6-16-2021

Human Impact on Pacific Harbor Seals in Urban Southern Puget Sound, Washington

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Human Impact on Pacific Harbor Seals in Urban Southern Puget Sound, Washington

by

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An undergraduate honors thesis submitted in partial fulfillment of the

requirements for the degree of

Bachelor of Science

in

University Honors

and

Biology

Thesis Advisor

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Portland State University

2021

Abstract

This research proposal aims to highlight the quantitative and qualitative impact of human disturbances Pacific Harbor Seals (*Phocca vitulina*) are experiencing in urban southern Puget Sound, Washington and how the data collected can educate the community to protect and conserve a healthy population of Harbor Seals. Urbanization and areas utilized by Harbor Seals within urban settings prompted data collection from four nearby sites. Site A, Carylon Beach, includes pedestrian and motorized and non-motorized boat disturbances. Site B, Tacoma Tidal Flats, only experiences boat disturbances. Site C, West Bay Marina, experiences motorized and non-motorized boat disturbances, Site D, Gertrude Island, is a private island with no pedestrian or boat disturbances and will act as a control. Site D, it should be noted, does include natural predators. Data will be collected during breeding season (July-September) at various times throughout the day, four times a week, using fifteen-minute intervals of scan sampling over the course of three hours, and will include observations of male and female adult and pup behaviors. Environmental factors, seal counts, disturbance information, and behavioral ethograms will be used to document observations. These data will be analyzed through descriptive and inferential statistical analyses. The goal is to better understand the levels of disturbance and harassment and their effects on seal pupping within urban settings. The results of this work will be used to direct education efforts at these and similar sites throughout inland waters to help mitigate negative interactions between humans and wildlife.

Introduction

Marine mammals are a diverse group of species critical to global marine ecosystems. They include four taxonomic groups including the Cetaceans (whales, dolphins), Sirenians (manatee, dugong), marine Fissiped (otters, polar bears), and Pinnipeds (seals, sea lions, and walrus). Pinnipeds are classified as carnivores that use their flippers to move on land and in water (NOAA, 2019). On land, they molt, breed, bear young and rest. Members of the Pinnipeds, Pacific Harbor Seals (*Phoca vitulina*) reside on the coastal waters of Northern Pacific oceans (Reeves et al, 2015). The Pacific Harbor Seal plays a key role in structuring communities serving as both predator and prey.

Harbor Seals are known as top predators, feeding on herring, flounder, hake, cod, octopus and squid, among other species (Berta et al, 2015). They are also primary prey for sharks and transient killer whales (Reeves et al, 2017). This balance depicts the importance of their ecological role in the oceans. As stated by the North Atlantic Research Consortium in a 2018 article titled *History and Ecological Role of Seals in the US NW Atlantic*, "they create positive feedback loops within their ecosystems that indirectly promote growth and greater abundance of other organisms" (para. 2). They are protected under the Marine Mammals Protection Act of 1972 which made hunting and harassing Harbor Seals illegal (Oceana, 2020). They are currently listed as *least concern* under the International Union for Conservation of Nature (Oceana, 2020). Their listing reflects their current status of 500,000 estimated individuals worldwide (Marine Mammal Center, 2020).

Despite their protection and healthy populations, Harbor Seals experience disturbances at haul out sites. Haul out sites are located on land and seals use them to rest, molt, give birth, and nurse (Da Silva & Terhune, 1988). Disturbances have been shown to affect Harbor Seals during

breading season by increasing the amount of energy expended as a result of the disturbance, which ultimately reduces the fitness of pups and negatively impacts the benefits of being hauled out on land (Suryan & Harvey, 1999). Disturbances include human and watercraft such as motorboats, canoes, and kayaks. Human disturbances have been found to cause fleeing behavior and significantly increase trips at sea, all of which interrupt the typical breeding season of seals (Andersen et al, 2012). Another study, conducted in Washington state, found Harbor Seals exhibited disturbed behavior such as fleeing into the water when boats (motorized and non-motorized) lingered near haul out sites (Johnson & Acevedo-Gutierrez, 2007). Their research also found a majority of kayaks and powerboats violated buffer zones established to limit disturbances (Johnson & Acevedo-Gutierrez, 2007). This highlights the need to further enforce and expand regulations that are in place to limit disturbance and harassment.

