

Observation of Zoo Guests' Identification of
Leopard Sharks (*Triakis semifasciata*) at
Chicago Zoological Society - Brookfield Zoo's
Living Coast Exhibit

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Abstract

With so many sharks in jeopardy of extinction largely due to anthropogenic impacts, it must be a focus for those institutions which house these animals to educate and inform their guests of these issues and how their guests may influence conservation efforts. To help connect that conservation message with sharks, correct identification of sharks is important. Chicago Zoological Society - Brookfield Zoo guests were observed for verbal identification of the leopard sharks. Guests approaching the shark exhibit were broken into three subcategories: 1. Guests who correctly identify the shark species; 2. Guests who incorrectly identify the shark species; or 3. Those that redirected themselves to the signs after incorrectly postulating the species. After 12 hours of observing over 2900 guests (n=2919), there were statistically significant differences between those who correctly identified the shark species after viewing the sign and those who correctly identified the species when they approached the tank. Given the overwhelming number of individuals who did not correctly identify the leopard sharks they were observing, and those who did not make any attempt at all to make an identification, it is suggested that the signs at Chicago Zoological Society - Brookfield Zoo's Living Coast shark exhibit are not adequately educating zoo guests in this instance.

Introduction

Zoos and aquariums have been a gateway for people to connect with rare and exotic animals from around the world, going all the way back to ancient Egypt with the first recorded menagerie in human history (Rose, 2010). Since the 1960's there has been a cultural shift among zoos and aquariums from menageries to centers for environmental conservation (Ballantyne et al., 2007; Yalowitz, 2004). With this cultural shift came a sense of purpose for these institutions to educate their guests so that they may learn and care about animals, and to inspire conservation of these animals and habitats (Ballantyne et al., 2007). To better inspire their guests, zoos have also shifted from concrete, artificial habitats to those that represent the animal's natural environment as best they could. As the naturalism and size of the enclosure and the zoo increased, guests spent an increased amount of time viewing the animals (Ballantyne & Packer, 2005; Ballantyne et al., 2007), suggesting visitors connect with naturalistic enclosures more than artificial, concrete enclosures (Johnston, 1998).

The challenge now lies with exhibit designers to provide conservation messages and allow their guests to connect emotionally with the animals (Clayton et al., 2009). In order for conservation messages to impact guests, they must first be noticed and then remembered (Yalowitz, 2004; Yalowitz & Ferguson, 2006). However, absorbing all of this can be incredibly difficult when guests are on a leisure trip with the family (Yalowitz, 2004). The responsibility to provide their guests with conservation behaviors which they will take on in their daily lives to have the greatest impact globally falls on the institution (Ballantyne & Packer, 2005; Ballantyne et al., 2007; Hayward, 1998). In order to inspire

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that change in their day to day actions, guests must be convinced that their daily actions locally can impact conservation efforts elsewhere (Ballantyne & Packer, 2005).

Like many apex consumers, global shark populations have been declining due to many factors including finning, habitat degradation, and overfishing (Nosal et al., 2013). With hundreds of shark species in jeopardy of extinction because of anthropogenic influences, it must be a focus for those institutions which house these animals to educate and inform their guests of the issues and how their guests may affect conservation efforts. Many institutions use ambassador animals to educate their guests about the plight of other animals around the world. The leopard shark (*Triakis semifasciata*) (Appendix: Figure 1) are highly charismatic animals with their eye catching spots and stripes, making them one of the most common species in zoos and aquariums (Nosal et al., 2013). These sharks are endemic to near coastal waters of California, ranging as north as Oregon all the way south to Mexico (Farrer, 2009). While California has passed several laws restricting the fishing of these sharks in recent years (Smith, 2001), the threat of habitat loss and destruction is ever present. While at present time, the leopard shark is listed as “Least Concern” by the International Union for Conservation of Nature (IUCN) (Carlisle et al., 2015), there has been a push from researchers in recent years to reclassify these sharks as “Vulnerable” due to their small geographic range, low genetic diversity, slow growth rates, delayed maturity, and long gestation periods.

At Chicago Zoological Society (CZS) - Brookfield Zoo’s Living Coast, a large floor to ceiling kelp bed tank houses a social group of four mature female leopard sharks. This enclosure is naturalistic in design and often visitors linger for long periods of time taking

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photos. During previous behavioral observations of the leopard sharks in the summer of 2016 (Williams, 2016), guests frequently approached with questions about the sharks. Thus the question arose, how many guests visiting the leopard shark exhibit looked for a sign to correctly identify the sharks, and how many guessed without looking for a sign at all? It was predicted that guests would be more likely to look for a sign. It was also predicted the guests who guessed at the species without looking for a sign, would guess incorrectly.

