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Dear George,

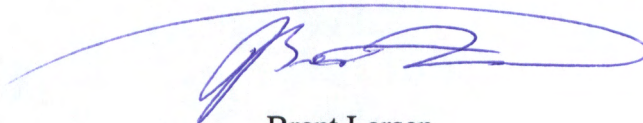
Here is my final draft for my Punalu'u Harassment Study. I apologize for it being so belated, but graduation, job hunting and moving to Oahu took up a large chunk of my time this summer.

I hope the information is useful to you, and I hope you find the study to have merit. I would like to thank you for the opportunity to work for you, I really enjoyed it and it gave me some valuable experience in field zoology and conservation biology. I had a really good time taking data on "Bleeper", it was fascinating work. I also had a lot of fun with this study, it was a lot of work, but well worth it because it was so interesting. Again, I would just like to say thanks for the remarkable experience.

I am currently employed as a technician at the Oceanic Institute in Waimanalo. I will be attending UH Manoa as an unclassified graduate student in the fall.

I will try to stay in touch. If you have any type of volunteer work on Oahu or else where I would be more than happy to help you in any way I can.

Sincerely,



Brent Larsen

A Study Of The Effect Posted Signs Have On The Anthropogenic Disturbances Received By Basking Green Sea Turtles, *Chelonia mydas*, At Punalu'u Beach Park On The Big Island Of Hawaii.

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This research is part of a continuing conservation effort for Hawaiian Green Sea Turtles. These animals are known to utilize Punalu'u Beach Park on the big island of Hawaii for basking activity. This beach is also very heavily utilized by human beings for numerous recreational activities. Because of the close proximity to humans, it is thought that the chance of anthropogenic stress on the turtles due to harassment from beach visitors may be a problem. This study was done to assess the amount of harassment behaviors the basking turtles received from humans, and whether or not the current means of preventing these behaviors from occurring were effective. For data collecting purposes, the human subjects being observed were generically classified as being "Residents of" or "Visitors to" Hawaii. The types of harassment behaviors were classified as being "Light" or "Heavy". A biologist observed basking sea turtles, and the type of treatment they received from humans who were utilizing the beach at the same time. Data on human behavior towards the basking turtles was collected for 11 days. After which a new set warning signs, written in both English and Japanese, were installed on the beach. After the signs were installed another 11 days of human behavioral data was collected. The data was analyzed using EXCEL and Minitab, to determine if these signs had any effect on the amount of harassment the turtles received from humans. The results showed that there were significant differences for visitors and insignificant differences for residents. However, these results must be interpreted with caution because an overall total number of beach users is not known. Suggestions as to a course of action are discussed at the end of the paper.

Introduction

Punalu'u Beach Park is located on the southern windward side of the big island of Hawaii, in a natural bay, that has fairly calm water. The area is habitat for several green sea turtles, *Chelonia mydas*, that can be observed feeding in the bay, and close to shore. The study area has a large black sand beach and as of the date of this paper, resident turtles regularly utilize the beach for a behavior known as basking. Turtles have been observed to haul out onto the beach and lay motionless for a few hours before returning to the water.

Basking is thought to help facilitate thermoregulation of the animal's body. Green sea turtles are known to bask periodically, however, in Hawaii, hunting pressures may have once caused this behavior to temporarily cease. Since they have been lifted from the pressure of hunting, basking has been reported to occur again. This basking behavior is not completely understood. It may or may not be necessary to the turtles health and well being, but as of the writing of this paper, basking has been observed to occur at Punalu'u.

This area is also heavily utilized by human beings. Visitors and residents alike use the beach for recreation, and there has been complaints of interactions between people and the turtles. Under federal law, the sea turtles are not supposed to be touched by humans in any way. Any contact by a human toward a turtle is constituted as "harassment", however, it has been reported that human contact with the turtles does occur at Punalu'u, particularly toward the turtles that are basking.

This research was conducted as part of a long term conservation effort for green sea turtles conducted by the National Marine Fisheries Service. This study was done to assess the types and amounts of harassment behaviors the basking turtles received from humans, and whether or not the current means of preventing these behaviors from occurring are effective. From studies such as this one, future conservation efforts can be planned to determine what steps should be taken to protect the resident turtles at Punalu'u and the rest of the state.

