

**A STUDY OF CONSERVATION MESSAGES  
IN THE SANT OCEAN HALL  
AT THE NATIONAL MUSEUM OF NATURAL HISTORY**



Office of Policy and Analysis  
Smithsonian Institution  
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## DIRECTOR'S PREFACE

Since 2008, the Office of Policy and Analysis, OP&A, has had the pleasure of conducting several visitors' studies of the Sant Ocean Hall. This study addressed visitors' awareness of ocean conservation messages and their attitudes about the well being and protection of the ocean. As such, it pulled together several topics such as climate change, overfishing, pollution, actions to benefit ocean health, concern about the future of the ocean, engagement with ocean conservation, and so on. The study's findings will be used, in part, to plan the content for a gallery at the back of the hall that is currently undergoing renovation.

The findings indicate that most Sant Ocean Hall visitors are already familiar with ocean conservation issues and concerned about the health of the ocean. The exhibition might be enhanced by adding elements that make more personal, emotional connections with visitors. Ultimately, the successful establishment of this type of gallery benefits from visitor research, a solid strategy, and the presentation of topics in lively, accessible, and stimulating ways to enhance people's real life knowledge and experiences.

I would like to thank Jill Johnson, an Exhibition Developer at the National Museum of Natural History (NMNH) for requesting this study; members of the Sant Ocean Hall exhibition team including Nancy Knowlton, Elaine Soulanille, Catherine Sutera, and Bill Watson, who contributed to OP&A's understanding of the exhibition; and Chip Clark for his cover photo.

OP&A's team, led by Dr. Andrew Pekarik, a senior analyst, merits appreciation. Dr. Pekarik was assisted by Professor James Schreiber, a visiting research scholar. Rachel Asquith, Ikuko Uetani and So Hyun Park led the field work. Questionnaire layout, pretesting, interviewing, editing and scanning was done by Lance Costello, Claire Eckert, Ioana Munteanu, and Maria Raviele, members of the OP&A staff, as well as by the following interns: Andrew Goodhouse, Cathy Noh, So Mi Park, Ah-Jin Lee, Jane O. Cavalier, Brittany Newman, and Rachelle Komarnisky. I am grateful to all of them for their dedication, efficiency and adherence to high standards of professional research practices.

Carole M.P. Neves  
Director  
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## EXECUTIVE SUMMARY

The Office of Policy and Analysis was asked to do a study of the effectiveness of eight freestanding conservation message signs that were added to the Sant Ocean Hall at the National Museum of Natural History. The eight signs (together with three new texts on existing entry walls) were installed during the week of July 11, 2011. The signs are titled *Jellyfish Burgers*, *Disappearing Diversity*, *Fish Explosion*, *Acid Ocean*, *Marine Protected Areas*, *Sharks and Humans*, *Size Matters*, and *Deadly Trash Diet*.

### AIMS

This study was designed to measure the impact of the exhibition and the new signs on visitors':

#### Awareness

- Ocean conservation messages
- Risks to ocean health
- Specific actions that individuals can take to benefit ocean health

#### Attitudes

- Concern about the ocean
- Conservation issues -
  - the health of the ocean is endangered*, and
  - human actions are the primary threat to ocean health*
- Certainty that their positions on these issues are correct
- Opinion regarding the future of the ocean

Background variables included:

- Visitor's engagement with ocean conservation
- Visitors' experience in the museum:
  - First or repeat visit to the museum
  - Seeing/reading the eight ocean conservation signs
  - Rating of overall experience in the Sant Ocean Hall
  - Social context of the visit
- Visitors' residence, age, and sex

### METHOD

Self-administered surveys were distributed to systematic cohort samples of different people entering and exiting the exhibition both before the signs were added (Baseline survey: Entrance N=316, Exit N=311) and after the signs were added (With Signs survey: Entrance N=300, Exit N=351). Cooperation rates were 64% for the Baseline survey and 68% for the With Signs survey. The 95% confidence interval for each of the samples is  $\pm 6\%$  and for the combined data is  $\pm 3\%$ .

## **FINDINGS**

**Across all awareness and attitude questions there was only one statistically significant difference between entrance and exit samples in either the Baseline survey or the With Signs survey:**

- In the With Signs survey, exiting visitors were more likely than entering visitors to identify climate change as a serious risk to ocean health (65% vs. 57%)<sup>1</sup>. These exiting climate-risk visitors were more likely than other visitors to have read two of the eight signs: *Jellyfish Burgers* (78% of them read it vs. 63% of other visitors),<sup>2</sup> which highlights the ideas of climate change and overfishing, and *Size Matters* (78% vs. 62%),<sup>3</sup> which more specifically addresses overfishing.

This is the only measurable impact of the eight signs on any of the awareness or attitude variables in the study. As a result, data from the four samples can be combined to produce an overall description of the ocean conservation awareness and attitudes of visitors in the Sant Ocean Hall, as follows.

### **Awareness of conservation information in the exhibition**

55% of visitors reported that they specifically remembered seeing or hearing anything in this ocean exhibition about how to protect or conserve the ocean.

### **Risks to the health of the ocean**

90% marked Pollution; 68% marked Overfishing; 61% marked Climate change; 56% marked Habitat loss; 42% marked Ocean acidification, and 32% marked Invasive species. 1% marked “none of the above,” and 3% marked “The ocean is not at serious risk.” On average visitors selected 3.5 from the list of six risks.

### **Awareness of actions to benefit ocean health**

63% of visitors indicated that they knew of specific actions individuals can take to help protect the ocean

### **Concern about the ocean**

40% of visitors were very worried about the health of the ocean

49% were somewhat worried

8% were not very worried

3% were not at all worried

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<sup>1</sup> Chi-square = 5.2, df=1, sig. = .02.

<sup>2</sup> Chi-square = 5.1, df=1, sig. = .02.

<sup>3</sup> Chi-square = 5.9, df=1, sig. = .02.

**Level of agreement with: *The health of the world's ocean is endangered***

*(using a scale from 0=Completely disagree to 10=Completely agree)*

And

**Level of certainty that this view is correct**

*(using a scale from 0%=Not certain at all to 100%=Completely certain)*

Average level of agreement: 8.0; Average level of certainty: 78%

**Level of agreement with: *The actions of human beings are the primary threat to ocean health***

*(using a scale from 0=Completely disagree to 10=Completely agree)*

And

**Level of certainty that this view is correct**

*(using a scale from 0%=Not certain at all to 100%=Completely certain)*

Average level of agreement: 8.0; Average level of certainty: 82%

By comparison the average levels of agreement for these items in the national survey conducted for The Ocean Project were 57 and 66, respectively (on a scale from 0=Completely disagree to 100=Completely agree).

**Opinion regarding the future of the ocean**

*(using a scale from 1=dismal to 10=bright)*

Average: 5.6

By comparison this is close to the 5.4 average for visitors in 1995 who answered this question when entering the NMNH exhibition *Ocean Planet*. (Exiting *Ocean Planet* visitors had a statistically significant lower average of 4.9.)

**Engagement with ocean conservation**

25% of visitors said that they were currently engaged in at least one ocean conservation activity.

**First or repeat visit to the museum**

36% were making a repeat visit to NMNH.

**Seeing/reading the eight ocean conservation signs**

79% of visitors saw at least one of the eight signs; 65% of visitors read at least part of at least one of the eight signs. The average number seen was 2.6; the average number read at least in part was 1.9.

The signs were seen and read to about the same degree, but *Sharks and Humans* was most seen (43% saw it) and most read (16% read part of it; 13% read most/all of it).

### **Rating of overall experience in the Sant Ocean Hall**

2% marked Fair  
20% marked Good  
57% marked Excellent  
21% marked Superior

By comparison this rating is very close to the rating for the museum as a whole in the summer of 2009 (3% Fair, 20% Good, 54% Excellent, 23% Superior). It is also above the average for Smithsonian exhibitions (1% Poor, 4% Fair, 27% Good, 47% Excellent, 21% Superior).

### **Visit Group**

5% were visiting the museum as part of a school or organized group, but were in the exhibition independently;  
12% were alone  
83% were with others

### **Residence, Age, Sex**

17% of visitors lived outside the United States  
5% lived in the Washington DC Metropolitan Area  
The average age was 35.2  
52% were female

## **DISCUSSION**

### **Awareness of messages and reading of signs**

Just over half of the visitors (55%) recalled seeing or hearing about how to conserve the ocean and this percentage was unaffected by the addition of the signs. This is about the same percentage among visitors entering the museum in 2009-2010 who said that they were looking forward to gaining information (52%). If only 52% of visitors are looking to gain information, it is not surprising that about the same percentage found it.

### **The effect of the exhibition on attitudes and certainty**

The fact that the exhibition did not change attitudes or certainty is understandable in view of the high levels of agreement that visitors had with the attitude statements and their very strong degrees of certainty. In other words, there was very little possibility for movement in the direction desired by the museum, since visitors were already so far above the national average. However, there may have been other effects related to attitude that were not captured by the questions used in the study.



### **The effect of adding signs**

Visitors may be more likely to read signs that are about subjects they are already familiar with and positions they already hold. From this viewpoint signs would tend to serve as reinforcement of existing attitudes and knowledge, rather than as sources of attitude change.

### **The relationship between attitude and overall experience rating**

There was a close association between attitudes that are supported by the museum and high rating of the exhibition experience (both on entrance and exit). Since visitors' attitudes appear to be independent of the exhibition experience, this linkage suggests that visitors may be responding positively to the fact that the exhibition agrees with their existing position on the subject.

## **RECOMMENDATIONS**

### **Further study**

This study raises questions regarding the differences between the attitudes of Sant Ocean Hall visitors and those studied in national surveys. Do the visitors who enter the Sant Ocean Hall differ in their attitudes towards the ocean from other visitors in the museum? Does the National Museum of Natural History differ from other U.S. natural history museums in the attitudes of its visitors with respect to ocean conservation?

In addition it could be worthwhile to conduct a thorough goal-free evaluation of the exhibition that would help to identify more likely candidates for visitor outcomes than attitude shifts or information gain.

### **The LOOP Gallery**

This study is intended to inform the planning for the gallery at the back of the Sant Ocean Hall that is currently undergoing renovation. In view of the results of this study, providing yet more information in that space is not likely to have a measurable impact.

It might be more useful to turn attention towards providing visitors with a more emotionally exciting presentation. As noted above, the current Superior rating for the exhibition (a measure of the degree to which visitors feel that the exhibition is truly special) is no greater than the Smithsonian exhibition average. Increasing this rating would mean that visitors would find the exhibition more engaging, exciting, and memorable than they do presently. A reasonable goal would be 30% Superior.

## BACKGROUND

The Office of Policy and Analysis was asked to do a study of the effectiveness of conservation messages that were about to be added to the Sant Ocean Hall at the National Museum of Natural History (NMNH). The 23,000 square-foot Sant Ocean Hall, which opened in September, 2008, is the largest exhibition in the museum. It includes nearly 700 marine specimens and models, high-definition video, a 1,500-gallon aquarium, a replica of a 45-foot-long North Atlantic Right Whale, and a giant squid preserved in fluid. In a museum exit study in July of 2009, 72% of NMNH visitors reported visiting the Sant Ocean Hall.<sup>4</sup>



A summative evaluation of the Sant Ocean Hall conducted in 2009 reported that 41% of Sant Ocean Hall visitors gave a positive response to the question “In the Hall do you specifically remember seeing or hearing anything about how to protect or conserve the ocean?”<sup>5</sup> Due to the feeling that this number was unexpectedly low, the exhibition team was asked to supplement the exhibition in a way that would serve to increase the percentage of visitors who reported seeing or hearing ocean conservation messages. The team also wished to put more emphasis on the specific actions that visitors could take to help protect the ocean.

