Museum of Science, Boston
Live Animal Garden Formative Evaluation
Final Evaluation Report
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1. EXECUTIVE SUMMARY

The Museum of Science, Boston intends to expand its Insect Zoo and Butterfly Garden to create a new Live Animal Garden gallery aimed at connecting visitors with the living world and inspiring visitors towards conservation action. This formative evaluation was conducted to help guide the design and decision-making process for this endeavor, seeking to gather insights around which types of animals are most popular, which signage and display styles guests prefer, and how exhibit messaging could be optimally conveyed.

In collaboration with Museum stakeholders Jackie Peeler, Senior Curator and Head of the Live Animal Team, and Michael Horvath, Senior Director of Exhibits, the evaluation team decided to focus on three existing live animal exhibits: the Charles River Gallery, Insect Zoo, and Tamarin enclosure from the Hall of Human Life. Six evaluation questions were crafted to probe how visitors perceived, discussed, and engaged with each exhibit, as well as what learning outcomes they walked away with. We employed three instruments to investigate these questions. In-gallery observations and in-gallery interviews—including controlled A/B testing for varied signage conditions for the tamarin enclosure—examined how guests responded to specific live animal exhibits in any given moment, while exit surveys explored their reflections on the exhibits as a collective whole after the fact. We collected a total of 84 observations and 24 interviews spread across all three galleries, as well as 22 exit surveys.

Findings revealed overwhelmingly positively visitor emotional reactions to the live animals, with children slightly more likely to express positive emotions than adults. Some visitors were unaware that the Museum offered live animals, though they expressed an interest in seeing them. Those that did visit the exhibits seemed to find them engaging—as evidenced by both observations and self-reporting—and the displays often successfully facilitated conversations both within and between visiting groups. Play-based interactive and non-animal elements within exhibits—like the tunnel system in the Charles River Gallery—were particularly effective at engaging visitors, especially children.

Although many visitors remarked on the novelty of being able to see live animals at the Museum and most believed they learned something new from the live animals during their visit, fewer were able to articulate exactly *what* they learned or to correctly identify the Museum's intended messaging. The addition of digital signage in the Tamarin enclosure had an impact on this: adding signage with conservation messaging was correlated with more visitors making connections to conservation efforts, even when few people directly engaged with the sign.

Finally, many visitors expressed a desire for more animals—both in terms of quantity and variety—and some also requested that more or different information about them be provided.

After conducting our evaluation, the research team believes that the Museum's *Live Animal Garden* project will serve many excited and engaged visitors after its completion, hopefully guided by the insights included herein.

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2. INTRODUCTION

The Museum of Science, Boston (MOS) is a premier cultural attraction in New England that invites visitors of all ages to explore and engage with a wide range of scientific topics—from astronomy and physics to biology and math—through hands-on exhibits and immersive programs.

In addition to offering hundreds of exhibits investigating scientific phenomena, the Museum is also accredited by the Association of Zoos and Aquariums (AZA) and boasts an extensive live animal collection comprising birds, mammals, fish, reptiles, amphibians, and insects. Many of these animals are currently spread out across the Museum to supplement broader galleries; however, in the coming years, the Museum plans to transform its existing Insect Zoo and Butterfly Garden space into a new, more holistic "Live Animal Garden" gallery that aims to connect the public with the living world and inspire action in the interest of climate response and species preservation.

Although still in early planning stages, the Live Animal Garden is envisioned to present "a rotating range of environments and [their] accompanying flora and fauna," and introduce actionable insights into "how visitors can support species living with [environmental] change" (Museum of Science, 2022). Other planned elements include: multisensory experiences, play spaces designated for early learners, and close encounters with animals.

At the time of this evaluation, the Museum had not yet made final decisions about what specific animals will be featured in the Live Animal Garden, what types of casework or signage will be included, nor how exhibit messaging will be conveyed. This evaluation was conducted to help guide these decisions, offer a springboard for next steps, and inform the overall design of the gallery.

In collaboration with Museum stakeholders Jackie Peeler, Senior Curator and Head of the Live Animal Team and Michael Horvath, Senior Director of Exhibits, our evaluation team decided to focus on three of the Museum's existing live animal exhibits—the Insect Zoo, Yawkey Charles River Gallery (CRG), and Hall of Human Life Tamarin displays—gathering data around mutually agreed upon objectives: how visitors *perceived*, *discussed*, and *engaged with* each exhibit, as well as what *learning outcomes* they walked away with.

Drilling down from these high-level objectives, the evaluation team crafted six evaluation questions to guide the study:

1. How, if at all, do visitors engage with live animal exhibits?
    a. How, if at all, do visitors engage with each other around live animal exhibits?
    b. How, if at all, do visitors engage with staff (when present) around live animal exhibits?
2. To what extent, if at all, do visitors make a connection between live animal exhibits and the Museum's intended themes or messaging for a given space?
    a. What, if anything, could the Museum change about how live animals are presented within exhibit galleries in order to increase the connection visitors make to intended messaging?
    b. What connections, if any, are visitors making between the live animals on display in the Museum and their own choices, actions, and daily lives in the real world?
3. Which types of animals, if any, seem to engage visitors more than others?
4. Which types of live animal display treatment, (enclosure size, case type, and content presentation), if any, do visitors find more engaging than others?

5. What positive and negative emotional responses, if any, do visitors experience to the live animal exhibits? How emotionally connected, if at all, do they feel to the animals and messaging?
6. What questions, concerns, or suggestions if any, do visitors have about live animal exhibits at the Museum?

We utilized three different instruments to probe these questions: 1) in-gallery observations, 2) in-gallery interviews, and 3) exit surveys. These instruments are described in further detail in the following section, titled Methods.

3. METHODS

This evaluation strives to collect data that will help inform the design of a future *Live Animal Garden* gallery supplementing the Museum of Science, Boston's existing butterfly garden on its top floor.

At the time of this evaluation, the Museum had not yet made final decisions about what specific animals would be featured in the new gallery, what types of enclosures and signage would be included, nor how exhibit messaging would be conveyed; neither did they yet have prototypes available for testing. We therefore utilized other, existing live animal exhibits located throughout the Museum as proxies, since the Museum was seeking to understand how visitors engage with, discuss, and respond to live animal exhibits of different types and styles.

The following three instruments were used to evaluate the Museum's Insect Zoo, Charles River Gallery, and Tamarin gallery (with a special focus via A/B content testing on the latter, per stakeholder request):

1. In-gallery observations
2. In-gallery interviews
3. Exit surveys

In-gallery observations and interviews, with controlled A/B testing featuring varied signage for the tamarin exhibit, were used to gather insight into how visitors interacted with and responded to specific live animal exhibits in any given moment. Meanwhile, exit surveys explored guests' reactions to and reflections on these exhibits collectively (if they visited more than one) after the fact. Through these three tools, we were able to employ a combination of closed-, scale-based, and open-ended questions to allow for quantitative as well as qualitative data analysis.

3.1 Observation Methods

Given that the content of the formative evaluation is entirely contextual to the MOS—how visitors engage with live animal exhibits in the context of the Museum—visitor observations were a crucial tool for gathering relevant data. Observations were minimally intrusive and allowed us to garner insights about how visitors use the exhibits in a highly naturalistic setting and their experiences in doing so. Data gathered using observations are not subject to biases such as the social desirability bias. During our observations, we did not engage with the visitors but instead observed them from a small distance away, unobtrusively tracking their movement through the exhibit space while recording their behavior on the prepared observation guides.

The observation guide was designed to record the adult/child composition of each observed visitor group, their behaviors while engaging with the exhibit, their engagement levels, the valence of any emotional response, and the exhibit in which the observation takes place. Furthermore, the observations collected data on whether and how visitors engage with piloted signage at the tamarins' B condition exhibit. This new signage, related to species and habitat preservation, will be contrasted

against the status quo visuals in an A/B test, where "A" represents status quo conditions and "B" includes new, digitally-presented signage. In addition, there is space on the observation guide for field notes, which were instrumental for capturing visitor quotations, interactions amongst themselves, staff, or the animals, and other visible behaviors that gave rise to many evaluation insights. The observation protocol, which can be found in Appendix 1, was designed to address the following evaluation objectives:

Evaluation Question	Observation Guide Content
How, if at all, do visitors engage with live animal exhibits? ● How, if at all, do visitors engage with *each other* around live animal exhibits? ● How, if at all, do visitors engage with *staff* (when present) around live animal exhibits?	The guide has pre-listed categories (Behaviors and Frequency) to record common and expected behaviors in the exhibit that showcase visitor engagement. These include a wide range of engagement methods and capture both interactions among visitors, e.g. "question to adult", and interactions between visitors and staff, e.g. "question to staff". There is also a box to record the group size and composition, and a check box to indicate whether a staff member is present or not. The guide also includes a section to record the intensity of visitor engagement as per Falk and Holland's engagement scale (found in Diamond et al., 2016). Lastly, the amount of time that visitors spend in the live animal exhibit is recorded in the section for start and end times.
To what extent, if at all, do visitors make a connection between live animal exhibits and the Museum's intended themes or messaging for a given space?	Checkbox on whether visitors make a verbal comment on actions they should take or intend to take, related to animals or the natural world, after their Museum visit. Checkbox to indicate whether the tamarins exhibit's signage is in "A" or "B" state to record if visitors engage differently with the new pilot signs related to action.
Which types of animals, if any, seem to engage visitors more than others?	Checkbox to record the exhibit in which the observation takes place. Since each exhibit houses a different type of animal (a mammal, fish and turtles, and insects), this will allow us to compare visitor engagement across different animal types.
Which types of live animal display treatment, (enclosure size, case type, and content presentation), if any, do visitors find more engaging than others?	See above. In addition, the checkbox for comments on the animal and field notes should capture any verbal visitor comments on live animal display treatment. See the checkbox on the tamarins' A/B testing on content presentation.
What positive and negative emotional responses, if any, do visitors experience to the live animal exhibits? How	Checkbox for indicating whether the visitor engagement appeared to be positive, negative, or neutral. Visitor quotations should also be captured in the field notes section to substantiate the emotional valence assigned to the

emotionally connected, if at all, do they feel to the animals and messaging?	observation.

In the observation guide, there was a section to indicate the visitors' level of engagement. All researchers referred to the following table from Diamond et al. (2016) when categorizing visitor engagement, in addition to team discussions on discrepancies or edge cases, to ensure consistency across the data collection process.

Table 3.1.1. *Engagement scale adapted from Falk and Holland (1991) to assess visitors' engagement with exhibits, as found in Diamond et al. (2016)*

Engagement Level	Observed Visitor Behavior
1. Minimal/Glance	Visitor does not stop, or stops and pauses briefly, glances at one or more elements, but demonstrates no apparent interest in any particular element or information.
2. Cursory	Visitor stops, watches/views elements briefly in a cursory way, perhaps casually points at something, and glances at text panels, but demonstrates no apparent interaction with the interactive.
3. Moderate	Visitor stops, views several elements of the interactive with apparent interest, reads some text, and appears somewhat engaged and focused.
4. Extensive	Visitor stops, views most elements of the interactive very intently; reads some text and appears very engaged and focused.

Observation Protocols

The evaluation team designed observation protocols to systematize and standardize the observation process as much as possible, including start and stop points. For the Hall of Human Life, the tamarin monkeys are housed in an enclosure with its own viewing room. Observations began when visitors entered the room and ended when they left the room. At the Insect Zoo, the initial plan was to observe the leafcutter ants exhibit, but given that the display was undergoing repairs, we pivoted to our backup plan of observing the stick insects instead. The observations began when visitors turned the corner down the Insect Zoo corridor and concluded when they passed the leafcutter ants exhibit. General observations unspecific to the stick insects, such as interaction with staff or footstools, were recorded in the field notes but only animal interactions with the stick insects could be coded and quantified. For the Charles River Gallery, the observations took place as visitors approached the tank housing the fish/turtle and concluded when groups walked away from the enclosure. If visitors returned to the enclosure, this was recorded in the field notes.

Our sampling method was to observe every visitor group for which an evaluator is available until roughly 20 observations were recorded, provided that the group is not a school-visit group. This was to comply with stakeholder protocols on children consent. Only one researcher was conducting observations at a time, accompanied by another researcher conducting in-gallery interviews in the Charles River Gallery and Hall of Human Life (both A and B conditions). We conducted observations during both weekdays and weekends. Overall, the observation data was collected over three separate sessions: one Saturday morning and afternoon, one Wednesday late morning/afternoon, and one

Thursday late morning/afternoon. Each animal exhibit was observed for an average of 1.5 hours to obtain the approximately 20 observations planned.

Process of Analyzing Observations Data

The process for analyzing the field observations began with inputting all the observations collected from paper/iPad copies into a Google Sheet. Once entered, the researchers calculated the duration of each observation, in minutes, by subtracting the start time from the end time. This completed the full dataset, with the raw, collected data being supplemented by a new calculated duration variable.

The observation field notes were then analyzed using thematic analysis (Rosala, 2022). The researcher primarily responsible for designing and conducting observations began drafting themes and codes during data input by taking note of common patterns and occurrences, in addition to conducting discussions with other team members during the data collection process. Collaboration between researchers primarily responsible for observations and interviews was crucial since we expected the codes from the in-gallery instruments to overlap, since these instruments drew on the same populations. After identifying the codes present in the interview data, the team member responsible for observations read through the observation field notes and identified new codes that were unique to the observation data.

The researchers then combed through the field notes and tagged each observation with the appropriate codes. To mitigate superficial or biased analysis, every distinct observation in the field notes was tagged with a theme, including non-events such as visitor groups not interacting with available Museum volunteers. Subsequently, these codes were tabulated with example quotes and observations were pulled from the field notes to substantiate each code. Each code's frequency across observations was also tabulated. Additionally, Pivot Tables and graphs were utilized to generate summaries of key variables, such as visitor emotional responses, engagement scales, and prominent visitor behaviors. Finally, armed with the cleaned and tagged dataset that allowed us to easily generate graphics and tables, the research team returned to the evaluation questions to identify any remaining questions that could be answered with the observation data.

3.2 Interview Methods

To gain deeper insight into visitors' thoughts, feelings, and opinions than could be gathered through observations alone, we interviewed groups of visitors immediately after they visited two different live animal exhibits: the fish tank in the Charles River Gallery and the tamarins exhibit in the Hall of Human Life. The interview questions were written based on our evaluation questions and aimed to reveal how visitors interacted with the live animal exhibits, how they responded emotionally to the live animals, their key takeaways from the exhibit, the connections they made between the exhibit and the world, and any possible questions or concerns they had about the live animal exhibits (see Appendix 3). Specifically, interview questions derived from the following three evaluation questions:

1) What positive and negative emotional responses, if any, do visitors experience to the live animal exhibits? How emotionally connected, if at all, do they feel to the animals and messaging?
2) To what extent, if at all, do visitors make a connection between live animal exhibits and the Museum's intended themes or messaging for a given space?

a) What connections, if any, are visitors making between the live animals on display in the Museum and their own choices, actions, and daily lives in the real world?
b) What, if anything, could the Museum change about how live animals are presented within exhibit galleries in order to increase the connection visitors make to intended messaging?

3) What questions, concerns, or suggestions, if any, do visitors have about live animal exhibits at the Museum?

Interviews also included questions about the demographics of Museum visitors such as age, race, gender, ability, local residency status, and Museum membership status. Demographic questions were intended to gather further data on the kinds of people who visit the live animal exhibits at the Museum. Our evaluation design included two testing sessions at the tamarin exhibit, the first condition which would include no signage added to the room (Group A), and the second condition which would include an additional digital screen with a QR code encouraging visitors to take action related to conservation (Group B).

We conducted in-person interviews over two days at the Museum of Science by following a systematic protocol to ensure that all interviews included the same questions, order in which questions were presented and materials for data collection (see Appendix 4). On the first day, we interviewed eight groups at the tamarin exhibit (Group A) and a few groups at the Charles River Gallery fish tank. On the second day, we interviewed eight more groups at the tamarin exhibit (Group B) and finished conducting interviews in the Charles River Gallery, totalling eight interviews per exhibit and 24 interviews overall. At each exhibit, interview subjects were selected randomly to get a sample as representative of the Museum's usual visitor population as possible. We aimed to interview approximately every other group that had been observed. For each group, we used the same recruitment script to ask visitors to participate in our study to ensure all interview groups were treated equally. The purpose of the recruitment script was also to inform participants of their rights so that they could give informed consent to participate in the interview (see Appendix 5).

Data was then analyzed through a thorough thematic analysis in which the evaluation team entered all interview responses into a common spreadsheet and coded the responses to identify overall themes, as well as themes specific to each exhibit or differences between the tamarin exhibit A/B testing groups. Demographic data was analyzed with descriptive statistics, and we used tables and charts to represent themes among groups of visitors at each exhibit and overall.

3.3 Exit Survey Methods

Finally, complementing the in-gallery observations and interviews, we employed exit surveys to gather insight into how—and whether—guests remembered and thought about various live animal displays across the Museum *after leaving the galleries*.

The exit survey format was chosen precisely because it allowed a general survey of visitor reactions to live animal exhibits as a whole (as opposed to in-gallery interviews focusing on a single, specific exhibit), leaving room for guests to make connections or comparisons between different exhibits, or generalizations about them overall. In this sense, the survey aligned with Baxter's suggested criteria in terms of (a) finding out user's likes and dislikes about the current live animal displays, and (b) learning how users engage with the existing exhibits (2015). The survey was also

deliberately kept short, averaging five minutes or less, with questions grouped by type, offering multiple choice answers for some and a bipolar scale for others (Baxter, 2015).

Striving to respect respondents' time and energy, the 19-question survey consisted of a combination of close- and open-ended questions crafted specifically to address three of the project's key evaluation questions:

1) How, if at all, do visitors engage with live animal exhibits?
    a) How, if at all, do visitors engage with each other around live animal exhibits?
2) To what extent, if at all, do visitors make a connection between live animal exhibits and the Museum's intended themes or messaging for a given space?
    a) What, if anything, could the Museum change about how live animals are presented within exhibit galleries in order to increase the connection visitors make to intended messaging?
    b) What connections, if any, are visitors making between the live animals on display in the Museum and their own choices, actions, and daily lives in the real world?
3) What positive and negative emotional responses, if any, do visitors experience to the live animal exhibits? How emotionally connected, if at all, do they feel to the animals and messaging?

The first section of survey questions was multiple choice, inviting respondents to choose as many answers as applied. The second section used a Likert scale, probing whether and how strongly respondents agreed or disagreed with a series of statements. The third section was open-ended, exploring guests' emotional reactions to and key takeaways from live animal exhibits and designed without the constraints of a multiple-choice or slider format in hopes of inviting rich detail that might otherwise be lost (Dilman et al., 2009). These allowed visitors to flag concerns or feelings the evaluation team may not have thought of. A final "is there anything else you'd like to share?" question also invited guests to offer their questions or ideas as well as their opinions, revealing thought patterns or opportunities for further research.

The fourth and final survey section comprised basic demographic questions. Included at the end in an attempt to avoid alienating cautious respondents or potentially influencing their reaction to the survey itself, the questions in this section asked respondents to identify their ethnicity, gender identification, Museum membership status, and age as well as the ages of any children in their party. This information was intended to help the evaluation team understand who exactly was reached with the exit surveys, and to help identify any potential patterns arising from any particular group.

The evaluation team collected exit survey responses from visitors as they left the Museum after seeing any number or combination of live animal exhibits (or none at all). We chose this system under the assumption that most would have visited at least one gallery containing live animals, and many would have visited multiple such galleries. We were right; of 22 groups surveyed, only three groups (13.6%) saw no live animals at all.

Evaluation was done on a busy Saturday afternoon and spread out over the course of several hours in hopes of obtaining as widely representative a sample of the Museum's guests as possible. Evaluators stood near the Museum's main exit and recruited respondents at random at the conclusion of their visit. They identified themselves—both verbally and through their apparel—as students from Harvard's Graduate School of Education working with the Museum to collect data on live animal exhibits to help inform the design and development of a new Live Animal Garden gallery. They read a recruitment script, (included in Appendix 5), to all visitors they approached, explaining the survey's

scope and purpose and that no personally identifying information would be collected. Many declined to participate, often citing tiredness, hunger, fussy children, or rideshare pickups waiting for them outside. Ultimately, 22 groups took the survey.

Surveys were disseminated in hard copy format on clipboards in order to allow visitors to easily write in their own answers for "other" responses on multiple-choice questions and to respond at length to open-ended questions. Both in the interest of accessibility and to support caregivers who may be juggling multiple children, respondents were given the choice between completing the survey themselves or with the assistance of an evaluator who offered to read the questions to them and/or record their responses on their behalf. The majority (17 of 22; 77.3%) enlisted the evaluator's help. Evaluators also emphasized that respondents were welcome to skip any question(s) they so chose.

Once collected, data was entered into a spreadsheet. Pivot tables were used to extract and isolate data for individual questions, which were then analyzed and sorted. Responses to closed-ended questions were then represented visually in graphs and charts. Responses to open-ended questions were first coded according to key themes and organized into tables before being similarly visualized.

3.4 Ethical Considerations

One of our main considerations while designing an ethical evaluation process was to take active steps to ensure that participating visitors were fully informed about the project and could give *and* revoke consent for participation.

Among adult participants, it was critical that they provided informed consent for interviews, so a recruitment script explaining the purpose of our study, our affiliation with the Museum and with Harvard, the goals for the Live Animal Garden, and what participation in our research would entail. Child participants were not observed, interviewed, or surveyed unless a caregiver who could give consent on their behalf was present. Children on school visits, identifiable by their lanyards or uniforms, were not selected for participation in any data collection for this reason, as per MOS guidelines. For observations, passive consent was necessary and obtained for every data collection session using official MOS signage that stated that an observation was occurring, what time the observation would conclude, and the contact information of Liz Kunz Kollman, the Director of Research and Evaluation (R&E) at the Museum. Visitors were invited to contact Liz with any questions and the evaluation team also prepared a script on informed consent if any visitor groups inquired team members in-gallery. The evaluation team coordinated all data collection sessions with the Museum's R&E team to ensure that we had the appropriate materials to comply with their evaluation and ethical protocols.

Visitors were also informed that if they chose to participate, all responses would remain anonymous and any identifiable materials would be struck from the data. The research team destroyed all hard and digital copies of original materials once the data was digitally inputted and analyzed. Visitors were told they could withdraw their consent to be interviewed or surveyed at any time. This information was also included in the script for observations, though it was not used. Though this did not happen, if that were the case, we had planned to remove any of their previous responses in our analysis. The right to choose not to participate or to withdraw from our evaluation was equally given to both adult and child participants.

Furthermore, in order to create rapport with Museum visitors and write evaluation questions that were culturally-responsive and culturally-sensitive, we obtained information about the demographics of visitors who visit the Museum's prior live animal exhibits, such as race, age, nationality, gender, and other identities, to understand who our audience would be. We also solicited

and implemented feedback from our Museum stakeholders who have experience designing for and working with MOS visitors as well as our teaching team to achieve this goal. Furthermore, we aimed to be responsive and respectful during all our interactions with visitors on the Museum floor. The research team made sure to wear respectable, business casual attire to signal professionalism and often wore clothing bearing the Harvard logo to forecast our affiliations. Researchers respected visitors' needs and desires even if they limited participation in our data collection process.

Finally, given that our project concerns engagement with animals and the wellbeing of live animals, we made sure to design our data collection tools in a manner that was respectful of the animals and presented them to visitors in a positive and informed way. We made sure to call the animals by their correct names and describe them accurately. Prior to beginning data collection, we met with staff members of the Live Animal Care team to get a sense of their main concerns for the animals and their exhibits in order to be sensitive to the Museum and Live Animal Care team's protocols in our interactions with the exhibits and animals. In addition, throughout the evaluation process, we checked our evaluation materials with our main stakeholder, Jackie Peeler, who is the Head of the Live Animal Care team and deferred to her expertise on matters of animal care and representation.

3.5 Project Timeline

The project timeline presented below has been revised where it deviated from the initial evaluation plan to reflect the evaluation process as it occurred.

Table 3.5.1. *Timeline of* Live Animal Garden *formative evaluation process*

Date	**Events**
February 10th	First stakeholder meeting with Jackie Peeler
February 15th	Museum of Science, Boston site visit ● Held casual meetings with live animal care staff present
February 23rd	Evaluation plan submitted
March 8th	Pilot of data collection instruments at MOS ● Observations - Insect Zoo, Hall of Human Life (Axolotls) ● Interviews - Insect Zoo, Hall of Human Life (Axolotls) ● Exit Surveys Note: The Charles River Gallery and Hall of Human Life Tamarin exhibits were both undergoing repairs on this day.
March 9th	First draft of evaluation instruments submitted for feedback Human Subjects Training completed
March 14th	Meeting discussing data collection instruments and implementation of A/B Testing with stakeholders Jackie Peeler and Mike Horvath, along with members of the Exhibit Design team

April 1st	First day of data collection at MOS ● Observations - Hall of Human Life, Tamarins A Group ● Interviews - Hall of Human Life, Tamarins A Group ● Exit Surveys
April 5th	Second day of data collection at MOS ● Observations - Insect Zoo
April 6th	Third day of data collection at MOS ● Observations - Hall of Human Life, Tamarins B Group ● Interviews - Hall of Human Life, Tamarins B Group
April 17th	Preliminary data analysis submitted for feedback
April 27th	Presentation of findings to stakeholders
May 8th	Final evaluation report submitted for teaching team feedback, to be sent to to stakeholders shortly thereafter (by mid- to end of May)

4. FINDINGS

This section of the report walks through the analyses performed on the data collected through each instrument, including tables detailing codes from thematic analyses and visual graphs. It also offers some low-level inferences drawn from the data analysis. Similar to the Methods section, the findings are ordered by data collection instrument: first observations, then interviews, and lastly, exit surveys. In Table 4.1 below, we present a grand overview of the data collected during this evaluation process.