Materials and Methods

Data was collected from several vantage points at Punalu'u beach park. The people visiting the habitat were classified into two groups, either being visitors to, and residence of, the state of Hawaii. These classifications were based on many criteria, one being the type of transportation utilized. A record of the number of tour buses arriving at the beach while the turtles were basking was accurately kept. Other criteria included style of clothing worn, and languages spoken by the people, that could be used to determine the probability of the subject being either a visitor to Hawaii, or a resident of Hawaii. The majority of the visitors were Asian due to the large numbers of tour buses that visit Punalu'u. These Asian tourists frequently utilize the organized tour groups provided by local companies.

The observed behaviors were categorized as being either Light Harassment or Heavy Harassment. The category of Light Harassment, included human behaviors such as lightly touching, or feeling the animal in such a manner that the behavior does not disturb the turtle, or elicit a response from the turtle. The category Heavy Harassment was defined by behaviors that caused a reaction from the turtle, appeared to be harmful to the turtle, or caused the turtle to terminate basking activity and return to the ocean.

Data on human behavior towards the basking turtles were collected for 11 days during the months of October through December of 1997, this period of time was designated as Study Period 1. Then a new set of warning signs, written in both English and Japanese, were

installed on the beach. After the signs were installed, another 11 days of human behavioral data was collected during the months of March through May of 1998, this period of time was designated as Study Period 2.

The data was analyzed using EXCEL, to determine which category of humans were responsible for the majority of harassment behavior that the turtles received before and after the signs were erected. The data was also analyzed using Minitab to determine if any significant differences in the amount of harassment between the two study periods could be detected.

Results

In the 11 day period before the new signs were erected 215 separate counts of some type of direct human harassment to the basking sea turtles were recorded. Of those 215 acts of harassment, 27 were committed by "Residents" and 188 were committed by "Visitors". Of the acts committed by residents, 17 were considered light and 10 were considered heavy. Of the acts committed by the visitors, 141 were considered light and 47 were considered heavy.

Chart 1 shows these data as percentages, with visitors responsible for 65 % of the observed light harassment behaviors, and 22 % of the heavy harassment behaviors. Chart 1 also shows that residents were responsible for 5 % of the heavy harassment and 8 % of the light harassment experienced by turtles. Table 1 explains these types of harassment behaviors done by the visitors in more detail. Table 2 explains them for residents.

Total Harassment Behaviors Before Installation Of New Warning Signs

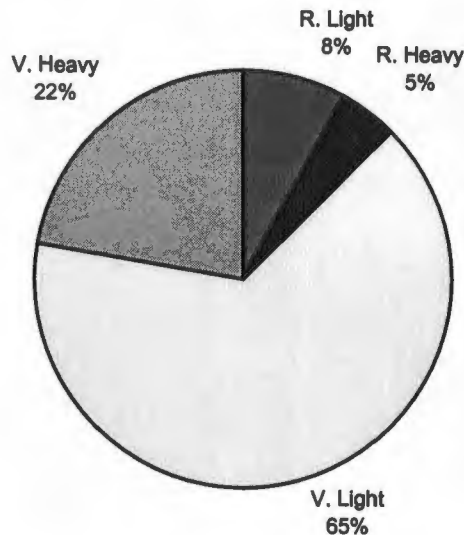


Chart 1.

Shows the percentage of harassment behaviors committed by visitors (V.) and by residents (R.) in the 11 day observational period before the new signs were erected.

Table 1. A listing of harassment data for visitors before installation of signs.

Date	Behaviors and occurrences	Comments
October 11, 1997. No. of Buses = 4	Heavy = 5 Light = 12	Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs were being taken of people standing next to turtle.
October 18, 1997. No. of Buses = 3	Heavy = 4 Light = 10	Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs were being taken of people standing next to turtle. Flipper handled roughly.
October 19, 1997. No. of Buses = 4	Heavy = 3 Light = 14	Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs were being taken of people standing next to turtle. Small child placed on carapace.
November 1, 1997. No. of Buses = 5	Heavy = 4 Light = 9	Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs were being taken of people standing next to turtle.
November 2, 1997. Number of Buses = 3	Heavy = 4 Light = 12	Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs were being taken of people standing next to turtle.

November 15, 1997. Number of Buses = 3	Heavy = 2 Light = 16	Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs were being taken of people standing next to turtle. Small child placed on carapace.
November 22, 1997. Number of Buses = 4	Heavy = 5 Light = 15	Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs were being taken of people standing next to turtle.
November 29, 1997. Number of Buses = 3	Heavy = 6 Light = 19	Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs were being taken of people standing next to turtle.
November 30, 1997. Number of Buses = 3	Heavy = 5 Light = 13	Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs were being taken of people standing next to turtle.
December 13, 1997. Number of Buses = 3	Heavy = 4 Light = 11	Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs were being taken of people standing next to turtle. Small child placed on carapace.
December 14, 1997. Number of Buses = 4	Heavy = 5 Light = 10	Carapace pounded on with fist. Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs were being taken of people standing next to turtle.