The exhibition team researched, designed, and produced eight freestanding signs that were placed prominently throughout the Sant Ocean Hall. The Office of Policy and Analysis helped the team to test early prototypes of three of these signs with Sant Ocean Hall visitors. The team tested the remainder by themselves.

Each sign addresses a major ocean conservation

<sup>4</sup> Smithsonian Institution Office of Policy and Analysis, *Nature, Science and Culture on Display*, Washington, D.C. July 2010. Accessed on August 8, 2011 at [http://si.edu/opanda/docs/Rpts2010/NMNH\\_0910\\_Final.pdf](http://si.edu/opanda/docs/Rpts2010/NMNH_0910_Final.pdf)

<sup>5</sup> Yalowitz, S., Figueiredo, K., and Ong, A. *Smithsonian Institution National Museum of Natural History: The Sant Ocean Hall Visitor Study Final Report*. Institute for Learning Innovation. Edgewater, MD, May, 2009, p. 52.

issue and includes a title, a dramatic photograph, a very brief description of the problem and its cause(s), specific suggestions under the title “YOU CAN HELP!”, and a website link and QR code to the Ocean Portal, the exhibition’s web presence.

The eight signs (together with three new texts on existing entry walls) were installed during the week of July 11, 2011. The signs are titled *Jellyfish Burgers*, *Disappearing Diversity*, *Fish Explosion*, *Acid Ocean*, *Marine Protected Areas*, *Sharks and Humans*, *Size Matters*, and *Deadly Trash Diet*.

## MARINE PROTECTED AREAS

A successful tool for **protecting marine environments**



**Marine Protected Areas (MPAs)** are parts of the ocean with special protection from human impacts that surrounding areas.

MPA in Papua New Guinea

Very few MPAs limit all human use. Like national parks, people are still able to visit them and enjoy their natural beauty. Many MPAs have some fishing restrictions. In most cases, the plants, animals, and habitat inside MPAs with these restrictions are **more abundant and healthier** than those outside.



Ecosystems and fisheries just beyond the boundaries of an MPA can benefit from the plants and animals that **spill over**.

### YOU CAN HELP!

- **Respect** MPA boundaries.
- Follow **all regulations** inside MPAs.
- **Enjoy** the beauty.



Explore America's national marine sanctuaries at <http://sanctuaries.noaa.gov/ocean/mpi/mpa.html>.

## FISH EXPLOSION!

**Venomous lionfish** from the Indo-Pacific are invading the Atlantic and **RAPIDLY TAKING OVER**.



### How'd they get there?

Accidental and intentional release from home aquaria.

### Why the concern?

Lionfish eat and out-compete native fish, including commercially important species.



Confirmed lionfish occurrences

Potential lionfish **predators**—such as large groupers and sharks—have been **overfished**. Restoring their populations may help reduce the disastrous effects of the voracious invasive lionfish.

### YOU CAN HELP!

- **Discard** plants and animals carefully. Even dead organisms can harbor potentially invasive hitch-hikers.
- **Eat lionfish**—they're safe and tasty when cooked.
- **Don't eat groupers or sharks**—leave them to eat the lionfish.

## AIMS OF THE STUDY

### Awareness

To ascertain the effectiveness of efforts to increase Sant Ocean Hall visitors' awareness of:

- Ocean conservation messages
- Risks to ocean health
- Specific actions that individuals can take to benefit ocean health

### Attitudes

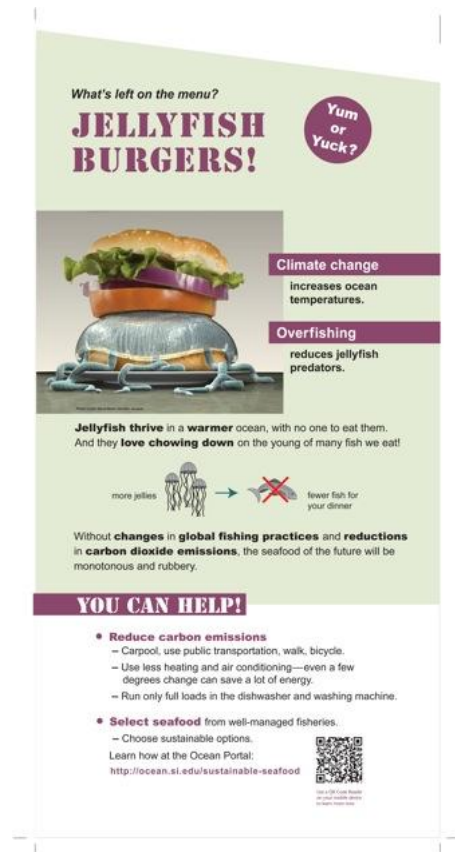
To investigate the impact of eight new ocean conservation signs on visitors':

- Concern about the ocean
- Attitudes towards key conservation issues -  
*The health of the ocean is endangered,*  
and  
*Human actions are the primary threat to ocean health*
- Certainty that their attitudes are correct
- Opinion regarding the future of the ocean

### Background

To determine the relationship (if any) of the following factors with Awareness and Attitudes:

- Visitor's engagement with ocean conservation
- Visitors' experience in the museum
  - First or repeat visit to the museum
  - Seeing/reading the eight signs
- Rating overall experience in the Sant Ocean Hall
- Social context of the visit
- Visitors' residence, age, and sex



## Method

### THE QUESTIONNAIRE

Self-administered surveys were distributed to systematic cohort samples of different people entering and exiting the exhibition both before the signs were added (Baseline survey) and after the signs were added (With Signs survey).

Questions proposed for the study were pretested with Sant Ocean Hall visitors and revised or replaced after discussion with the exhibition team. The questions were the same across the four samples, except that exiting visitors in both surveys were asked about their awareness of ocean conservation messages in the Sant Ocean Hall, and exiting visitors in the With Signs survey

were also asked to specifically identify which of the eight signs they had seen, read in part, or read most/all of.

**ACID OCEAN**

Human activities are **RAPIDLY** making seawater more acidic and harming ocean life!

**TODAY** **2100**

Today the ocean is **30%** more acidic than it was before the Industrial Revolution. By **2100**, acidity will increase by another **120%**. This rate is **100 times faster** than any time in the last 20 million years.

We add CO<sub>2</sub> to the atmosphere  
Much of that CO<sub>2</sub> ends up in the ocean  
CO<sub>2</sub> reacts with seawater to make carbonic acid

**Why should I care?**

Organisms with shells and skeletons—like oysters, crabs, and corals—have **difficulty** surviving in an **acidic ocean**.

- Much **less seafood** on your table
- **Lost jobs** for fishing communities

**YOU CAN HELP!**

- **Be energy efficient.**
  - Carpool, use public transportation, walk, bicycle.
  - Use less heating and air conditioning—even a few degrees change can save a lot of energy.
  - Run only full loads in the dishwasher and washing machine.
- See acidification in action at the Ocean Portal:  
<http://ocean.si.edu/ocean-acidification>

### THE SAMPLES

Observations of visitor flow were conducted to determine the best locations for intercepting entering and exiting visitors. The entrance samples were selected from visitors entering the exhibition from the Rotunda through the central archway (excluding those who went directly to the down escalator in the exhibition). The exit samples were selected equally from visitors leaving the back of the exhibition towards the North (direction of stairs and Discovery Room) and towards the South (entrance to the Human Origins exhibition).<sup>6</sup>

<sup>6</sup> Sampling was conducted using a continuous interviewing method, a sampling technique designed to produce a statistically representative sample of a mobile population. Continuous interviewing is a random sampling technique; all individuals crossing a pre-determined imaginary line at the entrance or exit had a known probability of being selected for an interview.

**DEADLY TRASH DIET**

Marine animals mistake plastic for food, causing **INTERNAL DAMAGE, STARVATION, and POISONING.**

The amount of plastic trash in the ocean is increasing as we add **billions of pounds** each year.

**Major sources:**

- Trash from streets and landfills that ends up in rivers and ultimately the ocean
- Lost or abandoned fishing gear
- Litter from ships and boats

**Shoreline cleanup MAKES A DIFFERENCE!**

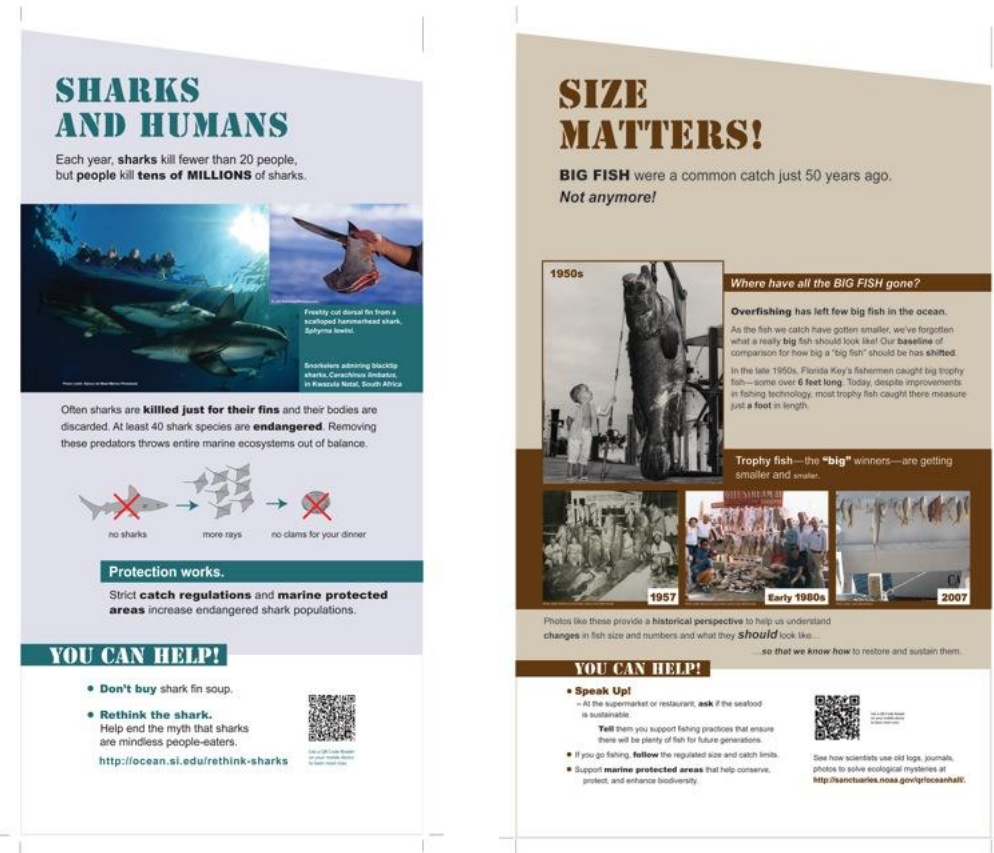
On just **one day** in 2010, over 600,000 volunteers in 114 countries removed more than **8½ million pounds** of trash.

**YOU CAN HELP!**

- **Help** with a neighborhood or coastal **clean-up**.
- **Reduce** your use of plastics by switching to non-disposable alternatives—bring your own shopping bags and water bottles.
- **Reuse and recycle.**
- **Never litter**—on land or at sea.
- **Join the discussion** on the Ocean Portal trash blog:  
<http://ocean.si.edu/trash-blog>

The study was conducted in two stages – entrance and exit samples before the signs were added (Baseline survey: June 27-29 and July 5) and entrance and exit samples after the signs were added (With Signs survey: July 19, 20, and 25).