In total, 24 groups participated in interviews at the turtle and fish tank in the Charles River Gallery and at the tamarin exhibit in the Hall of Human Life (Group A and Group B), with eight groups being interviewed at each. Group sizes ranged from one person to up to six participants. Out of the total sample, 25 (53.2%) people identified as girls/women, 21 (4.7%) as boys/men, and one person (2.1%) chose not to indicate their gender.

Table 4.1. *Number of visitor groups with data collected from across each data collection instrument (*N=130*, inclusive all instruments)*

Location	**# Observations**	**# Interviews**	**# Exit Surveys***
Hall of Human Life (Tamarins) A	24	8	22
Insect Zoo (Stick insects)	21	0	
Charles River Gallery (Fish and turtle tank)	18	8	
Hall of Human Life (Tamarins) B	21	8	*N/A*
Grand Total	**84**	**24**	**22**

** Note: Exit surveys are holistic to the Museum and not tied to any individual or specific live animal exhibit. However, it is important to note that they were conducted only during the A condition of the tamarin gallery; none were collected on the day the B condition was deployed.*

The evaluation team notes that the tamarins' enclosure in the Hall of Human Life also houses a tortoise that is visible to visitors. Though the tortoise is not represented in Museum signage and is separate from the Museum's messaging in the Hall of Human Life, nor is it a salient feature of our data collection tools and analysis, visitors often interact with it as they would any other animal. The evaluation team recorded these interactions as part of the tamarins exhibit and readers may see references to it in sample quotes and observations from visitors.

4.1 Observations Findings

A total of 84 visitor groups were observed over three in-gallery data collection sessions. As shown in Table 4.1 above, 24 observations were collected in the Hall of Human Life A condition, 21 in the Insect Zoo, 18 in the Charles River Gallery, and an additional 21 in the Hall of Human Life B condition. This gives us an average of 21 observations per exhibit. Since this was a passive observation, no demographic information was recorded besides whether the visitor was a child or an adult. The observation findings have been organized into five thematic subheadings, each supplemented with relevant data analysis.

Visitor Engagement with Live Animal Exhibits

The Museum's live animal exhibits are effective at engaging their audiences, as indicated by the summary of visitors' engagement scales and average amount of time spent on each live animal exhibit seen in Tables 4.1.1 and 4.1.2, respectively.

While the tamarins and stick insects seem to engage visitors for longer and at higher levels of engagement than the turtle and fish do, it is difficult to say whether this is due to the difference in animal species (mammal vs. insects vs. fish/reptiles) or due to a difference in display treatment (larger enclosure vs. one enclosure in the middle of a large gallery) from just the observation data, though we do manage to draw out some other insights regarding display treatment in a subsequent section of observation findings, 'Connections, Signage, and Physical Exhibit Interactions'.

It is important to note that because the observations were collected over three days, the average duration that visitors group spent at each gallery location might be influenced by factors external to the animals, such as the number of other guests in the space. In particular, the observations of the Hall of Human Life A and the Charles River Gallery were collected on a rainy Saturday afternoon, when the Museum floor was crowded and busy. In contrast, the Insect Zoo and Hall of Human Life B observations were collected on weekdays, when the flow of visitor traffic was much lower. While this allows us to reach a wider range of visitors, we should also take this into account when interpreting the average duration data. For example, visitors might choose to stay for longer not because of the animals, but because there is less of a need to share the space when there are fewer people around, or because they are not being jostled by a crowd.

Table 4.1.1. *Average durations spent in each live animal exhibit, calculated from number of minutes of each observation*

Location	Mean Duration (min)	Median Duration (min)
Hall of Human Life (Tamarins) A	0:02:15	0:02:00
Hall of Human Life (Tamarins) B	0:01:51	0:02:00
Insect Zoo (Stick insects)	0:01:23	0:01:00

Charles River Gallery (Fish and turtle tank)	0:00:43	0:01:00

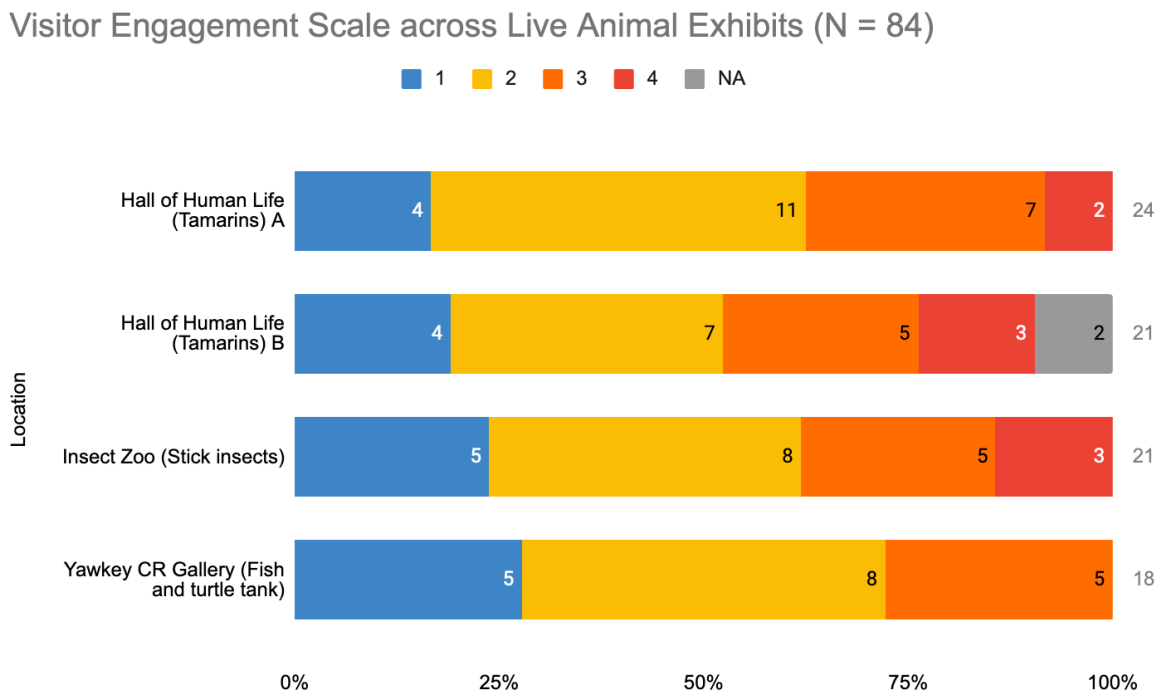

Figure 4.1.1. *Summary of visitor groups' engagement scale (adapted from Falk and Holland's engagement scale, found in Diamond et al., 2016). Note: A description of the engagement scale can be found on page 5, Table 3.1.1 under the section 'Observations Methods'.*

In order to address the question of *how* visitors engaged with live animal exhibits, the evaluation team coded the field notes with common themes and patterns noted in observations. A full list of codes and their proportions of representation among visitor groups can be found in the figures below, along with sample quotations.

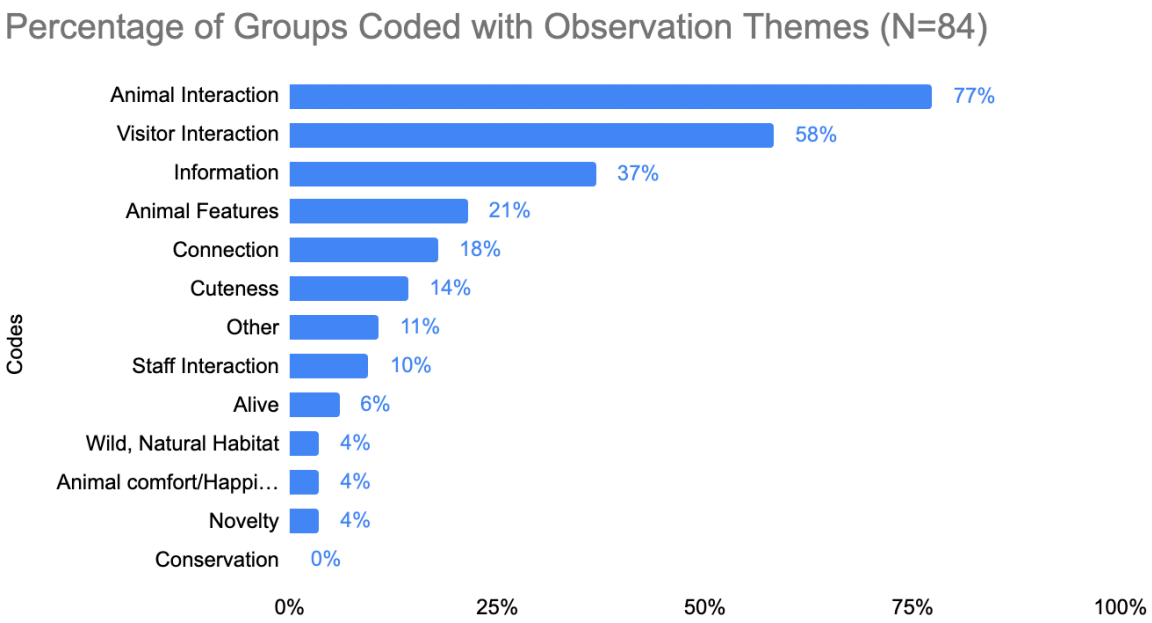

Figure 4.1.2. *A summary of the percentage of visitor groups coded with each observation theme (N=84)*

In Table 4.1.2 below, the "No. of groups", or number of groups, column is a count of how many groups conveyed this theme across the total number of groups observed (*N = 84*). Each observed group's field notes could be tagged with more than one code, owing to the fact that the field notes contain multiple and distinct instances of visitor behavior. Hence, a sum of the "No. of groups" column can and does exceed the total number of observation groups, i.e., 84 and includes percentages (in parentheses) that sum to more than 100%.

Table 4.1.2. *A table containing all visitor observation codes along with sample quotes and observations taken from the field notes, arranged in descending number of groups (N=84).*

Visitor Themes	**Description**	**Example 1**	**Example 2**	**No. of groups (% of N)**
Animal interaction	Includes all observations related to visitor interactions with the animals, such as observing, taking photos, or pointing at them or any pronounced effect of a lack of animal interaction	Visitors often leave the room when they cannot locate the tamarins in the Hall of Human Life (N=7)	"Where did it go?" (referring to tamarins), before leaving shortly after (*Adult and child, Hall of Human Life A*)	65 (77%)
Visitor interaction*	Includes all observations related to interactions between visitors, both intra- and inter-group, such as calls for joint attention, correcting behaviors, and	"Wow, look at [insect]. Did you see the giant stick bugs?" (*Adult, Insect Zoo*)	One caregiver reads the tamarins' signs and creates a guessing game for their charges:	49 (58%)

	sharing information, both from and not from Museum signage.		"They're called cotton top tamarins, why do you think that is?" (*Adult and child, Hall of Human Life B*)	
Information	Includes all observations related to knowledge visitors glean from Museum signage or displays	In response to a child's question, a caregiver reads the Museum signage aloud to entice child to come over and look (*Adult and child, Insect Zoo*)	"It's a monkey skeleton" "Look! Here are human skeletons" (G*roup, Hall of Human Life B*)	31 (37%)
Animal features	Includes all references to an animal's features, such as their size, abilities, or body parts	"The fish is giant", "He could just chomp your head off" (*2 children, Charles River Gallery*)	"Oh, that is! It looks just like a stick. Wow!" (*Adult, Insect Zoo*)	18 (21%)
Physical Interaction*	Includes all observations related to visitors physically interacting with room elements, such as brass models, enclosure glass, rope barriers, footstools, seating, and wall projections.	A caregiver and child tap on the window in the tamarin's gallery and realize it is not a one-way window (*Adult and child, Hall of Human Life A*)	A young child grabs onto brass turtle model and holds onto it for several minutes. They point at the tank. The caregivers note, "you like that turtle, huh?" (*Group, Charles River Gallery*)	17 (20%)
Connection	Includes all observations related to visitors making connections between the animal exhibits and things outside the Museum, such as their own expectations or associations; includes the anthropomorphizing of animals	"They look like Einstein. They should be called Einstein monkeys." (*Adult, Hall of Human Life B*)	"Look! They're playing leapfrog! [...] I'd be a good monkey." (*Child, Hall of Human Life B*)	15 (18%)
Cuteness	Includes all observations that relate to visitors' expression of animal cuteness; while this could be considered an animal feature, it comes up so regularly that we gave it its own code	One group gasps and remarks on "how cute!" the tamarins are (*4 adults, Hall of Human Life A*)	"Oh my gosh, they're so cute" (*Visitor, Hall of Human Life B*)	12 (14%)

Other	Includes all observations that do not fit into other codes and do not warrant a code of their own, e.g., due to being an outlier	Group moves quickly through the exhibit with pausing or commenting (*Group, Insect Zoo*)	"It's a little like being on display for the tamarins" (*Adult, Hall of Human Life B*)	9 (11%)
Staff interaction	Includes all observations related to visitor interactions with staff or other Museum representatives, such as observing them feeding the animals or taking photos of them during animal enrichment; also includes all observations where visitors did not interact with staff while staff were present	Visitor groups do not interact with and walk past a desk in the Insect Zoo where two high school Museum volunteers are stationed with printed materials (N = 4)	"Look, they're bringing treats and snacks for them to investigate" (*Adult, Hall of Human Life B*)	8 (10%)
Alive	Includes all observations where visitors explicitly note that the animal is alive	"See, I told you they have monkeys!" "I thought you meant stuffed ones, not live ones, that's weird." (*2 adults, Hall of Human Life B*)	"Those are alive? Okay, Now I'm scared." (*Adult, Insect Zoo*)	5 (6%)
Wild, natural habitat	Includes all observations related to visitors discussing animals' habitat and location	"Weird for Massachusetts, though" (referring to location of tamarins) (*Adult, Hall of Human Life B*)	"I wonder who first discovered them" (referring to stick insects' camouflage) (*Adult, Insect Zoo*)	3 (4%)
Animal comfort/ happiness	Includes all observations related to visitors' perceptions the animals' sense of comfort while in the Museum or specific enclosure	A child asks aloud if the fish and the turtle who share a tank get along (*Child, Charles River Gallery*)	"The tortoise can't eat that because it keeps swinging back and forth, poor thing" (*Adult, Hall of Human Life B*)	3 (4%)
Novelty	Includes all observations related to the unexpectedness or newness of encountering live animals in the Museum	"I didn't know they had animals here. Real ones"	"Oh, what is this?" upon entry into tamarin's room (*Adult,*	3 (4%)

		(*Adult, Hall of Human Life B*)	*Hall of Human Life A*)	
Conservation *Note: There were no observations with this code, which was taken from the interview data*	Includes all observations related to the conservation of live animal species and their habitats	-	-	0 (0%)

Notes: *The last column does not include animal interactions recorded in sections other than field notes. Codes marked with an asterisk (*) are unique to observation data, i.e., 'visitor interaction' and 'physical interaction' codes.*

Visitor and Animal Interactions

Museum visitors almost always interact with the live animals on display, whether it be by pointing at and searching for them, focusing on them, or commenting on them to their group members. Common conversation themes that emerged from the field notes include the animals' cuteness and their unique features, such as having long tails or camouflage.

In addition, the live animal exhibits greatly inspired visitors to engage in joint attention and calls for joint attention. Upon seeing the animals, visitors would often excitedly call over their group members using verbal language such as "look!" or by non-verbal gestures such as pointing. Entire groups would often coalesce around a live animal display for a few moments, commenting on the animal and engaging in activities such as counting the number of animals or asking questions about it together. Furthermore, these visitor interactions were not reserved for within-group interactions; often, visitors from distinct groups would communicate to share information about the animals, such as their location in the enclosure and how other visitors could find them. For example, one group pointed out to another group searching aloud that the tamarins were in their nesting box and could be viewed through the video recording screens in the gallery.

Staff Interaction

There were only a few observations (*N=8*) that overlapped with staff presence on the Museum floor, but one clear finding is that visitors were much more likely to engage with staff who were actively and visibly engaged with the animals rather than seated to the side. There were two instances when observations were conducted while staff were present: the first was two high school Museum volunteers were seated at a desk with printed materials displayed in front of them in the Insect Zoo (*N=4*), and the second was a live animal care staff member feeding the tamarins and tortoise in the Hall of Human Life, as well installing enrichment materials such as a hanging kebab of food for the tortoise (*N=4*).

Visitors were much more likely to engage with the staff member who was actively engaged with the tamarins and turtle than with volunteers who were passively seated in the same gallery space. Interactions with staff included commenting on their actions ("the tortoise can't eat that because it keeps swinging back and forth, poor thing"), making sense of their actions ("why are they weighing

them?"), and recording photographs and videos of them interacting with the animals. None of the visitor groups who were in the Insect Zoo at the same time as the Museum volunteers interacted with them.

Connections, Signage, and Physical Exhibit Interactions

Visitors were not often observed making connections between the animal exhibits and wider, external messaging (*N=15*) (Table 4.1.2). Of course, it may be that this is a difficult event to passively observe and the interviews provide much more compelling data on the connections that visitors make. When visitors did make connections, they often connected the animals with things outside the Museum and to their lives, rather than to the Museum's intended messaging.

Most groups did look at the Museum's signage. Out of 84 groups observed, 49 groups (58%) had at least one individual who looked at the signage, and 20 groups (24%) had individuals who read the signs aloud. Most often, signage was read aloud to answer the question of, "What animal is this?", indicating that visitors were curious about the animals and learning what they were. In the observation data, there were no notable differences between the tamarins' A and B conditions for the number of groups who looked at or read signage aloud at least once.

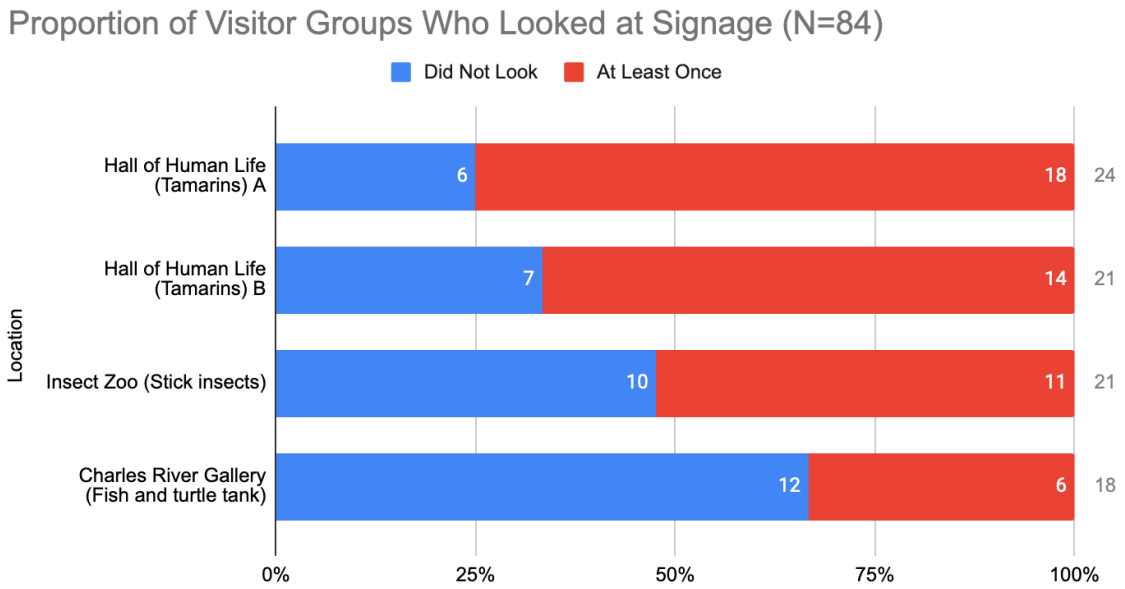

Figure 4.1.3. *Proportion of visitor groups that looked at Museum signage at least once across live animal exhibits*

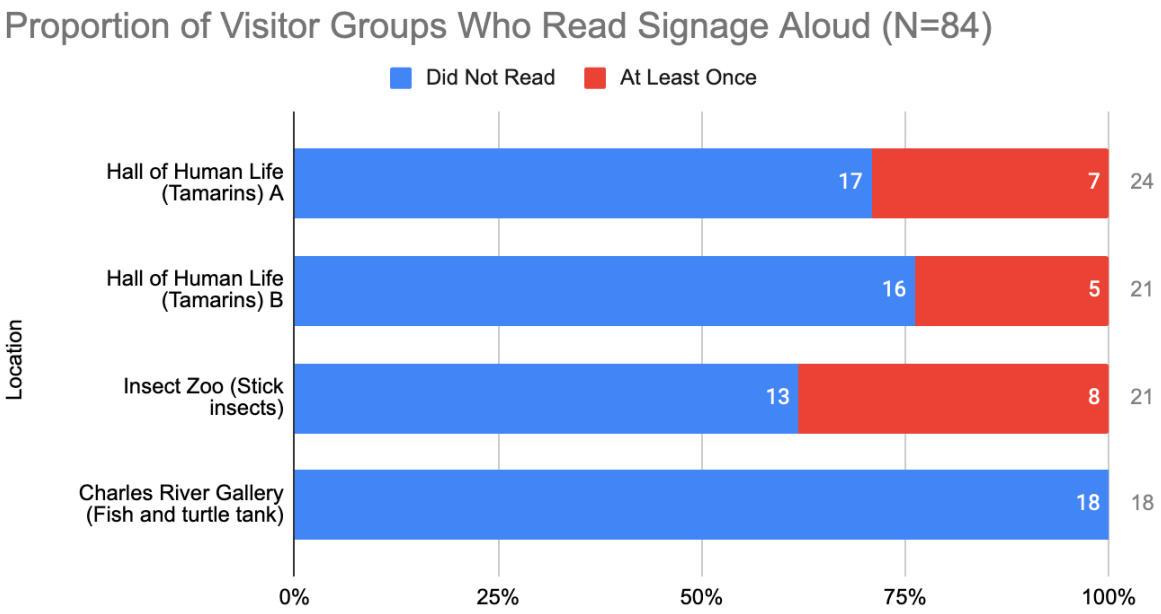

Figure 4.1.4. *Proportion of visitor groups that read Museum signage aloud at least once across live animal exhibits*

In addition, field notes were coded with the 'information' theme to indicate observations where visitor groups were demonstrably gaining knowledge from Museum signage or displays.

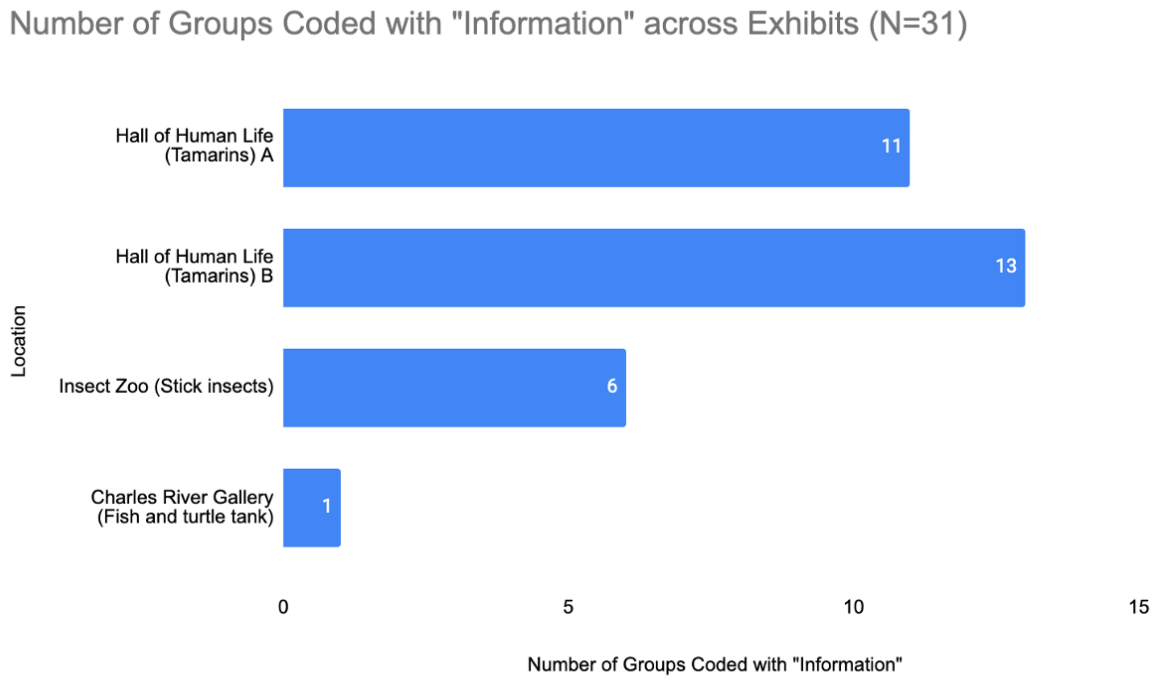

Figure 4.1.5. *Number of observed visitor groups coded with the 'information' theme across live animal exhibits (N=31, 37% of 84 total groups observed)*

This behavior of gleaning and using information from Museum signage is differential across the live animal exhibits observed. From Figure 4.1.5 above, we can see that visitors were observed to be much more likely to be coded with the 'information' theme if they were observed in the tamarins or stick insects exhibit. In fact, only one observation from the Charles River Gallery (*N=18*) conveyed the 'information' theme. Visitor groups in the B condition were more likely to be coded with 'information' (*N=13*, 62% of 21 observations) than visitors in the A condition (*N=11*, 46% of 24 observations), indicating that the additional digital signage may have been effective at communicating information to visitors.

