lo Profundo)* might play in simply introducing deep-sea life to visitors.

Table 11: Concern for Deep-sea Animals (n=55)

Level of Concern	# of Respondents	Representative Quotes
Concerned	30	*"I'm sure it [Predatory tunicate] is important in the whole ecosystem. I'm sure if they're not here, it would totally change the world order underneath the sea."* *"I wouldn't want them to disappear because they're probably important for something on the food chain. Yes, once you break the chain, then it dies. The effect is catastrophic."*
Not Concerned	15	*"I guess since you don't really see it that often. Out of sight, out of mind."* *"Considering I've never seen it before and didn't know it existed, I would say my concern level is pretty low."*

Indifferent	10	*"I am neither unconcerned nor concerned. I am mediocrely concerned. I don't have a personal connection to said thing, and I don't know how it impacts the rest of the universe."* *"I mean, I don't know whether or not it's endangered or not. I'd certainly hope not. I guess not overly concerned, but I'd certainly be unhappy if they were all to die out."*

It is important to note, however, that in empathy observations in *Into the Deep (En lo Profundo),* only 1.9% (n=4) of visitors were observed expressing compassionate concern in the exhibition proper. This may be because the exhibition was not designed to explicitly elicit those conversations (which represent the indicator associated with this observation type in the instrument used for this evaluation). In contrast, during the card sort and visitor intercept interviews in which prompts and opportunities to elaborate on their thinking about empathy, visitors sometimes were able to articulate or express compassionate concern as noted above.

If, as the data suggest, *Into the Deep (En lo Profundo)* is stimulating feelings of compassion and care in some visitors, this may have implications on pro-environmental behaviors the Aquarium is interested in fostering. Several studies, for example, have proposed that "empathy with suffering nature is one fundamental factor in predicting pro-environmental behavior."[8]

Limitations to this finding

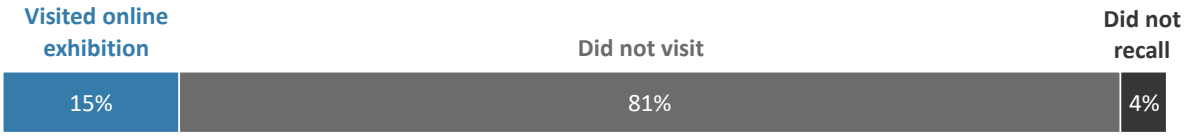
While this evaluation has found evidence of empathic reactions in visitors to *Into the Deep (En lo Profundo)*, it is important to keep in mind that empathy is complicated, and its application in zoo and aquarium settings is still in its infancy. As Young, Khalil, and Wharton note, "Empathy in itself is a remarkably complex construct that is built over time and throughout myriad life experiences" (p. 12). While the findings presented here are encouraging, they should be taken with caution. The empathy-focused data collection was just one part of this evaluation. A more focused, long-term study of empathy in relation to deep-sea life would be required to make stronger claims about the relationship between empathy and *Into the Deep (En lo Profundo)*, and this construct will be revisited during the delayed-post study that is the next phase of this evaluation. Additionally, while the data suggest that *Into the Deep (En lo Profundo)* may be evoking empathy in some visitors, the data were not sufficient to understand which specific exhibition components (e.g., displays, volunteer interactions) are most instrumental in bringing about these expressions.

[8] Pfattheicher, S., Sassenrath, C., and Schindler, S. (2015). Feelings for the suffering of others and the environment: Compassion fosters proenvironmental tendencies. *Environment and Behavior, 48*(7).

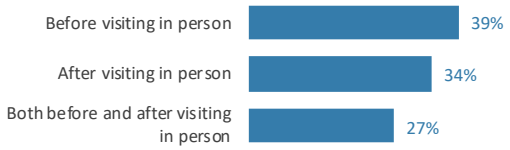
Section 5: Online Exhibition

Online Exhibition Data Summary

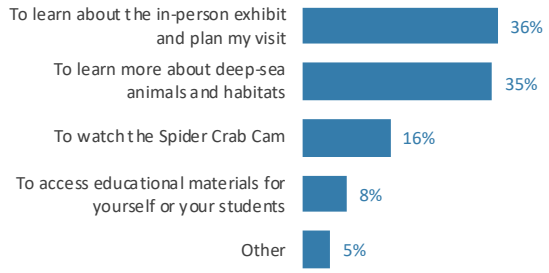
15% of exhibition guests said that they recalled visiting the companion online exhibition on the Monterey Bay Aquarium website prior to their visit. (n=797)



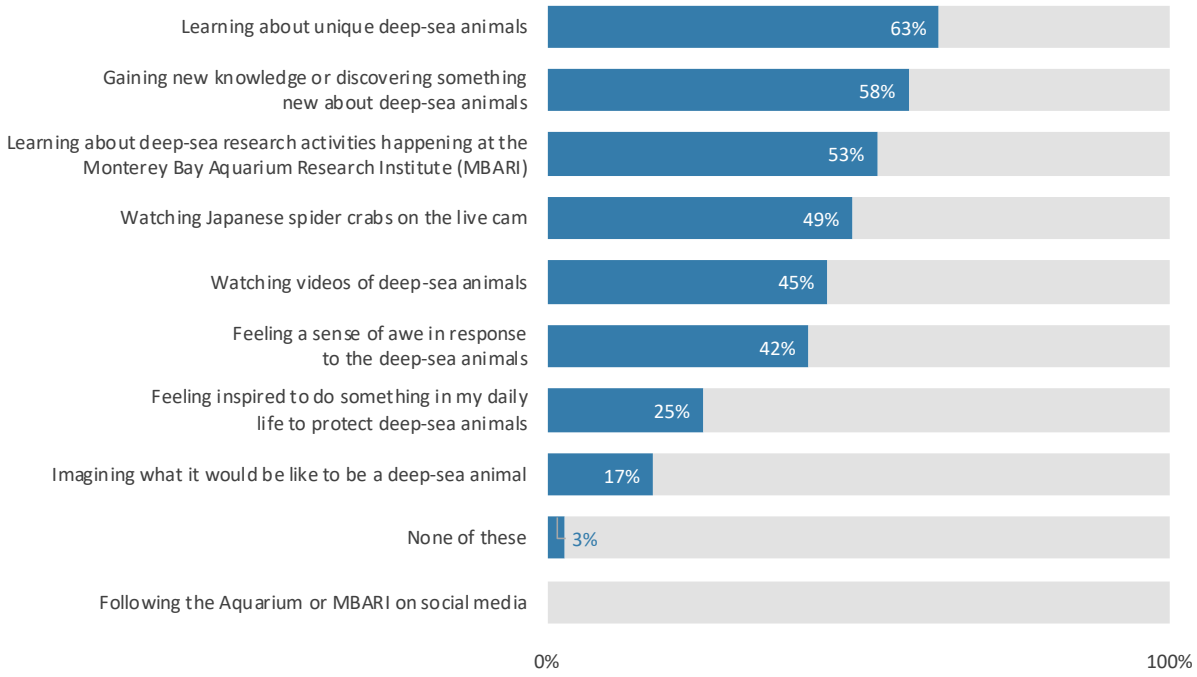
Just over one-third of these visited the online exhibition prior to their in-person visit. (n=121)



About one-third visited to plan their visit ahead of time, and another third visited to learn more about deep-sea animals. (n=121)



Learning about unique animals, Gaining new knowledge, and Learning about MBARI research activities were among the experiences selected most by online visitor as an especially satisfying part of their visit. (n=118)



Section 6: Conclusion

Conclusion and Points to Consider

Overall, this evaluation has found that visitors to *Into the Deep (En lo Profundo)* were highly satisfied with their experience, took away key messages from the exhibition, and experienced new feelings of empathy and compassion for deep-sea life. While it was not a goal of this evaluation to generate recommendations for changes to *Into the Deep (En lo Profundo)*, a few key points for the Aquarium to consider in future exhibition design emerged during our analysis.

Unique experiences
Visitors said that one of the most satisfying aspects of *Into the Deep (En lo Profundo)* was being able to see unique animals from the deep sea. They often recognized that this was an experience found nowhere else other than the Aquarium. While not every exhibition or animal that the Aquarium displays needs to be unique or unusual, there may be value in highlighting these aspects in future and/or current exhibitions elsewhere in the Aquarium.