Table 2. A listing of harassment data for residents before installation of signs.

Date	Behaviors and occurrences	Comments
October 11, 1997.	Heavy = 1 Light = 0	Turtle was kicked.
October 18, 1997.	Heavy = 0 Light = 3	Light harassment included touching and petting.
October 19, 1997.	Heavy = 2 Light = 5	Light harassment included touching and petting. Child climbed up on carapace. Flipper stepped on
November 1, 1997.	Heavy = 1 Light = 2	Light harassment included touching. Person banged on turtles carapace with fist.
November 2, 1997.	Heavy = 1 Light = 1	Light harassment included a touch. Person knocked on turtles carapace.
November 15, 1997.	Heavy = 1 Light = 1	Light harassment included touching and petting. Turtle was picked up.
November 22, 1997.	Heavy = 1 Light = 1	Light harassment included a touch. Person banged on carapace with fist
November 29, 1997.	Heavy = 1 Light = 1	Light harassment included petting. Turtle was picked up and moved.
November 30, 1997.	Heavy = 1 Light = 1	Light harassment a touching. Turtle was kicked.
December 13, 1997.	Heavy = 1 Light = 1	Light harassment included some petting. Turtles flippers were handled excessively.

December 14, 1997.

Heavy = 0
Light = 1

Light harassment included some petting.

In the 11 day period after the new warning signs were installed on the beach 99 separate counts of some type of direct human harassment to the basking sea turtles were recorded. Of those 99 acts of harassment, 25 were committed by "Residents" and 74 were committed by "Visitors". Of the acts committed by the residents, 19 were considered light and 6 were considered heavy. Of the acts committed by the visitors, 52 were considered light and 22

were considered heavy. Chart 2 shows these data as percentages, with visitors responsible for 53% of the observed light harassment behaviors, and 22% of the heavy harassment behaviors. Chart 2 also shows that residents were responsible for 6% of the heavy harassment and 19% of the light harassment experienced by turtles. Table 3 explains these types of harassment behaviors done by the visitors in more detail. Table 4 explains them for residents. __

Table 3. A listing of harassment data for visitors after installation of signs.

Date	Behaviors and occurrences	Comments
March 20, 1998. Number of Buses = 1	Heavy = 2 Light = 4	Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs were being taken of people standing next to turtle.
March 21, 1998. Number of Buses = 2	Heavy = 4 Light = 8	Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs were being taken of people standing next to turtle.
March 28, 1998. Number of Buses = 1	Heavy = 1 Light = 3	Light harassment included touching and petting. Small child placed on carapace
March 29, 1998. Number of Buses = 1	Heavy = 2 Light = 4	Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs were being taken of people standing next to turtle.
April 4, 1998. Number of Buses = 1	Heavy = 1 Light = 5	Light harassment included petting. Heavy harassment included turtle being accidentally stepped on while photographs were being taken of people standing next to turtle.
April 5, 1998. Number of Buses = 1	Heavy = 0 Light = 6	Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs were being taken of people standing next to turtle.
April 18, 1998. Number of Buses = 2	Heavy = 3 Light = 3	Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs were being taken of people standing next to turtle.
April 19, 1998. Number of Buses = 1	Heavy = 2 Light = 7	Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs were being taken of people standing next to turtle.
May 2, 1998. Number of Buses = 1	Heavy = 1 Light = 3	Light harassment included touching and petting. Heavy harassment included turtle being accidentally stepped on while

May 4, 1998.
Number of Buses = 0

Heavy = 4
Light = 4

photographs where being taken of people standing next to turtle.
Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs where being taken of people standing next to turtle.

May 9, 1998.
Number of Buses = 1

Heavy = 2
Light = 5

Light harassment included touching and petting. Heavy harassment included turtle being accidentally jumped on, and stepped on while photographs where being taken of people standing next to turtle. Turtle grabbed by front flippers.

Table 4. listing of harassment data for residents after installation of signs.