Methods

Data collection was performed at CZS - Brookfield Zoo in front of the large viewing window of the leopard shark habitat inside of the Living Coast (Appendix: Figure 2). The large viewing window was chosen over the small viewing window, which guests come into contact with first, for data collection because the signs indicating the species of the sharks are located on either side of the large viewing window (Appendix: Figure 3). The small viewing window does not have any signage posted for guests. Data was collected in one hour sessions for 12 days selected at random. Data was collected using a data sheet on a Windows Surface Pro3 in pdf format (Appendix: Figure 4).

Guests were observed performing two initial behaviors, which were then broken down into subcategories. Guests either approached the signs located at the side of the exhibit upon first approach, or approached the glass without locating the signs. Within each of these categories guests were observed for verbal identification of the shark species. These were broken into three subcategories: 1. Guests who correctly identify the shark species; 2. Guests who incorrectly identify the shark species; or 3. Those that redirected

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themselves to the signs after incorrectly postulating the species they were observing (this category was only observed after guests made their first approach towards the glass and incorrectly identified the species). From this point forward, these groups of guests will be broken down into their six distinct subcategories. Guests who directly approached the glass and correctly identified the leopard sharks without referring to the signs will be referred to as “Approached Tank Correct ID.” Those guests that approach the glass, incorrectly identified the sharks and made no attempt to correct themselves by use of a sign will be referred to as “Approached Tank Incorrect ID.” Guests who were unable to correctly identify the sharks when they approached the glass but redirected to the sign will be referred to as “Approached Tank Redirect ID.” Guests who approached the signs and made a correct identification will be referred to as “Approached Sign Correct ID.” There were no guests that approached the signs and made an incorrect identification or had to make a secondary redirect, however the option was available on the datasheet in case this behavior was observed (Appendix: Figure 4). These guests would have been referred to as “Approached Sign Incorrect ID” and “Approached Sign Redirect ID” respectively. Guests that made no verbal attempt at species identification were placed into a third category: No ID (Appendix: Figure 4). After each one hour session was concluded, the data was transferred into Excel.

An ANOVA was performed between the total number of guests who correctly identified the sharks after approaching the glass and those that approached the sign to determine statistical significance between the total number of visitors who correctly identified the sharks in each category. Totals of each subcategory allowed for analysis of

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the percentage of guests who performed each task within the main categories. Averages and percentages allowed for the number of guests who perform each action to be compared.

Results

After 12 hours of observing over 2900 guests (n=2919), 846 guests approached the tank first, while 235 guests approached the signs first. Of the 235 guests who approached the sign first, all of them belonged to the Approached Sign Correct ID category (Appendix: Table 1). Out of 846 guests who approached the tank first, only 82 guests were able to identify the sharks correctly without the signs (Approached Tank Correct ID). Most guests who approached the tank belonged to the Approached Tank Incorrect ID category with 764 guests being unable to correctly identify the leopard sharks (Appendix: Table 1). Of those 764 guests, 117 of them corrected themselves by finding a sign (Approached Tank Redirect ID) (Appendix: Table 1). The vast majority of zoo guests made no attempt at an identification (n=1838) placing them into the third category, No ID (Appendix: Table 1). There was a statistically significant difference guests who fell into the Approached Sign Correct ID category and those who fell into the Approached Tank Correct ID category ($p=0.018$, $F= 6.569$) (Appendix: Table 2). The average number of guests who visited the exhibit per hour was 243.25. On days which saw fewer guests per hour (six days) there were virtually no changes in guest behavior than days which saw higher guest attendance (six days) (Appendix: Table 3). There was a slight increase in Approached Tank Redirect ID's 6.39% of guests on low attendance days from 3.01% on high attendance days

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(Appendix: Table 3). However, this value was still statistically insignificant, and no other category saw as great of a percent increase (Appendix: Table 3).

Discussion

Overall, the initial predictions were met with mixed results. The overwhelming majority of zoo guests did not make any verbal attempt at identification of the shark species, which was not accounted for in the predictions. Most of those who did, did so without approaching the signs, which did not support the prediction, as it was predicted that zoo guests would be more likely to seek out the signs for more information. However, the vast majority of those who did guess, guessed incorrectly, which did support the prediction that guests would be unable to correctly identify the leopard sharks. The most often misidentification was the tiger shark (*Galeocerdo cuvier*) due to the highly visible stripes along the leopard shark's back. Guests may also be more familiar with the tiger shark due to the popularity of the tiger shark in documentaries featured in Shark Week where the timid leopard shark is less likely to be featured. In fact, since Shark Week began in 1987, tiger sharks have been the central focus on a headlining documentary five times beginning in 1996 with Tales of the Tiger Shark, which is the third highest watched Shark Week program of all time (Lamoureaux & Hirsh, 1996). The leopard shark has never once been a main feature on Shark Week (Shark Week: All Seasons, 2016).