On the other hand, visitors were much more likely to physically interact with the fish and turtle tank in the Charles River Gallery compared to the tamarins or stick insects enclosure. In Figure 4.1.6 below, we can see that eight out of 18 groups observed in the Charles River Gallery were coded with 'physical interaction' (44% of CRG observations), whereas every other exhibit had four or less observations coded with physical interaction. In four separate observations of visitor groups in the CRG, a young child would touch the brass turtle model located at the base of the tank and remain there. In other cases, children would run or move around the tank's curvature to track the fish inside. In the Hall of Human Life, children would often be told not to touch the glass or rope barrier in the gallery. One group was observed to be playing with the light display on the walls of the tamarin gallery. In the Insect Zoo, almost all observations coded with 'physical interaction' (2 out of 3) were related to children using the footstools in the gallery to elevate themselves, so as to see the animals more clearly.

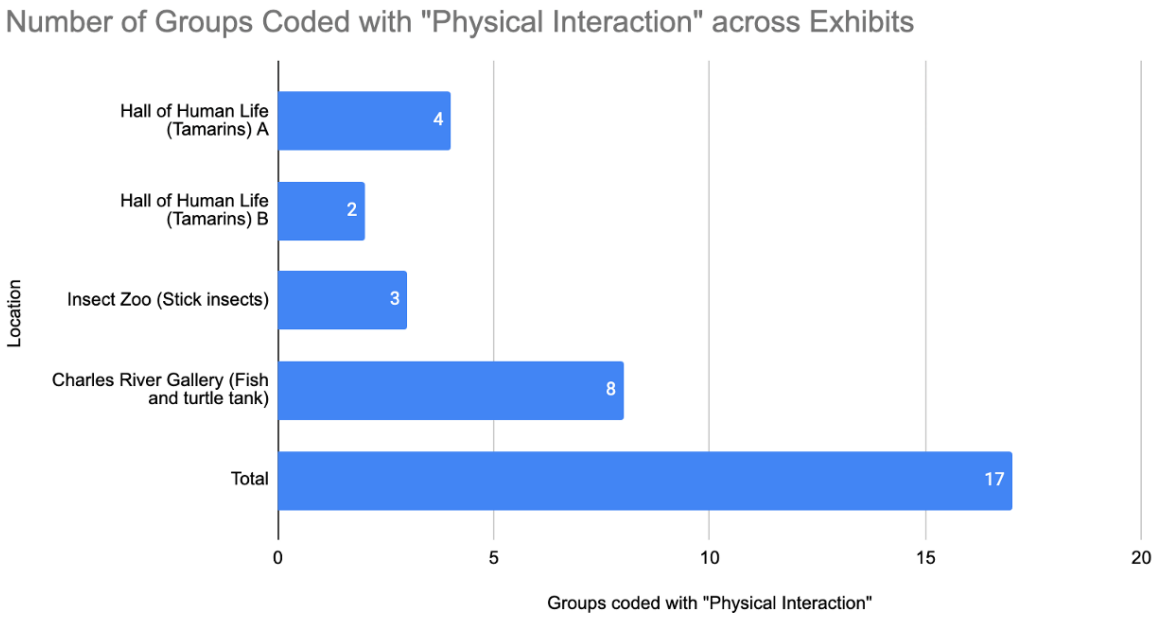

Figure 4.1.6. *Number of observed visitor groups coded with the 'physical interaction' theme across live animal exhibits (N=17, 20% of 84 total groups observed)*

Visitor Emotional Responses

In Figure 4.1.7 below, observation data indicates that most visitor groups have neutral or positive emotional reactions to the live animal exhibits. 74 out of 84 groups (88%) observed were coded as positive or neutral as a group and 79 groups had at least one positive or neutral individual.

This suggests that visitors enjoy the Museums' live animal exhibits; many of them expressed verbal and non-verbal excitement upon seeing them and were excited to share their emotions with their group members. Negative emotional responses came from two sources: concerns over animal wellbeing or feelings of disgust/fear at invertebrate species, such as insects. This contributed to the Insect Zoo having a higher negative and mixed emotional response compared to the other exhibits. Often, female-presenting caregivers would express disgust or fear at the insects while the children in the group would express excitement, which would be met with neutral responses from male-presenting caregivers.

Given that the issue of how the animal exhibits are being perceived is relevant to our stakeholders, it is important to emphasize that these negatively coded observations are in the minority (*N=8*, 10%), and concerns over animal wellbeing are rarer still (*N=2*, 2%). The observation data suggests that concerns regarding animal wellbeing is not a salient issue.

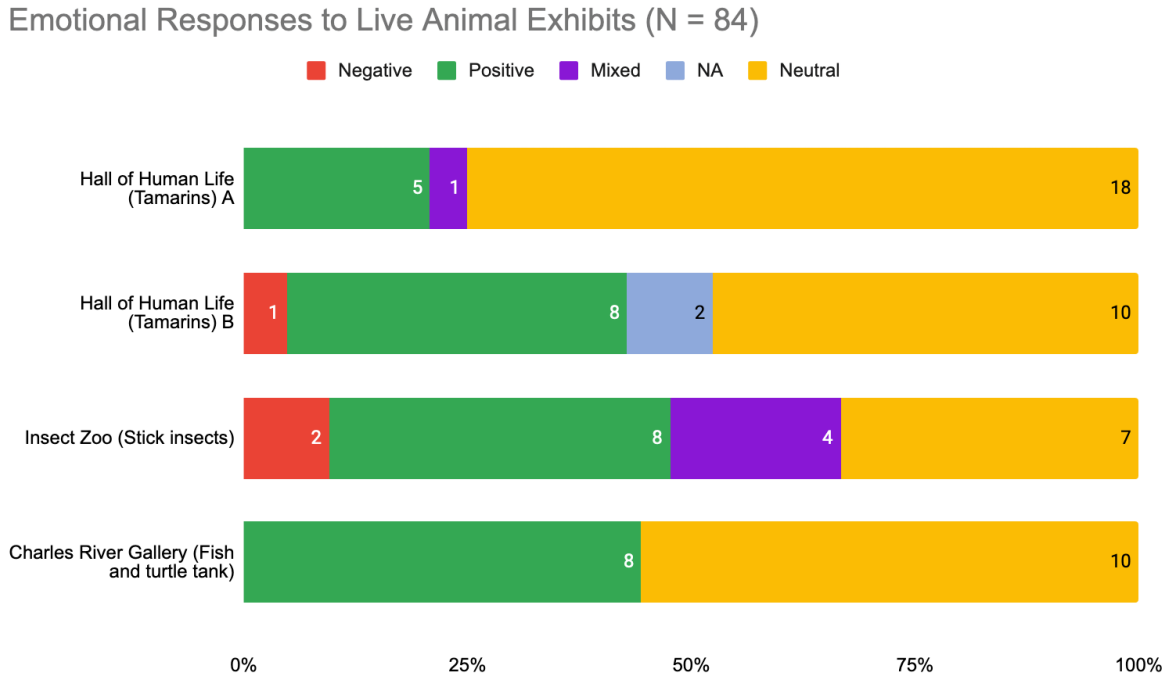

Figure 4.1.7. *A summary of observed visitor groups' emotional responses to live animal exhibits. Note: 'Mixed' emotional responses refer to visitor groups whose members express distinctly different emotional responses, such as containing members with positive responses and other members with negative responses.*

Visitor groups were categorized into emotional response categories based on their observed behaviors and verbal comments. Table 4.1.3 below demonstrates how the researchers conceptualize these categories and separates mixed emotional responses out into their respective positive, negative, or neutral individual responses. There were no emotional responses that could not be parsed into one of these three categories.

Table 4.1.3. *A table describing each emotional response category and sample observations taken from field notes*

Attitude	Description	Example 1	Example 2
Positive	Includes all observations that indicate visitors experienced the live animal exhibits in a positive manner	"Oh, it's alive! It's real! A turtle!" (*Adult, Charles River Gallery*)	"Mommy, you have to come see, look, pretty" (*Child, Insect Zoo*)
Negative	Includes all observations that indicate negative aspects of the live animal exhibit experience; or suggest changes that need to be made to the live animal exhibits	"It's like, how do I get out of here?" (referring to tamarins in their enclosure) (*Adult, Hall of Human Life A*)	"We are not friends" (referring to self and insects) (*Adult, Insect Zoo*)
Neutral	Includes all observations that have neither a positive nor negative tone, and do not point out aspects of the live animal exhibits that need to improve/change	"Let's sit in here and watch a movie" "No, this isn't a movie [...] Look at the monkeys! Don't you want to see the monkeys?" (*Child and adult, Hall of Human Life B*)	One group paused at the entrance of the tamarins' room and leaned their head in while peering at the enclosure (*2 adults and 1 child, Hall of Human Life A*)

4.2 Interview Findings

Interview participants represented a wide range of ages, with many groups either consisting of younger couples or friends between 19-30 years old (23.4% of total participants), or parents with their children in the 31-40 (25.5%) and 6-10 (12.7%) age ranges, respectively. The largest number of interview participants were in the 19-30 and 31-40 age ranges followed by 6-10 years old and then 41-50 years (10.6%).

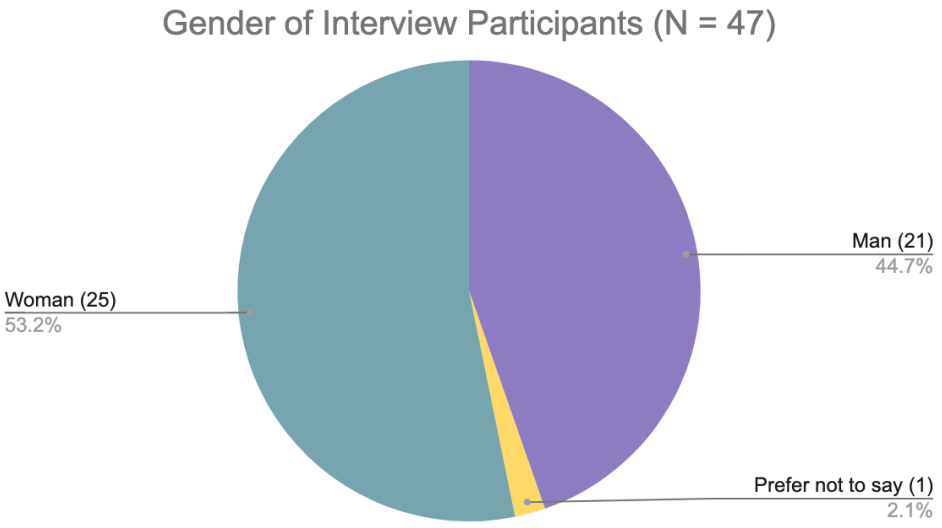

Figure 4.2.1. *Gender Breakdown of Interview Participants; N = total number of participant responses*

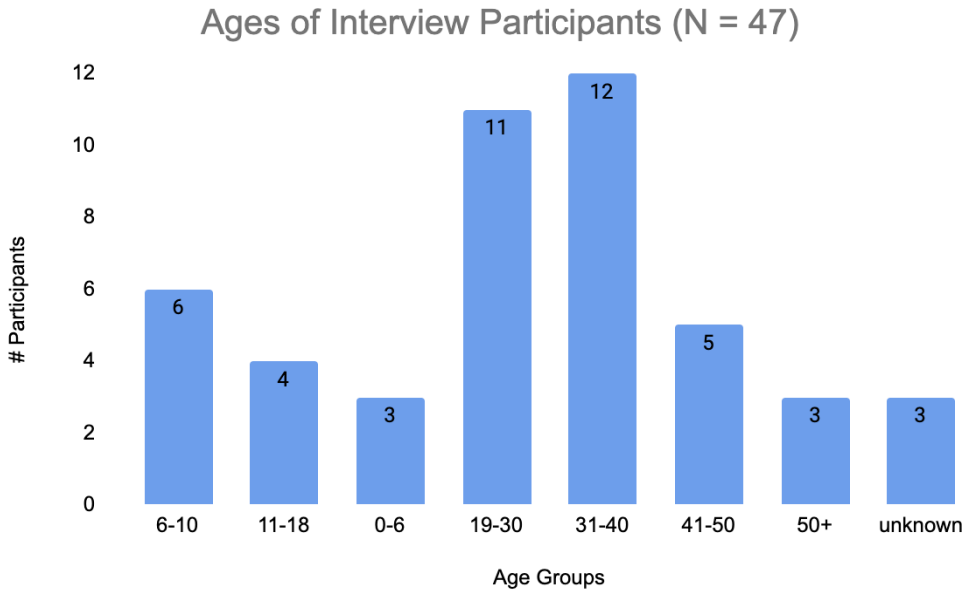

Figure 4.2.2. *Age Breakdown of Interview Participants, N = total number of participant responses*

The majority of interview subjects were White, representing 72.3% of total participants, with the next largest racial demographic being Hispanic (12.8%) followed by Asian (10.6%). Only one person (2.1%) each identified as Black, more than one race, or chose not to indicate their race or ethnicity.

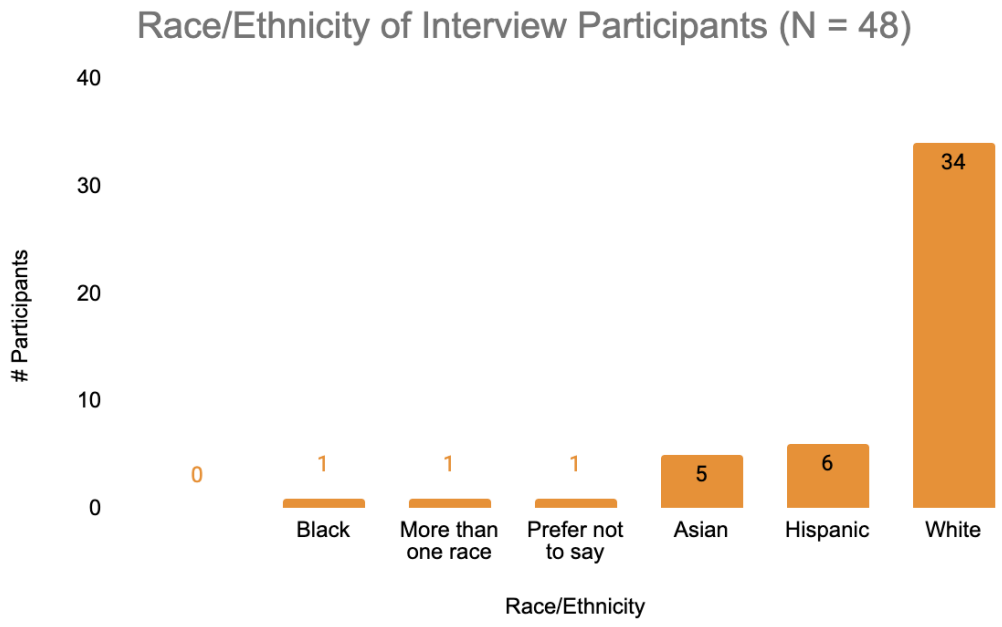

Figure 4.2.3. *Race/Ethnicity Breakdown of Interview Participants, N = total number of participant responses*

No respondents indicated having a permanent or temporary disability. 18 people indicated that they were not members of the Museum of Science while four groups were members. 14 people were not local to Boston, while 12 people responded that they were local residents. Since not every interview group provided demographic information for every member of their group, it was not possible to collect data in every demographic category for all participants.

Interview Key Takeaways and Summarized Findings

1) Visitors are interested in the enclosures and physical spaces in live animal exhibits, and the most interview responses about elements of the exhibit came from the tamarin Group B condition.
2) When staff were present, visitors enjoyed seeing them feed the animals.
3) The majority of interview responses referencing conservation occurred in the tamarin exhibit when signage about conservation was added to the room. Overall, however, most connections that people made were between live animals and the real world rather than to conservation messaging.
4) While some people learned information from signs in the live animal exhibits, many people did not read them or found the signs difficult to read or understand.
5) The majority of visitors had positive emotional responses to live animals, specifically focusing on the physical features and cuteness of the animals, their novelty, and their being alive rather than fake.

Visitor Engagement: Elements of Exhibit

Interviews with museum visitors revealed that some visitors take note of the ways or settings in which live animals are displayed in the Museum. Our analysis identified four codes related to elements of the exhibits themselves: the enclosure or space that live animals are in, elements of the room housing the enclosure, elements not related to the live animals themselves, and the signage displayed in the exhibit. In total, 48 interview responses were related to elements of the live animal exhibits.

Table 4.2.1. *A summary of interview participants' responses to elements of live animal exhibits at the Museum of Science, Boston (N = 48 where N = total number of codes)*

Key:

CRG = Charles River Gallery
TA = Tamarin Group A
TB = Tamarin Group B

Code	Definition	Example Quotes	# of Codes: Total
Enclosure/Space	Indicates all interview responses where visitors mentioned the case, enclosure, or physical display of the live animal exhibit	*Q1, TB: Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.* *A1: [Like other animal exhibits] There is still an issue of the reflection of the glass in the tamarin exhibit making it hard to see.* *Q2, TB: What about the exhibit made you select that image (indicating emotional response)?* *A2: I'm not too happy to see animals in boxes.*	*10 (20.8%)*
Room	Indicates all interview responses where visitors mentioned things in the room of the exhibit outside of the animal enclosure	*Q1, CRG: What about the exhibit made you select that image (indicating emotional response)?* *A1: I like that there are different types of animals in one room.* *Q2, TB: Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.* *A2: I liked how quiet it was.*	*3 (6.2%)*
Non-animal	Indicates all interview responses where visitors mentioned elements of the exhibit that were not living animals	*Q1, TB: Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.* *A1: AM: (Also used to work with animals) I like that they have hiding areas…* *AF: Yeah, but with cameras in them so we can still see them.* *Q2, TB: What key takeaways do you remember from the live animal exhibit? What about the exhibit, if anything, helped you remember that?* *A2: Oh look there is a nesting box (on camera), I didn't notice the nesting box before.*	*17 (35.4%)*
Signage	Indicates all interview responses where visits mentioned the signs in the exhibit	*Q1, TB: Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.* *A1: It was nice seeing the "shhh" sign. Usually people bang on the glass or make noise.* *Q2, TA: What connections, if any, did you see between the live animal exhibit and your own life or the world?... If not, what might have helped you make those connections more easily?* *A2: There is not a ton of signage explaining things. The video is hard to get useful information out of because I was not sure where to start watching [the slideshow]. The text on the signs is really small and hard to read.*	*18 (37.5%)*

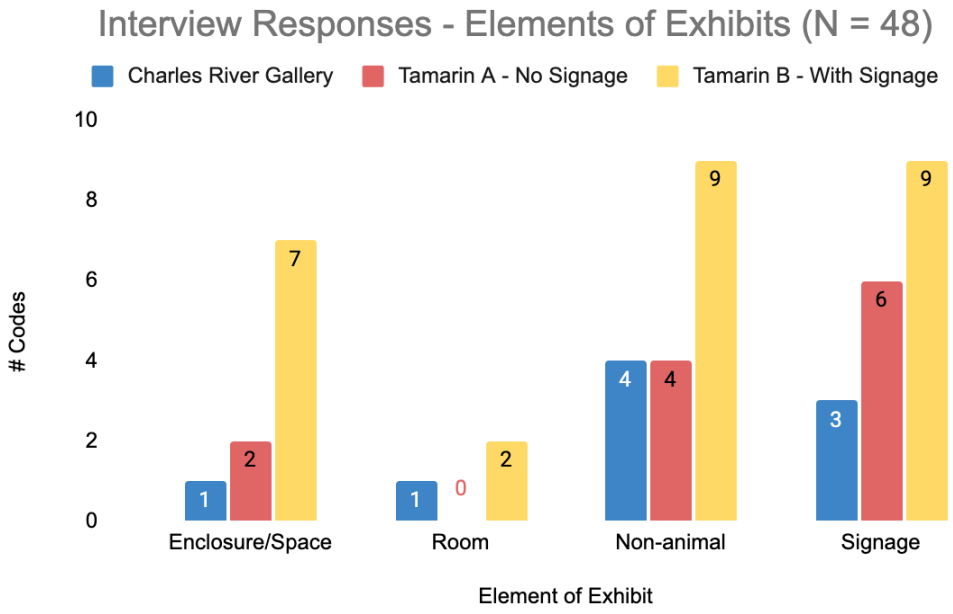

Figure 4.2.4. *Interview responses related to elements of live animal exhibits grouped by exhibit; N = total number of codes*

As seen in Figure 4.2.4, across all four codes related to the elements of live animal exhibits, the greatest number of responses (18 total) came from the tamarin Group B condition when extra signage was added. To understand the reasons that visitors took note of enclosures, specifically, we identified sub-codes within the responses coded for "enclosure/space."

Enclosure

Among the total number of people who commented on elements of the exhibits, 10 (20.8%) responses mentioned the live animal enclosures, with the largest number of these responses coming from the tamarin Group B testing condition (7) compared to two responses from the tamarin Group A condition and one response from the Charles River Gallery. Comments about enclosures typically focused on the physical space that the animals lived in and the enclosure's appearance mimicking the animals' natural habitat. A deeper analysis revealed three specific themes within comments about animal enclosures: glass, natural elements, and size.

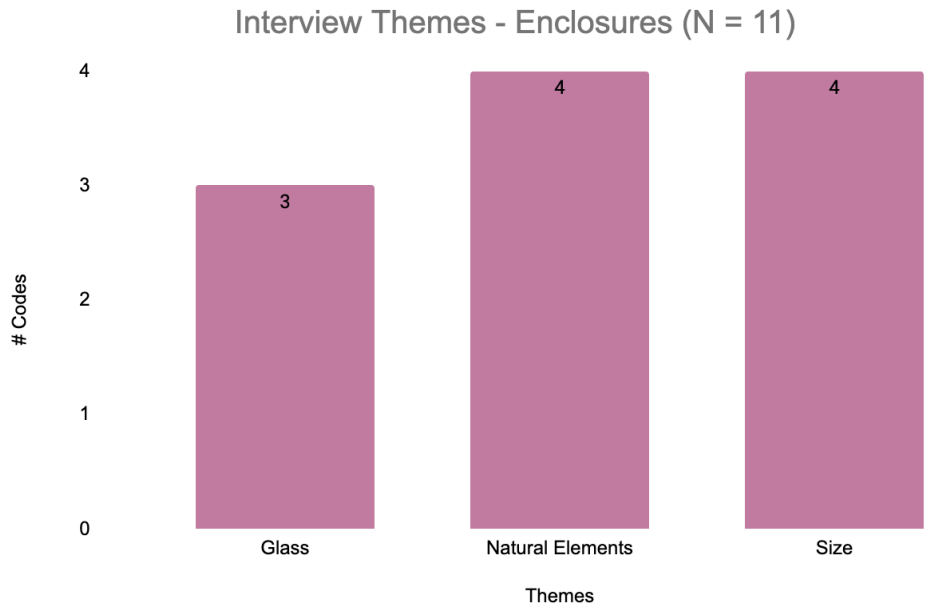

Figure 4.2.5. *Themes in interview responses about live animal enclosures, N = total number of codes*

Three respondents spoke about the glass case either making it difficult to see the animals, or that they enjoyed seeing the live animals in enclosures other than a simple glass box. Four responses focused on natural elements, with some visitors interested to see more natural elements in the enclosure like realistic grass, while others appreciated the efforts to make live animal enclosures look similar to the animals' natural habitats. Finally, four responses were about the size of the enclosure, with some people reflecting that they were happy about the large amount of space that animals had and some other visitors wishing that the enclosures were even bigger. Examples of direct quotes can be found in Table 4.2.1.

Room

Only three people commented on the room that the live animal exhibits were in, with one person commenting on the room in the Charles River Gallery, two comments coming from the tamarin Group B condition, and zero comments from the tamarin Group A testing. Examples of direct quotes can be found in Table 4.2.1.

Non-Animal

17 responses related to non-animal elements of the exhibit, such as objects or scenery. Four responses each came from interviews conducted in the Charles River Gallery and the tamarin Group A testing, with nine responses from the tamarin Group B relating to non-animal elements. In the Charles River Gallery, many people commented on the tunnel that the turtle and fish tanks surrounded, enjoying the ability for children to play in it and interact with each other and the exhibit. In the tamarin exhibit, people expressed liking the hiding places and toys that were provided for the animals. Examples of direct quotes can be found in Table 4.2.1.