Date	Behaviors and occurrences	Comments
March 20, 1998.	Heavy = 0 Light = 2	Light harassment included touching and petting.
March 21, 1998	Heavy = 0 Light = 1	Light harassment included touching and petting.
March 28, 1998	Heavy = 1 Light = 3	Light harassment included touching and petting. Turtle was kicked by adult man.
March 29, 1998	Heavy = 0 Light = 2	Light harassment included touching and petting.
April 4, 1998	Heavy = 1 Light = 2	Light harassment included touching and petting. Child stepped on flipper.
April 5, 1998	Heavy = 0 Light = 1	Child touched turtle on carapace.
April 18, 1998	Heavy = 2 Light = 3	Light harassment included touching and petting. Man banged on carapace with fist. Turtle was accidentally stepped on while photographs where being taken of someone standing next to the turtle
April 19, 1998	Heavy = 0 Light = 2	Light harassment included touching and petting.
May 2, 1998	Heavy = 1 Light = 1	Light harassment included touching and petting. Flipper was handled roughly.
May 4, 1998	Heavy = 0 Light = 1	Light harassment included touching and petting.
May 9, 1998	Heavy = 1 Light = 1	Light harassment included petting. Turtle was accidentally stepped on while photographs where being taken of someone standing next to the turtle

Total Harassment Behaviors After Installation Of New Warning Signs.

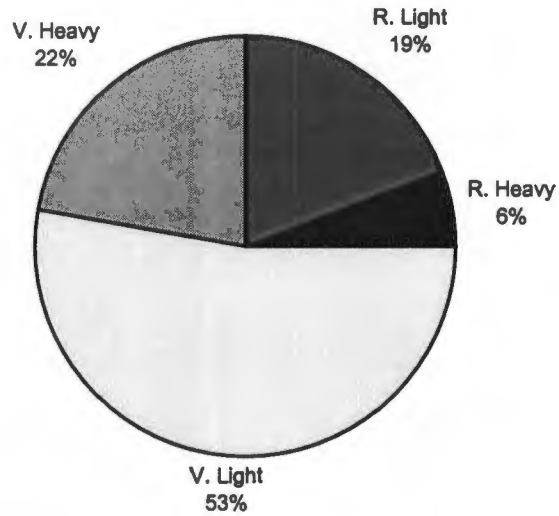


Chart 2.

Shows the percentage of harassment behaviors committed by visitors (V.) and by residents (R.) in the 11 day observational period after the new signs were erected.

A Comparison Of Harassment Behavior Occurances For Visitors.

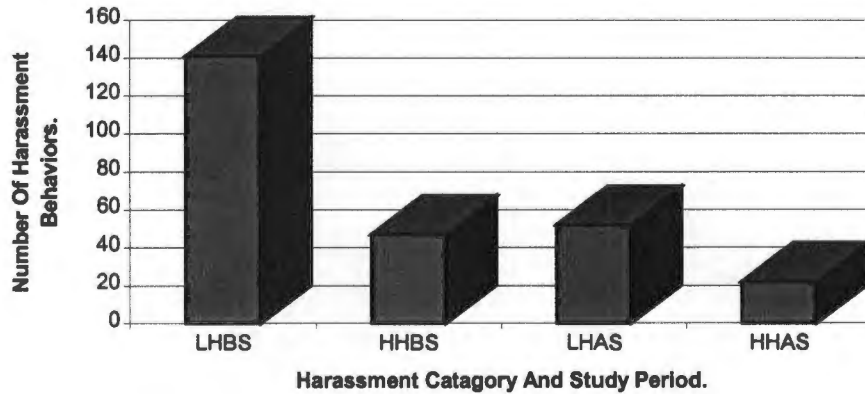


Chart 3.

A comparison of harassment behaviors committed only by "Visitors" between the eleven day study periods before and after the installation of the new warning signs on the beach at Punalu'u. LHBS = Light Harassment Before Signs; HHBS = Heavy Harassment Before Signs; LHAS = Light Harassment After Signs; HHAS = Heavy Harassment After Signs.

A Comparison In Harassment Behaviors For Residents.

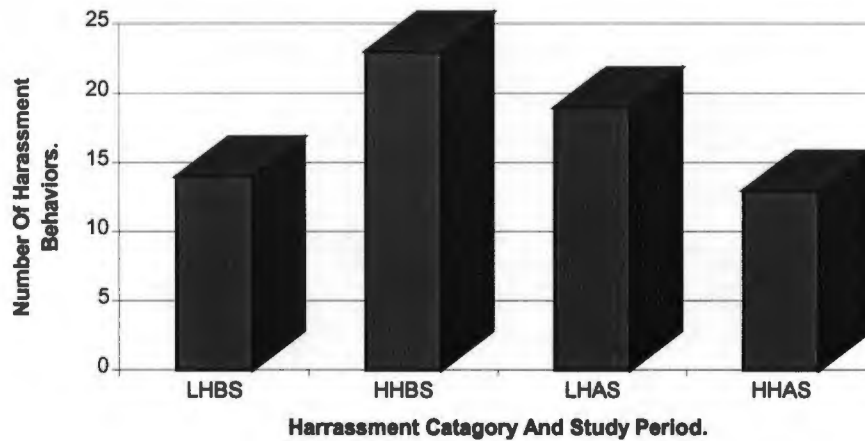


Chart 4.