A "secret sauce" for conservation messaging?
The evaluation findings suggest that the majority of visitors left the exhibition understanding the key conservation messages featured in *Into the Deep (En lo Profundo)*. We also know that conservation messaging was limited to a few key locations in the Aquarium. This suggests that the Aquarium's combination of (1) focused messaging in a concentrated area; (2) visually appealing and interesting features (e.g., microplastics "snow" display); and (3) interactive components (e.g., Midwater Survival Challenge game) may be a potent strategy for future exhibition design.

Strategies for fostering empathy through exhibitions
While the evaluation suggests that *Into the Deep (En lo Profundo)* may be fostering empathy for deep-sea life, there is an opportunity to enhance existing strategies or components within the exhibition explicitly aimed at fostering empathy. Explicitly testing new interpretive strategies (e.g., signage content and design) focused on fostering empathy would be new and novel within the wider zoo and aquarium community, given that much of the empathy-focused work to date has focused on programmatic interventions or the effects of existing interpretation. If the Aquarium's goal for future exhibitions is to foster empathy for the animals on display, the Aquarium should create a *clear* and *accessible* definition for what empathy means to the Aquarium and its visitors (given that empathy definitions tend to be academic and/or theoretical), and then identify and implement specific strategies to foster empathy. Overall, the Aquarium is well positioned to both draw on and contribute to empathy-focused research and practice in the future.

Create baselines across the Aquarium
At first glance, *Into the Deep (En lo Profundo)* had a high SRI and low diligent visitor rate when compared with other exhibitions and institutions. However, given variability in infrastructure, data collection protocols, overall visitor levels, etc., comparing data from the Aquarium to data from other institutions may not be most useful. While this evaluation attempted to compare

data for *Into the Deep (En lo Profundo)* with data from other exhibitions at the Aquarium, these data were roughly 10-20 years old. Future exhibition planning and evaluation at the Aquarium may benefit from more up-to-date timing and tracking data from a range of Aquarium exhibitions.

Opportunities for greater volunteer presence

During the evaluation period, the role of volunteers within *Into the Deep (En lo Profundo)* was limited to the Giant isopod touch station. Data suggest that interacting with a volunteer at the touch station was effective in helping visitors learn information about the animals. The data also suggest that the volunteer interaction made a positive contribution to the overall visitor experience within the exhibition and the Aquarium as a whole. With proper training, volunteers/docents could be an effective strategy for conveying conservation messaging (which few appeared to be explicitly doing). If stationed in other areas of the exhibition as well, volunteers may strengthen the visitor experience and potentially increase dwell time.

Finding the right balance with video

The video components of the exhibition drew some of the most polarized visitor feedback. On the one hand, visitors appreciated the footage that allowed them to see deep-sea life and research *in situ*. In contrast, one of the few critiques of the exhibition was that it featured too much video and not enough live animal displays. While this was the opinion of a minority of visitors, striking the right balance between video and live animal displays is a point for consideration in planning future exhibitions. It may be enough to simply have stronger messaging about *why* video is heavily featured. Visitors who appreciated the video in the exhibition often did so because they also understood how unique the exhibition was and how challenging it was for the Aquarium to execute. While it cannot be denied that one of the main draws to an Aquarium is the opportunity to see live animals, increasing awareness of the exhibition's complexities may in turn increase appreciation for the exhibition's video components.

Take visitors behind the scenes

While not explicitly addressed in the post-visit survey or intercept interviews, a recurring theme from visitors was that they wanted to know more about what happens "behind the scenes" to make an exhibition like *Into the Deep (En lo Profundo)* possible. Visitors often recognized how difficult it is to collect deep-sea specimens and then keep them in good health in the exhibition. They wanted to know more about the technical expertise and mechanical systems that make the exhibition possible. These topics may be opportunities for live interpretation by volunteers or for behind-the-scenes tours to be broadcast via the accompanying online exhibition.


New Discovery
Hello, my name is
Nuevo Descubrimiento
Hola, mi nombre es

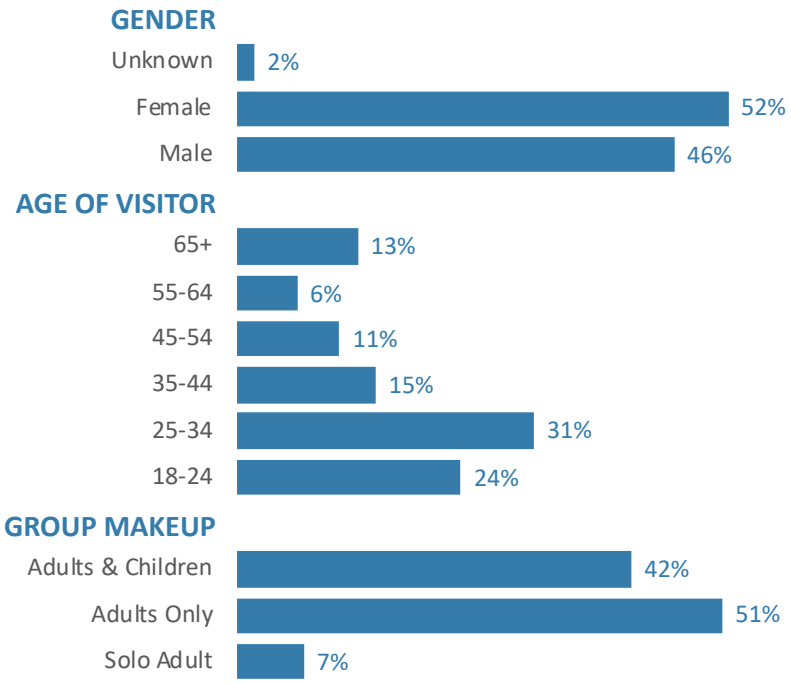
Appendices

Appendix A: Methods Detail

Timing and Tracking

We used timing and tracking to understand how visitors moved through the exhibition, where they chose to spend their time, and what types of behaviors they exhibited during their visit. We used continuous random sampling (i.e., the first adult to cross an imaginary line near the exhibition entrance becomes the subject for tracking) to select 156 visitors to unobtrusively follow as they moved through the exhibition. In addition to demographic data (e.g., approximate age, gender, group size), a data collector recorded the time (minute:seconds) when a visitor began and ended "attending to" or stopping at various exhibition elements. We also recorded "engagement behaviors" displayed by visitors, as well as whether they engaged with any staff or volunteers. Data collection took place on both weekdays and weekends, and at different times during the day. Timing and tracking data were analyzed for frequencies, means, and medians.

Demographic data for timing and tracking observations



Timing and Tracking Protocol

For this observational study, you will be using a paper map and stopwatch to trace the path that a selected visitor takes and timing how long they stop at a particular location. Our goal is to understand where visitors tend to congregate and how they devote their attention to different exhibition elements and signs.

Sampling

We will use *continuous random sampling* to ensure that we choose visitors in a random, unbiased manner. When you are ready to begin an observation, draw an imaginary line at the exhibition entrance and wait for the first adult (over the age of 18) to cross. This is the person you will be tracking from an unobtrusive distance.

Keep Your Distance

The goal of these observations is to avoid influencing the person with your actions. Though you will follow them through the exhibition, keep a distance of about 10 feet as you track their movements.

Timing and Tracking

Start the stopwatch when you have identified your random visitor. Though they may be in a group, you will only be tracing that individual's path. In addition to tracing their path, place an "x" on the map when they pause to attend to an exhibit or sign. *Attending to* is defined as spending two or more seconds looking at or interacting with an exhibit, regardless of whether they physically stop at that exhibit. You will also need to write the time from the stopwatch that they start attending and stop attending (i.e., 2:03 - 2:10) at that location. Stop timing when the participant leaves the exhibition and record the total time spent in the box at the top of the page.

Demographics and Conditions

Use the box at the top of the page to record key summary information about the visit. Record the date and approximate time you started the observation. Use your best guess for the person's age (rounded to within 5 years is fine) and gender. Note the composition of the group they are with by entering the number of party members in each age range. Crowd levels help us to understand what outside factors may influence their visit.