Signage

18 responses related to signage in the live animal exhibits, with half of those responses coming from the tamarin Group B, six from tamarin Group A, and three from the Charles River Gallery. Comments about signage were mixed, with some people appreciating the information they learned from signs in the Museum and others wishing the signs were easier to read, more noticeable, or that they had taken more time to read them. The impact of signage on how well visitors received intended messaging will be discussed later in this report. Examples of direct quotes can be found in Table 4.2.1.

Visitors' Opinions

Table 4.2.2. *A summary of interview participants' overall thoughts and opinions at the Museum of Science, Boston (N = 137 where N = total number of codes)*

Code	Definition	Example Quotes	# of Codes: Total
Animal comfort/happiness	Includes all interview responses related to the animals' sense of comfort while in the Museum or specific enclosure	*Q1, TB: Is there anything else you'd like to share about your experience with the live animal?* *A1: Is there enough space? I always think about how happy are the animals, and them running around is a positive sign.* *Q2, CRG: Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.* *A2: The animals are well taken care of. The cases look good, they don't look distressed.*	7 (5.1%)
Cuteness	Includes all interview responses that relate to how cute the animal is; while this could be considered an animal feature, it comes up so regularly that we gave it its own code	*Q1, CRG: Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.* *A1: I remember the axolotls, they were cute.* Q2, TA: *Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.* *A2: I didn't see them at first and then they popped out. They are my favorite, they're cute and interactive.*	16 (11.7%)
Information	Includes all interview responses related to knowledge visitors glean from Museum signage or displays	*Q1, TA: Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.* *A1: I read the sign, got some information.* *Q2, TA: What key takeaways do you remember from the live animal exhibit? What about the exhibit, if anything, helped you remember that?* *A2: I remember they come from a huge jungle, I think in North Africa?*	14 (10.2%)
Staff interactions	Includes all interview responses related to visitor interactions with staff, such as observing them feeding the animals or taking photos of them during animal enrichment	*Q1, TB: Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.* *A1: I got to observe their interactions with people [feeding them] and each other.*	3 (2.2%)

		Q1, TB: Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit. *A2: It was neat to watch them get fed.*	
Animal Interaction	Includes all interview responses related to visitor interactions with the animals or other elements of the exhibit, or animals' interactions with each other	*Q1, TB: Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.* *A1: I work in an aquarium and have worked in zoos so I am biased, but I noticed how it is designed for the animals to interact with each other.* *Q2, TA: Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.* *A2: It's good to see species in community, it's more natural. The animal and human connection was not clear at first.*	15 (10.9%)
Connection	Includes all interview responses related to visitors making connections between the animal exhibits and things outside the Museum, such as their own habits or associations	*Q1, TA: Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.* *A1: I liked the comparison of the skeletons of the squirrels and tamarins.* *Q2, CRG: What about the exhibit made you select that image (indicating emotional response)?* *A2: CM: It is calm, relaxing, it reminds me of school when we watch relaxing videos.* *AF: We have fish at home so they like them.*	29 (21.2%)
Alive	Includes all interview responses where visitors explicitly note that the animal is alive	*Q1, CRG: What about the exhibit made you select that image (indicating emotional response)?* *A1: The live animals are one of my favorite things, they move around.* *Q2, CRG: What connections, if any, did you see between the live animal exhibit and your own life or the world? If yes, was there anything in the exhibit that helped you make those connections?* *A2: I've always wanted something alive like an amphibian, but I only have cats and dogs.*	6 (4.4%)
Animal features	Includes all interview responses that relate to animal features, such as their size, abilities, or body parts	*Q1, TA: Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.* *A1: They're bizarre, they're so small, they shouldn't be real. They are so miniaturized.* *Q2, TA: What connections, if any, did you see between the live animal exhibit and your own life or the world? If yes, was there anything in the exhibit that helped you make those connections?*	11 (8%)

		A2: They remind me of cats, I don't know why. Maybe because they are nimble and they have long tails.	
Wild, natural habitat	Includes all interview responses related to the animals' habitat and location	*Q1, CRG: What connections, if any, did you see between the live animal exhibit and your own life or the world? If yes, was there anything in the exhibit that helped you make those connections?* *A1: Building connections with nature, seeing animals in nature.* *Q2, TA: What connections, if any, did you see between the live animal exhibit and your own life or the world? If yes, was there anything in the exhibit that helped you make those connections?* *A2: It looks like it was designed to reflect the real habitat of the jungle, forest, maybe tropical environment.*	15 (10.9%)
Novelty	Includes all interview responses related to the unexpectedness or newness of encountering live animals in the Museum	*Q1, TA: Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.* *A1: I don't see them often.* *Q2, TB: What key takeaways do you remember from the live animal exhibit? What about the exhibit, if anything, helped you remember that?* *A2: Learning what a tamarin is.*	10 (7.3%)
Conservation	Includes all interview responses related to the conservation of live animal species and their habitats	*Q1, TB: What key takeaways do you remember from the live animal exhibit? What about the exhibit, if anything, helped you remember that?* *A1: We know they're endangered and that their habitat is at risk.* *Q2, TB: What key takeaways do you remember from the live animal exhibit? What about the exhibit, if anything, helped you remember that?* *A2: I know they are endangered because the sign says to save them.*	6 (4.4%)
Other	Includes all interview responses that do not fit into other codes and do not warrant a code of their own, e.g. due to being an outlier	*Q1, CRG: What connections, if any, did you see between the live animal exhibit and your own life or the world? If yes, was there anything in the exhibit that helped you make those connections?* *A1: We saw the bees.* *Q2, CRG: If not, what might have helped you make those connections more easily?* *A2: If they could put a tank or a tide pool where you could touch and feel things.*	5 (3.6%)

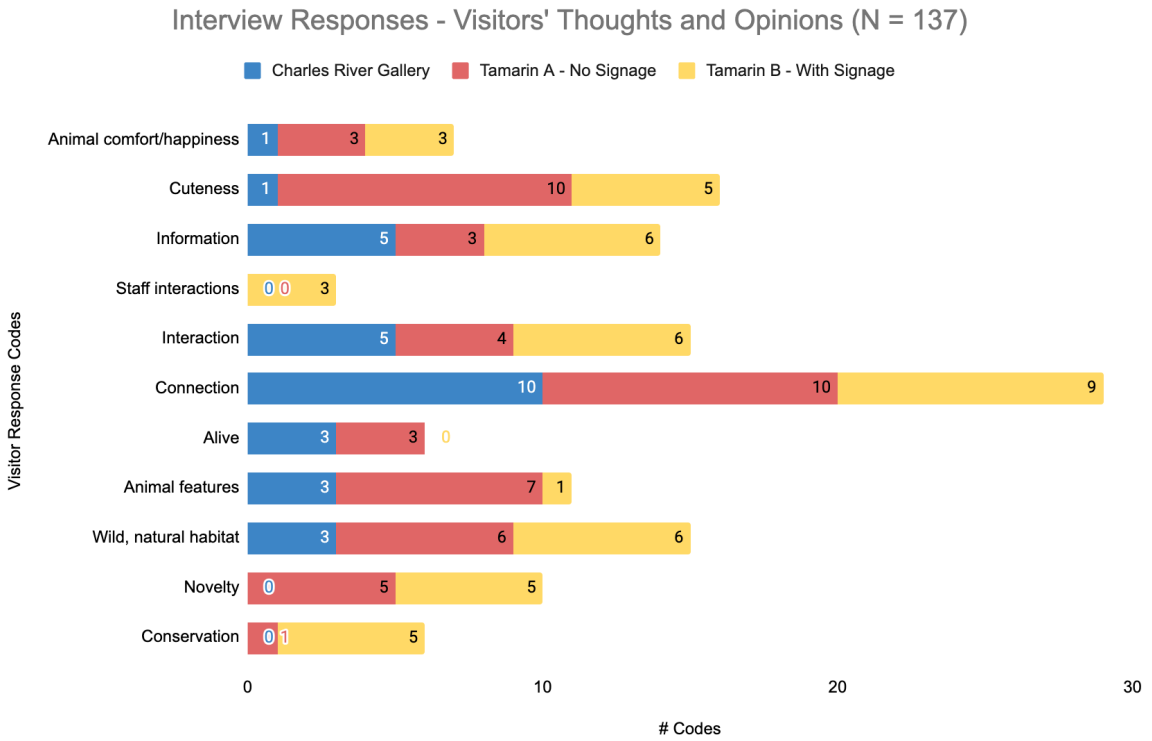

Figure 4.2.6. *Interview responses about visitors' thoughts and opinions about live animal exhibits grouped by exhibit; N = total number of codes; N = total number of codes*

Visitor Engagement: Staff

Apart from the ways that visitors engage with elements of the live animal exhibits, interviews also revealed the overall thoughts and opinions that visitors had while interacting with live animal exhibits, including their thoughts about staff interactions as seen in Table 4.2.3. There were a small number of interview subjects in the tamarin B group who got to observe the tamarins getting fed and cared for by Museum staff members. Staff were not present in the Charles River Gallery or the tamarin Group A condition on days that we conducted interviews, so there was no data collected in those groups related to staff interactions. In the tamarin B group, eight interviews were conducted after visitors witnessed the tamarins interacting with staff. Three (2.2% of total codes) comments focused on how Museum visitors feel about and interact with staff.

Table 4.2.3 *Interview responses related to staff interactions*

Question	Response
Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.	It's informative for sure. When I was coming in I learned their brains look like ours. I missed the signs on the walls. I got to observe their interactions with people [feeding them] and each other.

Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.	CM: Cute. I enjoyed it. They are playful. It was neat to watch them get fed.
Is there anything else you'd like to share about your experience with the live animal?	AF: I wish we could learn more about them. It would be nice to see them interact with humans. C: It would have been nice to watch a feeding.

The first two quotes indicate that visitors felt positively about seeing the tamarins interact with staff, while the third quote is from a participant who had missed getting to see staff feed the tamarins and wished they had seen it. While representing a small percentage of total interview responses, these quotes indicate that visitors enjoy seeing staff interact with the animals, although no visitors were able to directly interact with staff themselves.

Connections to Conservation Messaging

There were a total of six comments (4.4%) about conservation messaging with one interview response coming from the tamarin Group A testing with no added signage and the other five from tamarin Group B when extra signage had been added to the exhibit. There were no comments about conservation from the Charles River Gallery interviews. Of these six comments, three people specifically mentioned that the information they learned from signs was the reason for them making a connection between the exhibit and conservation messaging.

Table 4.2.4. *Interview responses to question, "What key takeaways do you remember from the live animal exhibit? What about the exhibit, if anything, helped you remember that?"*

"Conservation…they are an endangered species. Their habitat is also small. I read the sign, got some information." (Interview subject, Tamarin Group A).
"I didn't pay much attention [because of my granddaughter]. I know they are endangered because the sign says to save them" (Interview subject, Tamarin Group B).
"The poster for conservation, that was probably the main takeaway." (Interview subject, Tamarin Group B).

Connections to Real World

The majority of connections that people made were between the live animal exhibits and their own lives rather than connections to the Museum's intended messaging. 25 responses (18.2%) were coded for connections to visitors' lives or the world outside of the Museum, with several themes emerging from these responses.

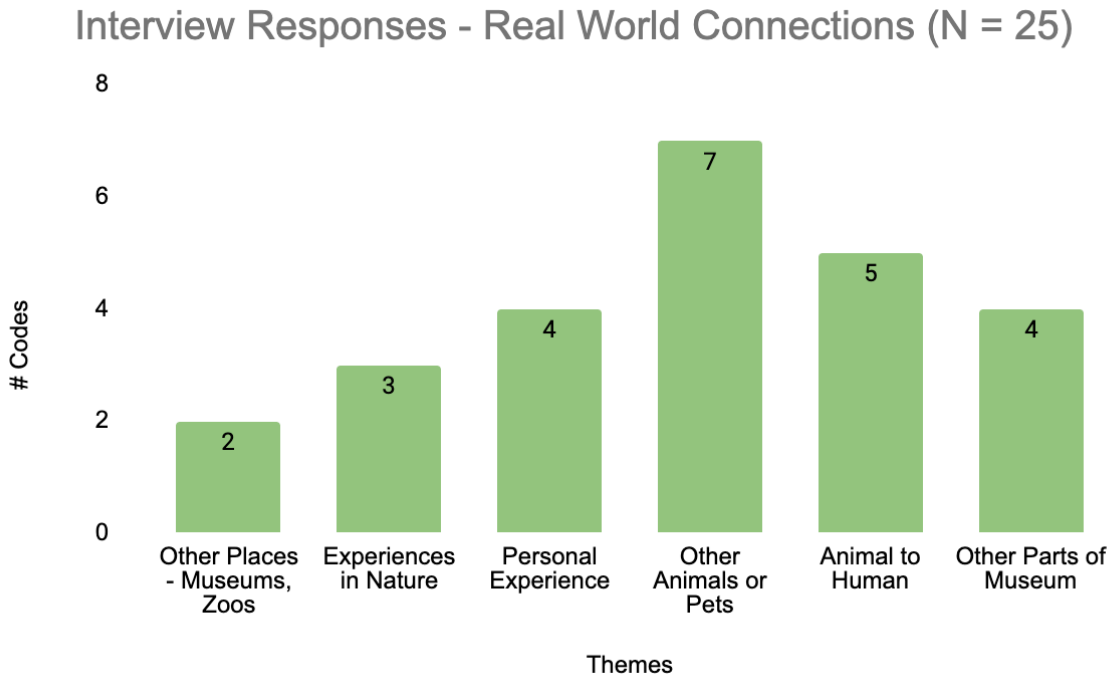

Figure 4.2.7. *Themes in interview responses about connections to the world and visitors' lives; N = total number of codes*

The majority of responses (7) connected the animals to other animals or pets, with many people in the tamarin exhibit saying the tamarins reminded them of their cats. A few people drew connections between the tamarins and the squirrel skeleton in the room as well. Five people connected the animals to humans, with some people saying that the tamarins looked like humans or played like young children. There were four comments each connecting the animals to personal experiences like childhood memories and other parts of the Museum like other galleries. Three people connected the animals to their own experiences in nature, such as connecting the fish and turtles in the Charles River Gallery to their own interest in fishing. Two people drew connections between the live animals and other museums or zoos, with one person expressing that they are more used to seeing live animals at the zoo than a museum. Examples of direct quotes can be found in Table 4.2.2.

Lack of Connections

When asked about the connections they found between the live animal exhibits and the real world, nine people responded that they did not see a connection.

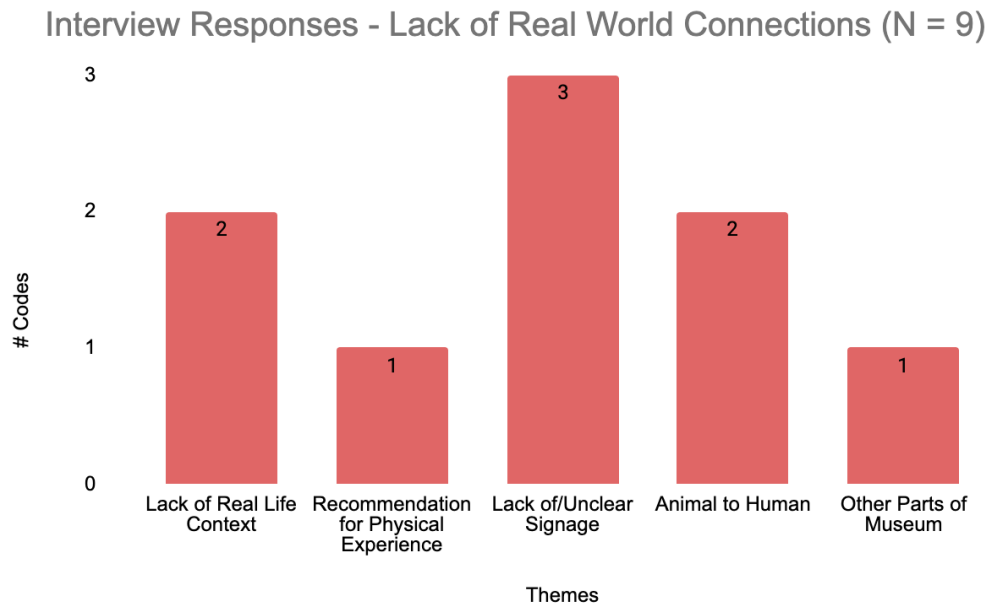

Figure 4.2.8. *Themes in interview responses about lack of connections to the world and visitors' lives; N = total number of codes*

When asked why they could not make a connection or what would have helped them make connections between the exhibits and the real world, three people replied that there was not enough signage to communicate relationships between the exhibit and the world or that the existing signage was unclear. Two responses each related to visitors lacking real life context for the exhibit, such as never having seen a tamarin before, or not understanding the connection between the animals and humans. One response each related to the lack of physical experience, such as having no way to touch the animals, and not understanding the connection to other parts of the Museum.

Animal Comfort

7 visitors (5.1%) indicated an interest in the comfort of live animals at the Museum. Of these responses, the themes that came up were the live animals' comfortability with humans, the care that animals received, and that they appeared happy.

Table 4.2.5. *Themes emerging from interview responses related to live animals' comfort and/or happiness*

Themes	Quotes
Comfort with Humans	*"They seem comfortable with humans. They remind me of my cat."*
Animal Care	*"The animals are well taken care of. The cases look good, they don't look distressed."* *"I enjoy looking at animals. The environment looks well-taken care of."*
Animal Happiness	*"Is there enough space? I always think about how happy are the animals, and them running around is a positive sign."*

	"It was enjoyable. I don't love seeing the turtle being tortured by the feeding toy." *"AF: They like to climb and play together.* *AM: The monkeys seem happy."* *"They're adorable, and they look so happy."*

Animal Habitat

15 interview responses (11%) were coded for an interest or concern for the animals' natural habitats.

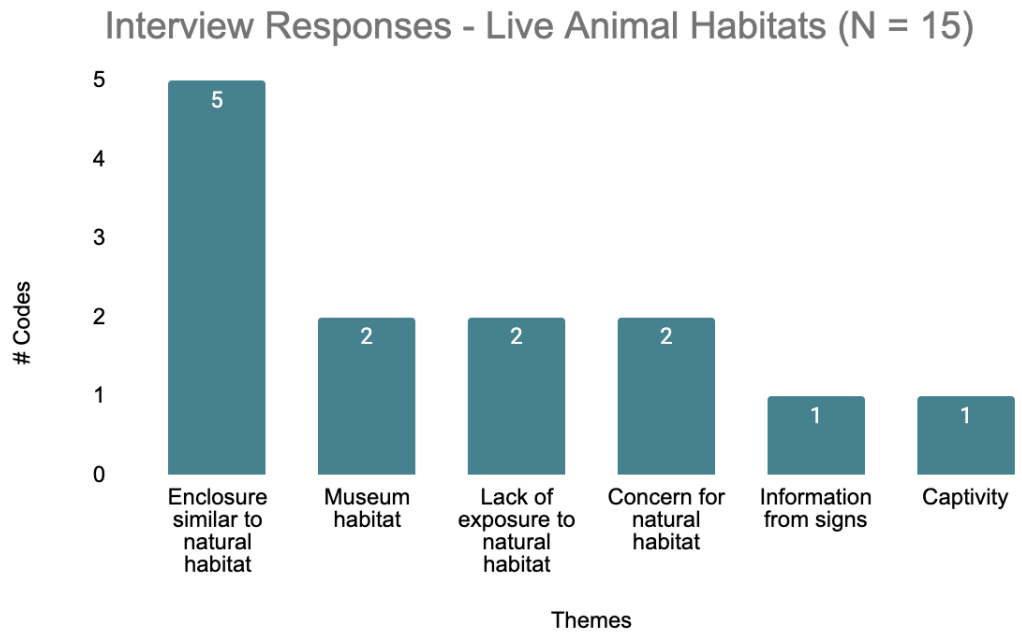

Figure 4.2.9. *Themes in interview responses related to live animals' habitats; N = total number of codes*

Of the main themes that emerged from these responses, Five comments reflected an appreciation for the Museum's efforts to design the enclosures to be similar to the animals' natural habitats, such as using realistic vines or the mural in the tamarin exhibit painted to look like the rainforest. Two participants responded that the live animal exhibits reminded them of how little exposure they have to live animals' natural habitats in their own lives, and two more people expressed concern for the animals' habitats and the need to protect their homes through conservation efforts. Two people focused on the size of the animal's habitat in the Museum and expressed a desire for their enclosure to be bigger. One person mentioned learning about the animals' natural habitat and diet from reading the signs in the exhibit, while one other person expressed an awareness for the live animals in captivity being taken out of their natural habitat. Examples of direct quotes can be found in Table 4.2.2.

Information

14 interview responses (10.2%) expressed that visitors had learned information about the live animals through the live animal exhibits at the museum.

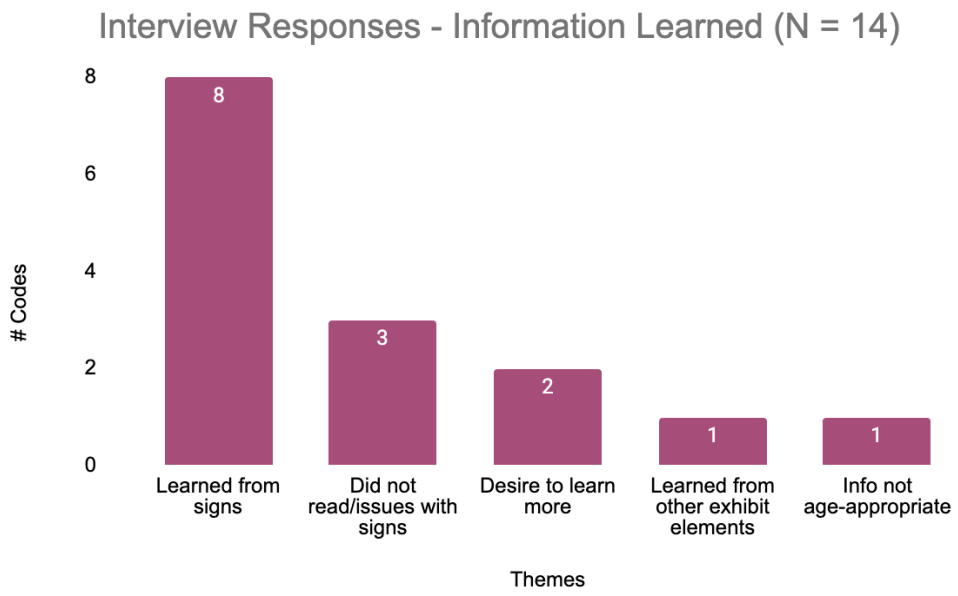

Figure 4.2.10. *Themes in interview responses related to information learned from live animal exhibits; N = total number of codes*

Eight of these responses described information that visitors learned from signage in the exhibit, such as learning about the different species or learning how the animals communicate. Three people revealed that they did not learn information about the animals because they did not read the signs or that they felt the signs could be improved to communicate information more clearly. Two respondents expressed a desire to learn even more information after observing the live animals, such as why the animals are in the Museum. One person learned information about the tamarins from the skeletons in the exhibit showing the connections between humans' and tamarins' anatomy. Of those who did not feel they learned information from the live animal exhibits, One parent to a 3-year old daughter felt that the scientific information and messaging at the turtle and fish tank in the Charles River Gallery was not age-appropriate for a child audience. Examples of direct quotes can be found in Table 4.2.2.

Animal Interactions

14 interview responses (11%) revealed an interest among visitors in three main themes of animal interactions: humans interacting with animals, humans interacting with non-animal exhibit elements, and animals interacting with each other.

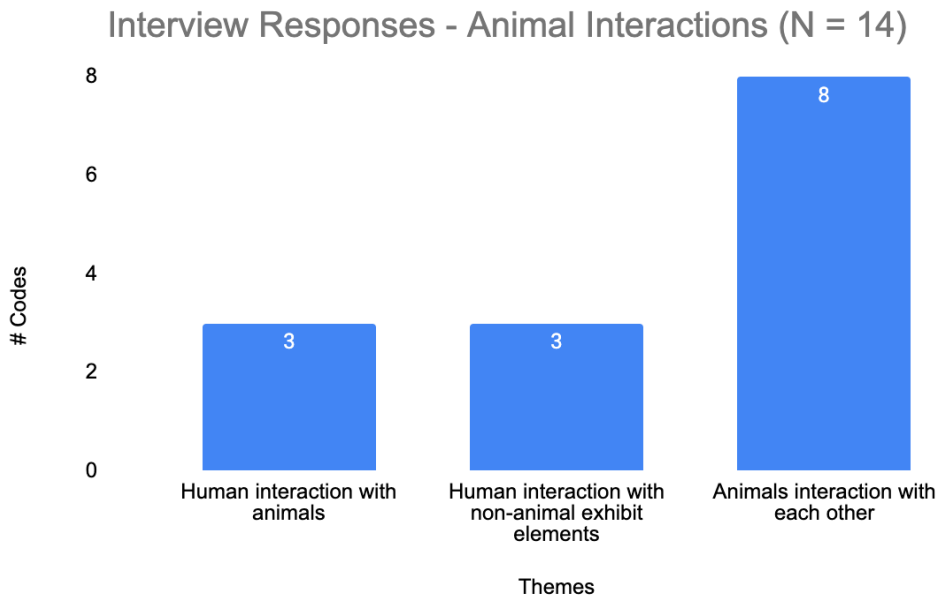

Figure 4.2.11. *Interview responses related to animal interactions; N = total number of codes*

Three responses were coded as relating to the ways that humans can interact with the live animals:

> *"She [3 y.o. child] enjoyed the live animals. She likes animals. She got a closer look at them"* (Interview respondent, Charles River Gallery).