A comparison of Harassment Behaviors committed only by “Residents” between the eleven day study periods before and after the installation of the new warning signs on the beach at Punalu’u. LHS = Light Harassment Before Signs; HHBS = Heavy Harassment Before Signs; LHAS = Light Harassment After Signs; HHAS = Heavy Harassment After Signs.

Another aspect of the results is to determine if the new signs had any effect on the amount of harassment behaviors between the two study periods. The data show that the total number of harassment behaviors did decrease among the “Visitors” group. The total harassment behaviors decreased from 215 incidents before the signs were installed, to 99 incidents after the new warning signs were installed. Light harassment before the installation of the new signs totaled 141 for the visitors. After the signs’ installation, the harassment was 52 incidences. Heavy harassment before the signs were installed totaled 47 incidences. This declined to 22 incidences after the new warning signs were installed. This data is summarized in Chart 3.

The data for the residence, show that the total number of harassment behaviors dropped from 27 incidences before the signs were installed, to 25 incidences after the signs were installed. Light harassment before the signs were installed totaled 17 for the residences. This actually increased to 19 incidences after the signs were installed. Heavy harassment before the signs were installed totaled 10 incidences for

the residents, this declined to 6 incidences after the new warning signs were installed. This data is summarized in Chart 4.

A statistical analysis, using Minitab for Windows, was also performed on the data. This was done to determine if there were any significant differences in the amount of harassment, between the two study periods, to determine if the new signs were effective in preventing harassment of the turtles at Punalu’u Beach Park.

T-Tests were performed on the following categories; total visitor harassment, visitor light harassment, visitor heavy harassment, total resident harassment, resident light harassment, and resident heavy harassment. They were all analyzed to determine if there was a significant difference in the amount of harassment before and after the new signs were installed.

The results of these T-Tests are as followings, and are summarized in Table 5. There were significant differences in the amount of harassment before and after the new signs for all three visitor categories. However, there was no significant differences for the residents.

Table 5. A summary of T-Tests for data taken at Punalu'u Beach Park.

Total Incidences Of Harassment For Visitors.

Before New Sign. Mean = 16.55 St. Dev. = 3.62 St. Error = 1.09 P < 0.0001
After New Sign. Mean = 6.73 St. Dev. = 2.28 St. Error = 0.69

Heavy Incidences Of Harassment For Visitors.

Before New Sign. Mean = 4.27 St. Dev. = 1.10 St. Error = 0.33 P < 0.0002
After New Sign. Mean = 2.00 St. Dev. = 1.26 St. Error = 0.38

Light Incidences Of Harassment For Visitors.

Before New Sign. Mean = 12.27 St. Dev. = 2.90 St. Error = 0.87 P < 0.001
After New Sign. Mean = 4.73 St. Dev. = 1.68 St. Error = 0.51

Total Incidences Of Harassment For Residents.

Before New Sign. Mean = 2.45 St. Dev. = 1.63 St. Error = 0.49 P = 0.774
After New Sign. Mean = 2.27 St. Dev. = 1.27 St. Error = 0.38

Heavy Incidences Of Harassment For Residents.

Before New Sign. Mean = 0.909 St. Dev. = 0.54 St. Error = 0.16 P = 0.183
After New Sign. Mean = 0.545 St. Dev. = 0.68 St. Error = 0.21

Light Incidences Of Harassment For Residents.

Before New Sign. Mean = 1.55 St. Dev. = 1.37 St. Error = 0.41 P = 0.706
After New Sign. Mean = 1.73 St. Dev. = 0.78 St. Error = 0.24

Conclusions and Discussion

From analyzing the data, it does appear that the overall harassment of green sea turtles by visitors did slightly decrease in occurrence. However, these results must be interpreted with caution, because the data only includes incidences of harassment, and does not have total number of beach users. Because of this, it can not be said that this trend is solely because of the sign. From the bus data, this observed affect is probably most likely due to the fact that the second study period occurred during a "slow season" for tourism.