Altogether 1,278 different visitors completed questionnaires (Baseline entrance: 316; Baseline exit 311; With Signs entrance 300; With Signs exit 351). Cooperation rates were 64% for the Baseline survey and 68% for the With Signs survey. The 95% confidence interval for each of the samples is  $\pm 6\%$  and for the combined data is  $\pm 3\%$ .<sup>7</sup>



<sup>7</sup> In other words there is a 95% likelihood that a percentage reported for a variable in one of the samples is within six percentage points of that variable in the population that was sampled. Similarly, a percentage for a variable in the combined data is 95% likely to be within three percentage points of the value of that variable in the sampled population.

## FINDINGS

### Awareness of ocean conservation messages in the Sant Ocean Hall

In order to ensure comparability with the previous summative evaluation, exiting visitors in both the Baseline and With Signs surveys were asked the same question used in that earlier study:

*In this ocean exhibition do you specifically remember seeing or hearing anything about how to protect or conserve the ocean?*

The results showed that the addition of the signs did not change the response to this question. In both cases over half of the exiting visitors reported seeing or hearing a conservation message. (Baseline survey: 55%; With Signs survey: 56%)<sup>8</sup>

### Awareness of risks to ocean health

Visitors were asked to select one or more from a list of risks. This list was constructed by the Sant Ocean Hall exhibition team and was the basis for the content of the eight signs:

*In your opinion, which of these pose a serious risk to the health of the world's ocean?*

*Climate change*

*Ocean acidification*

*Pollution*

*Invasive species*

*Habitat loss*

*Overfishing*

*None of the above*

*The ocean is not at serious risk*

As illustrated in Figure 1, pollution was the most commonly identified risk.

In the With Signs survey, exiting visitors were more likely to mark climate change than entering visitors (65% vs. 57%).<sup>9</sup> The exiting visitors who marked climate risk were more likely than other visitors to have read two of the eight signs: *Jellyfish Burgers* (78% of them read it vs. 63% of other visitors),<sup>10</sup> which highlights the ideas

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<sup>8</sup> The 2009 summative evaluation reported 41%. Yalowitz et al., op. cit., p. 52.

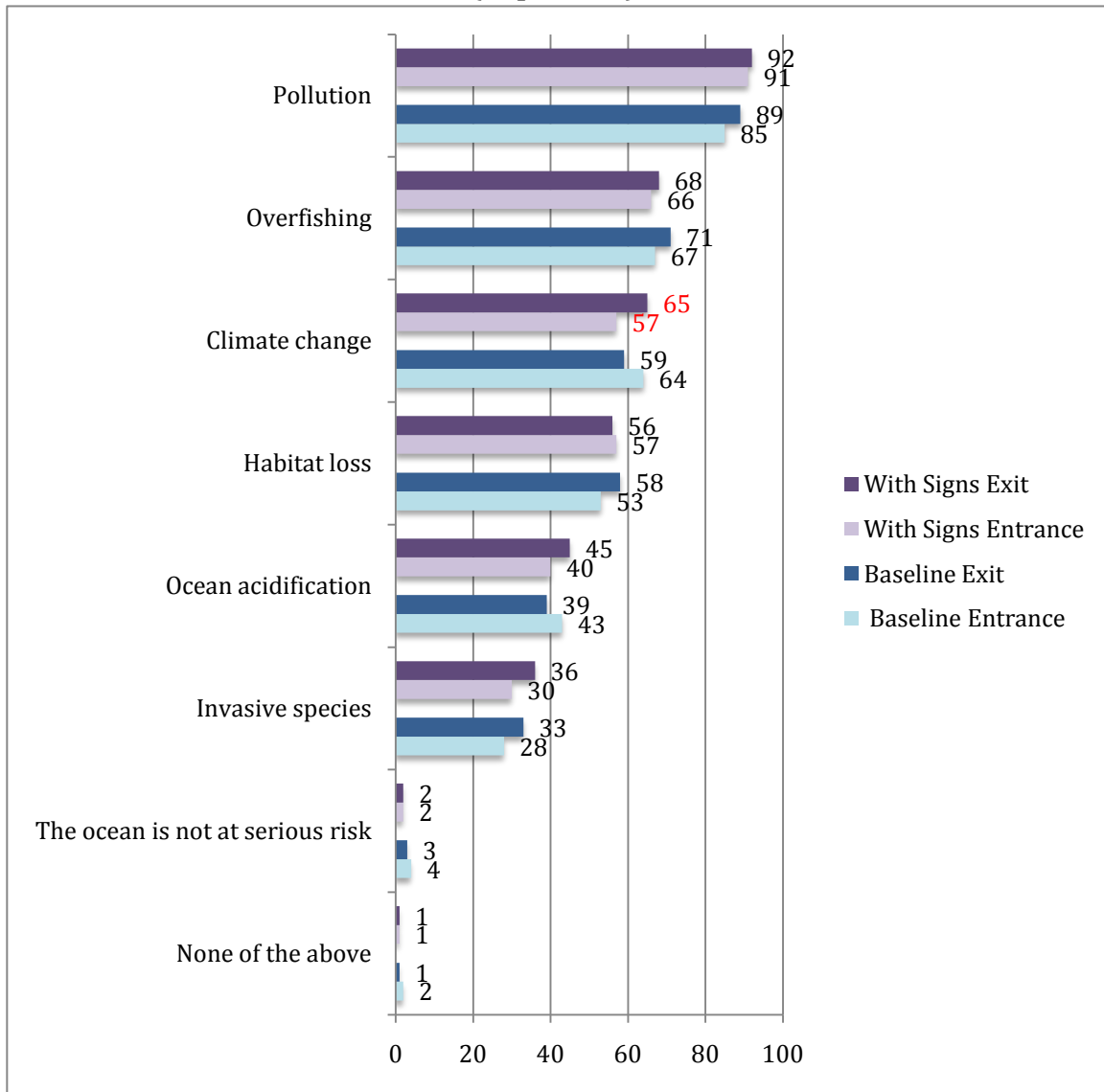
<sup>9</sup> Chi-square = 5.2, df=1, sig. = .02.

<sup>10</sup> Chi-square = 5.1, df=1, sig. = .02.

of climate change and overfishing, and *Size Matters* (78% vs. 62%),<sup>11</sup> which more specifically addresses overfishing.

On average visitors selected 3.4 of the six risks in the Baseline survey and 3.5 in the With Signs survey.

**Figure 1: Risks to the Health of the Ocean  
(in percent)**



<sup>11</sup> Chi-square = 5.9, df=1, sig. = .02.



## Awareness of actions individuals can take to benefit ocean health

All visitors were asked: *Do you know of specific actions that you can take to help protect the ocean?*

Across the whole study 63% of visitors answered yes. There were no statistically significant differences<sup>12</sup> between entrance and exit in either survey. During pretesting of the questionnaire visitors who acknowledged that they knew of specific actions were asked what they were. Their responses are reported in Appendix C.

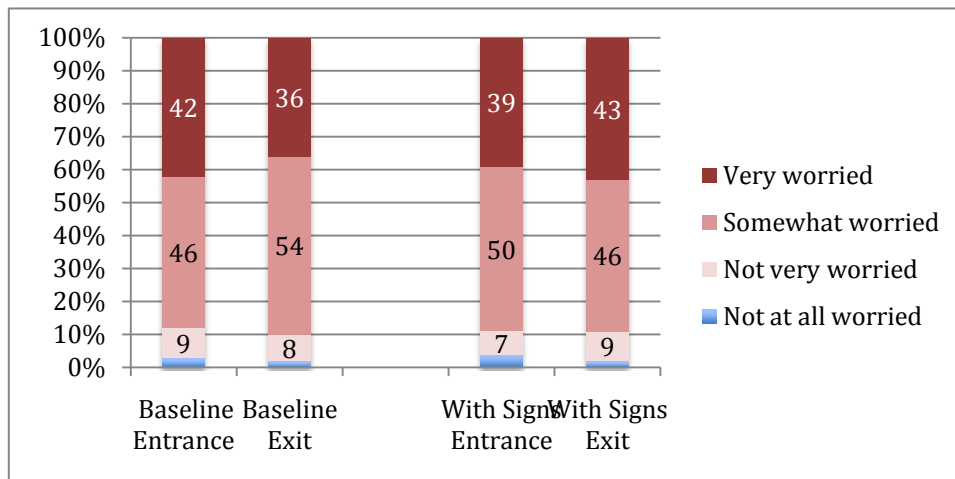
## Attitudes towards concern about the ocean

All visitors were asked: *How worried are you about the health of the ocean?*  
*Not at all worried, Not very worried, Somewhat worried, Very worried*

This question was based on a question and response options used in a national study on climate change:<sup>13</sup> *How worried are you about global warming?*

Across the entire study, 40% of visitors were very worried about the health of the ocean and 49% were somewhat worried. Only 11% visitors were less than somewhat worried, as shown in Figure 2. There were no statistically significant differences between entrance and exit in either survey.

**Figure 2: How worried are you about the health of the ocean?**



<sup>12</sup> In this study, a statistically significant difference is a difference that has less than a 5% probability of being an accident of the sample.

<sup>13</sup>Maibach, E., Roser-Renouf, C. & Leiserowitz, A., *Global Warming's Six Americas 2009: An Audience Segmentation Analysis*, Yale Project on Climate Change and George Mason University Center for Climate Change Communication, 2009, p. 76. Accessed on August 8, 2011 at [environment.yale.edu/uploads/6Americas2009.pdf](http://environment.yale.edu/uploads/6Americas2009.pdf)

Respondents in the 2009 national survey on climate change (N=2,129) were much less concerned about climate change: 17% were very worried, 46% were somewhat worried, 24% were not very worried, and 13% were not at all worried.<sup>14</sup>

### Attitudes towards ocean conservation issues: endangered

All visitors were asked to respond to the following:

To what extent do you agree with this statement:

*The health of the world's ocean is endangered*

Completely disagree ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Completely agree  
0 1 2 3 4 5 6 7 8 9 10

How certain are you that your view on this is correct?

Not certain at all ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Completely certain  
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

The statement is based on an item in a national survey<sup>15</sup> of attitudes towards the ocean: *The world's ocean is endangered*.<sup>16</sup> Respondents indicated degree of agreement in that study by choosing a point on the scale between 0 and 100, where 0 was marked as “completely disagree” and 100 as “completely agree.” The national average was reported as 57.

For Sant Ocean Hall visitors the average across both studies was 8.0 (on a scale of 0 to 10), much higher than the national average. There was no statistically significant difference between entrance and exit in either survey. As shown in Figure 3, very few visitors marked a level of agreement less than 5, and overall one in three visitors marked 10.