There appeared to be virtually no change in the percentage of guests who looked for the signs, before or after approaching the tank, regardless of the size of the crowds (Appendix: Table 3). This would suggest that the sign visibility may not be what drives a guest to seek out or ignore the sign, however it may lie with the individual guest. In general,

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zoo guests are knowledgeable about conservation issues than the public (Yalowitz, 2004). It may be that the guests who look for the signs are more interested in learning about animals and conservation messages than those who do not actively look for them.

Of the 2919 guests observed, the majority made no attempt to audibly identify the sharks (n=1838) (Appendix: Table 1). A possible explanation for the large number of individuals who made no attempt at an identification may be that repeat visitors are more familiar with the animals in each exhibit (Yalowitz, 2004). However, it is not possible to determine the previous knowledge of these individuals without directly surveying them, which was out of the scope of this project. Given the overwhelming number of individuals who did not correctly identify the leopard sharks they were observing, and those who did not make any attempt at all to make an identification, it is suggested that the signs inside the Living Coast at CZS - Brookfield Zoo's shark exhibit are not adequately educating zoo guests in this instance.

While it has been suggested that zoo guests are more inclined to be concerned about conservation and know more than the general public, findings also suggest that guests want to know more (Yalowitz, 2004). In a study at Monterey Bay Aquarium in California, it was found that conservation information was retained by 64% of guests (Yalowitz & Ferguson, 2006). Women were more likely to remember specific messages (70%) than men (56%) (Yalowitz & Ferguson, 2006). At the time of this paper's conception, CZS - Brookfield Zoo is currently not offering any additional information on the leopard sharks beyond common and scientific names. This is a missed opportunity. Leopard sharks, like many species of sharks around the world, are losing their habitats due to human influences

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(Ackerman et al., 2000; Larson, 2001; Nosal et al., 2013). They are also an eye catching, charismatic animal which are easily housed in zoos and aquariums (Ackerman et al., 2000). All these reasons place them in the perfect position to be ambassadors for sharks. A Monterey Bay Aquarium study on a recent exhibit, *Sharks: Myth & Mystery*, found that most guests wanted to learn more information about shark conservation and behaviors they can incorporate into their daily lives, such as sustainable seafood practices (Yalowitz & Ferguson, 2006). When no conservation information was offered, or no specific conservation behaviors were present within an exhibit, guests left more disillusioned and less confident that their daily actions make a difference (Hayward, 1998).

The exhibit at CZS - Brookfield Zoo is in a perfect location to educate guests on conservation behaviors that affect not only leopard sharks, but sharks in general if the information can be presented in an impactful way. Shark conservation efforts have been exceedingly sluggish compared to efforts made on behalf of marine mammals and turtles (Nosal et al., 2016). This is due, in part, to the lack of public support for shark conservation in government, as implementation and enforcement of conservation efforts hinges on public support (Nosal et al., 2016; Shiffman & Hammerschlag, 2016). Most of the public are misinformed regarding shark conservation efforts and policies available to them (Simpfendorfer et al., 2011). A misinformed public leads to lost, misguided, and wasted opportunities to affect these conservation policies (Shiffman & Hammerschlag, 2016). Thusly, it is up to Chicago Zoological Society-Brookfield Zoo and other AZA accredited institutions to educate and inspire their guests in a meaningful and impactful way to create change.

Action Component

At Chicago Zoological Society - Brookfield Zoo multiple department's work together when exhibits are designed in order to give guests the ultimate experience that reflects Brookfield Zoo's mission to inspire conservation leadership by connecting people with wildlife and nature. When the signs for a particular exhibit are being designed, the marketing department creates the overall strategic messaging goals set forth by Brookfield Zoo. These act as guidelines for Interpretive Programs to create the signage content and determine proper placement of the sign within the exhibit. Once the content and placement have been finalized, the Creative Services brings the content to fruition. With 12 hours of observation suggesting that the signs in front of the leopard shark exhibit are not adequately upholding Brookfield Zoo's mission to connect people with wildlife by failing to properly educate their guests about the identity of their sharks, this research may be able to help Interpretive Programs rethink their current direction.

With further help from other departments such as Guest Services, a guest survey be created to determine guest level of engagement, learning, and understanding of sharks, conservation issues faced by most species of elasmobranchs, and conservation behaviors they may undertake in their own lives.