Due the fact that there was only one observer, the total number of people using the beach could not be determined. However, the number of buses arriving at Punalu'u while the turtles basked was recorded. It is thought that each bus carries 40 people. In Study Period 1,

before the new signs were posted 39 buses (\cong 1560 people) were recorded arriving while the turtles basked. It is important to note that not every person committed a harassment behavior. It was also noted that 12 buses (\cong 480 total people) were recorded after the new signs were posted in Study Period 2..

A T-Test was performed on the bus data to determine if it could be reasonably suggested that the first observation period had more total beach users overall. The results of this T-Test are as follows. Before the new signs; Mean = 141.81 people, with a St. Dev of 27.5, and a St. error of 8.29. After the new signs; Mean = 47.27 people, with a St. Dev of 16.18, and a St. error of 4.67. The P value was less than 0.0001 showing that it is possible that there was a significant difference in the amount of people on the beach (that arrived in buses) between the two study periods.

Interviews with vendors on the beach, confirmed that less tourists visited the beach

during the months of February, March, and April, of 1998, which were the three months, data was taken after the installation of the new warning signs.

Even though the data do not account for it, the signs were observed to be read by some beach visitors. Asian tourists were also observed reading the sign in the Asian language. However, the data taken can not account the number of people who did read the sign and correlate that with the drop in visitor harassment behavior. But because people were observed reading the signs, it should be assumed that they were not entirely a waste of resources. The signs are very attractive and were definitely an excellent idea.

However, it should also be addressed that there is the possibility that despite these admirable new signs, there may not have been the desired effect of completely stopping, or even causing an observable decline in the harassment behaviors. This can be attributed to the fact that harassment did occur, even though the signs were visible to the public. Although the data does not account for it, many people were observed walking right past the signs.

A future study should also include a comparison between how many people do read, or do not read the warning signs when they arrive on the beach. This may be a better indication of their overall effectiveness. This study does suggest that more may need to be done at Punalu'u to solve this problem.

The results of the T-Tests indicate that it could be assumed that the number of harassment behaviors towards the beached turtles is simply a factor of how many people use the beach. It is not illogical to assume that the following scenario to be true. According to the T-Test on the bus data, less than half of the people in study period 1 were present on the beach in study period 2.

However, if there was, *half* as many visitors utilizing the beach in Study Period 2 as there were in Study Period 1, we can use this data to formulate a theory. For example, in study period 1, (x) number of people, visited the beach, and 215 harassment behaviors were the result of it. If we designate "Harassment" as a constant y, we can model this relationship mathematically.

Study Period 1.

$$\text{Harassment Behaviors} = (y)(x) = 215$$

In the second half of the study, 99 harassment behaviors occurred, because $\frac{1}{2}(x)$ people used the beach

Study Period 2.

$$\text{Harassment Behaviors} = (y) \frac{1}{2} (x) = 99$$

If harassment is a constant, and if half the number of people visited the beach in Study Period 2, than in Study Period 1, then the product of this relationship would give the above result. Now if the (x) of Study Period 2 was equal to the (x) of Study Period 1, then the number 99 would be doubled to 198.

Theoretical study period 2.

$$\text{Harassment Behaviors} = (y)(x) = 198$$

This would make the number of harassment behaviors toward the turtles much closer to the study period 1 value. This would also indicate a non-significant drop in the number of harassment behaviors, showing the new signs to be as ineffective as the signs they replaced. This possibility, does create frustration for resource managers, but must not be ignored.

Possible reasons for turtle harassment.

When visitors come to the big island of Hawaii, they are informed that Punalu'u is a prime place to view sea turtles, this is probably one of the reasons why so many bother to come to this beach at all. While the black sand beach is one of the most esthetically pleasing on the island, the cold, and mostly murky water, makes it a less desirable beach for many peoples interests such as snorkeling or swimming. Upon interview, most English-speaking peoples had prior knowledge of the turtles and had perceived that some do in fact beach themselves. The vast majority of the people interviewed had very little knowledge about sea turtle biology or conservation efforts.

It seems that the desire to have an encounter with a green sea turtle is overwhelming to most people. This may cause them to forget that there is a proper etiquette that must be followed when one makes contact with a protected species. In addition, the fact that one is at a beautiful beach in Hawaii, probably is an overwhelming stimulus that makes it very easy to overlook a simple warning sign. Then upon seeing the turtle the overall urge to get close to it

and experience it with every human sense, including touch, becomes very alluring.