Timing and Tracking Instrument

Date: Time: am/pm Data Collector Initials:

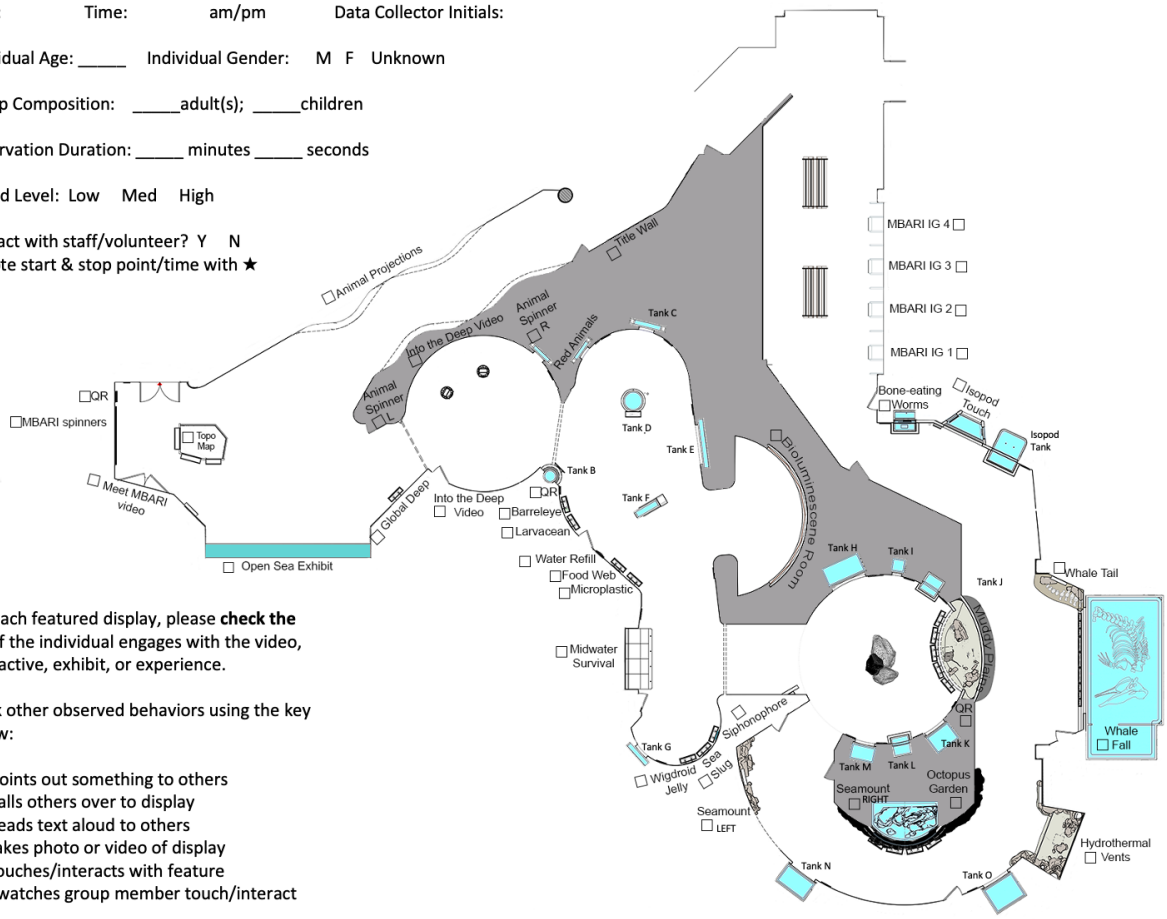
Individual Age: _____ Individual Gender: M F Unknown

Group Composition: _____adult(s); _____children

Observation Duration: _____ minutes _____ seconds

Crowd Level: Low Med High

Interact with staff/volunteer? Y N
Denote start & stop point/time with ★



For each featured display, please **check the box** if the individual engages with the video, interactive, exhibit, or experience.

Mark other observed behaviors using the key below:

P – points out something to others
C – calls others over to display
A – reads text aloud to others
F – takes photo or video of display
T – touches/interacts with feature
W – watches group member touch/interact

Visitor Intercept Interviews

Visitor intercept interviews were used to gather data from 121 *Into the Deep (En lo Profundo)* visitors as they left the exhibition. In consultation with the Aquarium, Inform developed an interview guide (below) to investigate both cognitive and affective outcomes. Data collection took place on both weekdays and weekends, and at different times during the day. Visitors were recruited for interviews using continuous random sampling near the exhibition exit. A total of 201 visitors were approached and asked to participate in an interview. One-hundred twenty-five agreed to participate (62% response rate). The data collector was fluent in both English and Spanish, though no visitors opted to complete the interview in Spanish. All interviews were recorded and transcribed for analysis. Interviews lasted approximately 2-5 minutes. Qualitative analysis of interview data was carried out using open coding to identify key themes and trends. Demographic data was summarized using frequencies and means.

Demographic data for visitor intercept interviews

First visit - yes	40	33%
First visit - no	80	66%
Member - yes	31	26%
Member - no	88	73%
Avg. # adults in party		2.2
Avg. # children in party		0.4
Avg. age		39

Interview Protocol

- Welcome
- Interviewing visitors to learn more about your impressions of the exhibition.
- No right or wrong answers -- looking for your open and honest feedback.
- Skip any question you'd like.
- Can quit at any time.
- Permission to record.

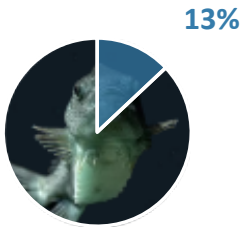
1. What stands out to you most about the *Into the Deep* exhibition? Why?
2. What is one new idea or thought that you had while going through *Into the Deep*?
    a. Do you remember where or how you learned about that in the exhibition? (Use map for reference, as appropriate.)
3. If anything, what did you learn about threats facing our oceans or ways to protect the ocean by visiting the *Into the Deep* exhibition?
    a. Do you remember where or how you learned about that in the exhibition? (Use map for reference, as appropriate.)
4. What is most memorable about the animals in the *Into the Deep* exhibition?
    a. Did your feelings about deep sea animals change in any way as a result of this exhibition?
5. Did you talk or interact with an Aquarium volunteer or staff member in the exhibition?
    a. Did you do the isopod touch activity and have someone help you with that?
    b. What did you discuss or do?
    c. Did the staff member or volunteer add to your visit in any way? If so, how?
6. Is there anything else you'd like to share about the *Into the Deep* exhibition?
7. Is this your first visit to the Aquarium?
8. How many adults are in your group today? How many children?
9. Are you a member of the Aquarium?
10. How old are you?

Survey of Recent Visitors

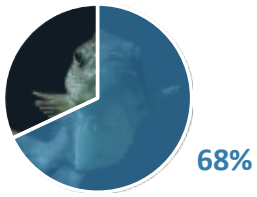
We worked with the Aquarium to distribute a post-visit survey via email to all visitors between June 25-Aug. 22, 2022, (and for whom the Aquarium has a valid email address). The survey investigated cognitive and affective outcomes, and included both closed- and open-ended questions. The survey was set up using Survey Monkey, and was available in both English and Spanish. The survey began by asking whether guests visited *Into the Deep (En lo Profundo)*. Those that did not visit the exhibition (or could not recall) were excluded from the remainder of the survey. An invitation to complete the survey was sent to 37,063 email addresses. There were 262 bounces. There were 1,566 unique clicks on the survey link in the email. Of the 1,263 who began the survey, 802 recalled visiting the exhibition and completed the entire survey. A total of seven respondents completed the Spanish-language version of the survey. Analysis of survey data included descriptive and inferential statistics (paired *t*-tests) for closed-ended questions, and open coding for open-ended questions.

Demographic data for post-visit survey

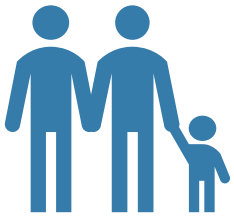
13% of respondent were first-time Aquarium visitors.