Research proposal

Woodard Bay Natural Resource Conservation Area in Washington is a site known as a primarily location for Harbor Seals to rest and give birth on log booms (Cascadia, 1991). In a study conducted by Cascadia Research Collective and the Marine Mammals Investigations of Washington Department of Wildlife, they found Woodard Bay log booms, floats, and creosote pilings to be crucial for Harbor Seal abundance. Due to continued disturbances by pedestrian recreation and harassment, the study proposed recommendations for expanding barriers to ensure long term preservation of Harbor Seals in the region (Cascadia, 1991). Though recommendations were implemented in 2013, a restoration project at Woodard Bay involved the removal of 2100 tons of creosoted material which included bay trestle, bay pier, pilings, and log booms. (Department of Natural Resources, 2020). Since the start of the restoration, informal sight observations have noted decreased Harbor Seal populations at Woodard Bay; formal data

collection and analysis are pending. Anecdotally, this suggest with the decrease of haul sites at Woodard Bay there was an increased use of urban settings. This research proposal aims to highlight the human impact of disturbances that Harbor Seals are experiencing during pupping season in urban southern Puget Sound, Washington by conducting field observations at four urban sites. These neighboring sites were identified and noted to have an increase in Harbor Seal populations following the 2013 restoration (J. Huggins, personal communication, November 14, 2020 [1]). Data collected will include environmental factors, seal counts, disturbance information, and a behavioral ethogram. These data will be used to educate the community and inform regulatory agencies in order to conserve these and similar sites throughout inland waters, thereby helping to reduce negative interactions between humans and Harbor Seal populations.

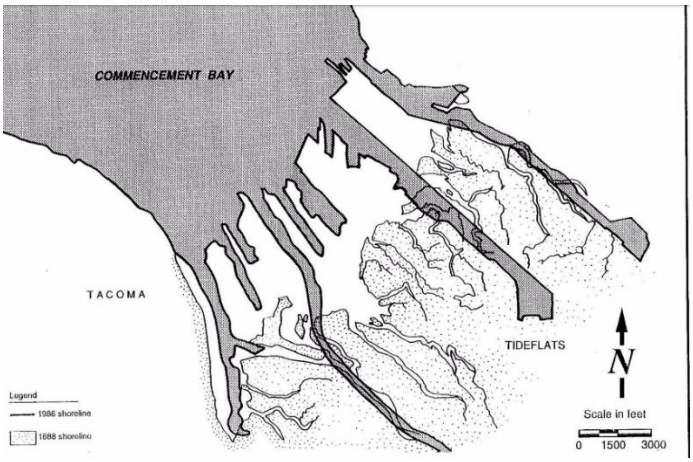
Methods

Field sites: Data will be collected from four field sites described below:

Figure 1: Image of Field site A Carylon Beach, WA (Google Maps, 2020)

Field site A: Carylon Beach, Washington. This location consists of a marina used as a haul out site more recently occupied by Harbor Seals. The location of the haul out site is near a pedestrian walkway and is also located next to open waters to the north where there is boat traffic as well as parked boats south of the site.

[1] J. Huggins (personal communication, November 14, 2020), researcher at Cascadia Research Collective (CRC), noted a shift in harbor seal haul out site populations following the 2013 restoration at Woodard Bay. Huggins has been with CRC since 2004 as the lead coordinator for mammal strandings and is engaged in marine mammal research.