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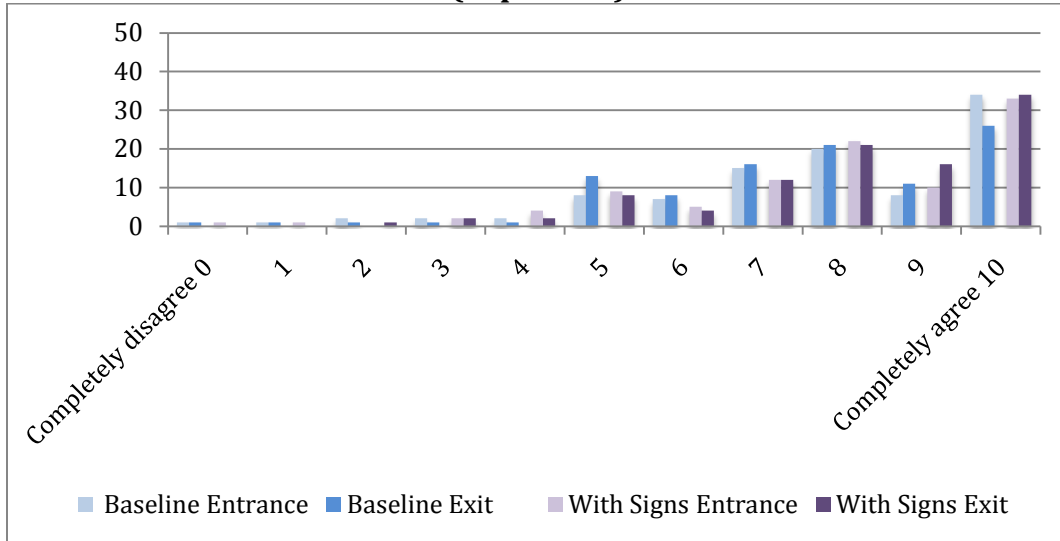
<sup>14</sup> A follow-up national survey on climate change in January of 2010 found that concern about climate change had decreased: 12% were very worried, 38% were somewhat worried, 27% were not very worried, and 23% were not at all worried. Leiserowitz, A., Maibach, E., & Roser-Renouf, C. *Global Warming's Six Americas, January 2010*, Yale Project on Climate Change and George Mason University Center for Climate Change Communication, 2010, p. 4. Accessed on August 8, 2011 at [environment.yale.edu/uploads/SixAmericasJan2010.pdf](http://environment.yale.edu/uploads/SixAmericasJan2010.pdf).

A study at the Science Museum of Minnesota using a shortened version of the national survey concluded that the science museum's visitors did not differ from the national sample. Phipps, M. *Global Warming's Six Americas: A Science Museum of Minnesota Audience Segmentation Analysis*. Science Museum of Minnesota, St. Paul, MN. 2010. Accessed on August 8, 2011 at [informal.science.org/reports/0000/0401/6Americas\\_with2011data.pdf](http://informal.science.org/reports/0000/0401/6Americas_with2011data.pdf)

<sup>15</sup> Boyle, P., and Mott, B. *America, the Ocean, and Climate Change: New Research Insights for Conservation Awareness, and Action Summary of Data*. The Ocean Project, June 2009. Accessed on August 11, 2011 at [http://www.theoceanproject.org/resources/download\\_results.php](http://www.theoceanproject.org/resources/download_results.php)

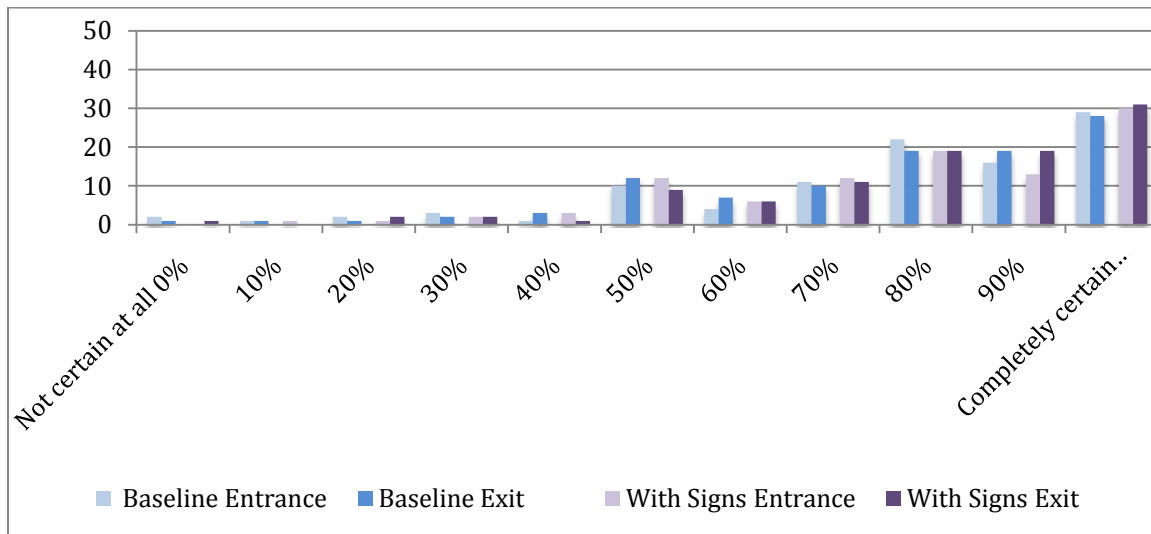
<sup>16</sup> The exact wording was changed somewhat because, as several visitors noted during pretests, the existence of the ocean is not endangered.

**Figure 3: To what extent do you agree with this statement:  
The health of the world's ocean is endangered  
(in percent)**



Research on attitude change and behavior has established that certainty needs to be considered separately from attitude.<sup>17</sup> Accordingly this study asked visitors to note the degree to which they felt that their attitude was correct. In the case of the endangered health of the ocean the average level of certainty was very high, 78%. There were no statistically significant differences between entrance and exit in either survey. See Figure 4.

**Figure 4: How certain are you that this view (endangered) is correct?  
(in percent)**



<sup>17</sup> See, for example, Tormala, Z. and Rucker, D., Attitude Certainty: A Review of Past Findings and Emerging Perspectives. *Social and Personality Psychology Compass*, Vol. 1, No. 1, November, 2007, pp. 469-492.

As with agreement, certainty was rarely less than 50%. There was a close association between agreement and certainty. Altogether 20% of visitors marked both “10” for agreement and “100%” for certainty. Research has shown that when certainty about an attitude is high, an individual is more resistant to persuasion<sup>18</sup> and more likely to take action on the basis of that attitude.<sup>19</sup> Overall 77% of visitors were at least 70% certain that their view was correct.

### Attitudes towards ocean conservation issues: human actions

Visitors were also asked to respond to a second statement:

To what extent do you agree with this statement:  
***The actions of human beings are the primary threat to ocean health***

Completely disagree ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Completely agree  
 0 1 2 3 4 5 6 7 8 9 10

How certain are you that your view on this is correct?

Not certain at all ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Completely certain  
 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

The statement is worded exactly the same as in the Ocean Project’s national survey. The national average for that question was 66 on a scale of 0 to 100.

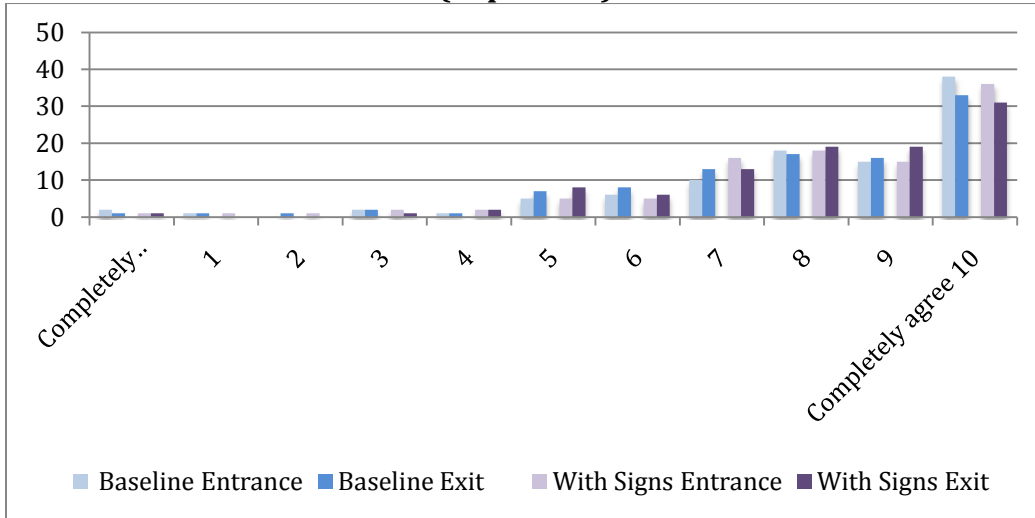
The average level of agreement at the Sant Ocean Hall with this statement was once again considerably higher, 8.0 (on a scale of 0 to 10), and the degree of certainty was slightly higher than for the endangered question, 82%. Once again there were no statistically significant differences between entrance and exit in either survey for agreement or for certainty. See Figures 5 and 6.

In this case 25% of visitors marked both “10” for agreement and “100%” for certainty, and 84% of visitors were at least 70% certain that their position was correct. If we consider all those who marked “9” or “10” in agreement and also marked “90%” or “100%” on certainty, that group includes 42% of all visitors.

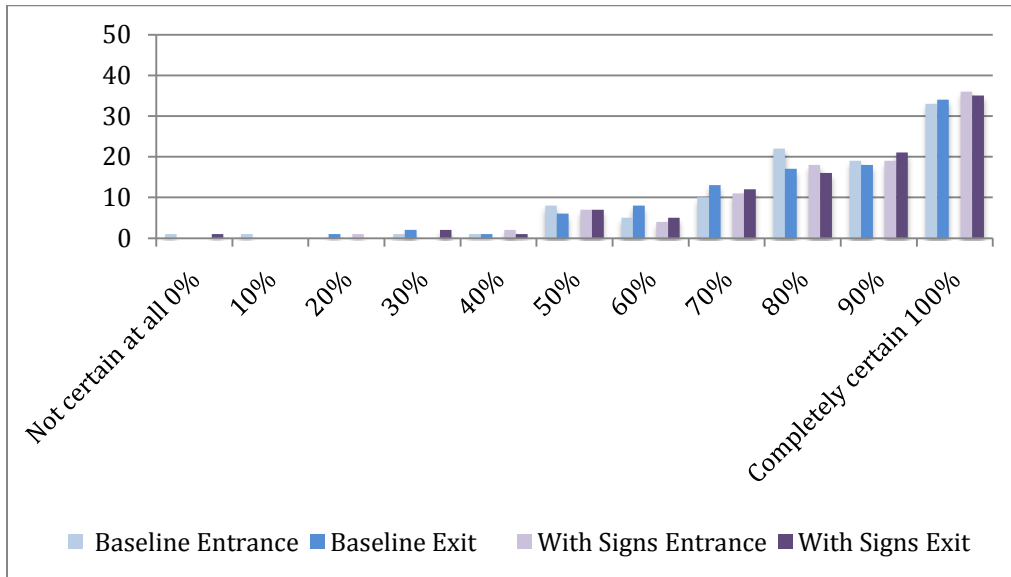
<sup>18</sup> Tormala, Z. and Petty, R. What doesn’t kill me makes me stronger: The effects of resisting persuasion on attitude certainty. *Journal of Personality and Social Psychology*, 2002, 83, pp. 1298-1313.

<sup>19</sup> Fazio, R., and Zanna, M. Attitudinal qualities relating to the strength of the attitude-behavior relationship. *Journal of Experimental Social Psychology*, 1978, 14, pp. 398-408.

