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2017 Pigeon Guillemot Study: Aggregated data and summary report

Background

Pigeon Guillemots are one of the few seabirds regularly breeding in Puget Sound. They can serve as an indicator of health of the Puget Sound as they are near the top of the food chain, and are found year-round in Island County. Monitoring their population numbers, selection of breeding sites, and prey selection can help indicate changing conditions in the birds' environment.

The MRC, in partnership with the Whidbey Audubon Society, has been studying the populations of pigeon guillemots on Whidbey Island since 2008. During the breeding season, from June-September, volunteers monitor each colony once per week for an hour. During this time, volunteers record the number of adults, the number of occupied burrows (defined as burrows an adult has entered), the number of burrows with chicks (defined as burrows to which an adult has delivered prey), and the type of prey delivered. Volunteers also record any disturbances, such as walkers on the beach, dogs, and large birds.

A research intern monitors selected colonies in-depth. In addition to the above parameters, the intern estimates the number of burrows that fledged chicks, defined as burrows that received prey for at least four consecutive weeks.

The overall objective of this project is to provide high quality data on the overall population and nesting activity of Pigeon Guillemots around Island County. The project goals are:

1. To monitor pigeon guillemots for population numbers, type of prey delivered to young, and breeding success as an indicator of local marine health.
2. To involve, educate, and train citizen scientists to monitor the guillemot breeding sites.

This report summarizes the methods and findings of the 2017 pigeon guillemot study on Whidbey Island.

Methods

Time Period: Volunteers observed colonies for one hour weekly from June 12 through September 20, 2017. The research intern observed two colonies for four hours two to three times per week from June 12 through August 25, 2017.

Volunteers: Volunteers arrived at their assigned colony before 9:00 am, and observed the colony for one hour. During their visit, they counted the number of adult birds, identified occupied burrows, and noted the number and type of prey delivered to those burrows. They also recorded any disturbances.

Intern: A research intern monitored two colonies in-depth: Rolling Hills and Cliffside. The intern observed each colony on alternating days, from 6am-10am. The intern counted the number of adult

birds every 30 minutes, identified active burrows, and the prey delivered to those burrows, as well as any disturbances.

Burrows: Burrows were designated as occupied if the researcher observed a bird entering a burrow. They were designated as a burrow with at least one chick if prey was delivered to the burrow.

Counts: Adult birds were counted every half hour by the intern, and at the arrival and after a half hour by the volunteers. The maximum number counted at any one time during the survey was recorded.

Disturbances: Researchers noted any disturbances such as bald eagles and other large birds, dogs, boats, and humans, that caused the birds to vacate their burrows, fly off the water, or otherwise change behavior.

Intern Data

The data gathered from the 2017 summer research intern is included in the intern summary report attached in Appendix A.

Aggregated Data

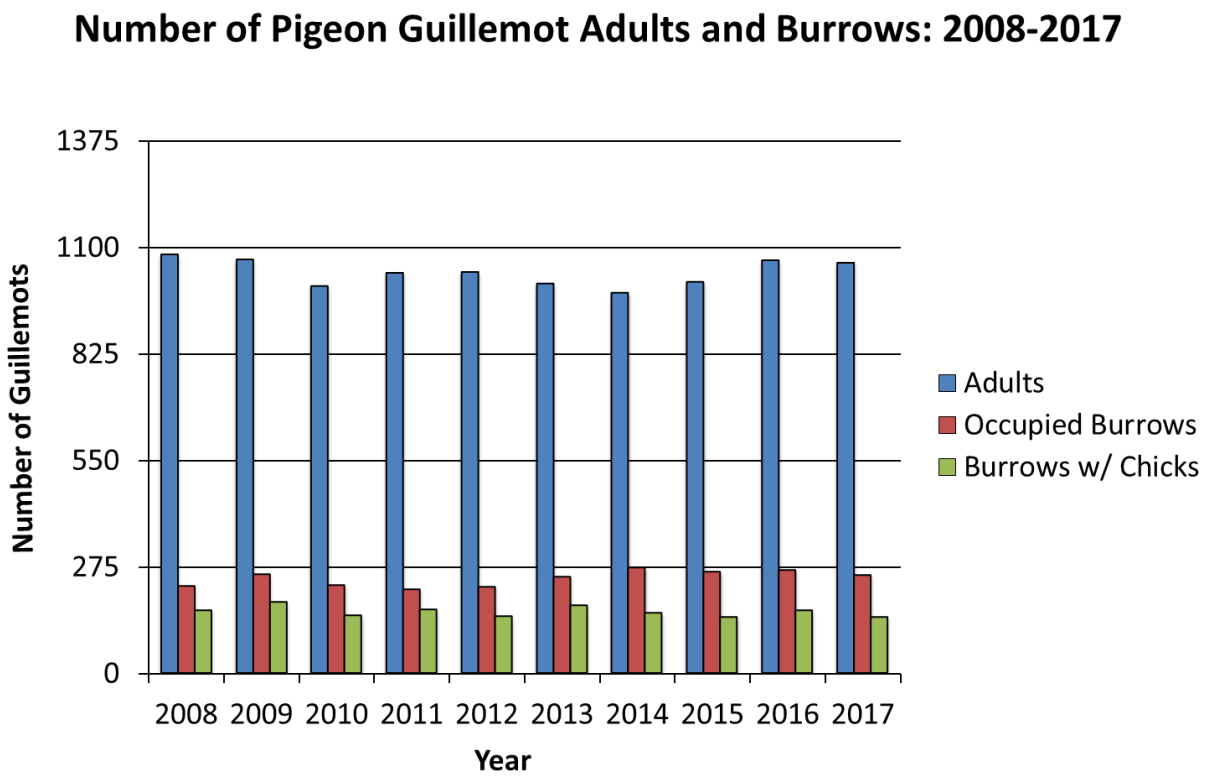

Figure 1. *Number of Pigeon Guillemot Adults and Burrows: 2008 to 2017.* This study has shown a consistent pattern of overall population, number of active burrows, and number of burrows with chicks.