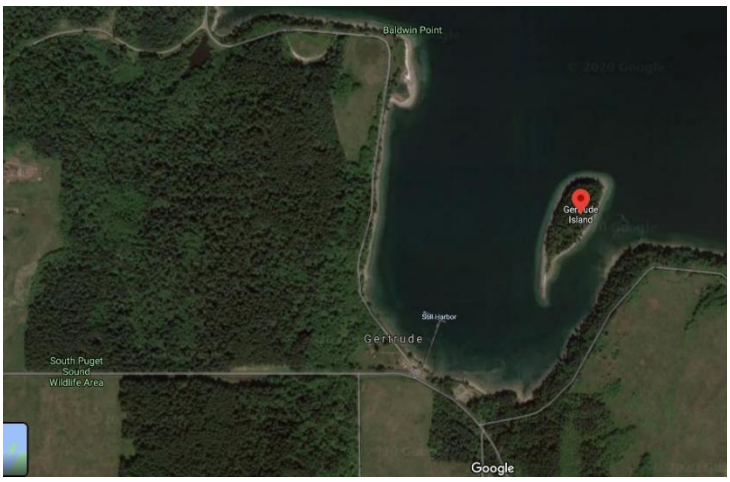


Field site B: Tacoma Tidal Flats, Washington. This location is primarily used as a metal recycling site. Harbor Seals have now used haul out sites as resting bits. This location has limited human interaction but does have both motorized and non-motorized boat traffic.

Figure 2: Image of Field site B Tacoma Tidal Flats, WA (Puyallup Watershed Initiative, n.d.)

Field site C: West Bay Marina, Washington. This location is a marina used by harbor seals as a haul out site. The marina experiences both motorized and non- motorized boat traffic.

Figure 3: Image of Field site C West Bay Marina, WA (Marinas, 2021)



Field site D: Gertrude Island, Washington. This site is located on an island which requires a permit for access. This site will be used as a control since it is permit restricted land and there is no pedestrian or boat disturbances. Instead, this island contains natural disturbances by eagles and coyotes.

Figure 4: Image of Field site D (control site) Gertrude Island, WA (Google Maps, 2020)

Description of Study Subjects

The target species for this study is the Pacific Harbor Seal (*Phoca vitulina*). Their coloration is spotted and ranges between gray, brown, black and white although dark coloration is most common in the Pacific Northwest. Males are ~6'3 in length and weigh ~370 pounds while females are slightly smaller at ~5'7 length and ~290 pounds (Berta et al, 2015). In addition, they have short dog-like snouts and are rather stocky. They can live 30-35 years if successful in avoiding predation and are considered non-migratory, opting to stay in one region. (Oceana, n.d.). They are the only seal that breeds in the Puget Sound, WA (Washington Nature Mapping Program, n.d.). Breeding season takes place from July to early September. Females give birth to one pup a year and nurse for about six weeks before abandoning the pup and mating again (Oceana, n.d.).

Materials needed for this study include:

- Telescope
- Tripod
- Camera
- Ethogram/ data collection prototype
- Disturbance key
- Laptop

Project Description

This study will take place during breeding season from July 1, 2021 to August 29, 2021. Observations will be conducted four times a week: Tuesday, Friday, and twice on Saturday. Tuesday will serve as an average workday site observation where the assumption is people will be at work. Friday and Saturday will serve as heavy traffic days as weekends are presumed to have more recreational activity. The first week of site observations will begin with Site A on Tuesday, Site B on Saturday and Site C and D on Friday. Each site and day will be alternated randomly and evenly as the study continues. Observations will last three hours at each site and

scan sampling will occur every 15 minutes. Times will depend on the day of the week: Tuesday: 11-2pm, Friday: 2-5 pm, Saturday: 9-12pm and 5:30-8:30pm. These times have been selected to cover a variety of the day in which activity can be observed and a variety in the frequency of recreational activities. Ethograms will be used to collect behavioral observations. Ethograms are used to document animal behaviors as a response to their environment (Woodland Park Zoo, 2020). These ethograms will focus on a group of Harbor Seals rather than a specific individual and will count the number of times certain behaviors are observed within the group. As well as document time elapsed for flee disturbance, return with pup, and return alone. This form of data collection will also consider:

a. Environmental factors including time, weather, and tides. This information will be collected using NOAA Seattle tide tables.
b. Seal counts of adults and pups.
c. Types of disturbances and whether they are related to either pedestrians, boats, or natural predators, or a combination, and how long it takes Harbor Seals to subsequently return. This will be documented using the key listed below.
d. Behaviors listed below as well as the time it takes to return to previous documented behaviors.