Three more responses from the Charles River Gallery fish tank revealed an appreciation for the interactive elements of the exhibit other than the animals themselves, such as the tunnel and play-based features. For example, one respondent said:

> *"I like that the kids can interact with the exhibit, with the tunnels and the animals. It reminded me of other museums we have been to. The kids wanted pictures with the otter statue. The statues are fun too"* (Interview respondent, Charles River Gallery).

The largest sample of responses within this group was comments about the animals interacting with each other. Specifically, people enjoyed watching the tamarins play together:

> *"When we were watching them interact with each other, we wondered if they were married"* (Interview respondent, Tamarin Group B).

Emotional Responses

When coding interview responses for visitors' attitudes towards live animal exhibits at the Museum, an overwhelming majority (92.2%) of responses reflected positive emotions. 3.3% of responses were negative, with 4.4% of responses being neutral. We measured attitude by coding for themes related to positive emotions as well as asking participants to rate their emotional experience interacting with the live animal exhibits from 1 (most negative) to 5 (most positive).

Table 4.2.6. *A summary of interview participants' overall thoughts and opinions at the Museum of Science, Boston (N = 90 where N = total number of codes)*

Code	Definition	Example Quotes	# of Codes: Total
Positive	Includes all interview responses that indicate visitors experienced the live animal exhibits in a positive manner	*Q1, CRG: Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.* *A1: I love it. I like the different fish tanks.* *Q2, TB: Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.* *A2: I liked watching them do daily stuff like cleaning, it was fun to watch them climb.*	*83 (92.2%)*
Negative	Includes all interview responses that indicate visitor dissatisfaction or talk about negative aspects of the live animal exhibit experience	*Q1, CRG: Is there anything else you'd like to share about your experience with the live animal?* *A1: It brings me some sadness because exhibits from when I was a kid are no longer here, so the kids can't see them.* *Q2, TA: What key takeaways do you remember from the live animal exhibit? What about the exhibit, if anything, helped you remember that?* *A2: They don't have a lot of space. It would be cool to have a big area for them.*	*3 (3.3%)*
Neutral	Includes all observations that have neither a positive nor negative tone	*Q1, CRG: What key takeaways do you remember from the live animal exhibit? What about the exhibit, if anything, helped you remember that?* *A1: It was fine. The science part went over her [3 y.o.'s] head. It was more play based.* *Q2, TA: Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.* *A2: I don't see them often.*	*4 (4.4%)*

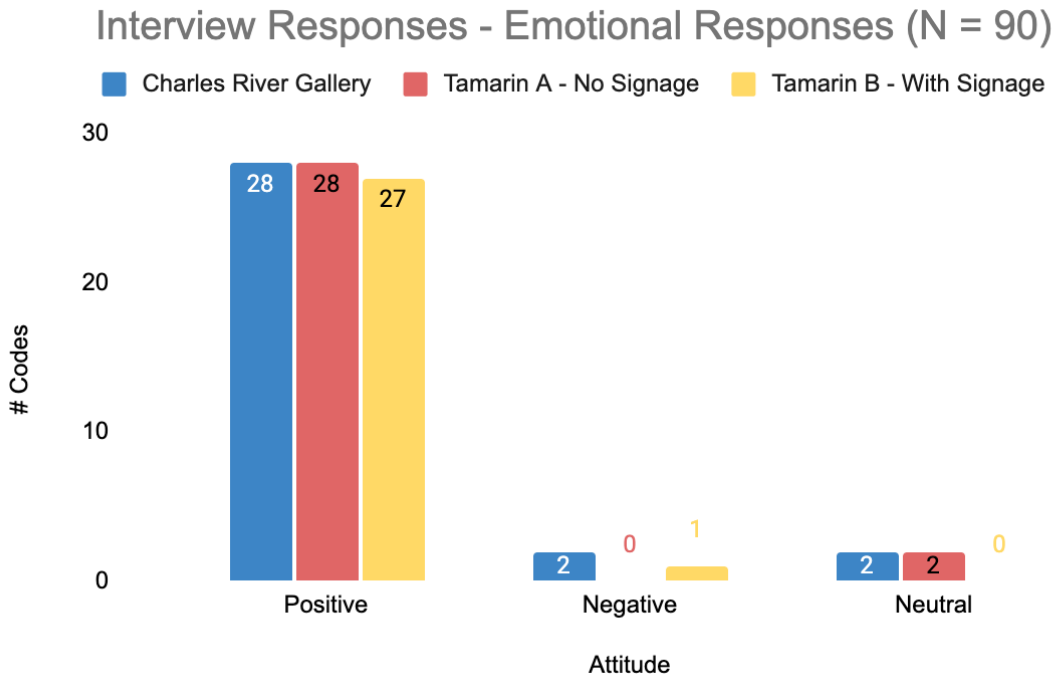

Figure 4.2.12. *Interview responses about visitors' emotional responses towards live animal exhibits; N = total number of codes*

As seen in Figure 4.2.12, the emotional responses to live animal exhibits was consistent across all three exhibits and testing conditions with very little variance across the three. When looking closer at the causes for most people's positive attitudes towards the live animal exhibits, four themes emerged: perceptions of the animals' cuteness, animals' physical features, the novelty of the animals, and the fact that animals were alive.

Cuteness

According to Figure X, 16 interview responses (11.7%) described the animals as cute, and all visitors who mentioned cuteness were also coded for positive emotional responses to the exhibits. Many people described the animals' cuteness as their reason for enjoying the exhibit. For example, one respondent rated their emotional experience as a 5/5, and when asked why they selected that rating, they replied, *"They're so cute, we thought they looked kind of like Guy Fieri. They're adorable, and they look so happy"* (Interview respondent, Tamarin Group A).

Animal Features

Eleven responses (8%) related to the animals' physical features or abilities, with many visitors enjoying seeing animals' faces, bodies, and movement patterns. In the turtle and fish tank, some visitors reflected on the turtle's neck or slow speed, while in the tamarin exhibit people commented on the tamarin's tails and their ability to jump. All participants who commented on animal features were also coded as having positive emotional responses to the animals. Examples of direct quotes can be found in Table 4.2.2.

Novelty

Ten interview responses (7.3%) involved comments about the novelty of the animal, such as not being used to seeing a turtle in a museum or not knowing what a tamarin was before coming to the Museum of Science. These comments often had positive connotations including an appreciation for the uniqueness of the tamarins or reflecting that they had learned something new. Every person that commented on the novelty of the animals rated their emotional experience as either a 4 or 5 on the 1-5 scale, indicating generally positive experiences. Examples of direct quotes can be found in Table 4.2.2.

Alive

Six respondents (4.4%) enjoyed seeing animals that were alive in the Museum. All people whose comments received an "Alive" code also reported positive experiences at the exhibit. At the fish tank in the Charles River Gallery, one child said, *"I love it. I like the different fish tanks, and that the turtle is actually alive"* (Interview respondent, Charles River Gallery). Another visitor shared, *"The live animals are one of my favorite things, they move around"* (Interview respondent, Charles River Gallery).

Visitors Questions and Concerns

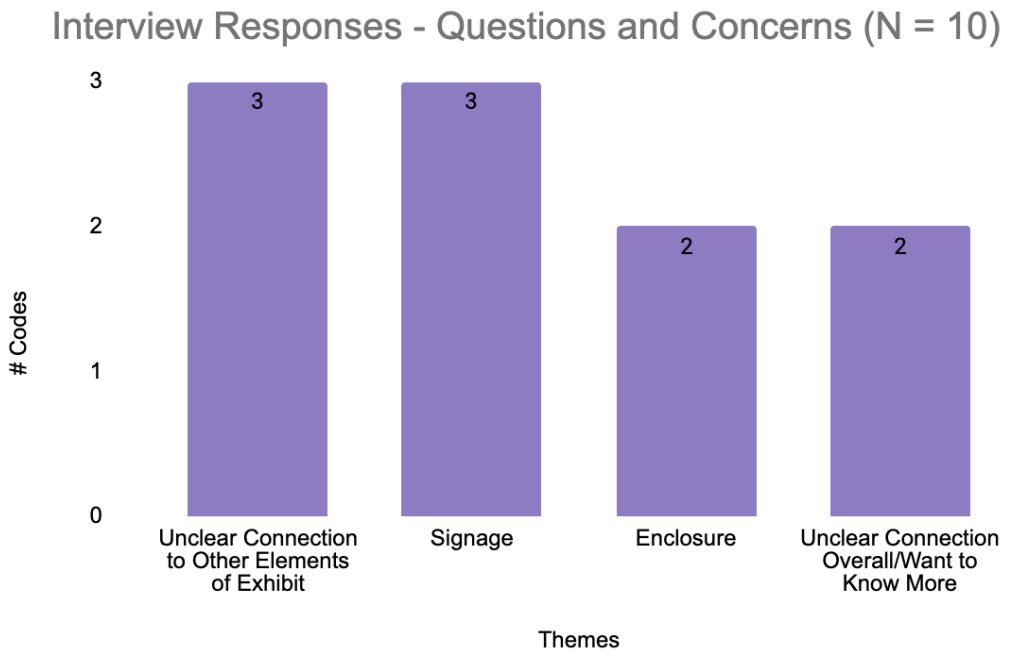

Figure 4.2.13. *Themes in interview responses related to questions or concerns; N = total number of codes*

Ten responses (7.3%) related to questions or concerns about the live animal exhibits. Of the main themes that emerged from these concerns, three responses reflected that there was an unclear connection between the live animals and the other elements of the exhibit such as between the tamarins and the human skeletons in the same exhibit. Three more people had concerns about the signage including feeling the signs were not easily visible or were difficult to read due to font size or

presentation. Two people expressed concerns about the amount of space and the conditions of the animal enclosures, and two more people found it challenging to make any connections in the live animal exhibits or wanted to know more information than what they found in the museum.

Table 4.2.7. *Quotes about visitors' questions or concerns about live animal exhibits (N = 8 where N = total number of responses)*

Question	Response
Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.	The animal and human connection was not clear at first.
What key takeaways do you remember from the live animal exhibit? What about the exhibit, if anything, helped you remember that?	AF: The board is clear, not too much to read. Cotton… I'm not sure how the human skeleton relates. AM: I noticed the nesting box.
If not, what might have helped you make those connections more easily?	I don't see a connection. I'd like to learn more about it. There is not a ton of signage explaining things. The video is hard to get useful information out of because I was not sure where to start watching [the slideshow]. The text on the signs is really small and hard to read.
If not, what might have helped you make those connections more easily?	Pictures, signs are there but I didn't see them at first.
What key takeaways do you remember from the live animal exhibit? What about the exhibit, if anything, helped you remember that?	I had never seen one. I am unsure about the connection [to the rest of the gallery]. I didn't read the signs. It would be nice if they had a verbal question-and-answer opportunity in here.
Is there anything else you'd like to share about your experience with the live animal?	AF: I wish we could learn more about them. It would be nice to see them interact with humans. C: It would have been nice to watch a feeding.
Is there anything else you'd like to share about your experience with the live animal?	Do they always live here in the enclosure? I guess the enclosure is better than a cage.
Is there anything else you'd like to share about your experience with the live animal?	AF: Is there enough space? I always think about how happy are the animals, and them running around is a positive sign. AM: I'd like more information on where they came from and why they are on display.

4.3 Exit Survey Findings

Exit Survey Participant Profiles

A total of 22 visitors or visiting groups participated in the exit survey. Of these, 13 (59.1%) identified as a woman/girl and eight identified as a man/boy (36.4%). One (4.5%) preferred to self-describe. See Figure 4.3.1 below.

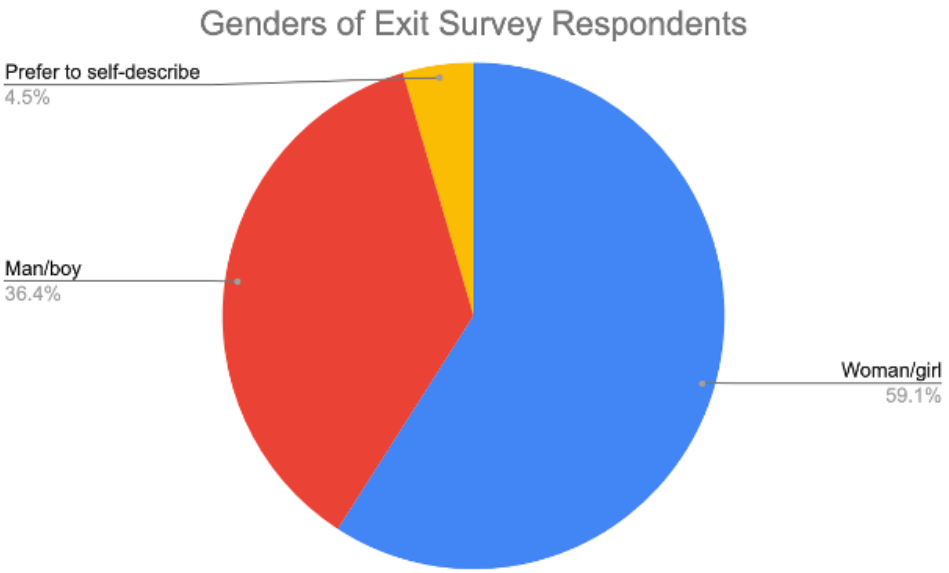

Figure 4.3.1. *For exit surveys, 59.1% of respondents identified as a woman/girl, 36.4% as a man/boy, and 4.5% preferred not to self-describe.*

Respondents were primarily white/Caucasian, with 16 of 22 groups (72.7%) identifying as such. Of the remaining groups, two were black or African American (9.1%) and one was Asian or Asian American (4.5%). Three (13.6 %) selected the "other" category but did not offer further details. One (4.5%) preferred not to self-describe.

See Figure 4.3.2 below. Note that although there were only 22 respondents, there were 23 responses here; one group, Group J, chose two options: "White or Caucasian" and "Black or African American."

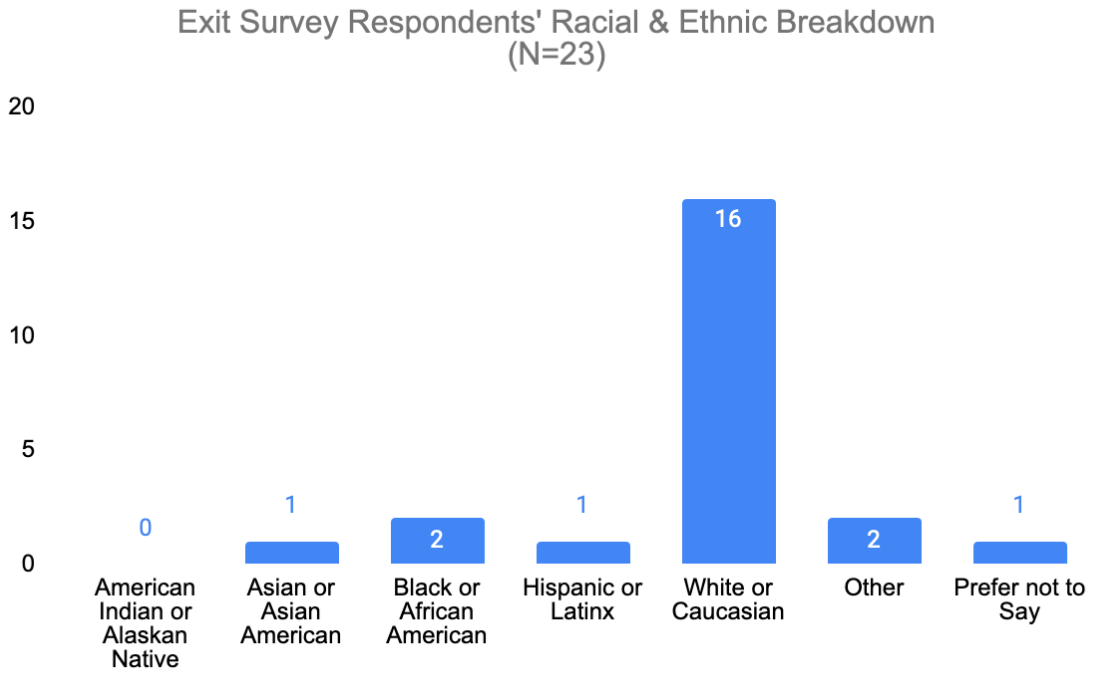

Figure 4.3.2. *Sixteen survey respondents (72.7%) self-identified as white/caucasian. Two were black or African American (9.1%) and one was Asian or Asian American (4.5%). Three (13.6 %) selected the "other" category but did not offer further details. One (4.5%) preferred not to self-describe.* ***Note:*** *Although there were only 22 survey respondents, one chose two categories in response to this question.*

While 18 of the 22 groups surveyed (89.8%) visited with one or more children, four groups (18%) had no children. Finally, three groups (13.6%) indicated that one or more members of their party had a temporary or permanent disability. Four groups (18%) were members at the Museum. Eleven groups (50%) lived locally in Boston.

Exit Survey Key Takeaways & Summarized Findings

1. Visitors generally reacted positively to live animal exhibits, often discussing them with each other or their children.
2. More visitors are *interested* in seeing various live animal exhibits than are *actually* seeing them, perhaps due to a lack of awareness of their presence or locations.
3. There are inconsistencies in respondents' understandings or perceptions of why the Museum offers live animal exhibits, as well as how they are relevant to their own lives.
4. A number of respondents expressed a desire for different/additional information about to help clarify the live animals' relevance, answer questions, and/or facilitate conversations with their children.
5. Some visitors expressed a desire to see a greater number or variety of animals.

Notable visitor responses included:

- *"[We] like the animals but the local animals make more sense than non-local ones. It's hard to know how to talk to [children] about the ones that aren't from around here because there isn't any context. It goes right over their heads."* - (Exit Survey Group J, adult)

- *"Only the Charles River animals make sense. Insects were interesting (unique) but I'm not sure why they're here. More mammals would be nice. Or birds. More info on the connection to us and science. Didn't even know you had a live animal care center [but it] sounds cool."* - (Exit Survey Group N, adult)

- *"We didn't know you had animals. Let alone tamarins and axolotls! Would have liked to see them if we'd known. Is there a map or list somewhere? There should be."* - (Exit Survey Group O, adult)

- *"Live animal care center sounds cooler than it is. Just windows with snakes. Show people actually caring for different animals and tell what happened to them."* - (Exit Survey Group V, adult)

Based on the responses, the Museum visitors seem to have a range of opinions regarding the live animal exhibits. Some do grasp intended messaging about the animals' habitats and our need to protect them; however, others express confusion about the purpose of the exhibits, or did not perceive any specific educational goal. Furthermore, no visitors mentioned a call to action or demonstrated a clear understanding of their own roles in protecting or influencing these animals, which Museum personnel had referenced as a desired takeaway.

Overall, the data suggests that visitors enjoy and are interested in the exhibits. Some made a connection to scientific themes around habitats and protection/conservation, as well as biology and animal behaviors. However, themes around visitors' own roles in affecting these animals came through inconsistently. The Museum may want to consider clearer messaging and a more explicit call to action to help visitors understand not only how the animals are relevant to them, but also how they themselves are relevant to the animals and how they can make a difference in their lives.

Exit Survey Full Findings

(a) Which Live Animal Exhibits Were Most Visited?

The survey's first question surfaced which of the Museum's live animal exhibits respondents saw that day.

We found that respondents were twice as likely to have visited two exhibits—the fish, turtles, and amphibians and/or insects—as any other animals (see Figure 4.3.3 below): 15 of 22 groups (68.2%) stopped by the fish, turtles, and amphibians and 14 groups (63.6%) explored the insects/invertebrates.

Tamarins and axolotls, meanwhile, were both visited by seven of the 22 groups (31.8%). Reptiles were seen by six groups (27.3%), while five groups (22.7%) stopped by the Live Animal Care Center. Additionally, three respondents indicated that they saw "other" live animals, including a legless lizard, bunny, and spider. Three reported that they saw no live animals during that day's visit, but still replied to the rest of the questions. (Two of these three noted that they had seen the Museum's animals during previous visits.)

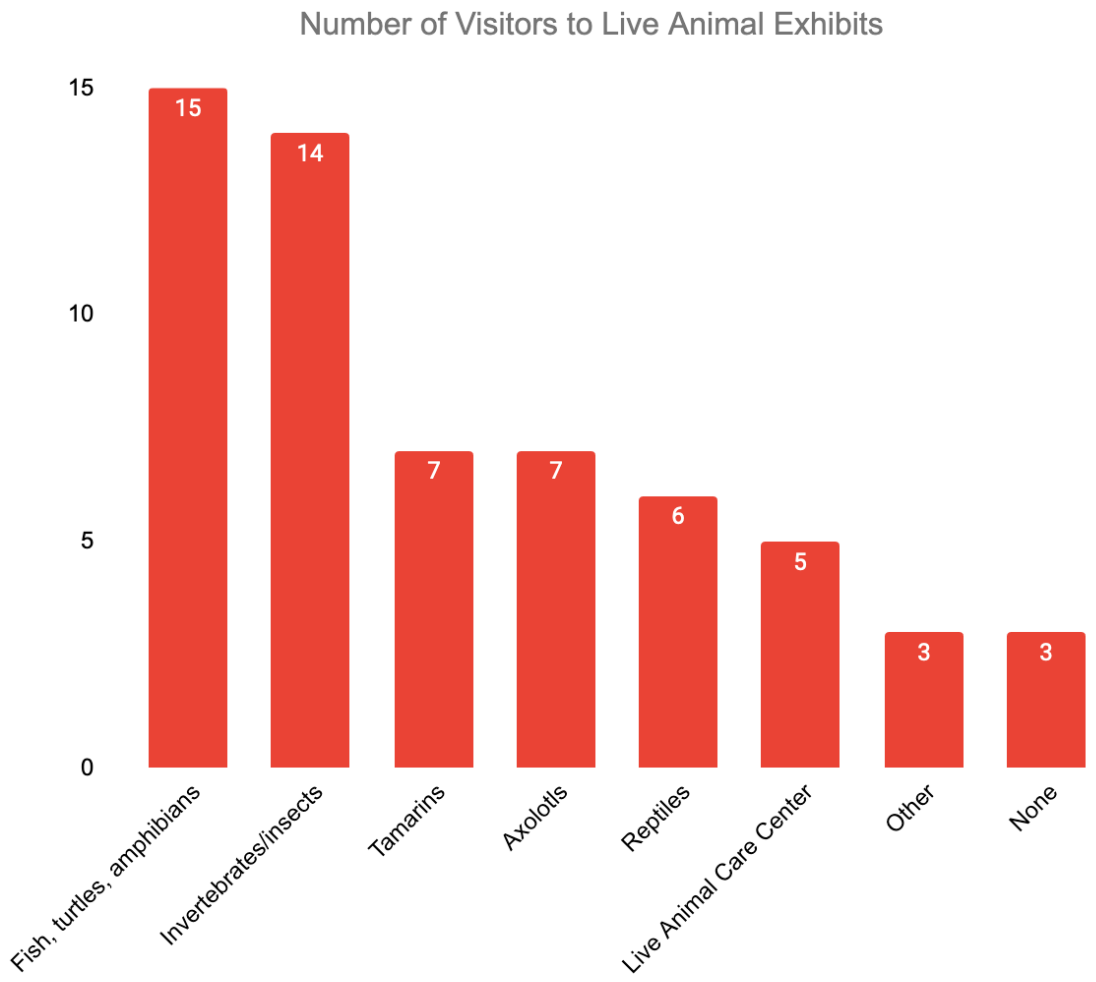

Figure 4.3.3. *Fish, turtles, and amphibians along with invertebrates/insects were the most popularly visited live animal exhibits.* ***Note:*** *Respondents were invited to choose as many answers as they felt applied for this question, and many gave multiple answers. Under "other," respondents wrote in: legless lizard, bunny, spider.*

(b) Which Live Animal Exhibits Were Visitors Most Interested In?

Regardless of which—if any—live animal exhibits they saw that day, survey respondents were asked in the second question: "which live animal exhibits most excite or interest you?"

The majority of groups (18 of 22; 81.8%) identified tamarins as one of the key exhibits they were most interested in. This was followed by invertebrates/insects (12 of 22; 54.5%) and the Live Animal Care Center (11 of 22; 50%). Reptiles and Axolotls both had eight interested parties (36.4%), and fish, turtles, and amphibians had seven interested parties (31.8%). Six respondents chose "other," writing in specific suggestions like: polar bears, alligators, jellyfish, legless lizards, boa constrictors, and raptors/eagles. See Figure 4.3.4 below.