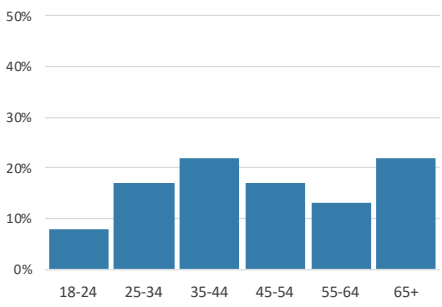
68% of respondent were Aquarium members.



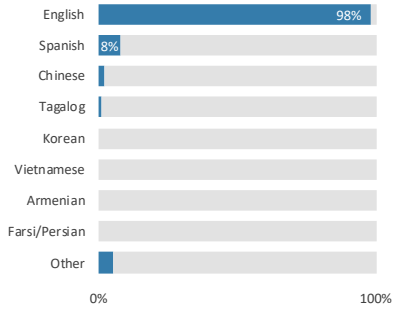
The median group size was two adults and one child.

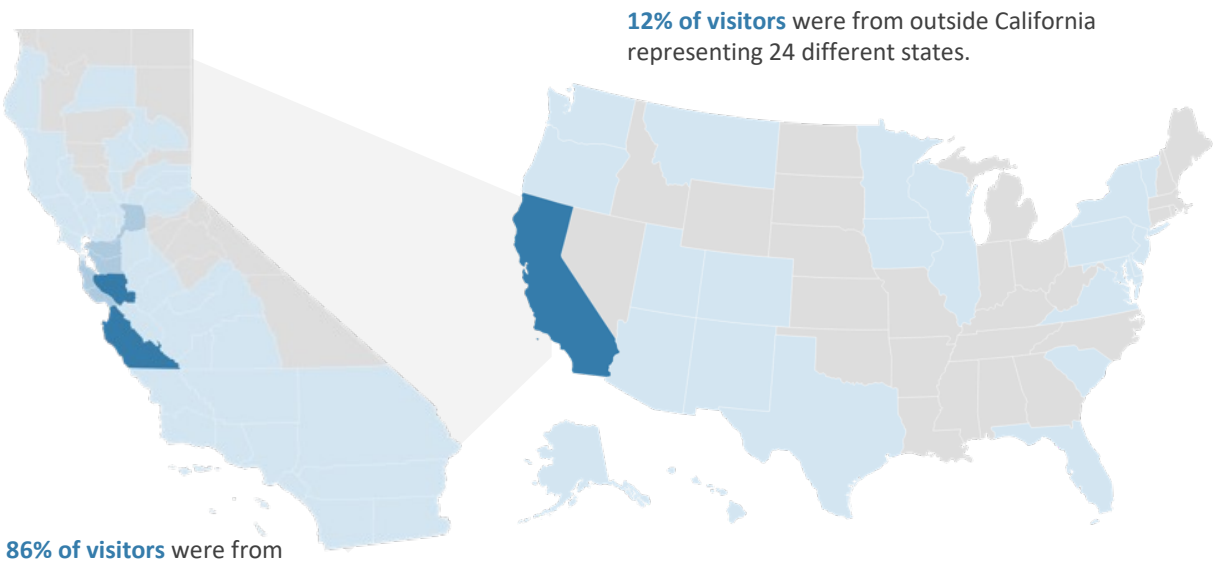


Just over half of respondent were 45 years of age or older.



Nearly all (98%) of visitors said they speak English at home. 8% speak Spanish.





12% of visitors were from outside California representing 24 different states.

86% of visitors were from the state of California. Of in-state residents, 34% were from Santa Clara and Monterey counties (17% each).

2% of visitors were from outside the United States representing seven countries; United Kingdom, Germany, Canada, France, Mexico, Norway, and Poland.

Survey Instrument

The Monterey Bay Aquarium recently opened its new *Into the Deep (En lo Profundo)* exhibition. We are gathering feedback from our visitors about the new exhibition. Our records show that you recently visited the Aquarium. Therefore, we are inviting you to take part in a survey about your experience.

This survey will take you about 5 to 10 minutes to complete. Responses to the survey will be confidential. We will not ask for any identifying information.

If you have any questions about this survey, please contact Brian Johnson (brian@informeval.com). Thank you for your time!

1. During your recent visit to the Monterey Bay Aquarium, did you visit the new *Into the Deep* exhibition?
    a. If "no" or "I don't recall," respondents are disqualified and the survey ends.
2. How would you rate your overall experience of the *Into the Deep* exhibition?
    a. Poor
    b. Fair
    c. Good

    d. Excellent
    e. Outstanding
3. Why did you choose that rating?
4. What stood out for you most about the *Into the Deep* exhibition and why?
5. If any, which of the following experiences were especially satisfying to you in the *Into the Deep* exhibition? (Select all that apply.)
    a. Gaining new knowledge or discovering something new about deep-sea animals
    b. Talking with or listening to Aquarium staff or volunteers about deep-sea animals
    c. Seeing rare or unique deep-sea animals
    d. Watching videos of deep-sea animals that can't be displayed at the Aquarium
    e. Learning about deep-sea research activities happening at the Monterey Bay Aquarium Research Institute (MBARI)
    f. Feeling inspired to do something in my daily life to protect deep-sea animals
    g. Imagining what it would be like to be a deep-sea animal
    h. Watching deep-sea animals move, play, or be active
    i. Feeling a sense of awe in response to the deep-sea animals
    j. None of these
6. What is one new idea you learned by visiting the *Into the Deep* exhibition?
    a. Do you remember where or how you learned about that in the exhibition?
7. Think about your experience visiting the *Into the Deep* exhibition. Please rate how much you would have agreed or disagreed with each of the following statements before your visit, and how much you agree or disagree with each statement now.
    a. I understand what animals need to survive in the deep sea.
    b. I understand the connection between deep-sea animals and people.
    c. I understand how deep-sea animals interact with one another.
    d. I understand how my actions can impact the deep-sea environment and its animals.
    e. I understand how conservation issues impact deep-sea animals.
    f. I feel compassion for deep-sea animals.
    g. I am concerned about the well-being of deep-sea animals.
    h. I feel connected to the deep sea and its animals.
    i. I feel in awe of deep-sea animals.
    j. I want to help deep-sea animals and their environment.
    k. I want to share what I learned about deep-sea animals with others.
8. Did you interact with a volunteer or staff member in the *Into the Deep* exhibition?
    a. [If yes] What did you discuss or do?
    b. [If yes] Did the staff member or volunteer add to your visit in any way? If so, how?
9. Have you seen the companion online exhibition for *Into the Deep (En lo Profundo)* on the Monterey Bay Aquarium website? (https://www.montereybayaquarium.org/intothedeep)
    a. Yes
    b. No
    c. I don't recall.

10. Did you visit the *Into the Deep (En lo Profundo)* online exhibition before or after your in-person visit?
    a. Before visiting in person
    b. After visiting in person
    c. Both before and after visiting in person
11. What was the reason for your visit to the online exhibition?
    a. To learn about the in-person exhibition and plan my visit
    b. To learn more about deep-sea animals and habitats
    c. To watch the Spider Crab Cam
    d. To access educational materials for yourself or students
    e. Other (please explain) _____
12. If any, which of the following experiences were especially satisfying to you in the *Into the Deep (En lo Profundo)* **online** exhibition? (Select all that apply.)
    a. Gaining new knowledge or discovering something new about deep-sea animals
    b. Learning about unique deep-sea animals
    c. Watching videos of deep-sea animals
    d. Watching Japanese spider crabs on the live cam
    e. Learning about deep-sea research activities happening at the Monterey Bay Aquarium Research Institute (MBARI)
    f. Following the Aquarium or MBARI on social media
    g. Feeling inspired to do something in my daily life to protect deep-sea animals
    h. Imagining what it would be like to be a deep-sea animal
    i. Feeling a sense of awe in response to the deep-sea animals
    j. None of these
13. Do you have any other thoughts or comments about the online exhibition?
14. Was this your first visit to the Monterey Bay Aquarium?
15. Are you a member of the Monterey Bay Aquarium?
16. How many adults were in your group?
17. How many children were in your group?
18. How old are you?
    a. 18-24
    b. 25-34
    c. 35-44
    d. 45-54
    e. 55-64
    f. 65+
19. What is your zip code? (If you are not from the United States, please enter the country you were visiting from.)
20. What language do you speak at home most often?
    a. English
    b. Spanish
    c. Chinese

d. Tagalog
e. Korean
f. Vietnamese
g. Armenian
h. Farsi/Persian
i. Other (please specify)