**Figure 5: To what extent do you agree with this statement:  
The actions of human beings are the primary threat to ocean health  
(in percent)**



**Figure 6: How certain are you that this view (human actions) is correct?  
(in percent)**



## Attitudes regarding the future of the ocean

In 1995 the museum presented an exhibition called *Ocean Planet* in the same space where Sant Ocean Hall is today, and the visitor response was studied through an entrance-exit survey.<sup>20</sup>

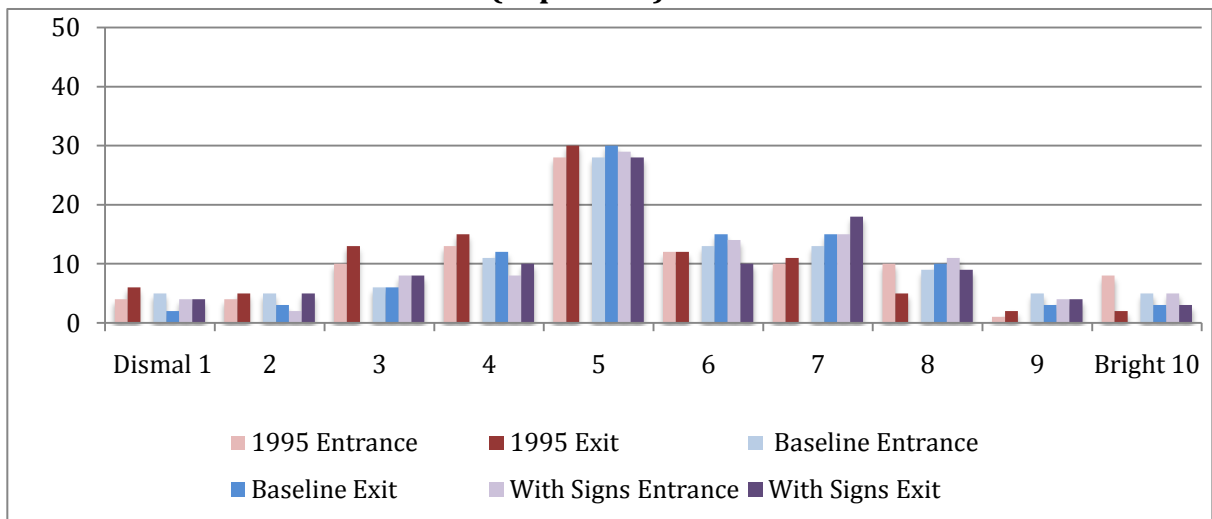
At the beginning and end of the 1995 exhibition survey different samples of visitors were asked:

*Using a scale from 1 to 10, where 1 means “dismal” and 10 means “bright,” how would you rate the future of the ocean?<sup>21</sup>*

In 1995 visitors left the exhibition slightly more pessimistic than they entered (Entrance average: 5.4; Exit average 4.9).

The same question was asked in the current study. Today’s visitors on average gave nearly the same rating (5.6), as entering visitors in 1995. There were no statistically significant differences between entrance and exit in either 2011 survey. See Figure 7.

**Figure 7: How would you rate the future of the ocean?  
(in percent)**



<sup>20</sup> Bickford, A., Pekarik, A., Doering, Z, and Yalowitz, S., *Ocean Views: A Study of Visitors to the Ocean Planet Exhibition at the National Museum of Natural History*. Smithsonian Institution, Institutional Studies Office, Washington, D.C., May 1996. Accessed on August 8, 2011 at [si.edu/opanda/Reports/Earlier/96-5-Ocean.pdf](http://si.edu/opanda/Reports/Earlier/96-5-Ocean.pdf). That exhibition, in turn, was informed by a 1993 study of visitor attitudes towards ocean issues that was conducted at natural history museums in Washington, Chicago, and Denver. See Bickford, A. *Visitors and Ocean Issues: A Background Study for the National Museum of Natural History Ocean Planet Exhibition*. Smithsonian Institution, Institutional Studies Office, Washington, D.C., 1993.

<sup>21</sup> The 1995 study used the phrase “the oceans,” while the 2011 study used “the ocean.”

## Background: Engagement with ocean conservation

Visitors were asked: *Are you currently engaged in at least one ocean conservation activity?*

Overall 25% of visitors said “yes.” There were no statistically significant differences between entrance and exit in either survey.<sup>22</sup>

As we would expect, there is a close relationship between engagement in ocean conservation activities and all of the attitude and awareness factors measured in the study. In order to identify the ones that most determine engagement, a regression model was constructed with engagement as the dependent variable and with the attitude and awareness variables, as well as demographic and visit variables, as independent variables (worry, agreement on endangered, certainty on endangered, agreement on human actions, certainty on human actions, number of cited risks, knowing of specific actions, age, sex, and first or repeat visit).<sup>23</sup> The model indicated that when all other factors are controlled for, the strongest association with engagement is knowing of specific actions.<sup>24</sup> Weaker associations include being older, making a repeat visit, and citing more risks.<sup>25</sup>

When we compare visitors’ awareness of specific actions with engagement in conservation activities, we find that 36% of visitors neither know of actions they can take nor are engaged, 40% know of actions but do not engage in them, and 24% both know and are engaged.

## Background: experience in the museum – first or repeat visit

One in three visitors (36%) were making a repeat visit. Repeat visitors were somewhat more in tune with the conservation position of the museum: compared to first time visitors they were more likely to have cited more risks (3.8 vs. 3.4),<sup>26</sup> to

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<sup>22</sup> A similar item was included in a survey with a national sample in The Ocean Project: “I am actively engaged in at least one ocean conservation initiative.” But the question was asked on a scale of 0=Completely disagree to 100=Completely agree. The national average was 45. A follow-up in Fall 2010 showed that by August of 2010 the national average had increased to 51%, and the average among those who had visited a zoo, aquarium or museum in the past year was 58%. The Ocean Project, *America, the Ocean and Climate Change: Research Insights for Conservation, Awareness and Action – Quarterly Update: Fall 2010*. Accessed on August 11, 2011 at [http://www.theoceanproject.org/resources/download\\_results.php](http://www.theoceanproject.org/resources/download_results.php)

<sup>23</sup> Logistic Regression. Adjusted R Square= 0.28.

<sup>24</sup> Odds Ratio=13.8, sig.=.000.

<sup>25</sup> Odds Ratio=1.02, sig.=.004 for Age, and Odds Ration=0.7, sig.=.01 for First Visit.

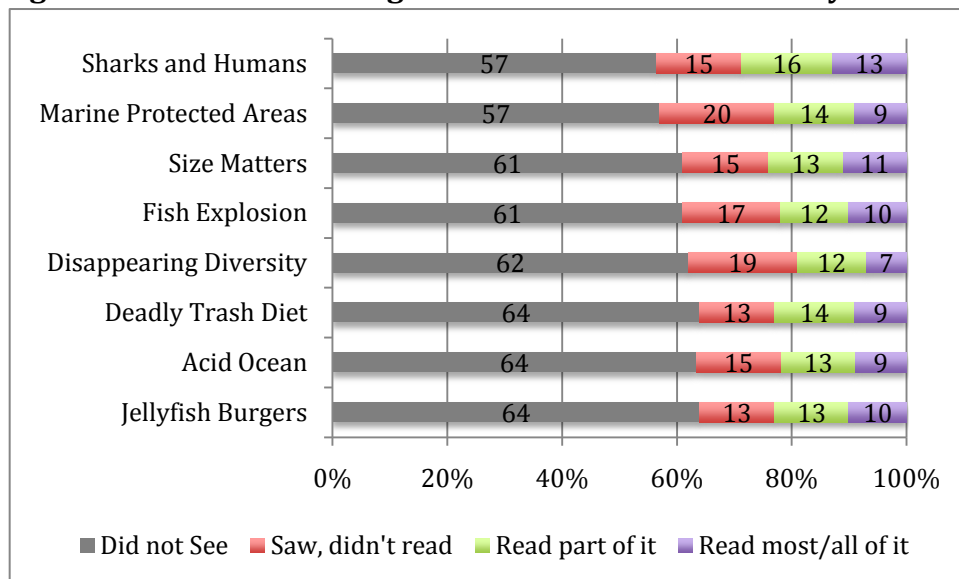
<sup>26</sup> t=3.4, df=978, sig.=0.001.

know about conservation actions and be engaged in them (32% vs. 20%),<sup>27</sup> and to have read the sign *Marine Protected Areas* (30% vs. 19%).<sup>28</sup>

### Background: experience in the museum – seeing/reading the eight signs

Four out of five visitors (79%) exiting the Sant Ocean Hall after the ocean conservation signs were installed saw at least one of the eight; two out of three (65%) read at least part of one; one out of three (35%) read most/all of at least one sign. The average number seen was 2.6 and the average number read in whole or in part was 1.9. As illustrated in Figure 8, attention was fairly evenly divided among the eight signs, although *Sharks and Humans* was the most seen (43% saw it) and the most read (16% read part of it; 13% read most/all of it).

**Figure 8: Which of these signs in the Sant Ocean Hall did you read?**



There are some significant associations between items identified as serious risks to the ocean and the signs that visitors reported reading.

- Those who marked climate change risk were more likely than other visitors to have read *Jellyfish Burgers* (27% vs. 15%)<sup>29</sup> and *Size Matters* (28% vs. 15%)<sup>30</sup>
- Those who marked ocean acidification risk were more likely to have read *Acid Ocean* (28% vs. 16%)<sup>31</sup>

<sup>27</sup> Chi-Square=19.2, df=2, sig.=.000.

<sup>28</sup> Chi-Square=4.4, df=2, sig.= 0.4.

<sup>29</sup> Chi-Square=5.1, df=1, sig.=.02

<sup>30</sup> Chi-Square=5.9, df=1, sig.=.02

<sup>31</sup> Chi-Square=5.9, df=1, sig.=.02



- Those who marked invasive species risk were more likely to have read *Fish Explosion* (29% vs. 18%)<sup>32</sup> and *Size Matters* (34% vs. 19%)<sup>33</sup>
- Those who marked habitat loss were more likely to have read *Fish Explosion* (28% vs. 15%)<sup>34</sup>
- Those who marked overfishing risk were more likely to have read *Jellyfish Burgers* (28% vs. 12%)<sup>35</sup> and *Fish Explosion* (26% vs. 14%)<sup>36</sup>

### Background: experience in the museum - Rating overall experience in the Hall

Entering visitors were asked: *How do you think you will rate your overall experience in this Ocean exhibit when you leave?*

Exiting visitors were asked: *How would you rate your overall experience in this Ocean exhibit?*

The response options were: Poor, Fair, Good, Excellent, Superior.

The overall experience rating for the Sant Ocean Hall is very close to the rating for the experience in the museum as a whole that was measured in the summer of 2009. This is not surprising, since 72% of the 2009 summer visitors had visited the Sant Ocean Hall and the Sant Ocean Hall was the largest exhibition in the museum.<sup>37</sup>

The Sant Ocean Hall rating is higher than the Smithsonian exhibition average because fewer visitors gave the Poor, Fair, or Good ratings that suggest some level of dissatisfaction. Rating differences between entrance and exit in both surveys were not statistically significant.