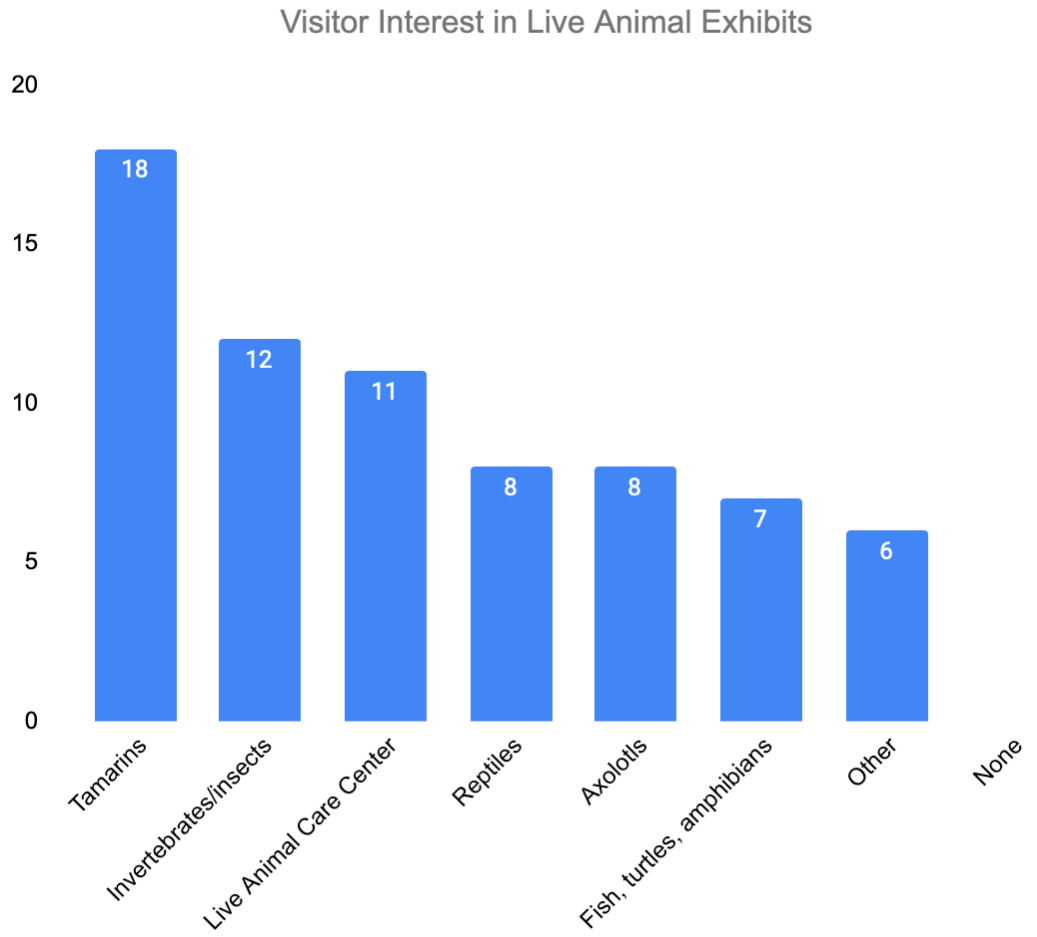

Figure 4.3.4. *Tamarins were the most popular live animal exhibits in terms of visitor interest. Note that respondents were invited to choose as many answers as they felt applied. Under "other," respondents wrote in: polar bears, alligators, jellyfish, legless lizards, boa constrictors and raptors/eagles, and mammals.*

(c) Comparison of Interest to Actual Visits

In order to compare visitor interest as indicated in the survey versus actual visitors to any given exhibit, we created a separate bar chart containing both datasets (see Figure 4.3.5, below).

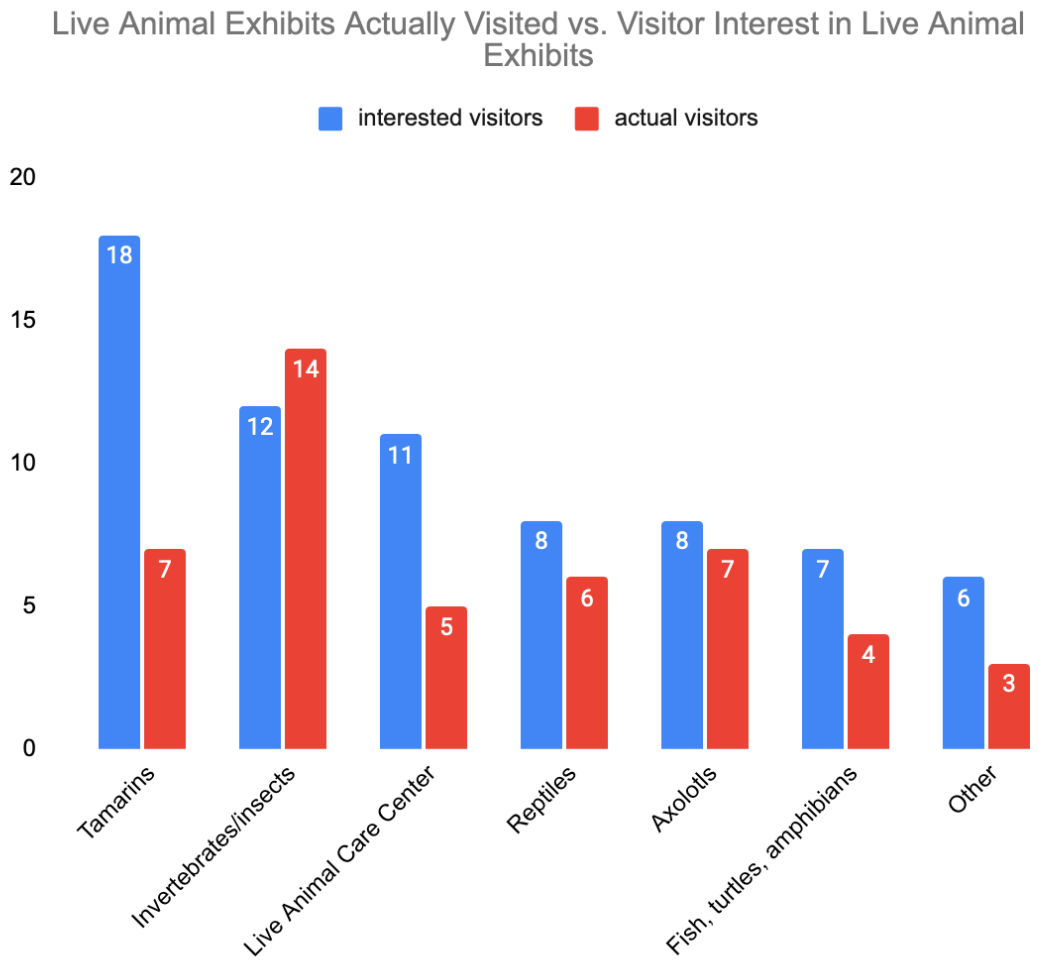

Figure 4.3.5. *Comparison between respondents' visits to versus interest in live animal exhibits.*

In most instances, more respondents were *interested* in various live animal exhibits than actually *saw* them. This trend could indicate a lack of awareness that the exhibits exist, supported by a quote from an adult visitor from Group O who stated: "We didn't know you had animals. Let alone tamarins and axolotls! We would have liked to see them if we'd known."

The interest-visit gap is particularly large for the tamarins, which 18 respondents were interested in but only seven actually saw. To a lesser extent, it is also true for the Live Animal Care Center, which is located relatively far from other galleries. While 11 of 22 (50%) of respondents were interested in the Live Animal Care Center, only five (22.7%) actually saw it.

Only the insects/invertebrates received fewer "interested" votes than actual visits. However, eight of the 12 "interested" votes (54.5%) for invertebrates/insects came from respondents who had actually visited them. This correlation has two potential interpretations. It may point to self-selection, with people who like insects being more likely to seek out or opt into the Insect Zoo. However, it may also suggest that an insect exhibit *sounds* unappealing to those who haven't seen it, but proves to be quite interesting to those who have. (In other words: perhaps the exhibit sparks interest in otherwise neutral parties). More research would have to be done to further probe this trend.

(d) Visitor Perceptions of their Learning

The next set of questions employed a Likert scale.

Sixteen survey respondents (72.7%) agreed or strongly agreed with the statement: "I learned something new from the live animal exhibits I saw today." See Figure 4.3.6 below.

This suggests that the exhibits successfully facilitate learning for many guests, though it stops short of exploring *what* they're learning.

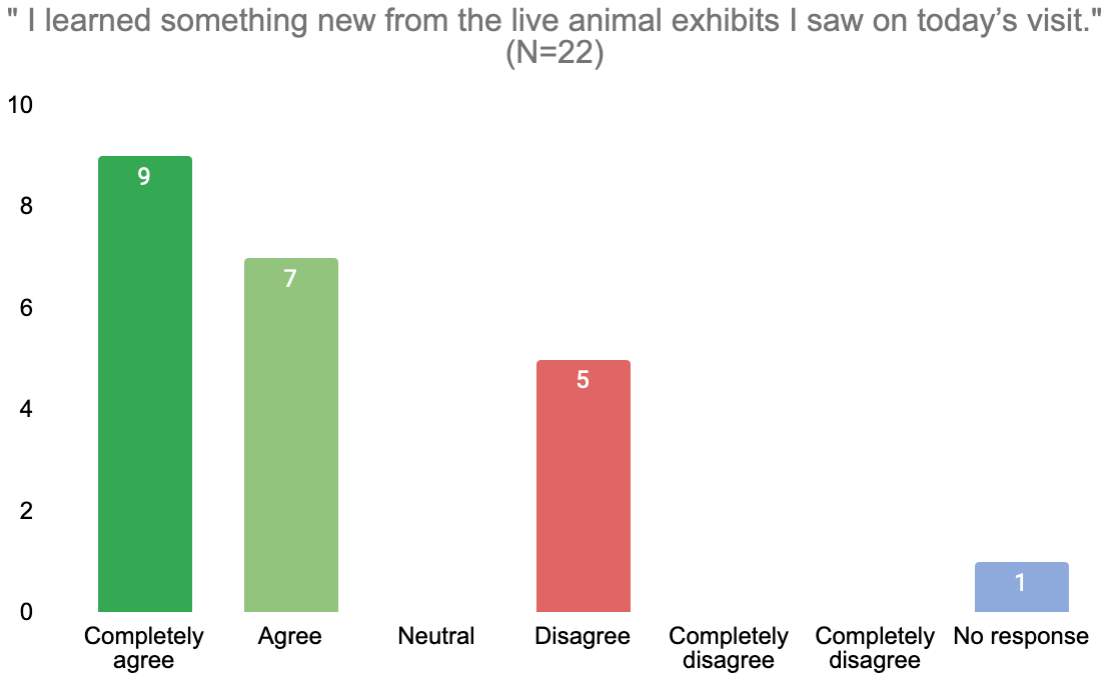

Figure 4.3.6. *72.7% of respondents agreed, to some extent, to having learned something new from the live animal exhibits.*

(e) Visitor Conversations Prompted by Live Animal Exhibits

Most visitors (16 of 22 surveyed; 72.7%) agreed or completely agreed with the statement "I had conversations with my child(ren) or others in my group about the live animals." See Figure 4.3.7 below. Of the three who disagreed or completely disagreed, two had children with them. The third was visiting alone.

This suggests the Museum's live animal exhibits do effectively foster conversations between many guests, especially those visiting in groups. It does, however, stop short of exploring whether the exhibits may have facilitated conversations or interactions between two or more different groups or with Museum staff.

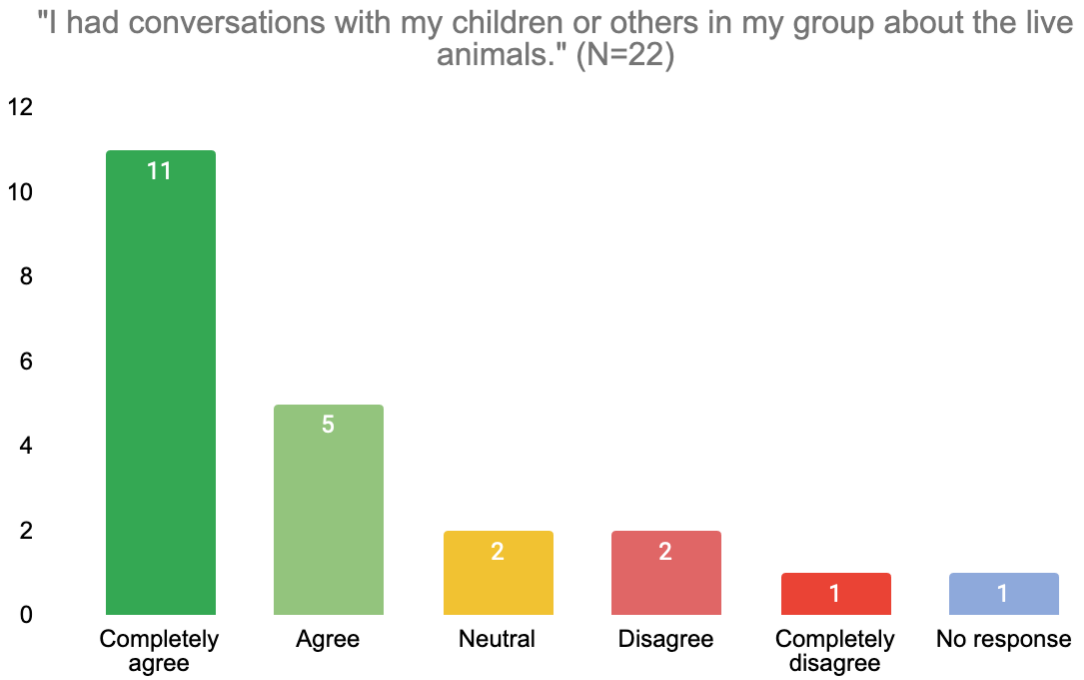

Figure 4.3.7. *72.7% of respondents agreed, to some extent, that the live animal exhibits facilitated conversations with their child(ren) or others in their group.*

(f) Visitor Satisfaction with Information Presented about Live Animal Exhibits

Thirteen respondents (59.1%) indicated that they agreed or completely agreed with the statement: "I was able to find the information I wanted to know about the live animals."

A relatively high number of neutral responses to this question versus others (6 of 22; 27.3%) may suggest that visitors had few or no questions about the animals in the first place, possibly correlating with a lack of deep engagement or consideration. It could also suggest that they didn't pay enough attention to signage to know whether or not the answers to any questions they *did* have were posted.

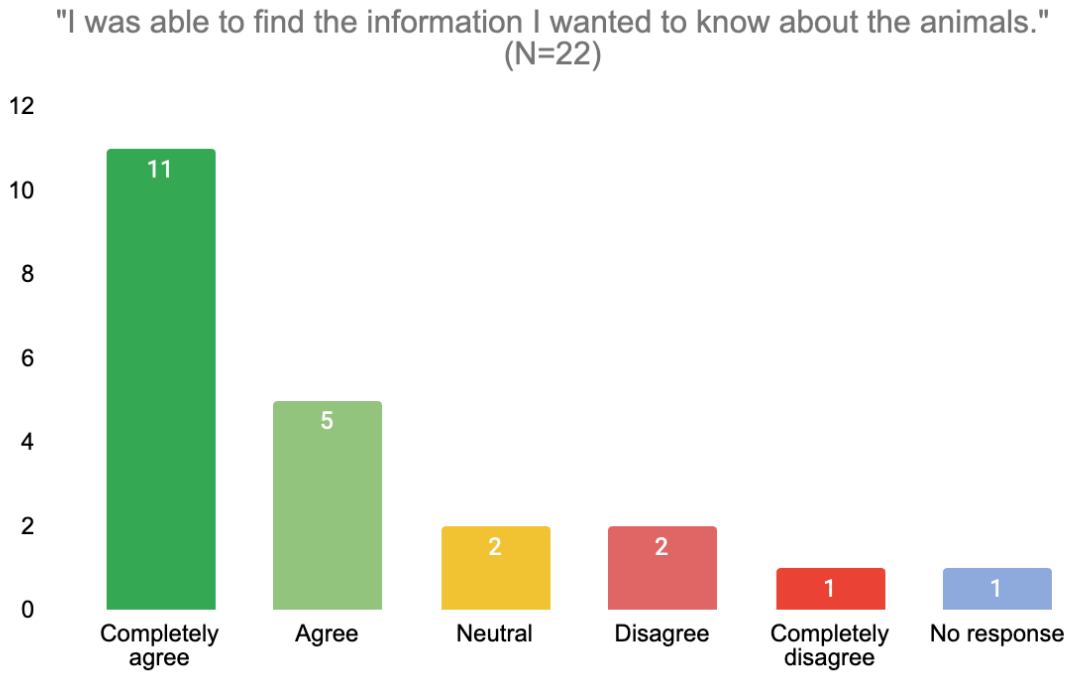

Figure 4.3.8. *59.1% of respondents agreed, to some extent, that they were able to find the information they wanted to know about the live animal exhibits.*

(g) Visitor Understandings of Why the Museum Offers Live Animal Exhibits

Fifteen of 22 respondents (68.2%) agreed or strongly agreed with the statement: "I understand why the Museum has animal-related exhibits." Six respondents (27.3%) indicated some level of active disagreement. None were neutral. See Figure 4.3.9, below.

Although this suggests that most visitors *think* that they grasp the purpose of the live animal exhibits at the Museum, it stops short of probing exactly what they think this purpose is. This is further explored later, through an open-ended question. Please reference subsection (l) for visitor responses and analysis.

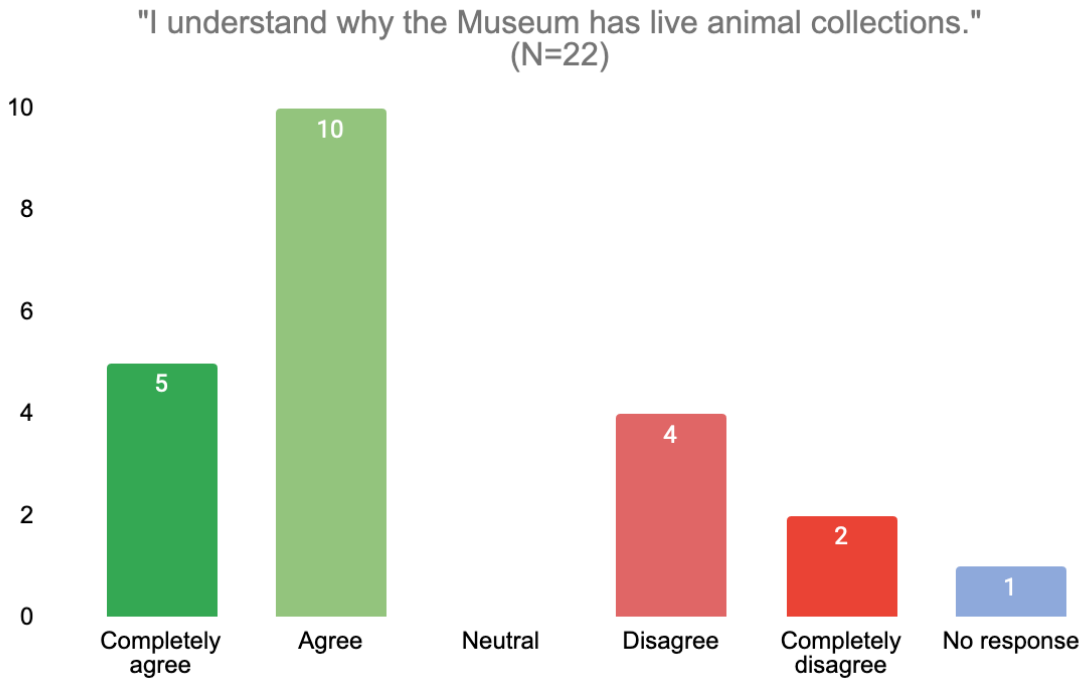

Figure 4.3.9. *68.2% of respondents felt, to some extent, that they understood why the museum offered live animal exhibits as part of their collections. However, only five "completely" agreed, a decline from previous questions.*

(h) Visitor Perceptions of Live Animals' Relevance to Them

Fourteen respondents (63.6%) indicated some level of agreement with the statement: "The live animal exhibits felt relevant to me." However, five (22.7%) were neutral and two (9.1%) actively disagreed. That means that seven of the 21 respondents who actually answered this question were unclear or unconvinced about the animals' relevance—fully one third. See Figure 4.3.10, below.

This suggests an opportunity to increase visitors' perceived relevance of the live animal exhibits, perhaps through signage, facilitation, or by changing which animals are featured.

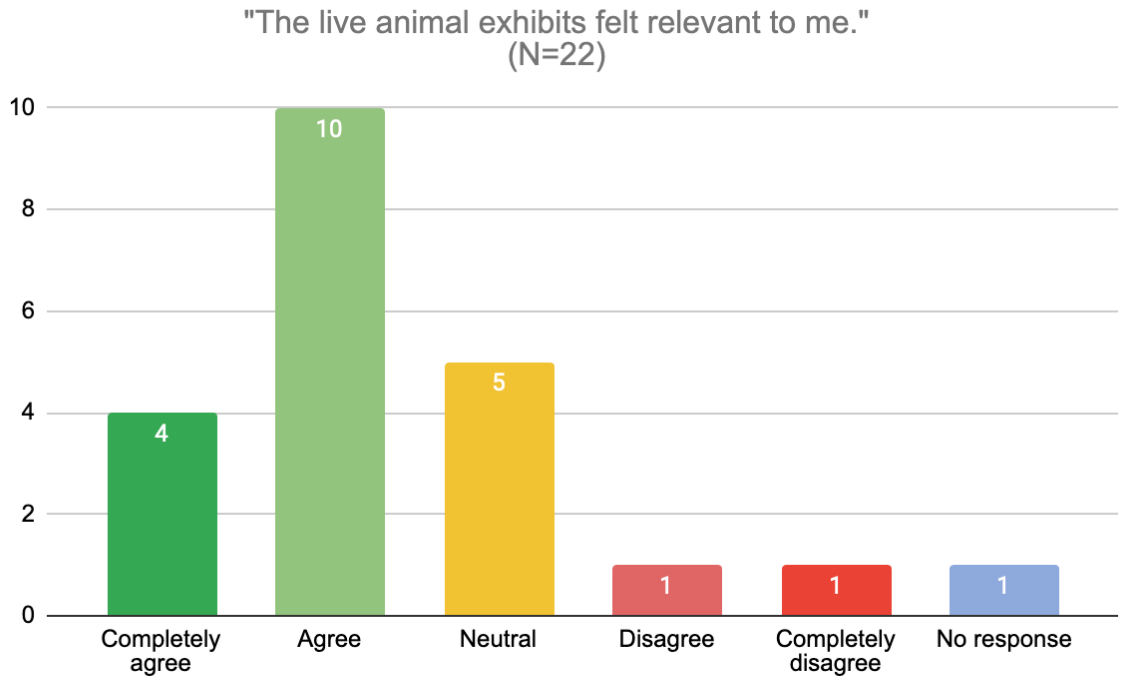

Figure 4.3.10. *63.6% of respondents agreed, to some extent, that the live animal exhibits felt relevant to them. However, only four "completely" agreed.*

(i) Visitor Perceptions of Animal Enclosures

Surprisingly, no respondents indicated any level of disagreement with the statement "the live animal enclosures felt appropriate for the animals they hosted," suggesting few concerns about these particular displays.

This contradicts some Museum staff's anecdotes about guests concerned with animals' captivity; however, it is important to note that most anecdotal references centered around a bluejay, Cobalt, featured in a temporary exhibit that was closed by the time this survey was disseminated. It is possible that seeing a flighted animal in captivity is more triggering for guests than the types of animals studied here; alternatively, the bird's case/enclosure may have been differently designed. Further evaluation is suggested to help explore this.

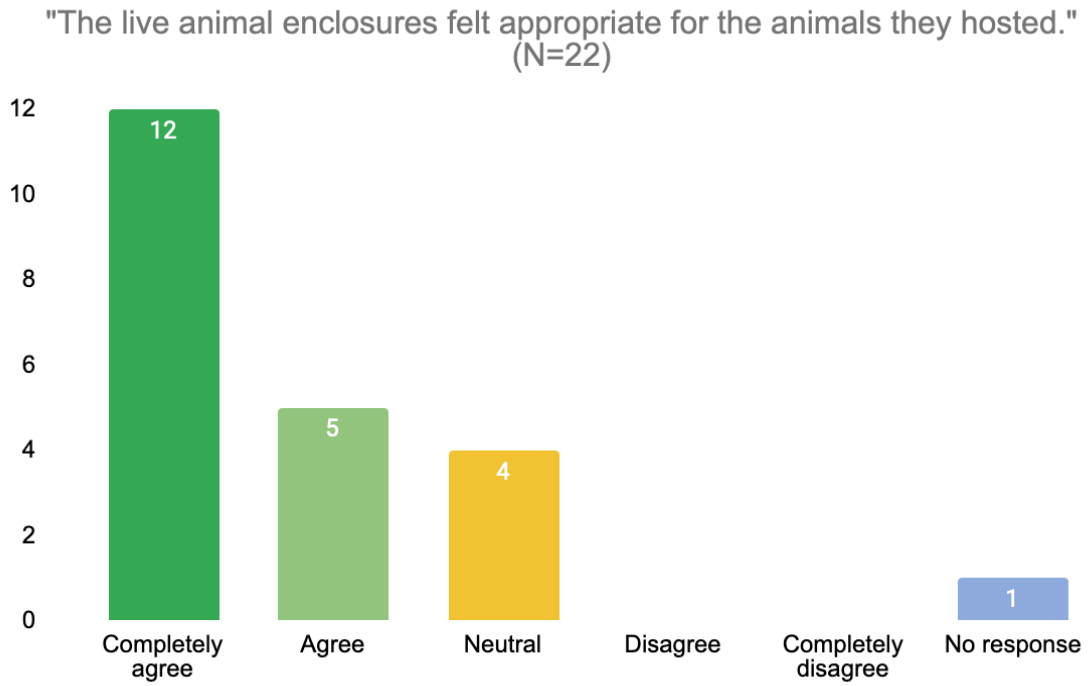

Figure 4.3.11. *77.3% of respondents agreed, to some extent, that the live animal enclosures felt appropriate for the animals they hosted. No respondents disagreed to any extent.*

(j) Visitors' Emotional Responses to Live Animal Exhibits

Open-ended questions further probed the emotions visitors experienced in response to the Museum's live animal exhibits. This relates directly to the evaluation question: *What positive and negative emotional responses, if any, do visitors experience to the live animal exhibits?*

The first such survey question asked respondents to note—by writing in their answers—what emotions they experienced in relation to the live animal exhibits. Responses were first coded into broad categories derived from the responses themselves: happiness, negative feelings, confusion, interest/curiosity, excitement, connection, and/or boredom. They were subsequently sorted into three positivity codes:

- **Positive reactions**: joy, happiness, excitement, connection
- **Negative reactions**: boredom, disgust, confusion
- **Interested reactions**: interest/curiosity

(Note: "interest" was judged to be neither inherently positive nor negative, though if one of the Museum's key missions is to promote interest and curiosity, then these could be absorbed into the "positive" category at their discretion.)