Empathy Observations

To better understand empathy-related outcomes, we used a modified version of the visitor observation tool developed by the Measuring Empathy Collaborative Assessment Project (MECAP). MECAP consists of a group of zoo and aquarium professionals and researchers working to generate and validate instruments to measure empathy in zoo and aquarium audiences. The observation tool included more than 30 expressions of empathy and related emotions (see below) that can be observed in aquarium and zoo visitors. We conducted 209 observations using the empathy observation tool, collecting visitor data at a variety of exhibition components in order to better understand which parts of the exhibition are most effective at eliciting empathic reactions *during* the visitor experience. Observations focused on an entire visiting group (e.g., family, friend group) – not individuals. Observations took place in four locations within the exhibition: Isopod touch station, Whalefall, the Predatory tunicates, and Bloody-belly comb jellies. Continuous random sampling was used to select a group for observation. After a group was selected, the data collector discreetly followed that group until they left the observation area. Using the observation log sheet (one log sheet per group), the data collector recorded details of what was observed, where in the exhibition it was observed, and any other relevant information.

Empathy-related Behaviors and Examples

Observable Behavior or Engagement	**Description of what to look for (*example quotes)***
Understands needs of an animal	
Talks about animal's basic needs (e.g., food)	*"The animal needs its breakfast."*
Talks about additional animal needs	Recognizes additional animal needs, such as social, environmental, reproductive, or activity.
Compares self to animal (similarities)	*"The animal likes to swim too!"* *"They have eyes just like I do."*
Contrasts self to animal (differences)	*"They don't have a nose like I do."* *"They don't live on land like I do."*

Able to take perspective of animals	
Predicts or speaks to animal's state or emotion	"*I think he's mad.*" "*Maybe it's hungry.*"
Provides reasonable explanation for prediction of emotion	*"That octopus seems really relaxed. They're a paler color when they're relaxed."*
Mimics the behavior of an animal	Pretends to act like an animal through movement or expression.
Has compassionate concern for animals	
Shows concern for the direct well-being of an animal	"*I think I'm scaring the animal.*" "*Is it safe for the smaller fish to share a tank with the the other animals?"*
Expresses ways people can contribute to animal's direct well-being	*"If we are quiet and don't bang on the glass, the animal won't freak out."* *"If we use less plastic, the animal will be better off."*
Shows positive behavior towards animals	
Self-regulates behavior to make animal feel safe or calm	Sits still; stays quiet; doesn't bang on glass. Recognizes that it's not good to take flash photos.
Corrects behavior of others to be more positive around animal	Models or corrects other's behavior. *"Don't bang on the glass!" "Don't use the flash on your camera!"*
Has interest or curiosity toward animal	
Observes animal closely	Watches animal with expressed interest; points to and follows animal with finger.
Verbalizes observations of animal	Comments on their own observations. *"I can see him breathing."*
Seeks information about animal	Asks question to staff/volunteer/group member about the animal. Looks for information on sign.
Wants to observe longer or for a second time	Comes back for a second look at an animal. Doesn't want to move along in the exhibition.
Has appreciation/respect for animal	
Verbalizes appreciation, gratitude or love for animal.	*"I love wolf eels. They're like old men."*

Shows non-verbal appreciation/love toward animal.	Laughs, smiles at animal.
Verbalizes positive feelings about animal's characteristics	*"That animal is so beautiful."* *"I can't believe how smart octopus are."*
Recognizes animal as individual with own agency	
Comments on animal's independent movements	*"Woah, look at the sea urchin moving."*
Uses pronouns/personal name of animal	Refers to animal as a "he" or "she" or by name.
Greets or says goodbye to animal	Waves to animal or says, *"Hi, Barney."*
Speaks to animal (beyond greeting)	*"Barney, you sure do love to eat fish, don't you?"*

Empathy Observation Log Sheet

Data collector _____ **Date & Time** _____

Observation area _____

# of adults in group _____ **# of children in group** _____

Observable Behavior or Engagement	Description and Notes
Understands needs of an animal	
Talks about animal's basic needs (e.g., food)	
Talks about additional animal needs	
Compares self to animal (similarities)	
Contrasts self to animal (differences)	
Able to take perspective of animals	
Predicts or speaks to animal's state or emotion	

Provides reasonable explanation for prediction of emotion	
Mimics the behavior of an animal	
Has compassionate concern for animals	
Shows concern for the direct well-being of an animal	
Expresses ways people can contribute to animal's direct well-being	
Shows positive behavior towards animals	
Self-regulates behavior to make animal feel safe or calm	
Corrects behavior of others to be more positive around animal	
Has interest or curiosity toward animal	
Observes animal closely	
Verbalizes observations of animal	
Seeks information about animal	
Wants to observe longer or for a second time	
Has appreciation/respect for animal	
Verbalizes appreciation, gratitude or love for animal.	
Shows non-verbal appreciation/love toward animal.	
Verbalizes positive feelings about animal's characteristics	
Recognizes animal as individual with own agency	
Comments on animal's independent movements	

Uses pronouns/personal name of animal	
Greets or says goodbye to animal	
Speaks to animal (beyond greeting)	

Empathy Card Sort and Interviews

To investigate empathy-related outcomes visitors may have taken away from the exhibition, we used a card sort activity and follow-up interview. Visitors were shown an image of a deep-sea animal and then were asked to select words from a list that best matched how they felt about that animal. Follow-up interview questions were used to probe why visitors selected each word. Using continuous random sampling, 256 adult visitors (18 and over)[9] were invited to participate in the card sort and interview; 130 visitors agreed to participate (59.8% response rate). Half of the interviews were conducted near the entrance to the Aquarium. Half were conducted at the exit of *Into the Deep (En lo Profundo)*.

Empathy Card Sort Instructions and Interview Guide

Welcome

- Interviewing visitors to learn more about your impressions of animals at the Aquarium.
- No right or wrong answers -- looking for you to be open and honest.
- Can quit at any time.
- Permission to record.

Instructions

"Have a look at this picture of a XXXXXX. On the table are a range of cards with words on them. Please choose up to three words that best match what you think or feel about this animal."

Follow up: "Can you tell me about why you chose those cards?"

Card choices

- Ugly
- Beautiful
- Unfriendly
- Friendly
- Important

[9] Occasionally, a parent/caregiver would invite their child to be part of the interview by asking them to answer some of the questions. When this happened, we proceeded with the interview as normal, so long as the originally sampled visitor was 18 or older.

- Not important
- Interesting
- Boring
- No personality
- Lots of personality
- Similar to me
- Not similar to me
- Sad
- Happy
- Healthy
- Unhealthy

"Now, I'd like you to take another look and choose up to three words that are the opposite of what you think or feel about this animal."

Follow up: "Can you tell me about why you chose those cards?"

<u>Follow-up questions</u>

1. Are there any other words that you would use to describe what you think or feel about these animals?
2. How much would you say you are concerned about the well-being of these animals? Why?
3. Is there anything else that comes to mind about how you feel about these animals?