The overall experience rating has strong associations with all of the attitude and awareness variables, except for pollution risk and the future scale. For example, among those who were engaged in ocean conservation activities, 28% gave a Superior rating, compared to 19% of those who were not.<sup>38</sup> Higher rating individuals were also more likely to have read *Trash Diet*, *Fish Explosion*, or *Jellyfish Burger*.<sup>39</sup>

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<sup>32</sup> Chi-Square=4.8, df=1, sig=.03

<sup>33</sup> Chi-Square=8.6, df=1, sig=.003

<sup>34</sup> Chi-Square=6.5, df=1, sig=.01

<sup>35</sup> Chi-Square=9.1, df=1, sig=.003

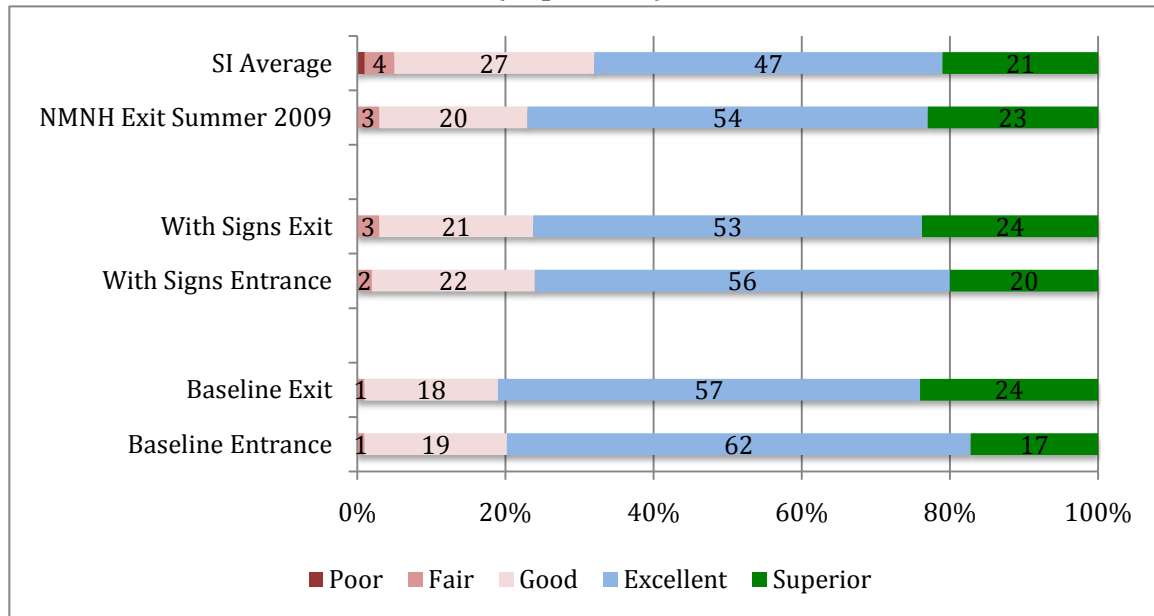
<sup>36</sup> Chi-Square=4.9, df=1, sig=.03

<sup>37</sup> *Nature, Science and Culture on Display: Results from the 2009-10 National Museum of Natural History Visitor Survey*. Smithsonian Institution Office of Policy and Analysis, Washington, D.C., July, 2010. Accessed on August 11, 2011 at [http://si.edu/opanda/docs/Rpts2010/NMNH\\_0910\\_Final.pdf](http://si.edu/opanda/docs/Rpts2010/NMNH_0910_Final.pdf)

<sup>38</sup> Chi-Square=12.1, df=2, sig=.002

<sup>39</sup> Respectively, Chi-Square = 11.9, 12.1, and 8.0; df=2, sig= .003, .002, and .02.

**Figure 9: Overall Experience Rating (Anticipated and Actual)  
(in percent)**



### Background: experience in the museum - social context of the visit

Visitors were asked: *With whom are you visiting this museum?*

Response options were: I am alone with a school group/organized group, I am alone, and I am with others. Since the interview selection protocol excluded visitors entering or leaving the exhibition together in organized groups, the five percent of visitors who said they were with a group represented those who were visiting independently of their group. As is typical for this museum, only 12% of visitors were alone. These lone visitors were less likely to select pollution risk (84% vs. 91% of those with others)<sup>40</sup>, and less likely to specifically remember seeing or hearing anything about how to conserve the ocean (43% vs. 58% for those with others).<sup>41</sup>

### Background: residence, age, and sex

Visitors were asked: *Where do you live? What is your age? What is your sex?*

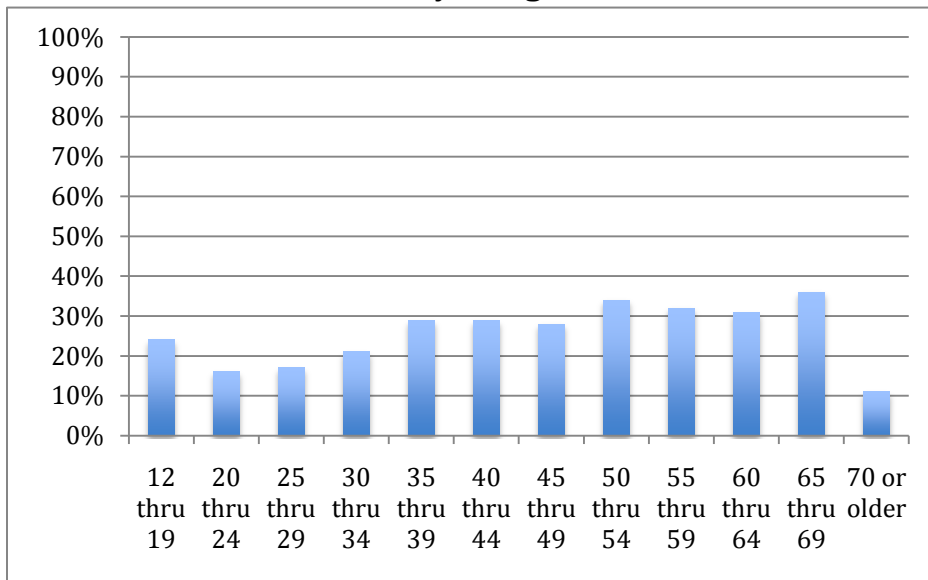
<sup>40</sup> Chi-Square=5.8, df=1, sig.=.02

<sup>41</sup> Chi-Square=7, df=1, sig.=.008

Four out of five visitors (83%) were residents of the United States.<sup>42</sup> Only one in twenty (5%) lived in the Washington, DC Metropolitan Area. The average age was 35.2 and median age was 35, and there were slightly more females (52%).

Those visitors who cited habitat loss as a risk to the ocean were younger on average (34 vs. 37)<sup>43</sup>, while those who were very worried were older than those who were somewhat worried (average age: 36.7 vs. 34.5)<sup>44</sup>, and those who were engaged in ocean conservation activities were also older than other visitors (average age: 37.5 vs. 34.5).<sup>45</sup> As shown in Figure 10, a sense of responsibility for the ocean tends to increase with age, reaching its maximum among visitors in their late 60s and then dropping off sharply.

**Figure 10: Percent who engage in ocean conservation activities for each 5-year age cohort**



Females were more worried about the health of the ocean (43% very worried vs. 37% for males) and more likely than males to agree that it was endangered (mean 8.1 vs. 7.6)<sup>46</sup> and that human actions were a threat (mean 8.3 vs. 7.9)<sup>47</sup>. They were also more likely to cite risks (mean 3.7 vs. 3.3)<sup>48</sup>, to know of specific actions (66%

<sup>42</sup> In the exit sample of the With Signs survey foreign visitors were over-represented by 4% (21% vs. expected 17%). The data were weighted to align with the other three samples.

<sup>43</sup>  $t=3.6$ ,  $df=1234$ ,  $sig.=.000$

<sup>44</sup>  $t=2.3$ ,  $df=1095$ ,  $sig.=.02$

<sup>45</sup>  $t=3.1$ ,  $df=1231$ ,  $sig.=.002$

<sup>46</sup>  $t=4.7$ ,  $df=1244$ ,  $sig.=.000$

<sup>47</sup>  $t=3.4$ ,  $df=1244$ ,  $sig.=.001$

<sup>48</sup>  $t=4.3$ ,  $df=1242$ ,  $sig.=.000$

vs. 59%)<sup>49</sup>, to be engaged in ocean conservation activities (27% vs. 22%)<sup>50</sup>. They were also more likely to be younger (average age 34.2 vs. 36.2 for males).<sup>51</sup> Males, on the other hand, were more likely to have read *Acid Ocean* (27% vs. 16%)<sup>52</sup> and *Size Matters* (31% vs. 16%).<sup>53</sup>

## Discussion

### The effect of the exhibition on attitudes and certainty

This study demonstrated that the Sant Ocean Hall exhibition, whether it had the eight conservation signs or not, did not change visitor attitudes with respect to either the danger facing the ocean or the threat posed by human actions. Moreover, the exhibition did not affect the degree to which visitors felt that their views on these matters were correct.

This result is not surprising, since it is well known that brief interventions are unlikely to affect strongly held opinions, and what is remarkable in this data is the high levels of agreement with the two attitude statements and the very strong degrees of certainty. In other words, there was very little possibility for movement in the direction desired by the museum, since visitors were already so far above the national average in this regard. The exhibition is literally preaching to the already converted.

However, it is quite possible that the exhibition had effects related to attitude that were not captured with agreement or certainty. In particular, recent research has noted the importance of “clarity” as a distinct component of attitude, and demonstrated that repeated exposure to an idea strengthens clarity, but not certainty of correctness.<sup>54</sup> That may be what is happening in this exhibition as visitors find their existing opinions repeated back to them.

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<sup>49</sup> Chi-Square=5.5, df=1, sig.=.02

<sup>50</sup> Chi-Square=4.3, df=1, sig.=.04

<sup>51</sup> t=2.4, df=1232, sig.=.02

<sup>52</sup> Chi-Square=5.7, df=1, sig.=.02

<sup>53</sup> Chi-Square=8.7, df=1, sig.=.003

<sup>54</sup> See, for example, Petrocelli, J.V., and Tormala, Z.L Unpacking Attitude Certainty: Attitude Clarity and Attitude Correctness. *Journal of Personality and Social Psychology* (2007) vol. 92(1), p. 30-41. Other aspects of attitude besides clarity and correctness include extremity, importance, accessibility, and intensity. See Tormala and Rucker, op. cit., p. 469.

## The effect of adding signs

In nearly all of these cases where there were statistically significant associations between identification of a risk to the ocean by exiting visitors and the reading of a particular sign, there was a direct connection between the risk and the content of the sign. But, as noted earlier, only climate change risk showed a measurable difference between entrance and exit samples.

Why did the other signs not have similar effects? One possibility is that *Jellyfish Burgers* was a much more compelling sign than the others, but if that is so, why wasn't it viewed or read more than the other signs? And why did the sign's other message, overfishing, not have comparable impact?

The climate-risk visitors, for example, also were more likely to have read *Size Matters*, whose key message, overfishing, is highlighted in *Jellyfish Burgers*, as well, and although those who marked overfishing as a risk were also more likely to have read *Fish Explosion*, (which mentions overfishing), there was no corresponding difference between entrance and exit in the percentage of visitors who identified overfishing as a risk.

One possibility to consider is that visitors are more likely to read signs that are about subjects they already are familiar with. Experiments in perception support this possibility.<sup>55</sup> Individuals are more likely to notice objects that evoke accessible attitudes. From this viewpoint signs such as these would tend to serve more to confirm existing attitudes and knowledge, rather than to change or supplement them.

## The relationship between attitude and overall experience rating

The Office of Policy and Analysis has been using the Poor-Fair-Good-Excellent-Superior scale to measure overall experience in Smithsonian exhibitions and museums for eight years. The reliability and validity of the rating scale has been demonstrated across more than 70 exhibition studies and 50 museum studies. These studies have shown that those who rate an exhibition or museum Poor, Fair, or Good generally have some level of criticism or dissatisfaction, while those who give a Superior rating consider the exhibition or museum to be particularly fine. About half of visitors to Smithsonian exhibitions on average give a rating of Excellent, which generally describes satisfaction and an absence of criticism.

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<sup>55</sup> Items that evoke existing attitudes are more likely to be noticed when viewed and to be recollected in response to questions. See Roskos-Ewoldsen, D. R.; Fazio, R. H. On the orienting value of attitudes: Attitude accessibility as a determinant of an object's attraction of visual attention. *Journal of Personality and Social Psychology*, 63(2), Aug 1992, pp. 198-211.