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Appendix

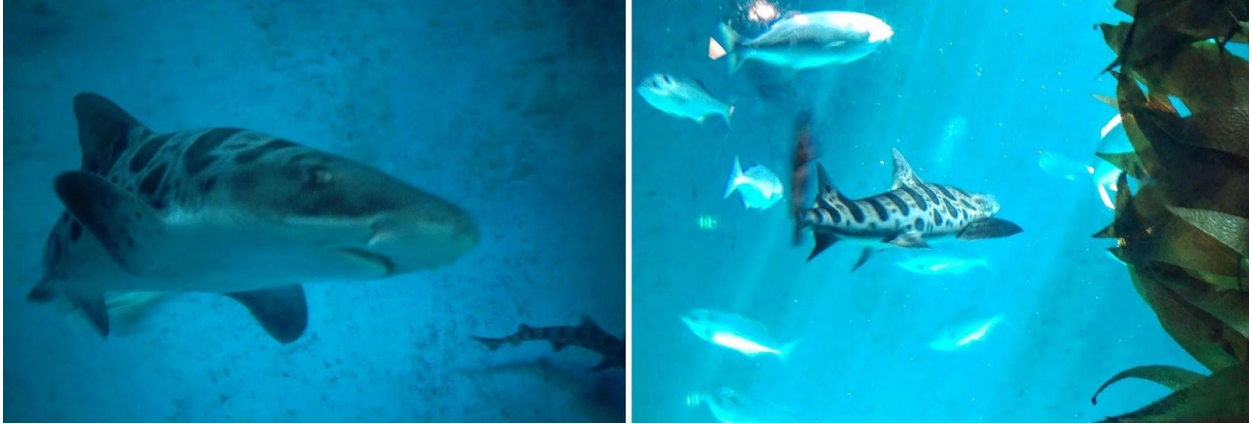


Figure 1. Leopard Sharks (*Triakis semifasciata*) at Chicago Zoological Society- Brookfield Zoo (Original Content).



Figure 2. Large viewing window of the leopard sharks at CZS-Brookfield Zoo's Living Coast (Original Content).

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Figure 3. Signs posted on each side of the Living Coast large window (Original Content).

Date:		Location:						
Environmental Conditions:								
Start/End Time	Approaches Tank			Approaches Sign			No ID	Total Visitors
	Correct ID	Incorrect ID	Redirect ID	Correct ID	Incorrect ID	Redirect ID		

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Figure 4. Data sheet used during each hour of observation (Original Content).

Table 1. Number of guests who performed each action when visiting the shark exhibit at CZS-Brookfield Zoo during the 12 hours of observation.

Guest Action	Total Number of Guests Observed	Average Number of Guests Per Observation	Standard Error
Approached Tank: Correct ID	82	6.83	1.26
Approached Sign: Correct ID	235	19.58	4.81
Approached Tank: Incorrect ID	764	63.67	9.43
Approached Sign: Incorrect ID	0	0.00	0.00
Approached Tank: Redirect ID	117	9.75	1.53
Approached Sign: Redirect ID	0	0.00	0.00
No Approach: No ID	1838	153.17	25.14
Total Visitors	2919	243.25	36.81

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Table 2. One Way ANOVA of the guests who correctly identified the leopard sharks when first approaching the tank and those guests who correctly identified the sharks after first approaching the sign.

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Approaches Tank: Correct ID	12	82	6.833	19.06
Approaches Sign: Correct ID	12	235	19.583	277.90

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	975.4	1	975.375	6.56902	0.018	4.301
Within Groups	3267	22	148.481			
Total	4242	23				

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Table 3. Number of guests observed performing each action by subcategory on low attendance days (less than the average 243.25 visitors per hour of observation) and on high attendance days (more than 243.25 visitors per hours of observation).

Guest Action	Low Attendance Days (6 days)			High Attendance Days (6 days)		
	Guests Observed	Total Number of Guests	% of Guests	Guests Observed	Total Number of Guests	% of Guests
Approached Tank: Correct ID	23	861	2.67	59	2058	2.87
Approached Sign: Correct ID	61	861	7.08	174	2058	8.45
Approached Tank: Incorrect ID	248	861	28.80	516	2058	25.07
Approached Sign: Incorrect ID	0	861	0.00	0	2058	0.00
Approached Tank: Redirect ID	55	861	6.39	62	2058	3.01
Approached Sign: Redirect ID	0	861	0.00	0	2058	0.00
No Approach: No ID	529	861	61.44	1309	2058	63.31