Appendix B: Reasons for Overall Experience Ratings

Reason	# (n)	%	Illustrative Quotes
Unique nature of the exhibition	117	19.2%	*"It was amazing to see unique sea creatures that are not available elsewhere."*
Overall exhibition quality	97	15.9%	*"It meets the same level of quality as the rest of the aquarium."*
Learning opportunities	80	13.1%	*"Well designed and educational exhibit. I appreciate the explanation of how the aquarium brings those animals to the surface."*
Engaging	63	10.3%	*"This immersive exhibit was phenomenally engaging. One of the best aquarium experiences we ever had."*
Design	44	7.2%	*"It was very well designed, and I liked how they made you feel like you were actually in the deep sea (very dark/colder)."*
Awe-inspiring	37	6.1%	*"I really love the exhibit…. The huge crabs are awe-inspiring. Oh, also those lobster larvae riding jellyfish are so interesting!"*
Animals	30	4.9%	*"I'd seen these animals on documentaries before– I never thought I'd actually get to see any of them in person."*
Interactive	30	4.9%	*"We really enjoyed this exhibit. There were many amazing animals to view, lots of interactive experiences, and it was learning rich."*

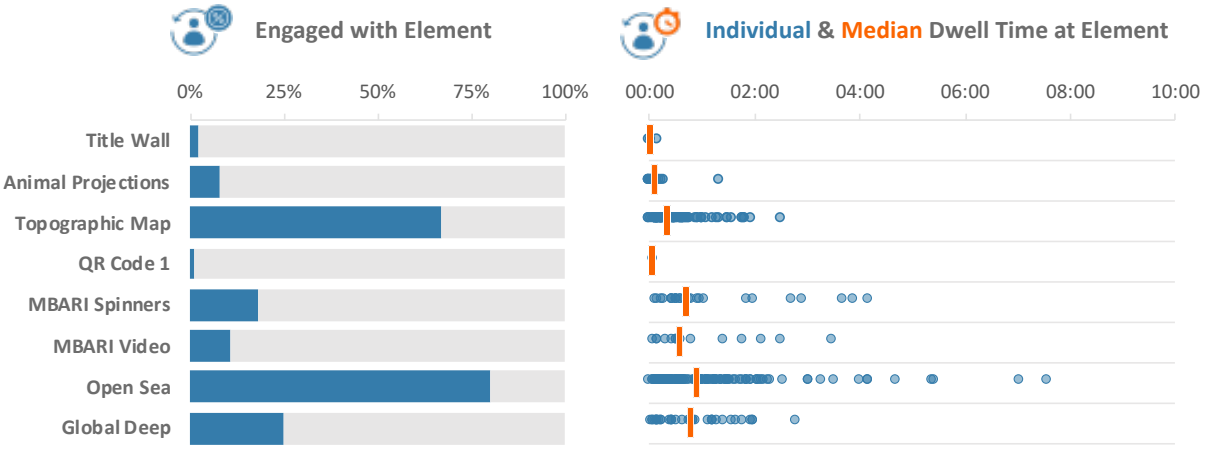
Appendix C: Exhibition Zone Timing and Tracking Detail

A detailed summary of timing and tracking for each exhibition zone begins on the next page. For specific locations of all exhibition components highlighted in this appendix, please refer to the Timing and Tracking instrument on Page 43.

Intro & Down to the Deep

Engagement and Dwell Time at Exhibit Elements

142 visitors engaged in this zone. Data show proportion of these visitors who stopped at element and their respective dwell time at each.



Frequency of Engagement Behaviors at Exhibit Elements

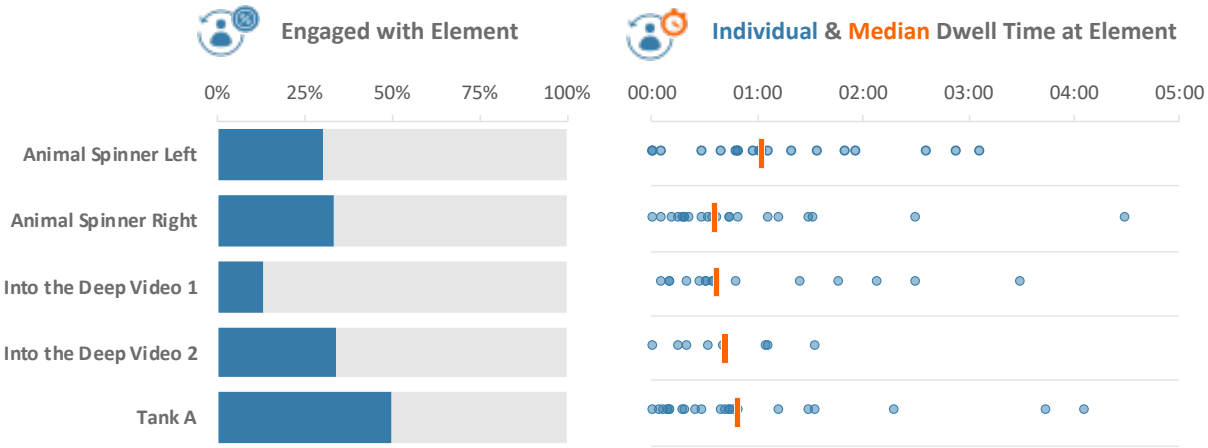
142 visitors engaged in this exhibit zone. The heat table represents the number of instances of each engagement behavior recorded (for exhibit element-level these counts also represent number of visitors who engaged in the behavior, i.e. 47 visitors were observed pointing at Open see).

	Pointed to something	Called to someone	Read aloud	Took photo/video	Touched/ Interacted	Watched someone interacting
Title Wall	-	-	-	-	1	-
Animal Projections	3	1	2	1	1	-
Topographic Map	31	5	12	3	33	3
QR Code 1	-	-	-	-	-	-
MBARI Spinners	1	-	3	3	11	6
MBARI Video	1	-	-	2	-	-
Open Sea	47	7	3	29	9	4
Global Deep	18	1	3	3	9	3

Deep Sea Intro

Engagement and Dwell Time at Exhibit Elements

64 visitors engaged in this zone. Data show proportion of these visitors who stopped at element and their respective dwell time at each.



Frequency of Engagement Behaviors at Exhibit Elements

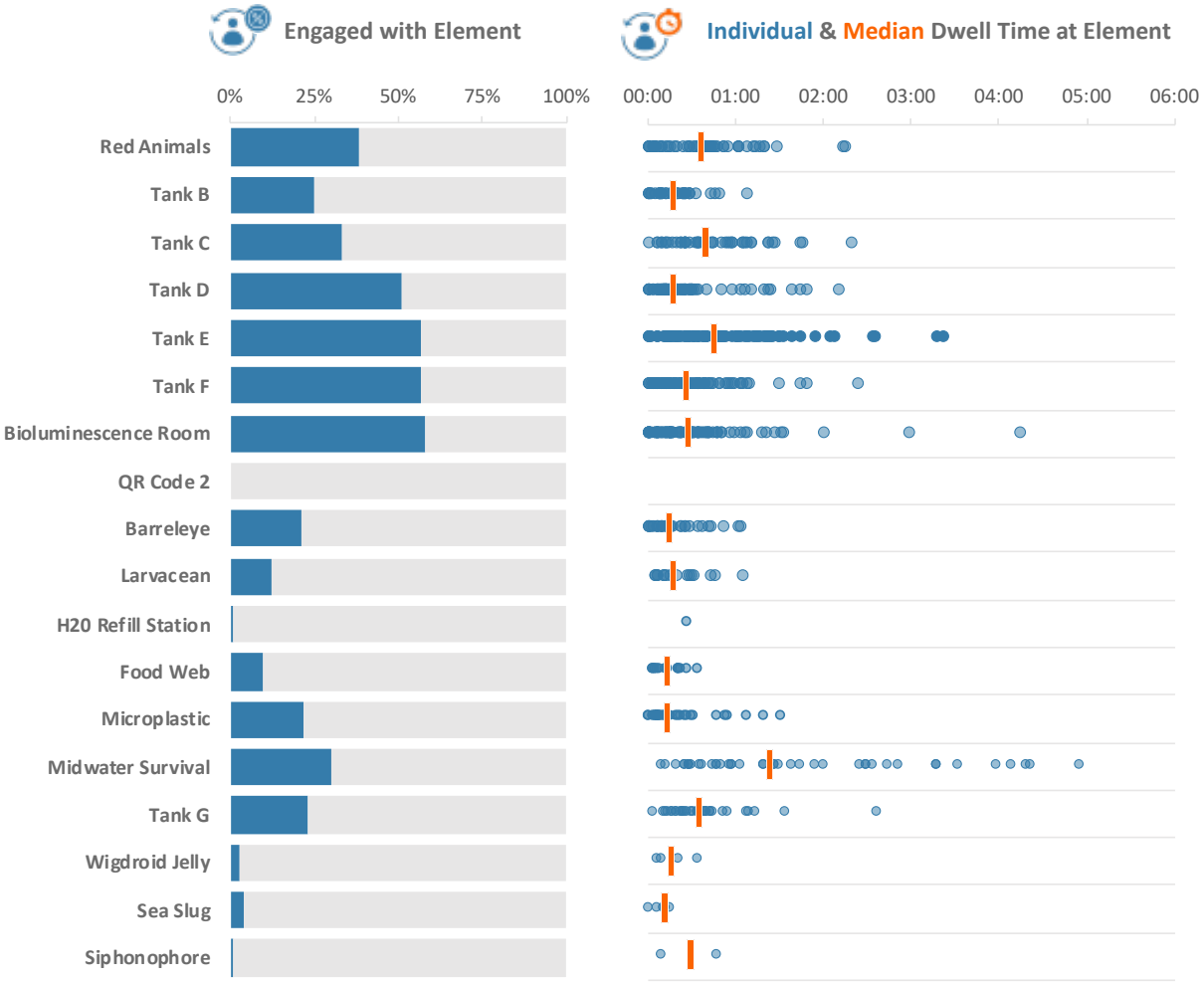
64 visitors engaged in this exhibit zone. The heat table represents the number of instances of each engagement behavior recorded (for exhibit element-level these counts also represent number of visitors who engaged in the behavior, i.e. 12 visitors were touching/interacting at Animal Spinner Right).