Some visitors behave around the turtles as if they were animals in a petting zoo. Indeed, there are many such attractions in other places that encourage human/animal encounters that involve touching. People without the proper biological knowledge, or erudition of the law, inadvertently make inappropriate contact with the turtle that would result in a fine if this law concerning contact with the turtles were strictly enforced.

However, this paper was not written to paint a morbid picture of the people who visit Punalu'u. The next question that must be asked should be, "Is enough being done to educate these people about how to act around green sea turtles?" The intent of this paper is not to argue that the state of Hawaii or the Federal Government is not doing enough to protect its ocean resources either. The NMFS does an excellent job of that already, and State Resource Managers make great improvements every year. However, upon viewing these signs, it is apparent that they do leave something to be desired in terms of overall education and etiquette awareness.

Although, the signs do mention that fines can be imposed for touching a sea turtle, they still do not seem to have the desired educational content to make a person not want to touch a sea turtle. Everyone should be well aware, that the word "fine" is a fairly meaningless term. The sign does not mention how much the fine is. It also stands to reason that unless an authority figure such as a policeman, or a park ranger is constantly around to give out a fine, then this clause can be easily ignored or forgotten.

The biggest concern as of right now, is that there is still a huge lack of general educational material readily available to people on the subject of the etiquette one should display when they have encounters with these endangered animals. Even the new warning signs are quite vague in this area. They do mention the fact that the turtles are endangered, and protected under law, and should not be touched. However, there is no adequate mention of how to properly act around a turtle in terms of how far away from it one should stand when observing the animal.

Indeed, many people would not have touched the turtle if they were informed to stay at least three feet away. All of the "Heavy

Harassment" behaviors done by visitors would probably be avoided if there was more education in the aspect of etiquette. Notes taken by the observer suggest that most of the harassment done to the turtles is the result of photography. People place small children on their shell. People get close to the turtle to have their picture taken with it, and then pet it since they are sitting so close to it.

The vast majority of heavy harassment from visitors comes from the people falling down on, or stepping on the turtle when a person, or group of people, kneels down to have a photo taken with the turtle. When a wave washes up on shore, and hits the person's, or persons' feet, they react by jumping up, and a heavy harassment is committed when the person lands on, or near the turtle.

The author suggests placing a police tape barricade around the turtles, like the ones used for basking monk seals, to prevent people from getting so close when they photograph the turtles. A different approach with the warning signs may also be appropriate to prevent this accidental and intentional interaction.

Of the entire Harassment Behaviors that occur at Punalu'u, Asian visitors are by far responsible for the vast majority of it. General notes with the observations over 22 days easily show this to undeniable. Asian visitors comprise the majority of the people utilizing the beach simply because they arrive in large buses that are usually filled to capacity.

These visitors tend to travel in large tour groups. This is in comparison with Western style visitors, who tend to use rental cars, and typically travel in smaller groups. Everyday these buses arrive at Punalu'u every half hour on the hour, as entire busloads of these visitors are shuttled to and from Punalu'u.

The ultimate forms of insult to the basking turtles unfortunately come from these people. Every one of these people has a camera and seems to want to have their picture taken with the turtles! They stand too close to the turtles, with their backs to the ocean, and fall onto the animal when waves splash their feet. They also pet the turtles, sometimes an entire group of people will pet the turtle at the same time.

While it maybe easy to blame tour bus operators for these unfortunate incidents, the brunt of the blame must fall on resource managers, and steps to correct these problems

are probably better solved with educational materials. Awareness of the green sea turtle as an endangered species, and how to conduct oneself around them, maybe a neglected topic in the United States. It is probably non-existent in most of Asia.

It has been observed on almost every observational period that Asian visitors, will get off the bus and travel around the beach in a tight group. If a turtle is seen the entire group will run over and begin to experience the turtle simultaneously. They seem to portray excitement, and will surround the turtle all at once, begin to take photographs, and make contact with the turtle, most of it inappropriate, and some of it worth documenting as being dangerous to the turtle. This group of visitors should be the most heavily targeted when it comes to greens sea turtle education and etiquette information.

It is not the intent of this paper to disturb the reader into thinking that the green sea turtle population at Punalu'u is being harassed by human encounters to the point that it is in immediate peril. While turtles do experience human contact, the vast majority of it is not harmful, nor does it keep the turtle from basking.