Table 4.3.1. *Table synthesizing coding methods and examples for visitors' answers to the open-ended question: "What emotions did you experience today in response to the live animal exhibits?" Note that some responses fell into multiple categories, in which case they received all codes that applied.*

Code	Description	Example #1	Example #2
Positive	Includes responses indicating positive reactions, with keywords like joy, excitement, happiness.	"Excited, wanted to share." (*Adult, Group V*)	"Complete joy, excitement, surprise. The kids loved them." (*Adult, Group J*)
Negative	Includes responses indicating negative reactions like disgust, boredom, or confusion.	"Stay back." (*Adult, Group D*)	"Not so excited." (*Child, Group F*)
Interest	Includes responses neither inherently positive nor negative but focusing on curiosity.	"Intrigue, interest, wonder." (*Adult & child, Group G*)	"Interested, investigatory, observant." (*Adult & child, Group P*)

After coding the responses, they were sorted and visualized. This revealed that 42.3% of groups indicated that they felt some type of joy, excitement, or happiness—positive reactions—in response to the live animal exhibits. 19.2% indicated that they experienced negative emotions akin to boredom, disgust, or apprehension. (These feelings were attributed to a range of factors that sometimes extended beyond the exhibits themselves; for example, one guest later clarified that his "boredom" and "frustration" were due to the fact that the animals wouldn't properly pose so that he could make their photographs into memes.)

Furthermore, 34.6% of groups identified reactions that fell cleanly into neither the positive nor negative categories, like interest, curiosity, or inquisitiveness.

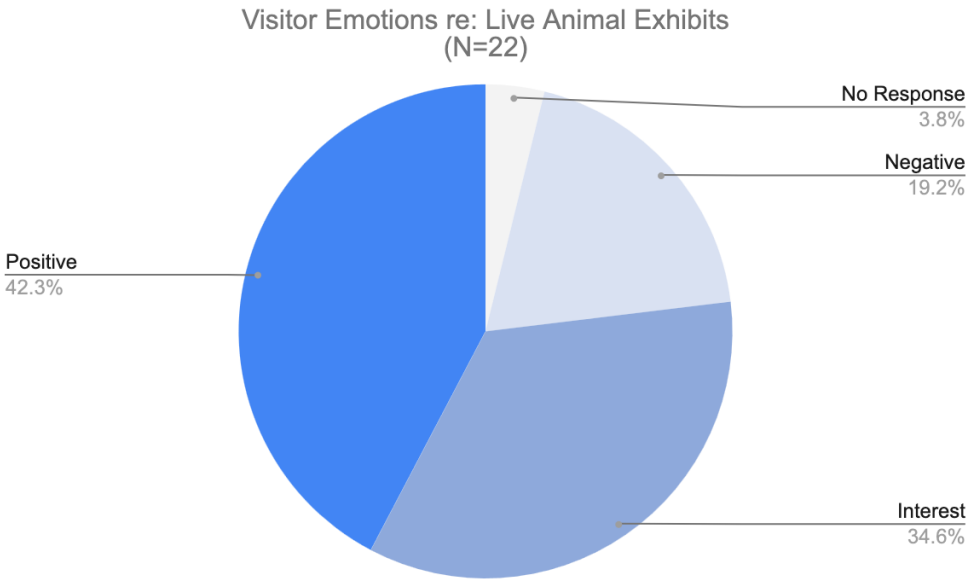

Figure 4.3.12. *Note that some responses fell into multiple categories, in which case they received all codes that applied.*

(k) Factors Motivating Visitors' Emotional Responses

After they were asked to identify what emotions they felt in response to the live animal exhibits, survey respondents were further asked to probe what factors may have led to them feeling those emotions.

Several themes arose during coding: new experience, cool factor, gross-out, empathy, learning experience, and watching behaviors.

Table 4.3.2. *Table synthesizing coding methods and examples for visitors' answers to the open-ended question: "What factors do you think contributed to the emotions you experienced in response to the live animals?" Note that some responses fell into multiple categories, in which case they received all codes that applied.*

Factor	Description	Example #1	Example #2
Learning experience	Includes responses that discuss teachable moments or learning experiences	"Learning experiences for the kids, teachable moments." (*Adult, Group J*)	"Our family loves animals & always want to learn more about them." (*Adult, Group O*)
Watching animal's behaviors	Includes responses emphasizing how the animal acted / observations made	"[We] like making observations about the bugs. How they move and their colors and bodies." (*Adult & child, Group P*)	"Seeing the animals play and do things." (*Child, Group H*)
New/novel experience	Includes responses focused on a new, novel, or unique experience	"Biology is fascinating. It's rare to see animals in the city. Our little one had never seen a fish before." *(Adult, Group L)*	"I got to experience something new and to learn." (*Adult & child, Group G*)
Cool factor	Includes responses that discuss awe or excitement	"I've never seen them before. They're cool." - *(Adult, Group A)*	"[I] don't get why they're here, but cool to see them." *(Child, Group N)*
Gross-out / disgust	Includes responses referencing being grossed-out or disgusted	"I don't like bugs. They creep me out." *(Adult, Group B)*	"[I] expected them to smell horrible." *(Adult, Group D)*
Empathy, connection, compassion	Includes responses that mention sharing or connection	"[I'm] sad they don't have their own homes anymore and have to be here instead, but happy they're here and safe and being taken care of and we get to see them." *(Child, Group B)*	"Knowing they're probably endangered." *(Adult, Group U)*

Other	Includes responses that don't fit into other categories, like remarks about things nearby	"Loved the tunnel system and being able to crawl around." *(Child, Group T)*	"They weren't posing very well." *(Child, Group I)*

Salient quotations from respondents include:

> *"We have been visiting for nine years and love learning all about the animals. They're appropriate and wonderful. The kids get to see things they wouldn't see otherwise." - (group K, adult)*
>
> *"Watching the fish swim, the turtle, learning about new kinds of weird bugs."- (group R, adult)*

These coded responses were then sorted and organized into a bar graph for easy visualization.

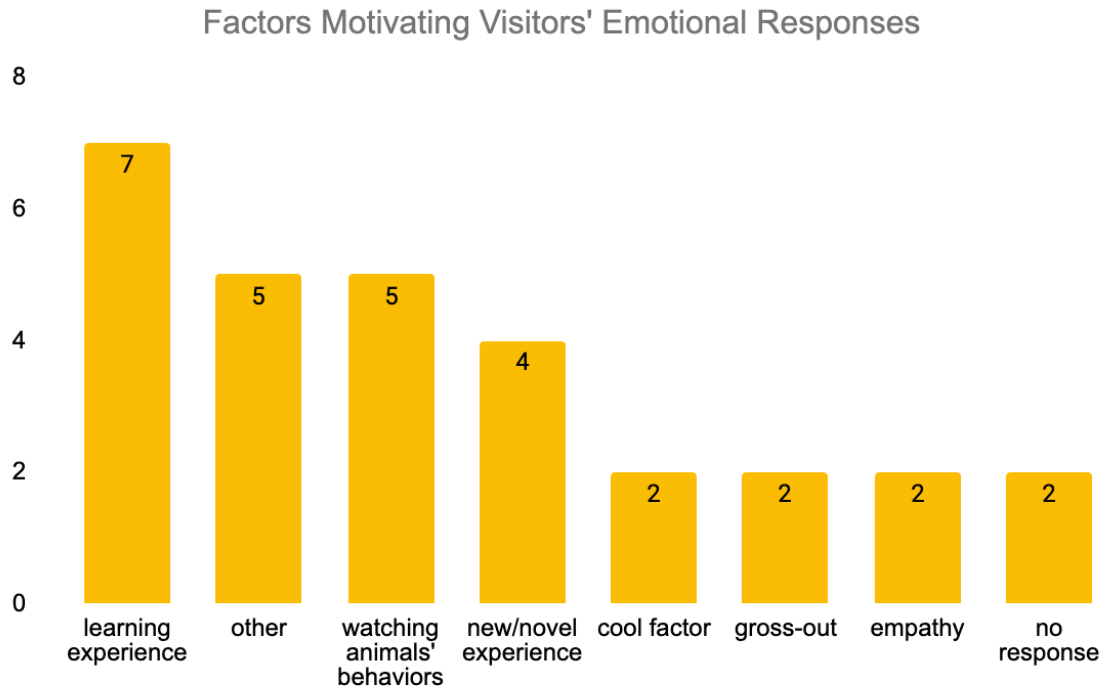

Figure 4.3.13. *Open-ended responses to the question "what do you think contributed to the emotions you felt?" were coded into the categories above, sorted by theme. Note that some responses fell into multiple categories, in which case they received all codes that applied.*

(l) Visitor Perceptions of Intended Learning from Live Animal Exhibits

The exit survey's third open-ended question asked respondents: "what do you think the Museum was trying to have you learn by including live animals in their exhibits?" This was intended to directly address evaluation question #2: *To what extent, if at all, do visitors make a connection between live animal exhibits and the Museum's intended themes or messaging for a given space?*

Responses were coded according to keywords and key themes they touched upon: exposure to animals, animals' importance, habitats/environments, protection/conservation, local relevance, "nothing specific," and other. See Table 4.3.3 below.

Table 4.3.3. *Table synthesizing coding methods and examples for visitors' answers to the open-ended question: "What do you think the Museum was trying to have you learn by including live animals in their exhibits?" Note that some responses fell into multiple categories, in which case they received all codes that applied.*

Theme	Description	Example #1	Example #2
Habitats/ environment	Includes responses that discuss the animals' natural habitats	"I assume about their habitats or environmental roles, but I feel I brought a lot of that with me instead of learning it here from the displays." (*Adult, Group V*)	"What they look like and their environments" (*Adult, Group G*)
Conservation/ protection	Includes responses emphasizing themes of conservation	"Why we should care about protecting them." (*Child, Group I*)	"We need to take care of our planet." (*Adult, Group U*)
Local relevance	Includes responses focused on the animals' specific relevance to the Boston area	"What's local to New England, re-creation of native habitats, geographical locations." (*Adult, Group J*)	"About wildlife in the river and different types of animals." (*Adult, Group N*)
Exposure to (new) animals	Includes responses that specifically reference being exposed to new (or a variety of) animals	"Exposure to new animals." (*Adult, Group M*)	"Show people animals." (*Child, Group O*)
Importance to our lives	Includes responses that mention animals' importance to humans	"Their importance in nature and science. We probably don't think about them enough or consider them in our choices. It's a good reminder to see them." (*Adult, Group K*)	"C: They're important to some people's lives." (*Child, Group B*)
Animal characteristics	Includes responses that mention characteristics or behaviors of the animals in the exhibits	"The tamarins have skeletons like ours because they evolved the same way, except we kept going and they didn't." (*Child, Group S*)	"Different kinds of animals do different things." (*Child, Group R*)
Other	Includes responses that don't fit into other categories	"Ecosystems. Wastewater treatment effects." (*Adult, Group L*)	"How to feed them…" (*Child, Group H*)

"Nothing specific"	Includes responses indicating a lack of understanding or interest	"Nothing specific, just to teach." (*Adult, Group D*)	"No guesses, seems random, no context." (*Adult, Group E*)
Perceived shortcoming in presentation	Includes responses that mention a dissatisfaction or perceived shortfalls from Museum content	"I assume about their habitats or environmental roles, but I feel I brought a lot of that with me instead of learning it here from the displays." (*Adult, Group V*)	"Their importance to the natural world, I assume. This doesn't come across clearly in my opinion." (*Adult, Group P*)

These coded responses were then organized and displayed visually for easy reference. Five of 22 responses (22.7%) mentioned themes relating to animals' habitats and different environments. Four each (18.1%) referenced protection/conservation themes or local relevance. Three each mentioned (13.6%) believed the Museum was aiming to expose guests to new animals; convey their importance; and/or showcase their characteristics or behaviors. Two (9.1%) didn't feel there was a specific educational goal behind the live animal exhibits. Additionally, three responses contained information best falling into an "other" category referencing: geography (where animals were from), diversity ("different types of animals"), and animal behaviors ("different kinds of animals do different things"). See Figure 4.3.14 below.

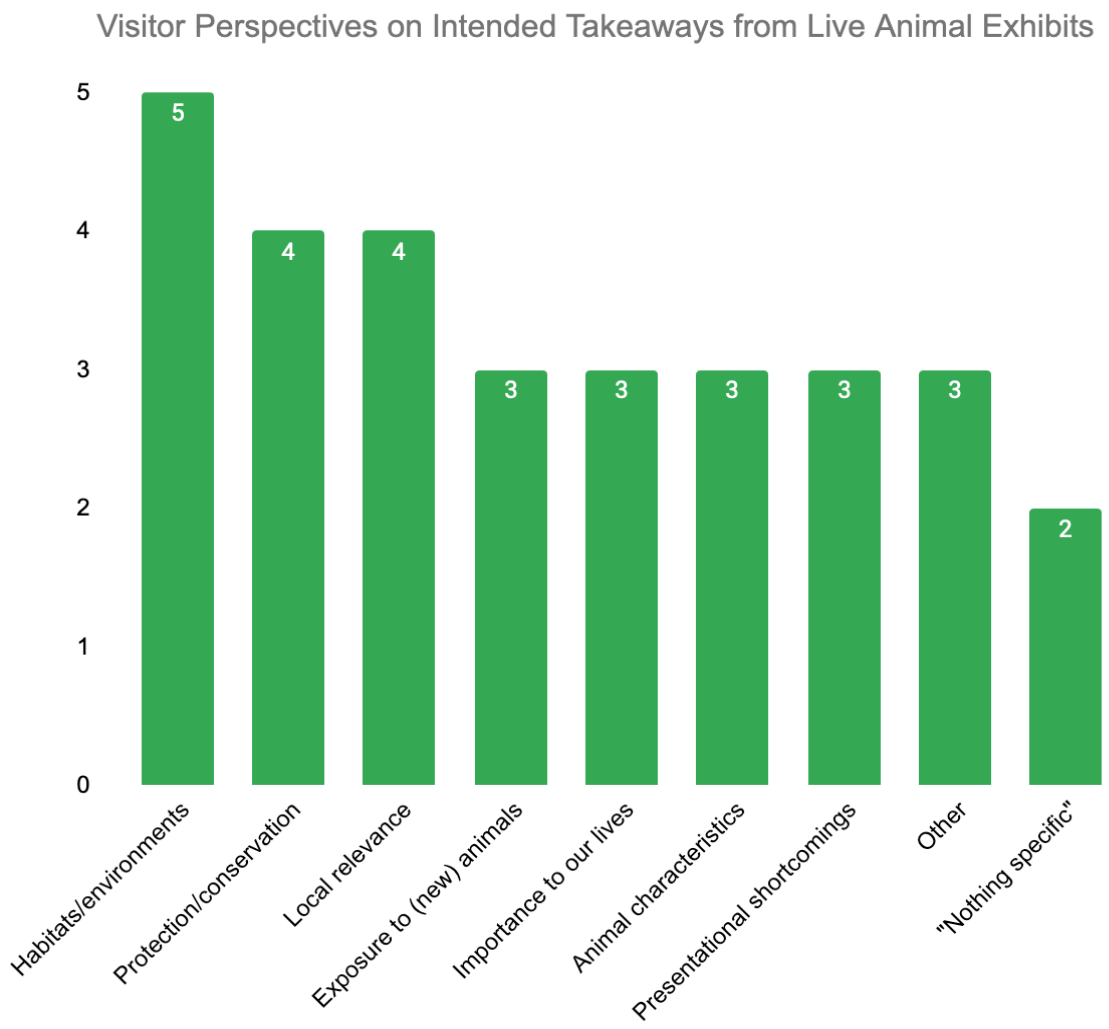

Figure 4.3.14. *Open-ended responses to the question "what do you think contributed to the emotions you felt?" were coded into the categories above, sorted by theme. Note that some responses fell into multiple categories, in which case they received all codes that applied.*

This suggests that while some Museum visitors do make a connection to scientific themes around habitats and protection/conservation, intended themes are not coming across clearly or consistently to all. Neither did any visitors mention a call to action or demonstrate a clear understanding of their own abilities to protect or influence these animals, even when they recognized that protection was important.

(m) Additional Insights

A final open-ended question was deliberately vague, asking respondents whether there was anything else they would like to share about the live animal exhibits. This directly addressed evaluation question #6: *What questions, concerns, or suggestions if any, do visitors have about live animal exhibits at the Museum?*

Responses were sorted into categories and coded. See Table 4.3.4 below for coding methods and examples.

Table 4.3.4. *Open-ended responses to the question "what do you think contributed to the emotions you felt?" were coded into the categories above, sorted by theme. Note that some responses fell into multiple categories, in which case they received all codes that applied.*

Theme	Description	Example #1	Example #2
Content reactions / suggestions	Includes respondents' requests and suggestions for new/additional content	"Also consider teaching kids about how they affect these animals and how their choices make a difference for them even in different countries." (*Adult, Group S*)	"Live animal care center sounds cooler than it is. Just windows with snakes. Show people actually caring for different animals and tell what happened to them." (*Adult, Group V*)
Celebration of live animal exhibits	Includes responses that celebrate, support, or otherwise endorse the exhibits	"We like being able to come see the animals. She focuses on them more than anything else because they move." (*Adult, Group L*)	"Love them! The bugs are our favorite!" (*Adult & child, Group P)*
Desire for more animals	Includes responses emphasizing a desire for more (quantity or variety of) animals	"More mammals would be nice. Or birds…" (*Adult, Group N*)	"Get more!" (*Child, Group H)*
Confusion about exhibits' purpose	Includes responses that express confusion about the live animal exhibits' presence at the Museum	"We like the animals but the local animals make more sense than the non-local ones. It's hard to know how to talk to them [children] about the ones that aren't from around here because there isn't any context. It goes right over their heads." (*Adult, Group J*)	"Only the Charles River animals make sense. Insects were interesting (unique) but I'm not sure why they're here." (*Adult, Group N*)
Lack of awareness of exhibits	Includes responses that reference a lack of awareness of the exhibits' existence	"Didn't know you had animals. Let alone tamarins and axolotls! Would have liked to see them if we'd known. Is there a map or list somewhere? There should be." (*Adult, Group O*)	"Didn't even know you had a live animal care center—sounds cool." (*Adult, Group N*)
Other	Includes responses that don't fall into the above categories	*Child:* "I mostly took pictures of them and their expressions." *Adult:* "He likes to make them into memes."	"Animals were interesting but not relevant." (*Adult, Group G*)

		Child: I write captions for them." (*Adult & child, Group I)*	
New/unique experience	Includes responses that mention the uniqueness of the live animals	" The kids get to see things they wouldn't see otherwise." (*Adult, Group K*)	"Many were new to me!" (*Adult, Group A*)"

Surprisingly, 14 of 22 groups (63.6%) chose to answer this, providing a range of answers coded into categories: endorsement of the exhibits as evidenced by positive comments, remarks about a new experience, suggestions for additional/improved content, a lack of awareness of the exhibits' presence, a desire for more live animal exhibits, and confusion about the purpose of the exhibits. Full results are in Figure 4.3.15 below.

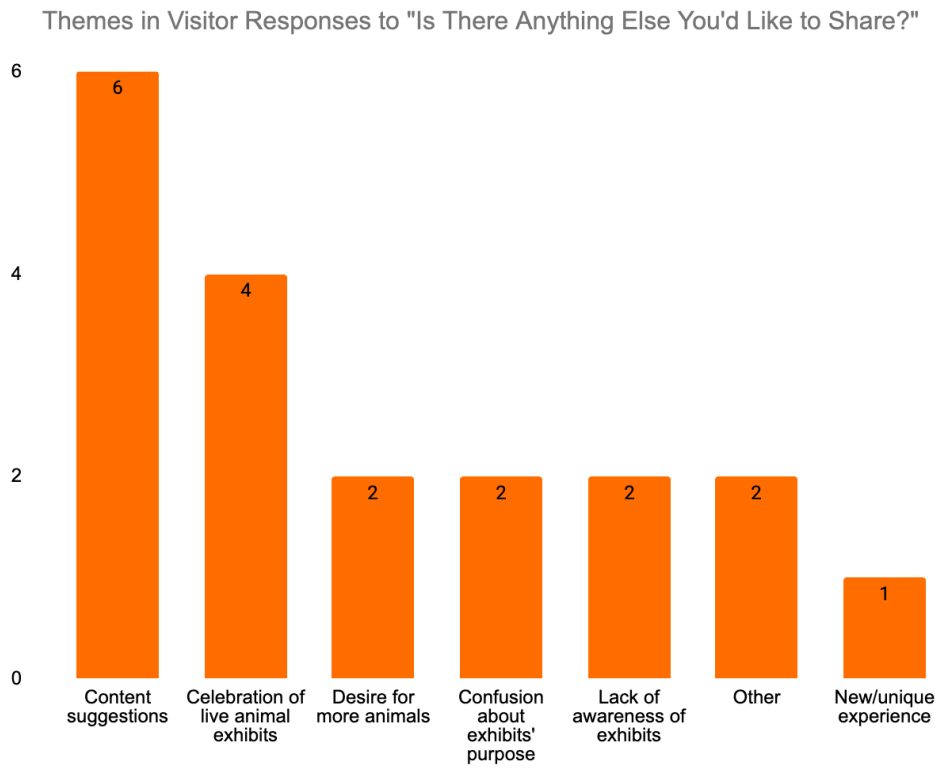

Figure 4.3.15. *Open-ended responses to the question: "Is there anything else you'd like to share about the live animal exhibits?" were coded into the categories above, sorted by theme. Note that some responses fell into multiple categories, in which case they received all codes that applied.*

Particularly insightful responses included:

- "We have been visiting for nine years and love learning all about the animals. They're appropriate and wonderful. The kids get to see things they wouldn't see otherwise." - (group K, adult)

- "Prefer the shows because then we get more of a feel for the animals' personalities and sometimes their names. Lots of interesting facts about them and where they came from before

they were here. I look for that information on the signs sometimes but never see it, but it would be nice not to have to invent names and stories for them. Also consider teaching kids about how they affect these animals and how their choices make a difference for them even in different countries." - (group S, adult)

- "Only the Charles River animals make sense. Insects were interesting (unique) but I'm not sure why they're here. More mammals would be nice. Or birds. More info on the connection to us and science. Didn't even know you had a live animal care center—sounds cool." - (group N, adult)

- "Should be more interactive." - (group R, adult)

5. DISCUSSION

Reviewing data collected from across all three evaluation instruments—observations, interviews, and exit surveys—has allowed our team to identify patterns in Museum visitors' thoughts, behaviors, takeaways from, and feelings about live animal exhibits.

We have organized these insights according to the six evaluation questions crafted with Museum stakeholders at the beginning of the project. Interpretations of findings for each question are detailed below.

5.1 How, if at all, do visitors engage with live animal exhibits?

Live animal exhibits facilitated visitor engagement at the Museum in three ways: 1) with the animals themselves, 2) with each other, and 3) with Museum staff.

Engagement with Animals

Engagement with the animals themselves was high across instruments. Our evaluation data suggests that mammals and insects engaged visitors for longer periods of time (an average of 111 seconds compared to 43 seconds) and at higher levels of engagement, as per the Visitor Engagement Scale (Table 3.1.1), compared to reptiles and fish. Nevertheless, visitors were likely to engage with the live animals – even if they did not engage with any other exhibit elements such as signage, the vast majority of visitors would at least stop to look at the animals.

Exit survey responses indicated that most Museum guests randomly surveyed (19 of 22 groups; 86.4%) engaged with at least one live animal exhibit during their visit. The two most commonly visited live animal displays were the fish, turtles, and amphibians in the Charles River Gallery (15 of 22 groups; 68.2%) and the insects in the Insect Zoo (14 of 22 groups; 63.6%).