	Pointed to something	Called to someone	Read aloud	Took photo/video	Touched/ Interacted	Watched someone interacting
Animal Spinner Left	1	-	1	2	7	12
Animal Spinner Right	-	-	4	1	12	8
Into the Deep Video 1	1	-	-	-	-	-
Into the Deep Video 2	4	-	-	2	-	-
Tank A	5	2	-	6	2	-

Midwater

Engagement and Dwell Time at Exhibit Elements

138 visitors engaged in this zone. Data show proportion of these visitors who stopped at element and their respective dwell time at each.



Midwater

Frequency of Engagement Behaviors at Exhibit Elements

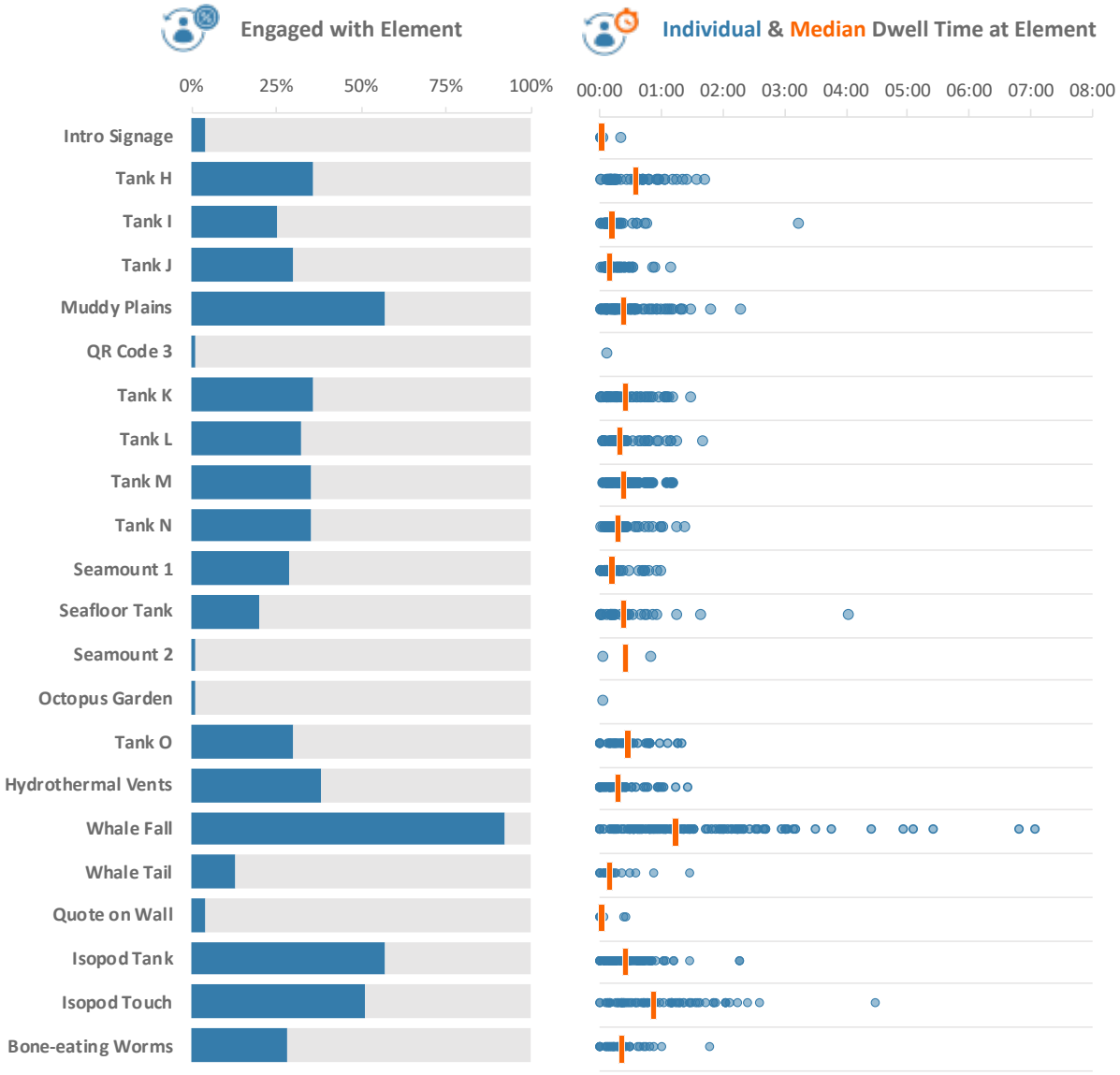
138 visitors engaged in this exhibit zone. The heat table represents the number of instances of each engagement behavior recorded (for exhibit element-level these counts also represent number of visitors who engaged in the behavior, i.e. 28 visitors were taking photos/video at Tank E).

	Pointed to something	Called to someone	Read aloud	Took photo/video	Touched/ Interacted	Watched someone interacting
Red Animals	4	3	5	15	7	2
Tank B	6	1	3	-	2	1
Tank C	4	4	2	13	1	1
Tank D	6	2	1	5	6	2
Tank E	12	4	2	28	-	1
Tank F	13	4	-	9	2	2
Bioluminescence Room	2	3	1	5	1	1
QR Code 2	-	-	-	-	-	-
Barreleye	3	1	1	-	11	5
Larvacean	3	-	-	-	1	2
H20 Refill Station	-	-	-	-	-	-
Food Web	-	-	-	-	-	1
Microplastic	1	1	3	-	10	7
Midwater Survival	1	-	1	-	21	25
Tank G	1	-	1	6	-	-
Wigdroid Jelly	-	-	-	-	-	-
Sea Slug	-	-	-	-	-	-
Siphonophore	-	-	-	-	-	-

Seafloor

Engagement and Dwell Time at Exhibit Elements

138 visitors engaged in this zone. Data show proportion of these visitors who stopped at element and their respective dwell time at each.



Seafloor

Frequency of Engagement Behaviors at Exhibit Elements

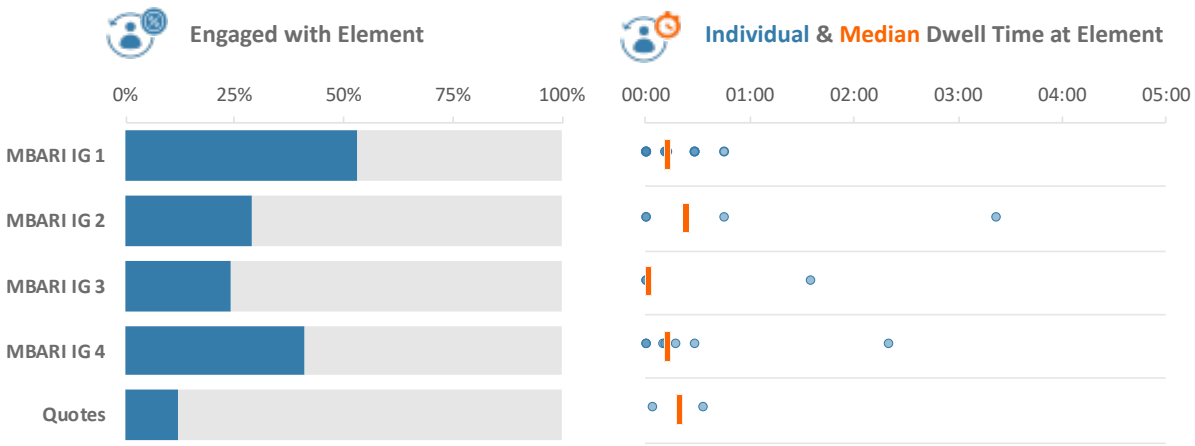
138 visitors engaged in this exhibit zone. The heat table represents the number of instances of each engagement behavior recorded (for exhibit element-level these counts also represent number of visitors who engaged in the behavior, i.e. 40 visitors were observed taking photos or video at Whale Fall).