Many of the people, visitors and residence alike, where respectful of the turtles and it is not uncommon to hear people request another person to stop touching a turtle. Most of the contact the turtles received was simple touching, petting, and affectionate gestures that a curious person gives any animal that they come into contact with. The turtle may not even notice that it is being touched, or it may not be concerned about the contact. However, the fact that Punalu'u has the potential to draw large crowds of people must be considered and addressed for future management of this area.

While visitors at Punalu'u are mostly responsible for the majority of all the harassment incidences, it should be noted that harassment by residents is also a problem that should be addressed. While they are not responsible for much of the overall harassment, they do contribute to a significant amount of the heavy harassment that the turtles receive. Residents have been observed banging on the turtles shells with their fists, kicking the turtles, and even picking them up. It is assumed that these people are examining the turtle to see if it is dead, or alive. After the turtle responds, the harassment

usually immediately stops, and the person walks away.

Resident children have been observed to play rough with the basking turtles. Climbing on them, walking on them, and burying them in the sand have all been observed. While this study did not incorporate observations of turtles in the water, it should be noted that resident children have been observed to chase the swimming turtles, grab them, and let the turtle give them a ride. While the mindset of the residents is not entirely known, it maybe speculated that they believe turtles are very tough and can handle this harassment. In addition, because Greens Sea Turtles are fairly abundant in Hawaii, residents may not think the turtles are in dire need of protection from anything.

It may also be assumed that in both groups of people, there is a reasoning that the behaviors they are directing towards the turtles are not considered "harassment". To the uninformed person, there probably is not any harm in touching, playing with, or picking up a green sea turtle. Because they are not delicate looking animals, there seems to be no regard for how they can be handled. Also one must consider that because these turtles are tagged by the NMFS, some people will assume that these animals are used to being handled, and that anyone can handle them.

Popular media has also glorified encounters with animals, including close encounters with endangered species. People are depicted handling animals on television, and in literature, without harmful consequences. The images shown by the popular media may in fact be partially responsible for people "loving turtles to much".

Turtles are fascinating animals and are depicted in very positive ways in local literature and culture. There are many stories that depict turtles as guardians of children, many children's story books published in Hawaii show drawings of children and adults playing with turtles. Punalu'u Beach Park even has a bronze sculpture showing a human figure lying on a turtle's shell.

These types of images, although they can not be held responsible for peoples' actions, are in a broad sense conflicting with the conservation efforts intended when warning signs are posted on beaches where turtles bask. In general, the people observed in this study, really posed no real threat to the turtle's immediate safety. The people probably just

wanted to get close and observe the animal, and part of all human observation includes touching.

In a general sense, it would be wrong to assume that the product of millions of years of evolution, could be endangered by people petting it. However, when too many people pet it, or pet it to the point that its behavior is altered, then the animal is in danger. From this study is obvious that public education regarding appropriate and inappropriate turtle observing practices must be continued, and if possible, increased substantially.

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Recommendations for future green sea turtle conservation efforts.

1) Have Hawaii's school children construct a more noticeable sign and erect it close to the other signs at the Punalu'u Beach Park Entrance. This sign should be bright and maybe have cartoon depicting a green sea turtle asking people not to touch it or come within three feet of it. Incorporate more turtle awareness campaigns as part of a conservation curriculum in schools and in agencies that deal with visitors. Make student projects that involve the whole family out of these campaigns.

2) Start incorporating turtle conservation materials into visitor's brochures, making sure that the information is multilingual. These brochures would be most effective if they were passed out to people to read before they got on a bus to go touring to Punalu'u. Employ them as public service announcements that must have equal time in advertising. These types of materials must be able to convince people to enjoy the turtles from an appropriate distance.

3) Have resident volunteers erect a police tape barricade around the turtle when the turtles come up on shore to bask. These barricades may

ensure people keep their distance when observing the turtle. This approach is used to protect basking monk seals, there is no excuse why it could not be used for the turtles also.

4) Punalu'u is an excellent spot view turtles. In the future it should also be considered a place to have a public information center about green sea turtles and green sea turtle conservation. Displays maintained by the public, and volunteers, such as the ones working at Haunama Bay could be used to educate people about these animals and why they must be left alone. The intent is not to clutter the beach with signs, but to have two or three large, bright, and attractive display signs up at the entrance of the beach. The intent is to have enough information about green sea turtles on these signs to give a sound base of knowledge to an uneducated person. The signs should then point, or refer to the main sign on the beach that reads "Do not touch the sea turtles, and please stay at least 3 feet away." These signs must be multilingual, and have such an appearance that people would want to read them right as they arrived to the beach.