As noted in the Findings, there was a close association between attitudes that are supported by the exhibition and high rating of the exhibition experience (both on entrance and exit). Since visitors' attitudes appear to be independent of the exhibition experience, this linkage suggests that visitors may be responding positively to the fact that the exhibition agrees with their existing position.

In Office of Policy and Analysis studies of Smithsonian exhibitions we have long noted that visitors who come to a museum specifically to see an exhibition rate their experience more highly than those who are on a general visit. We have assumed that this "halo effect" represents the investment made in deciding to come and a desire to avoid cognitive dissonance. But the results of this study suggest that it might more generally reflect the degree to which an exhibition aligns with the existing interests and beliefs of its visitors.

If this is correct, it has important implications for expanding audiences. It could also explain why visitors to the Sant Ocean Hall enter with such high levels of agreement with the museum. Is it possible that visitors choose to enter the museum and the exhibition that they believe will align with their views? Or, conversely, is it possible that those who anticipate that the museum will NOT share their opinions on important matters will avoid that museum or exhibition?

### Awareness of messages and reading of signs

Just over half of the visitors (55%) recalled seeing or hearing about how to conserve the ocean and this percentage was unaffected by the addition of the signs. This is about the same percentage among visitors entering the museum in 2009-2010 who said that they were looking forward to gaining information (52%). Analyses of other entrance-exit studies at the Smithsonian have demonstrated that visitors are inclined to have the experiences that they are looking for. If only 52% of visitors are looking to gain information, it should not be surprising that about the same percentage find it. In order to raise the percentage of visitors who read, it is necessary to entice visitors who generally prefer other types of experiences. This is only possible if displays are constructed in such a way that visitors are engaged in the mode that they prefer and then "flipped" to unexpected experiences.<sup>56</sup>

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<sup>56</sup> See Pekarik, A. and Mogel, B. Ideas, Objects, or People? A Smithsonian Exhibition Team Views Visitors Anew. *Curator: The Museum Journal* 53(4), 2010, pp. 465-482.

## Recommendations

### **Further study**

This study raises questions regarding the differences between the attitudes of Sant Ocean Hall visitors and those studied in national surveys. Do the visitors who enter the Sant Ocean Hall differ in their attitudes towards the ocean from other visitors in the museum? Does the National Museum of Natural History differ from other U.S. natural history museums in the attitudes of its visitors with respect to ocean conservation?

In addition it could be worthwhile to conduct a thorough goal-free evaluation of the exhibition that would help to identify more promising candidates for outcomes than attitude shifts or information gains.

### **The LOOP Gallery**

This study is intended to inform planning for the gallery at the back of Sant Ocean Hall that is currently undergoing renovation. In view of the results of this study, providing yet more conservation information in that space is not likely to have a measurable impact on attitudes or awareness.

It might be more useful to turn attention towards providing visitors with a more emotionally exciting presentation. As noted above, the current Superior rating for the exhibition (a measure of the degree to which visitors feel that the exhibition is truly special) is no greater than the Smithsonian exhibition average. Increasing this rating would mean that visitors would find the exhibition more engaging, exciting, and memorable than they do presently. A reasonable goal would be 30% Superior.





Is this your first visit to this museum, the National Museum of Natural History?  Yes  No

How would you rate your overall experience in this Ocean exhibit?

Poor  Fair  Good  Excellent  Superior

How worried are you about the health of the ocean?

Not at all worried  Not very worried  Somewhat worried  Very worried

To what extent do you agree with this statement:

*The health of the world's ocean is endangered*

Completely disagree             Completely agree  
0 1 2 3 4 5 6 7 8 9 10

How certain are you that your view on this is correct?

Not certain at all            Completely certain  
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

To what extent do you agree with this statement:

*The actions of human beings are the primary threat to ocean health*

Completely disagree            Completely agree  
0 1 2 3 4 5 6 7 8 9 10

How certain are you that your view on this is correct?

Not certain at all            Completely certain  
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

In your opinion, which of these pose a serious risk to the health of the world's ocean?  
[Mark one or more]

- Climate change  
 Ocean acidification  
 Pollution  
 Invasive species  
 Habitat loss  
 Overfishing  
 None of the above  
 The ocean is not at serious risk

Do you know of specific actions that you can take to help protect the ocean?  Yes  No

Are you currently engaged in at least one ocean conservation activity?  Yes  No

On a scale of 1 to 10 where 1 means "dismal" and 10 means "bright," how would you rate the future of the ocean?

In this ocean exhibition do you specifically remember seeing or hearing anything about how to protect or conserve the ocean?  Yes  No

\*With whom are you visiting this museum today? [Mark only ONE]  I am with a school group/organized group  
 I am alone  
 I am with others

\*Where do you live?  United States. ZIP Code:       
 Other country. Please specify: \_\_\_\_\_

\*What is your age?

\*What is your sex?  Male  Female

**Thank You for your time and assistance!**

Sex

Seg

1  2  3  C  R  L  I

ID

With Signs Exit:

2650475683

□ □ □ □

Ocean Hall Study 2011

2 MSG EXIT

Is this your first visit to this museum, the National Museum of Natural History?

Yes  No

How would you rate your overall experience in this Ocean exhibit?

Poor  Fair  Good  Excellent  Superior

How worried are you about the health of the ocean?

Not at all worried  Not very worried  Somewhat worried  Very worried

To what extent do you agree with this statement:

*The health of the world's ocean is endangered*

Completely disagree  0  1  2  3  4  5  6  7  8  9  10 Completely agree

How certain are you that your view on this is correct?

Not certain at all  0%  10%  20%  30%  40%  50%  60%  70%  80%  90%  100% Completely certain

To what extent do you agree with this statement:

*The actions of human beings are the primary threat to ocean health*

Completely disagree  0  1  2  3  4  5  6  7  8  9  10 Completely agree

How certain are you that your view on this is correct?

Not certain at all  0%  10%  20%  30%  40%  50%  60%  70%  80%  90%  100% Completely certain

In your opinion, which of these pose a serious risk to the health of the world's ocean?  
[Mark one or more]

- Climate change
- Ocean acidification
- Pollution
- Invasive species
- Habitat loss
- Overfishing
- None of the above
- The ocean is not at serious risk

Do you know of specific actions that you can take to help protect the ocean?  Yes  No

Are you currently engaged in at least one ocean conservation activity?  Yes  No

On a scale of 1 to 10 where 1 means "dismal" and 10 means "bright," how would you rate the future of the ocean?

□ □

In this ocean exhibition do you specifically remember seeing or hearing anything about how to protect or conserve the ocean?  Yes  No

\*With whom are you visiting this museum today? [Mark only ONE]  I am with a school group/organized group  I am alone  I am with others

\*Where do you live?  United States. ZIP Code: □ □ □ □ □ □  Other country. Please specify: \_\_\_\_\_

\*What is your age? □ □

\*What is your sex?  Male  Female

Please Continue On The Back

□ □  1  2  3 C  R  L  I

3676475682

Four empty boxes for marking answers.

Which of these signs in the Ocean Hall did you read?  
[Please mark one item for EACH sign.]

### JELLYFISH BURGERS!

Turn or Flip?



**Climate change**  
Increases ocean temperatures.

**Overfishing**  
Increases jellyfish predators.

Jellyfish thrive in a warmer ocean, with no need to eat them. And they have chewing claws on the stinging tentacles that can kill you!



Without changes in global fishing practices and reductions in carbon dioxide emissions, the world of the future will be unrecognizable and scary.

#### YOU CAN HELP!

- Didn't see
- Saw, didn't read
- Read part of it
- Read most/all of it

### DISAPPEARING DIVERSITY

A diverse ocean is a healthy ocean. Our species are being lost at an alarming rate.

#### Climate Change

Warming oceans are causing coral bleaching and other damage to coral reefs.

#### Overfishing

Overfishing is causing the collapse of many fish stocks.

#### Bycatch

Bycatch is causing the death of many non-target species.



#### Protection works.

Marine protected areas can help protect our oceans and the species that live there.

Working together, we can protect our oceans and the species that live there.

#### YOU CAN HELP!

- Didn't see
- Saw, didn't read
- Read part of it
- Read most/all of it

### FISH EXPLOSION!

Invasive species from the Indo-Pacific are flooding the Atlantic and RAPIDLY TAKING OVER.



#### How'd they get there?

Accidents and intentional releases from home aquaria.

#### Why the concern?

Jellyfish are not only competing with fish, they're also eating them.



Invasive species predators—such as large groupers and sharks—have been overfished. Removing their predators may help reduce the dramatic effects of the invasive jellyfish.

- Didn't see
- Saw, didn't read
- Read part of it
- Read most/all of it

### ACID OCEAN

Human activities are RAPIDLY making seawater more acidic and harming ocean life!



**TODAY** 2,600

Today the ocean is 26% more acidic than it was before the Industrial Revolution. By 2100, acidity will increase by another 100%. The rate is 100 times faster than any time in the last 24 million years.



#### Why should I care?

Disrupts with all life and threatens—the workers, cities and nations—have difficulty surviving in an acidic ocean.

• Acid rain is bad for you and your crops.

• Acid rain is bad for the people and animals that eat it.

- Didn't see
- Saw, didn't read
- Read part of it
- Read most/all of it

### MARINE PROTECTED AREAS

A successful tool for protecting marine environments



Over 100,000 MPAs exist around the world. They protect important marine resources and ecosystems. Many MPAs have been established in recent years. The global network of MPAs is growing rapidly. More MPAs are being established and better managed.



MPAs can help protect our oceans and the species that live there.

- Didn't see
- Saw, didn't read
- Read part of it
- Read most/all of it

### SHARKS AND HUMANS

Each year, sharks kill fewer than 20 people. But people kill tens of MILLIONS of sharks.



Other sharks are killed just for their fins and their bodies are discarded. At least 40 shark species are endangered. Finning—the practice of cutting off a shark's fins and discarding the rest—is a major threat to shark populations.



#### Protection works.

Shark catch regulations and marine protected areas increase endangered shark populations.

- Didn't see
- Saw, didn't read
- Read part of it
- Read most/all of it

### SIZE MATTERS!

BIG FISH are a common catch just 70 years ago. Not anymore!



#### Where have all the BIG FISH gone?

Overfishing has led to the loss of many large fish species.

Overfishing has led to the loss of many large fish species.

Overfishing has led to the loss of many large fish species.

Overfishing has led to the loss of many large fish species.

#### YOU CAN HELP!

- Didn't see
- Saw, didn't read
- Read part of it
- Read most/all of it

### DEADLY TRASH DIET

Marine animals mistake plastic for food, causing INTERNAL DAMAGE, STARVATION, and POISONING.



#### Major sources

• Trash from events and festivals that ends up in rivers and along the shore.

• Lost or abandoned fishing gear.

• Lost mail bags and seals.

#### Showing clean-up MAKES A DIFFERENCE!

On just one day in 2012, over 100,000 volunteers in 174 countries removed over 100 million pounds of trash.

- Didn't see
- Saw, didn't read
- Read part of it
- Read most/all of it

Thank You for your time and assistance!