	Pointed to something	Called to someone	Read aloud	Took photo/video	Touched/ Interacted	Watched someone interacting
Intro Signage	1	-	1	1	-	-
Tank H	10	2	3	5	1	-
Tank I	2	-	2	5	-	-
Tank J	3	-	-	3	1	-
Muddy Plains	11	3	4	2	4	10
QR Code 3	-	-	-	-	-	-
Tank K	5	2	2	1	-	-
Tank L	9	-	4	3	-	-
Tank M	6	2	-	6	1	-
Tank N	3	-	1	12	-	-
Seamount 1	1	1	-	1	1	1
Seafloor Tank	2	-	1	-	-	1
Seamount 2	-	-	-	-	-	-
Octopus Garden	-	-	-	-	-	-
Tank O	6	2	1	3	-	-
Hydrothermal Vents	8	2	2	1	2	2
Whale Fall	33	5	7	40	2	7
Whale Tail	-	-	1	3	-	1
Quote on Wall	-	-	-	-	-	-
Isopod Tank	6	5	2	6	-	2
Isopod Touch	2	3	-	3	26	23
Bone-eating Worms	1	1	2	1	-	-

On the Horizon

Engagement and Dwell Time at Exhibit Elements

17 visitors engaged in this zone. Data show proportion of these visitors who stopped at element and their respective dwell time at each.



Frequency of Engagement Behaviors at Exhibit Elements

17 visitors engaged in this exhibit zone. The heat table represents the number of instances of each engagement behavior recorded (for exhibit element-level these counts also represent number of visitors who engaged in the behavior, i.e. 3 visitors were observed watching someone touch/interact at MBARI IG 4).

	Pointed to something	Called to someone	Read aloud	Took photo/video	Touched/ Interacted	Watched someone interacting
MBARI IG 1	-	-	-	-	2	2
MBARI IG 2	-	-	-	2	1	2
MBARI IG 3	-	-	-	-	-	1
MBARI IG 4	-	-	-	-	2	3
Quotes	-	-	1	-	-	-

Appendix D: Significance Tests for Retrospective Pre-Post Data

	Before Visit			After Visit			
	n	% Agree or Strongly Agree	Mean	*n*	% Agree or Strongly Agree	Mean	*t*
I understood what animals need to survive in the deep sea.	799	44%	3.23	796	85%	4.17	-25.85***
I understood the connection between deep-sea animals and people.	794	35%	3.06	794	76%	3.99	-25.302***
I understood how deep-sea animals interact with one another.	796	31%	2.91	796	82%	4.03	-30.805***
I understood how my actions can impact deep-sea animals.	796	56%	3.47	796	86%	4.25	-22.227***
I understood how conservation issues impact deep-sea animals.	796	56%	3.5	795	87%	4.25	-22.417***
I was concerned about the well-being of deep-sea animals.	793	62%	3.66	794	91%	4.38	-21.094***
I felt connected to the deep sea and its animals.	795	35%	3.06	794	81%	4.15	-28.287***
I felt in awe of deep-sea animals.	798	76%	3.93	798	95%	4.62	-20.965***
I wanted to help deep-sea animals and their environment.	793	54%	3.57	791	85%	4.23	-22.973***
I wanted to share what I learned about deep-sea animals with others.	791	37%	3.22	785	78%	4.1	-25.036***
*p < .05. **p < .01. ***p < .001							

Appendix E: Empathy Observation Data

Observation Location		
Isopod Touch	56	26.8%
Whale Fall	58	27.8%
Seafloor	51	24.4%
Midwater	44	21.1%
Group Composition		
Adults Only	94	45.0%
Adults with Children	85	40.7%
Solo Adult	30	14.4%

Empathy Codes	All data count	All data %	Isopod count	Isopod %	Whale Fall count	Whale Fall %	Seafloor count	Seafloor %	Midwater count	Midwater %
Understands needs of an animal	46	22.0%	19	33.9%	16	27.6%	6	11.8%	5	11.4%
Talks about animal's basic needs (e.g., food)	33	15.8%	14	25.0%	13	22.4%	4	7.8%	2	4.5%
Talks about additional animal needs	12	5.7%	8	14.3%	1	1.7%	1	2.0%	2	4.5%
Compares self to animal (similarities)	5	2.4%	0	0.0%	3	5.2%	1	2.0%	1	2.3%
Contrasts self to animal (differences)	1	0.5%	0	0.0%	1	1.7%	0	0.0%	0	0.0%
Able to take perspective of animals	11	5.3%	1	1.8%	7	12.1%	0	0.0%	3	6.8%
Predicts or speaks to animal's state or emotion	4	1.9%	1	1.8%	3	5.2%	0	0.0%	0	0.0%
Provides reasonable explanation for prediction of emotion	1	0.5%	0	0.0%	1	1.7%	0	0.0%	0	0.0%
Mimics the behavior of an animal	7	3.3%	0	0.0%	4	6.9%	0	0.0%	3	6.8%
Has compassionate concern for animals	4	1.9%	2	3.6%	1	1.7%	1	2.0%	0	0.0%
Shows concern for the direct well-being of an animal	4	1.9%	2	3.6%	1	1.7%	1	2.0%	0	0.0%

Expresses ways people can contribute to animal's direct well-being	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Shows positive behavior towards animals	125	59.8%	44	78.6%	36	62.1%	30	58.8%	15	34.1%
Self-regulates behavior to make animal feel safe or calm	119	56.9%	42	75.0%	32	55.2%	30	58.8%	15	34.1%
Corrects behavior of others to be more positive around animal	16	7.7%	8	14.3%	7	12.1%	0	0.0%	1	2.3%
Has interest or curiosity towards animal	183	87.6%	40	71.4%	51	87.9%	50	98.0%	42	95.5%
Observes animal closely	148	70.8%	21	37.5%	46	79.3%	46	90.2%	35	79.5%
Verbalizes observations of animal	65	31.1%	9	16.1%	20	34.5%	17	33.3%	19	43.2%
Seeks information about animal	94	45.0%	21	37.5%	22	37.9%	26	51.0%	25	56.8%
Wants to observe longer or for a second time	30	14.4%	11	19.6%	9	15.5%	6	11.8%	4	9.1%
Has appreciation/respect for animal	127	60.8%	42	75.0%	37	63.8%	19	37.3%	29	65.9%
Verbalizes appreciation, gratitude, or love for animal	42	20.1%	9	16.1%	14	24.1%	9	17.6%	10	22.7%
Shows non-verbal appreciation/love toward animal	101	48.3%	39	69.6%	29	50.0%	12	23.5%	21	47.7%
Verbalizes positive feelings about animal's characteristics	24	11.5%	5	8.9%	8	13.8%	5	9.8%	6	13.6%
Recognizes animal as individual with own agency	32	15.3%	4	7.1%	17	29.3%	7	13.7%	4	9.1%
Comments on an animal's independent movements	17	8.1%	0	0.0%	9	15.5%	4	7.8%	4	9.1%
Uses pronouns/personal name of animal	9	4.3%	2	3.6%	4	6.9%	3	5.9%	0	0.0%
Greets or says goodbye to animal	4	1.9%	2	3.6%	2	3.4%	0	0.0%	0	0.0%
Speaks to animal (beyond greeting)	4	1.9%	0	0.0%	4	6.9%	0	0.0%	0	0.0%