However, it is difficult to say whether this difference in engagement across exhibits is due to the difference in animal species (mammal vs. insects vs. fish/reptiles) or due to a difference in display treatment (larger enclosure vs. one enclosure in the middle of a large gallery). It is important to note that because the data was collected over three days, the average duration that visitors group spent at each gallery location might be influenced by factors external to the animals, such as the number of other guests in the space. In particular, the observations of the Hall of Human Life A and the Charles River Gallery were collected on a rainy Saturday afternoon, when the Museum floor was crowded and busy. In contrast, the Insect Zoo and Hall of Human Life B observations were collected on weekdays with slower visitor traffic.

Finally, it is a testament to the live animal exhibits' ability to engage visitors that guests were much more likely to stay in an exhibit for longer when the animal was visible. For example, guests would frequently leave quickly if the tamarins were not visible in their enclosure, but they would be enticed to stay and engage with the exhibit for longer if even the tortoise (an animal who is not represented on the signage and or related to the exhibit) was present and visible.

Engagement with Each Other

Data suggests that the live animal exhibits were extremely successful at facilitating visitors' engagement with each other.

The majority of exit survey respondents, (16 of 22 groups surveyed; 72.2%), agreed that they had conversations about the live animals with their child(ren) or others in their group. This is corroborated by in-gallery observations and interview data; visitor groups were often observed to coalesce their attention onto a live animal exhibit, sharing information about the animal, pointing at it, trying to find it together, etc. Frequently, one visitor would see the live animal exhibit first, which would prompt them to call their group members over to engage in joint attention. In-gallery observations further suggest that the exhibits promoted engagement not only within but also *between* groups, with visitors from distinct visitor groups often pointing out animals' locations or behaviors to each other.

Engagement with Museum Staff

Overall, visitors enjoyed seeing Live Animal Care staff interact with animals and were much more likely to engage with staff (even if indirectly) when staff were actively engaged with the animals than when staff were passively present in the gallery space, for example, when seated at the Insect Zoo desk.

Through interviews conducted during the tamarin Group B condition when staff members were present to feed the tamarins, we identified an interest among visitors in seeing the animals interact with people, specifically staff. Visitors enjoyed seeing staff feed the animals and expressed a desire to see more staff-animal interactions. The tamarin Group B testing condition and Insect Zoo were the only settings where staff were present, which limited our sample of visitors who had experiences observing staff interactions. None of the interview subjects interacted directly with staff themselves and could only interact by commenting on their actions or videotaping them interacting with the animals. Visitor groups did not interact with Museum volunteers at all while they were seated in the Insect Zoo.

More research would need to be conducted to understand visitors' overall impression of staff interactions with animals and with Museum guests.

5.2 To what extent, if at all, do visitors make a connection between live animal exhibits and the Museum's intended themes or messaging for a given space?

Although some visitors did make a connection between the Museum's live animal exhibits and intended themes, this was relatively inconsistent.

Interestingly, most visitors felt that they learned something new from their visit (16 of 22 exit survey respondents; 72.7%), and that they understood why the Museum offers live animal exhibits as part of their collections (15 of 22; 68.2%). However, when asked to specify *what*, exactly, they thought the Museum was trying to have them learn, their answers varied widely. They sometimes indicated guesswork, using phrases like "probably," or "I assume."

Several respondents even noted outright that although they believed *they* understood the Museum's goals, they didn't feel these goals would come through clearly to others:

> *"I assume about their habitats or environmental roles, but I feel I brought a lot of that with me instead of learning it here from the displays."* (Adult, Exit Survey Group V)

> *"Their importance to the natural world, I assume. This doesn't come across clearly in my opinion."* (Adult, Exit Survey Group P)

In-gallery interviews further revealed that a small number of visitors took away conservation messaging from live animal exhibits compared to overall interview responses.

Among the visitors that did reference the Museum's intended conservation messaging, 83% were from the tamarin Group B condition when added digital signage was present. This suggests that, even when visitors did not read a sign for long—sometimes merely glancing at it— adding signage with clear messaging and a call to action did seem to positively impact visitors' understanding of said messaging.

Noticeably, no interviewees from the Charles River Gallery commented on conservation messaging. In this exhibit, fewer people mentioned having read the signs than in the tamarin exhibit for both condition groups A and B.

5.3 Which types of animals, if any, seem to engage visitors more than others?

Broadly speaking, mammals and insects seemed to engage Museum visitors more than reptiles and fish. While this can be observed in the limited in-gallery observations and interview data, which were related to tamarins, stick insects, fish, and turtles specifically, it is also supported by exit survey data. Visitors surveyed were much more likely to express interest in seeing the tamarins and insects than in any other listed animal.

Notably, significantly more Museum visitors expressed an interest in insects after actually *seeing* the insects, while interest from those who had *not* seen them was much lower. For other animals, interest remained high regardless of whether a respondent had seen them or not.

This could indicate that guests self-selected to visit the Insect Zoo, with people who like insects more likely to seek it out or opt in. However, it may also suggest that an insect exhibit *sounds* unappealing to those who haven't seen it, but proves to be quite interesting to those who have. (In other words: perhaps the exhibit sparked an interest in otherwise neutral parties). If the latter is the case, perhaps the Insect Zoo's presentational displays and content were particularly successful. More research would have to be done to further probe this trend.

It is important to note that visitor interest does not always equate to actual visitor engagement with a live animal exhibit; however, it is nonetheless an insight into the types of animals Museum visitors are most interested in seeing.

5.4 Which types of live animal display treatment, (enclosure size, case type, and content presentation), if any, do visitors find more engaging than others?

The piloted B group digital signage seemed to be more effective than the A group signage at conveying the Museum's intended conservation messaging, though no visitors were observed scanning the QR code. In addition, young visitors were engaged by physical exhibit elements, such as animal models, curved tank glass, lighting effects, and play areas.

Over the course of this evaluation, we realized that our evaluation tools were not specific enough to allow us to concretely disentangle visitor responses to the animals themselves from visitor responses to the animals' display treatments. The addition of A/B display testing in the tamarins gallery helped address the specific question of signage – while the observations data showed no difference between visitor behavior in terms of looking at and reading signs between the tamarins A and B groups, it did suggest that visitor groups were more likely to utilize knowledge from Museum signage in the B condition. This is supported by interview data, which suggested that the additional conservation messaging in the tamarin B group was more effective at conveying the intended messaging than without. These responses suggest that the added conservation-based signage may have made an impact on people's likelihood to reflect on the animals' enclosures as they related to animals' well-being and environmental needs. Additionally, as mentioned in the response to Question #2, the correlation between added signage and the increase in comments about conservation further supports the likelihood that the digital sign may have prompted visitors to think more deeply about the need to protect live animals in the wild.

Our open-ended interview questions and observation field notes also offer some distinguishing insights on visitors' physical engagement with animal display treatments. For example, when asked about their overall experience with the exhibit or more specifically, "What key takeaways do you remember from the live animal exhibit? What about the exhibit, if anything, helped you remember that?" 17 visitors mentioned *non-animal elements* of the exhibit rather than the animals themselves. In CRG, four visitors mentioned the tunnel, otter statue, and other play-based elements of the exhibit, reflecting that these interactive elements may have been more engaging to children than the live animals themselves.

Visitor groups were also observed to be more physically engaged with the CRG's live animal display compared to the tamarins or stick insects displays. Young visitors would smack at the signage and the enclosure glass, press their faces against the glass, and walk around the tank to track the animals inside. Young children were observed to physically interact with the brass turtle model (*N=4*), often conveniently located for their height, and sometimes verbalize what it was ("tur-tle"). Eight CRG observation groups were observed engaging in such behavior, while only 4, 3, 2 groups respectively were observed physically interacting with the space in the Group A tamarins, Group B tamarins, and Insect Zoo. Often, young visitors in these spaces would be told not to interact with the physical elements of the gallery space, in particular the enclosure glass, in response to Museum signs about respecting the live animals' need for a calm and quiet habitat.

Overall, the data suggests that physical interactive elements are effective at engaging young visitors in play, which in turn tends to engage caregivers. Another possible explanation is that the placement of the CRG fish and turtle tank in the middle of the gallery, visible from multiple angles and integrated with interactive elements, is more supportive of physically interactive behavior compared to the more quiet, still, and single-plane glass separation environments of the tamarins and stick insects. While we cannot fully distinguish visitor engagement between engagement with the animals and engagement with animal display treatment, (given that the evaluators did not wish to bias participants by asking overly specific questions,) the data collected and analyzed still offers useful insights on physical engagement, especially in light of the Museum's current plans to include a natural play area for young learners in the Live Animal Garden.

5.5 What positive and negative emotional responses, if any, do visitors experience to the live animal exhibits? How emotionally connected, if at all, do they feel to the animals and messaging?

Museum visitors were overwhelmingly likely to react to live animal exhibits with positive emotional responses such as excitement, joy, and curiosity. Visitors responded positively to the animals' cuteness and the fact that they were alive (instead of stuffed or fake), as well referring to the exhibits as novel or good learning experiences. Negative emotional responses represented a small minority and tended to stem from boredom, disgust, or fear responses. Concerns over animal wellbeing did surface in our evaluation, but were not a major or salient issue for the vast majority of visitors (*N=4*, 3% of 130 visitor groups collected over all instruments).

One trend that surfaced from the observation data was the differentiation in emotional responses according to age and gender presentation. Young visitors were more likely to be excited by the live animals such as the tamarins and stick insects, and older visitors were more likely to respond to these same exhibits with disgust, fear, or—much more uncommonly—with concern over animal wellbeing. This was especially apparent in the Insect Zoo, where young visitors and male-presenting caregivers were more likely to express positive or neutral emotional responses while female caregivers were more likely to express negative emotional responses. None of the negative responses in the Insect Zoo were related to animal wellbeing.

This sense that negative emotional responses to the live animals tended to be rooted in reasons external to the animals themselves or their enclosures is emphasized by exit survey data. Respondents who reported negative emotions often attributed them to factors external to the exhibits themselves; for example, one guest clarified that his "boredom" and "frustration" were due to the fact that the animals wouldn't properly pose so that he could make their photographs into memes.

The in-gallery interview data helped reveal the underlying reasons for visitors' positive emotional responses. It indicated that visitors enjoyed watching the animals due to their cute physical features and behaviors, and many visitors enjoyed seeing live animals they either did not expect to, or had never before seen, like the tamarins.

Visitors' responses suggested that many people's positive attitudes towards the live animal exhibits stemmed from the exhibits' uniqueness as well as the animals' striking physical appearances.

5.6 What questions, concerns, or suggestions, if any, do visitors have about live animal exhibits at the Museum?

Some of the questions or concerns that visitors expressed stemmed from a lack of understanding of why live animals were in the Museum. While most people observed and enjoyed the animals, fewer people thought more deeply about the purpose for including them.

There seemed to be themes of not understanding connections between the animals and the rest of the gallery or Museum, as well as not finding signage helpful for learning information. A small number of visitors had concerns about the animals not having enough space, although most people who commented on enclosure space felt the enclosures were spacious and well-maintained. Visitors also often wanted to know more than what was available to learn in the Museum, suggesting a need for more detailed signage or other means of communicating content.

Some of the suggestions that visitors made for improving live animal exhibits related to desires to see more relevance between the animals and visitors' lives, as well as wanting to see a more prominent call to action for visitors to understand their connection to animals. Among these comments, some visitors felt that it was more relevant to show animals native to the Boston area or

that visitors might realistically encounter in their lives, such as those from CRG. Due to the lack of relevance to other exhibits like the Insect Zoo, visitors wished for the Museum to support adults in explaining animals' connections to their children's lives.

6. CONCLUSION

Summary of Findings

After collecting, analyzing, and discussing our data across observations, interviews, and surveys, we have identified the following main takeaways from our evaluation of live animal exhibits at the Museum of Science, Boston:

1. Live animals exhibits are successful at engaging Museum visitors. However, it is unclear based on our data whether the animals themselves or other elements of the exhibit are the driving force behind engagement.
2. Live animals are helpful at facilitating interactions between visitors.
3. Many visitors believed that they learned something new during their visit to the Museum, but fewer were able to articulate exactly *what* they learned.
4. The animals that seem to interest and engage visitors the most are mammals and insects compared to reptiles and fish.
5. Evaluation participants had positive overall reactions to live animals, with children slightly more likely to express positive emotions than adults.
6. While most people are enjoying animals, fewer are thinking deeply about the animals' significance to the museum. Many visitors made connections between the live animals and their own lives, such as pets and personal experiences with nature.
7. More visitors are interested in seeing various live animal exhibits than are actually seeing them, and many visitors didn't know the Museum had live animals at all or where to find them.
8. Visitors desire for different/additional information to clarify relevance, answer questions, and facilitate conversations with children.
9. Visitors would like to see a wider variety and greater quantity of live animals.
10. Adding signage with conservation messaging was correlated with visitors making connections to conservation efforts, even when few people directly engaged with the sign.
11. Play-based interactive or non-animal elements of exhibits are effective at engaging visitors, especially for children.
12. People want to know more information but feel it is not available in the museum or that existing information is not relevant to them.

Recommendations

Based on this summary of our findings, we recommend the following in the design and development of the *Live Animal Garden*:

Locating Animals

There is an opportunity to make information more accessible to visitors to enhance their learning and ability to navigate the live animal exhibits in the Museum. For example, a few visitors expressed a desire for a list of live animal exhibits or a map indicating where to find them.

Relevance

With some visitors struggling to understand the relevance of live animals to the rest of the museum or to their own lives, there is an opportunity to improve the Museum's messaging around the ways that live animals are relevant to the Museum and our ecosystem, including the ways that humans and animals are connected.

Signage

Visitors would benefit from a clearer way to discern meaningful information from signs, screens, or other displays to make takeaway messaging clearer to visitors. Specifically, if the Live Animal Garden intends to communicate messaging around environmental conservation including a call to action, then clear, visible signage was most effective in our study at helping visitors understand the intended messaging.

Interaction

Given the popularity of the play-based interactive tunnels and statues in CRG, the Live Animal Garden may present several opportunities for visitors, specifically children, to interact with the exhibit through activities or games. Visitors would also benefit from activities encouraging them to interact with each other, such as parent-child interactions.

Balance of Species

Based on our findings regarding the popularity of different kinds of animals, the design of the Live Animal Garden should take into consideration an optimal balance of species. Specifically, consider the balance of mammals and insects – found to be most popular in our study – with fish, reptiles, and other species. Additionally, given some visitors' interest in seeing more variety in the animals, there is an opportunity to bring in species that do not currently exist at the Museum.

Stakeholders are invited to request copies of the full collected dataset for posterity and future analyses. The evaluation team is unable to provide a link to the current copy at this time due to concerns over the digital longevity of Harvard email addresses after graduation.

7. APPENDICES

Appendix 1: In-Gallery Observation Guide

<table>
<tr><td>Observation #:
Evaluator:</td><td>Date:
Time: AM/PM → AM/PM</td></tr>
<tr><td>Location:
● Hall of Human Life (Tamarins) A / B
● Yawkey Gallery (Turtle and fish tank)
● Insect Zoo (Stick insects)</td><td>Individual/Group Composition:
● Adult + Child (# /#)
● Adult only (#)</td></tr>
<tr><td colspan="2">Behaviors and Frequency
● look at exhibit only
● touch exhibit e.g. glass
● look at signage
● read signage aloud

● touching glass/enclosure
● search for animal
● point at animal
● focus on/track animal (gaze >5 seconds)
● photograph animal

● comment on animal, not related to exhibit
● comment on animal, related to exhibit
● comment, related to action
● question to peer
● question to adult

● staff present? passive / active
● look at staff
● listening to staff
● question to staff
● interacting with staff</td></tr>
<tr><td>Engagement Scale
Minimal/Glance Cursory Moderate Extensive</td><td>Emotional Response
+ / - / Neutral</td></tr>
</table>

Field Notes:

Appendix 2: Informed Consent Script for Observations, if any visitors inquire

We are students at the Harvard Graduate School of Education and we are conducting research for the Museum of Science to help them build a new exhibit, the Live Animal Garden. We are affiliated with but do not work for the Museum. We are trying to understand how visitors respond to current exhibits that feature living animals, so we are conducting in-person observations to record visitor behavior when engaging with live animals. This information will go directly to helping the Museum determine the best way to design their new exhibit. You can choose to opt out of the observation at any point and you are welcome to ask questions. If you prefer to have a particular comment or action to be omitted from our observation notes, we will be happy to accommodate this. None of the data collected will be identifiable.

Appendix 3: Interview Instrument

1) Thinking about the animal exhibit you just visited, tell me more about your experience interacting with the exhibit.

_____
_____
_____
_____
_____

2) Looking at this scale, which picture best describes your emotional experience at the animal exhibit?

What about the exhibit made you select that image?

_____
_____
_____
_____
_____

3) What key takeaways do you remember from the live animal exhibits? What about the exhibit, if anything, helped you remember that?

_____
_____
_____
_____
_____

4) What connections, if any, did you see between the live animal exhibit and your own life or the world?

    a) If yes, was there anything in the exhibit that helped you make those connections?

_____
_____
_____
_____
_____

    b) If not, what might have helped you make those connections more easily?

_____
_____
_____
_____
_____

5) Is there anything else you'd like to share about your experience with the live animal?

_____

_____
_____
_____
_____

6) If you are comfortable, would you be willing to share some brief demographic information?

(circle one)

a) Ages of all members of your group:

<6 **6-10** **11-18** **19-30** **31-40** **41-50** **50+**

b) Gender: **Man** **Woman** **Non-binary**

Other: _____ **Prefer not to say**

c) With which racial or ethnic group(s) do you most closely identify (select all that apply)?

- ○ American Indian or Alaskan Native
- ○ Asian or Asian American
- ○ Black or African American
- ○ Hispanic or Latinx
- ○ White or Caucasian
- ○ Other
- ○ Prefer not to say

d) Does anyone in your group have a temporary or permanent disability? **Yes / No**

e) Member of the MOS?: **Yes / No**

f) Local resident?: **Yes / No**

Appendix 4: Interview Protocol

1) Researchers printed copies of the interview questions or had digital copies on a computer or iPad ready. For printed copies, researchers were prepared with a writing utensil and clipboard.
2) Researchers stood near the animal exhibit that they intended to study, waiting for the Observations researcher to finish observing subjects. They aimed to interview as many observed groups as possible with the understanding that not all groups would agree to participate or they would miss a few groups that were passing through quickly. Researchers approached visitors shortly after they observed an animal exhibit and conducted eight interviews per exhibit. During the A/B testing at the tamarins exhibit, researchers conducted eight interviews with visitors who observed the exhibit without the added signage and eight interviews with those who visited the exhibit with the presence of added signage.

3) Researchers approached potential participants and used the recruitment script to explain the evaluation study to them as well as the confidentiality and anonymity of the study. If they agreed to participate in the interview, researchers obtained their verbal consent before asking them the prepared interview questions.
4) After interviews had been completed, the research team stored them in a privately shared Google Drive and coded them for themes. Once all data had been entered and analyzed, paper or digital interview notes were discarded.

Appendix 5: Interview Recruitment Script

We are students at the Harvard Graduate School of Education and we are conducting research for the Museum of Science to help them build a new exhibit, the Live Animal Garden. We are trying to understand how visitors respond to current exhibits that feature living animals, and your thoughts and opinions will directly help the Museum determine the best way to design their new exhibit. Would you be interested in answering some questions about your experience in the (name of exhibit) exhibit? (Be sure to obtain parental consent for their children as well as children's assent)

[If yes]: Thank you! The interview should take about 5 minutes. All of your responses will be completely confidential and no identifiable information will be collected. You may choose to withdraw your participation at any time with no consequences, and if you choose to do so, your responses will be deleted from our records. Do you have any questions for me before we begin?

[If no]: Thank you for your time. Have a good day at the Museum. (might give them an I Helped sticker so they are not asked for other data collection that day)

Appendix 6: Exit Survey Tool & Recruitment Script

In order to optimize this exit survey, the evaluation team conducted pilot testing with a draft version of the survey on-site at the Museum of Science, Boston (MOS) with five guest groups.

This testing was intended to help evaluators understand whether the recruitment script was comprehensive and welcoming, and whether the survey's questions and answer choices were presented in a way that was easily understandable for Museum guests.

The experience yielded helpful feedback, including the realization that evaluators should ask guests whether they were concluding their visit before pitching the survey. Because many guests filter through the Museum's main lobby on their way to or from the café or various other secondary locations, this helped ensure evaluators were not interrupting someone's brief detour before they actually visited the relevant galleries, and that we were indeed collecting true exit surveys at the end of their visit.

We also learned the extent to which the open-ended questions yielded richer feedback than the closed-ended ones, even for respondents who did not (or did not remember) seeing live animal exhibits during that day's visit. For example, during pilot testing, two respondents who did not see live animal exhibits still responded to the open-ended exhibits with their feelings about the idea of live animal exhibits in the Museum. One was strongly supportive, saying "I think it's a great idea to have live animals (rescued) in the exhibits so the kids [sic] feels more responsible for the planet." The other opposed including live animals at all: "I don't think there should be alive [sic] animals here."

Notes: survey questions were refined between pilot testing and final evaluation. Responses gathered during pilot testing were not included in the final evaluation. The survey questions and recruitment script included in the following pages reflect the final iteration of both tools.

Exit Survey Recruitment Script

To the caregiver:
Hi there. Are you concluding your visit today?

If 'yes':
Wonderful! Would you be willing to tell me a little about your visit? I am a Harvard graduate student collecting a study in collaboration with the Museum of Science. I am hoping to learn a bit about your experience with any live animal exhibits today. Would you be willing to take a brief written survey? If so, the process should only take about 3-5 minutes and your responses may help inform the design and development of a new exhibition the Museum is working on.

If the caregiver says 'no':
Thank you for your consideration. Have a great day.

If the caregiver says 'yes':
Wonderful, thank you! You have two choices: I can give you the survey to take on your own, or I would be happy to read you the questions and record your responses for you. In either case, you are welcome to skip any questions you choose or to stop at any time. Your responses will be completely anonymous, and there are never any wrong answers! [Give them the survey in the mode they choose.]

After the survey is completed:
Thank you so much for sharing your insight, and for visiting the Museum today! Your participation is a huge help. I'd love to give you a special triceratops sticker as a thank you! Would you like a sticker?

If yes:
[Give them the sticker, as well as one for each child.] *Thank you again! Have a great day!*

If no:
Okay, thank you again. Have a great day!

Exit Survey Tool

Tell us about your experience with the Museum of Science, Boston's **live animal exhibits**! We're a group of Harvard graduate students partnering with the Museum to conduct some research.

The Museum is in the early stages of planning a brand-new live animal gallery, and is looking for insight into how visitors engage with existing live animal displays to help inform its design.

We appreciate any feedback you can offer, and any thoughts about how we can make the new gallery as engaging and impactful as possible.

Note: you may skip any questions you choose, or quit at any time. No personally identifying information will be collected, including your name.

1. **Which live animal exhibits did you see during today's visit?**
Please note all that apply.

Tamarins (monkeys)
Axolotls
Invertebrates (insects)
Fish, turtles, and amphibians
Reptiles (snakes and lizards)
Live Animal Care Center
Other: _____
None of the above: I do not remember seeing any live animals today

2. **Which live animal exhibits most excite or interest you?**
Please note all that apply, whether you've seen them or not.

Tamarins (monkeys)
Axolotls
Invertebrates (insects)
Fish, turtles, and amphibians
Reptiles (snakes and lizards)
Live Animal Care Center
Other: _____
None of the above: I do not remember seeing any live animals today

Please rate the following on a scale of <u>completely disagree</u> to <u>completely agree</u>.

3. I learned something new about the live animals I saw on today's visit.
[completely disagree] [disagree] [neutral] [agree] [completely agree]

4. I had conversations with my child(ren) or others in my group about the live animals.
[completely disagree] [disagree] [neutral] [agree] [completely agree]

5. I was able to find the information I wanted to know about the animals.
[completely disagree] [disagree] [neutral] [agree] [completely agree]

6. I understand <u>why</u> the Museum has live animal collections.
[completely disagree] [disagree] [neutral] [agree] [completely agree]

7. The live animal exhibits felt relevant to me.

[completely disagree] [disagree] [neutral] [agree] [completely agree]

8. The live animal enclosures felt appropriate for the animals they hosted.

[completely disagree] [disagree] [neutral] [agree] [completely agree]

Short response questions

9. What emotions did you experience in response to the live animal exhibits today?

10. What do you think led to you feeling these emotions?

11. What do you think the Museum was trying to have you learn by including live animals in their exhibits?

12. Is there anything further you'd like to share about the live animal exhibits?

Demographic information

(note: none of this will be personally identifiable or attributable back to you):

13. With which racial or ethnic group(s) do you most closely identify?

American Indian or Alaskan Native
Asian or Asian American
Black or African American
Hispanic or Latinx
White or Caucasian
Other
Prefer not to say

14. With what gender do you most closely identify?

Woman/girl

Man/boy
Non-binary
Prefer to self-describe
Prefer not to say

15. What is your age?

_____

16. Did you visit with any children today? If so, what are their ages?

17. Does anyone in your group have a temporary or permanent disability?

Yes
No
Prefer not to say

18. Are you a member of the Museum of Science, Boston?

Yes
No

19. Are you a local resident of Boston?

Yes
No
Prefer not to say

Appendix 7: Stakeholder Presentation Link

PowerPoint Presentation Link

Appendix 8: References

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