## Appendix B: Frequencies

<b>OCEAN CONSERVATION MESSAGES STUDY</b>							
	<b>BASELINE</b>			<b>WITH SIGNS</b>			<b>All</b>
	<b>Entr.</b>	<b>Exit</b>	<b>Total</b>	<b>Entr.</b>	<b>Exit</b>	<b>Total</b>	<b>Total</b>
<b>Is this your first visit to this museum, the National Museum of Natural History?</b>							
Yes	58	66	62	61	69	65	64
No	42	34	38	39	31	35	36
<b>How do you think you will rate our overall experience in this Ocean exhibit when you leave? / How would you rate your overall experience in this Ocean exhibit?</b>							
Poor	0	0	0	0	0	0	0
Fair	1	1	1	2	3	3	2
Good	19	18	19	22	21	22	20
Excellent	62	57	59	56	53	54	57
Superior	17	24	20	20	24	22	21
Poor/Fair/Good	20	19	20	24	24	24	22
Excellent	62	57	59	56	53	54	57
Superior	17	24	20	20	24	22	21
<b>How worried are you about the health of the ocean?</b>							
Not at all worried	3	2	2	4	2	3	3
Not very worried	9	8	9	7	9	8	8
Somewhat worried	46	54	50	50	46	48	49
Very worried	42	36	39	39	43	41	40
Less than somewhat worried	12	10	11	11	11	11	11
Somewhat worried	46	54	50	50	46	48	49
Very worried	42	36	39	39	43	41	40

	BASELINE			WITH SIGNS			All
	Entr.	Exit	Total	Entr.	Exit	Total	Total
<b>To what extent do you agree with this statement: The health of the world's ocean is endangered</b>							
Completely disagree 0	1	1	1	1	0	1	1
1	1	1	1	1	0	1	1
2	2	1	1	0	1	1	1
3	2	1	1	2	2	2	2
4	2	1	2	4	2	3	3
5	8	13	10	9	8	8	9
6	7	8	7	5	4	4	6
7	15	16	16	12	12	12	14
8	20	21	21	22	21	21	21
9	8	11	9	10	16	13	11
Completely agree 10	34	26	30	33	34	34	32
Mean	7.8	7.7	7.8	7.8	8.1	8	8
Standard Deviation	2.2	2.1	2.2	2.3	2.1	2.2	2.2
Low Agreement (0-6)	23	26	23	23	18	20	22
Medium Agreement (7-8)	35	37	37	34	32	33	35
High Agreement (9-10)	42	37	39	43	50	47	44
<b>How certain are you that this view is correct?</b>							
Not certain at all 0%	2	1	1	0	1	1	1
10%	1	1	1	1	0	1	1
20%	2	1	1	1	2	1	1
30%	3	2	3	2	2	2	2
40%	1	3	2	3	1	2	2
50%	10	12	11	12	9	10	10
60%	4	7	6	6	6	6	6
70%	11	10	11	12	11	12	11
80%	22	19	21	19	19	19	20
90%	16	19	18	13	19	16	17
Completely certain 100%	29	28	26	30	31	31	29
Mean	78%	77%	78%	78%	80%	79%	78%
Standard Deviation	23	22	23	22	21	21	22
Low Certainty (0%-60%)	23	27	25	25	20	22	23
Medium Certainty (70%-80%)	33	29	32	32	31	31	31
High Certainty (90%-100%)	45	47	44	43	50	47	46

	BASELINE			WITH SIGNS			All
	Entr.	Exit	Total	Entr.	Exit	Total	Total
<b>To what extent do you agree with this statement: The actions of human beings are the primary threat to ocean health</b>							
Completely disagree 0	2	1	2	1	1	1	1
1	1	1	1	1	0	1	1
2	0	1	1	1	0	1	1
3	2	2	2	2	1	1	2
4	1	1	1	2	2	2	2
5	5	7	6	5	8	6	6
6	6	8	7	5	6	6	6
7	10	13	11	16	13	14	13
8	18	17	18	18	19	19	18
9	15	16	15	15	19	17	16
Completely agree 10	38	33	36	36	31	33	35
Mean	8.1	8	8	8.1	8.1	8.1	8
Standard Deviation	2.3	2.2	2.3	2.1	1.9	2	2.1
Low Agreement (0-6)	17	21	20	17	18	17	18
Medium Agreement (7-8)	28	30	29	33	32	33	31
High Agreement (9-10)	53	49	51	50	50	50	51
<b>How certain are you that this view is correct?</b>							
Not certain at all 0%	1	0	1	0	1	1	1
10%	1	0	0	0	0	0	0
20%	0	1	0	1	0	1	1
30%	1	2	1	0	2	1	1
40%	1	1	1	2	1	1	1
50%	8	6	7	7	7	7	7
60%	5	8	7	4	5	5	6
70%	10	13	12	11	12	12	12
80%	22	17	19	18	16	17	18
90%	19	18	19	19	21	20	19
Completely certain 100%	33	34	34	36	35	36	35
Mean	82%	82%	82%	83%	83%	83%	82%
Standard Deviation	20	19	20	18	20	19	19
Low Certainty (0%-60%)	17	18	17	15	16	16	16
Medium Certainty (70%-80%)	32	30	31	28	27	28	30
High Certainty (90%-100%)	52	52	53	56	57	56	54

	BASELINE			WITH SIGNS			All
	Entr.	Exit	Total	Entr.	Exit	Total	Total
<b>In your opinion, which of these pose a serious risk to the health of the world's ocean? [Mark one or more]</b>							
Pollution	85	89	87	91	92	91	90
Overfishing	67	71	69	66	68	67	68
Climate change	64	59	61	57	65	61	61
Habitat loss	53	58	55	57	56	57	56
Ocean acidification	43	39	41	40	45	43	42
Invasive species	28	33	30	30	36	33	32
None of the above	2	1	2	1	1	1	1
The ocean is not at serious risk	4	3	3	2	2	2	3
Average number of risks	3.4	3.5	3.4	3.4	3.6	3.5	3.5
Standard Deviation	1.7	1.6	1.7	1.7	1.8	1.8	1.7
<b>Do you know of specific actions that you can take to help protect the ocean?</b>							
Yes	64	64	64	60	63	62	63
No	36	36	36	40	37	38	37
<b>Are you currently engaged in at least one ocean conservation activity?</b>							
Yes	25	22	24	26	26	26	25
No	75	78	76	74	74	74	75
<b>On a scale of 1 to 10 where 1 means "dismal" and 10 means "bright," how would you rate the future of the ocean?</b>							
Dismal 1	5	2	4	4	4	4	4
2	5	3	4	2	5	4	4
3	6	6	6	8	8	8	7
4	11	12	12	8	10	9	11
5	28	30	29	29	28	28	29
6	13	15	14	14	10	12	13
7	13	15	14	15	18	17	16
8	9	10	9	11	9	10	10
9	5	3	4	4	4	4	4
Bright 10	5	3	4	5	3	4	4
Mean	5.5	5.6	5.5	5.7	5.6	5.6	5.6
Standard Deviation	2.2	1.9	2.1	2.1	3	2.6	2.4

	BASELINE			WITH SIGNS			All
	Entr.	Exit	Total	Entr.	Exit	Total	Total
<b>In this ocean exhibition do you specifically remember seeing or hearing anything about how to protect or conserve the ocean?</b>							
Yes		55		NA	56	56	55
No		45		NA	44	44	45
<b>With whom are you visiting this museum today? [Mark only ONE]</b>							
I am with a school group/organized group	3	5	4	5	5	5	5
I am alone	14	15	15	8	12	10	12
I am with others	82	80	81	87	83	85	83
<b>Where do you live?</b>							
United States	83	84	83	84	83	83	83
Other Country	18	16	17	16	17	17	17
<b>Mall Radius</b>							
0-5 miles	2	1	2	3	2	3	2
5-10 miles	1	1	1	4	1	3	2
10-20 miles	3	4	4	4	2	3	3
20-40 miles	3	6	4	4	4	4	4
40-100 miles	3	3	3	3	4	4	4
100-250 miles	10	13	11	10	10	10	11
Other U.S.	60	56	58	55	59	57	58
International	18	17	17	16	17	17	17
<b>Local</b>							
Washington DC Metro Area	4	5	4	8	5	6	5
Outside the Metro Area	96	95	96	92	95	94	95
<b>What is your age?</b>							
Mean age	36.2	35.6	35.9	35.1	34.2	34.6	35.2
Standard Deviation	14.5	15.1	14.8	14.9	15.3	15.1	15
Median age	37	35	36	36	31	33	35
<b>By generations:</b>							
Silent (born 1925-45)	3	4	3	2	3	3	3
Leading Baby Boomers (born 1946-1955)	6	8	7	8	8	8	7
Trailing Baby Boomers (born 1956-1964)	16	10	13	11	12	12	12
Generation X (born 1965-1981)	38	40	39	38	33	35	37
Generation Y (born 1982-1995)	29	27	28	28	34	31	30
Digital Natives (born after 1996)	8	11	10	12	12	12	11



	BASELINE			WITH SIGNS			All
	Entr.	Exit	Total	Entr.	Exit	Total	Total
<b>What is your sex?</b>							
Male	45	49	47	45	51	48	48
Female	55	52	53	55	49	52	52
<b>Which of these signs in the ocean hall did you read? (With Signs Exit Only)</b>	Did not See	Saw, didn't read	Read part of it	Read most/all of it			
Sharks and Humans	57	15	16	13			
Marine Protected Areas	57	20	14	9			
Size Matters	61	15	13	11			
Fish Explosion	61	17	12	10			
Disappearing Diversity	62	19	12	7			
Jellyfish Burgers	64	13	13	10			
Acid Ocean	64	15	13	9			
Deadly Trash Diet	64	13	14	9			
<b>Number of signs seen (and/or read)</b>							
None	NA	NA	NA	NA	21	21	
One	NA	NA	NA	NA	14	14	
Two	NA	NA	NA	NA	12	12	
Three	NA	NA	NA	NA	13	13	
Four	NA	NA	NA	NA	10	10	
Five	NA	NA	NA	NA	7	7	
Six	NA	NA	NA	NA	10	10	
Seven	NA	NA	NA	NA	6	6	
Eight	NA	NA	NA	NA	7	7	
Mean					3.1	3.1	
Standard Deviation					2.6	2.6	
<b>Number of signs read (at least in part)</b>							
None	NA	NA	NA	NA	35	35	
One	NA	NA	NA	NA	20	20	
Two	NA	NA	NA	NA	11	11	
Three	NA	NA	NA	NA	12	12	
Four	NA	NA	NA	NA	9	9	
Five	NA	NA	NA	NA	9	9	
Six	NA	NA	NA	NA	2	2	
Seven	NA	NA	NA	NA	1	1	
Eight	NA	NA	NA	NA	1	1	
Mean					1.9	1.9	
Standard Deviation					1.9	1.9	

## Appendix C: Specific Actions

*Do you know of specific actions that you can take to help protect the Ocean?  
(asked of visitors during pre-testing of the questionnaire)*

Recycle; eat sustainable seafood  
Beach clean-up  
Recycling  
Stop using gasoline, protect fisheries in Eastern Canada  
Abstaining from dealing with it; not overfishing, disposing of pollutants sustainably, not mining [sic] for oil  
Be environmentally safe  
Refrain from using products that aren't biodegradable and end up in the ocean  
Manage sources of pollution and over fishing  
Global warming  
Pick up trash/ recycle  
No plastic!  
Beach clean up  
Depoliticize Chinese and Japanese fishery treaties  
Eat less fish, don't dump down sewers  
Do not put tires in Ocean (Florida's mistake)  
Don't throw trash on ground, reduce detergent use  
No over fishing; since a lot of people throw garbage in ocean—dissolvable garbage  
Pick up garbage on the ground and cans on the beach  
Putting posters up (10-year-old visitor)  
Reduce pollution and waste  
Use less chemicals and plastics (oils)  
Don't flush toilets  
Drive less  
Stop killing it  
Don't pollute  
Ban pebble mine  
Stop litter  
Recycle; support non-profits