Animal behavior ethogram

Type of behavior	Behavior	Code	Description of Behavior
Stationary	Inactive	I	Animal is not alert to environmental changes, is in one place
Social	Nursing	N	Animal is engaging in nursing its pup
	Birth	B	Animal is giving birth
Aggressive	Fight	F	Animal engages in physical conflict with another animal in its environment
Disturbance	Alert	A	Animal is displaying alertness to change in environment
	Flee disturbance	FD	Animal is leaving its location to avoid change in environment (Note time)
Return	Return with pup	RP	Animal returns with pup (Note elapsed time)
	Return alone	RA	Animal returns alone (Note elapsed time)

Table 1: Summary of listed behaviors to be documented.

Key for types of human disturbances

Type of disturbance	Code	Description of disturbance
Pedestrian	P	Humans approaching / interacting with animals within a close proximity that cause a behavioral response
Motorized boat	MB	Motorized boat approaching animal within a close proximity to initiate behavioral response
Kayak	K	Kayak approaching animal within a close proximity to initiate behavioral response
Canoe	C	Canoe approaching animal within a close proximity to initiate behavioral response
Jet ski	JS	Jet ski approaching animal within a close proximity to initiate behavioral response
None	NA	No disturbance occurred

Table 2: Summary of listed disturbances to be documented.

Data collection prototype

Date:	
Location:	
Weather:	
Tide:	

					Behavior										
	Adults	Pups	Total	Disturbance	I	N	B	F	A	FD	FD Time in mins	RA	RA Time in mins	RP	RP Time in mins
11:00am															
11:15am															
11:30am															
11:45am															
12:00pm															
12:15pm															
12:30pm															
12:45pm															
1:00pm															
1:15pm															
1:30pm															
1:45pm															
2:00pm															

Table 3: Data collection summary of number of adults, pups, disturbances, and behaviors

Data analysis

Data will be analyzed through statistical analyses in the form of descriptive analysis and inferential analysis. Descriptive analysis summarizes the data and graphs for a sample group. This allows for understanding of collected observations. There is no uncertainty because the observer is describing the sample that was measured (Frost, 2019). Tools used in this form of analysis include central tendency: finding the mean and median to indicate where most measures fall. There is also dispersion analyses which highlight how far data extends using standard

deviation and/or range. In order to represent findings, graphs and or charts can be used to summarize results (Frost, 2019).

Inferential analysis uses the data collected to infer properties of a larger population (i.e. all Pacific Harbor Seals). The goal of this analysis is to draw conclusions and generalize them to the population at hand (Frost, 2019). Tools used in this form of analysis include regression analysis. This draws the relationship between independent variable and dependent variables to analyze their correlation in the study and what implications it can mean for the population (Frost, 2019). This data will be analyzed with the goal of better understanding the levels of disturbance/harassment and their effects on breeding season.

Summary

In this study, quantitative and qualitative data will be analyzed to determine the human impact of various disturbances on Harbor Seal behaviors in urban Washington. Data collected will include environmental factors, seal counts, disturbance information, and behavioral ethograms. The results of this work will be used to direct education efforts at these and similar sites throughout inland waters to help mitigate negative interactions. Outcome of data analysis can also be used to guide future research and education efforts. One such direction of future research can include the ecological impact of Harbor Seal disturbances and what that means for their role in the trophic cascade. Anticipated problems with this study include but are not limited to inaccurate recordings of seal counts and behaviors given difficulties viewing them from a distance that does not disturb them.

Acknowledgements: This project will be funded in part by a grant received by Cascadia Research Collective located in Washington. In addition, mentorship for this research project is provided by Jessie Huggins and Kiirsten Flynn. Jessie, whom has been with CRC since 2004, is the lead coordinator for mammal strandings and is engaged in marine mammal research. Kiirsten, whom has been with CRC since 1991, is a lead biologist and intern coordinator.

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