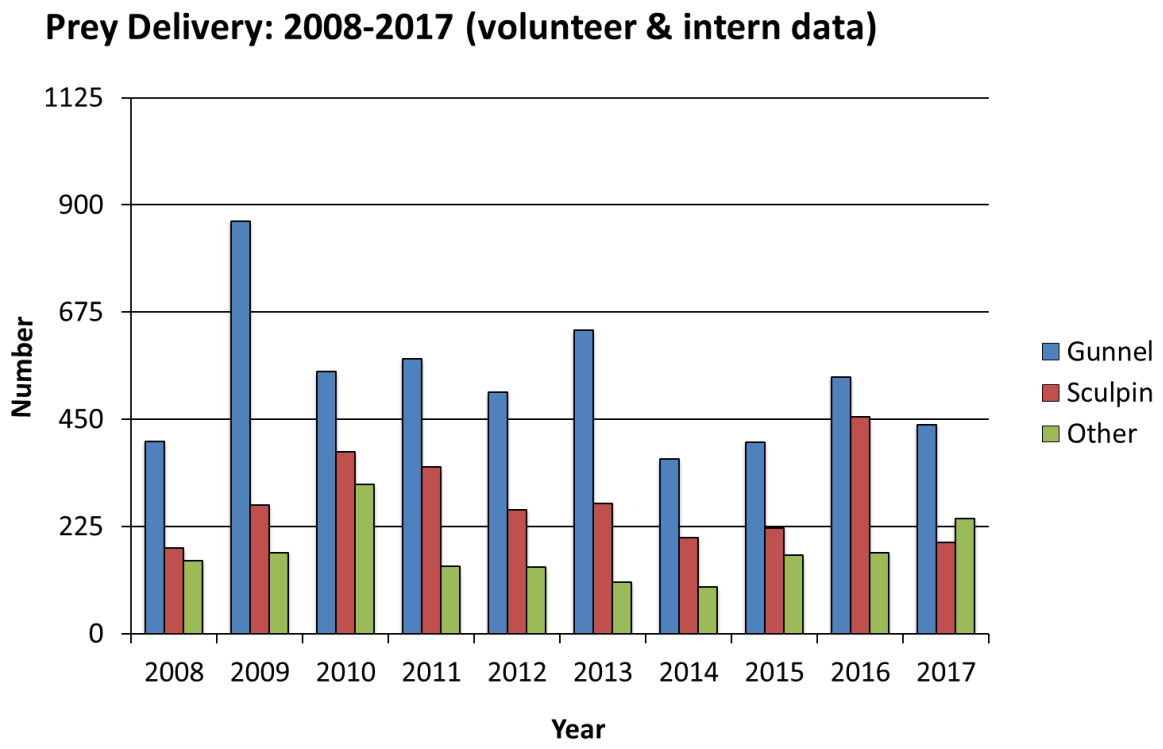

Figure 2. Prey Delivery: 2008-2017. Prey delivered to the chicks was primarily gunnels.

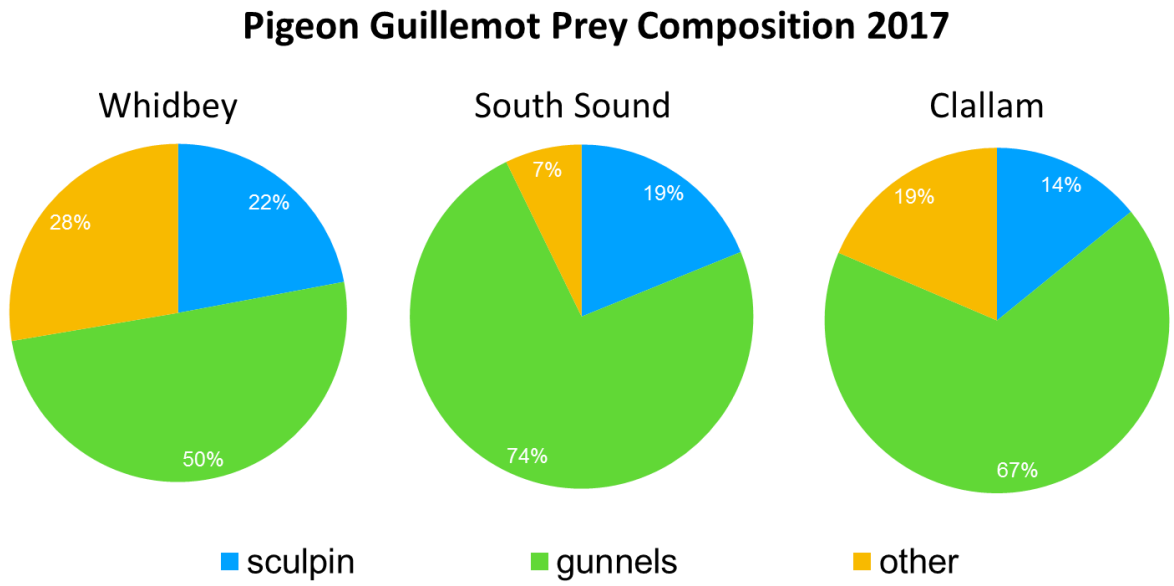

Figure 3. Pigeon Guillemot Prey Composition 2017. Prey composition of Pigeon Guillemots on Whidbey was compared to studies from South Sound and Clallam.

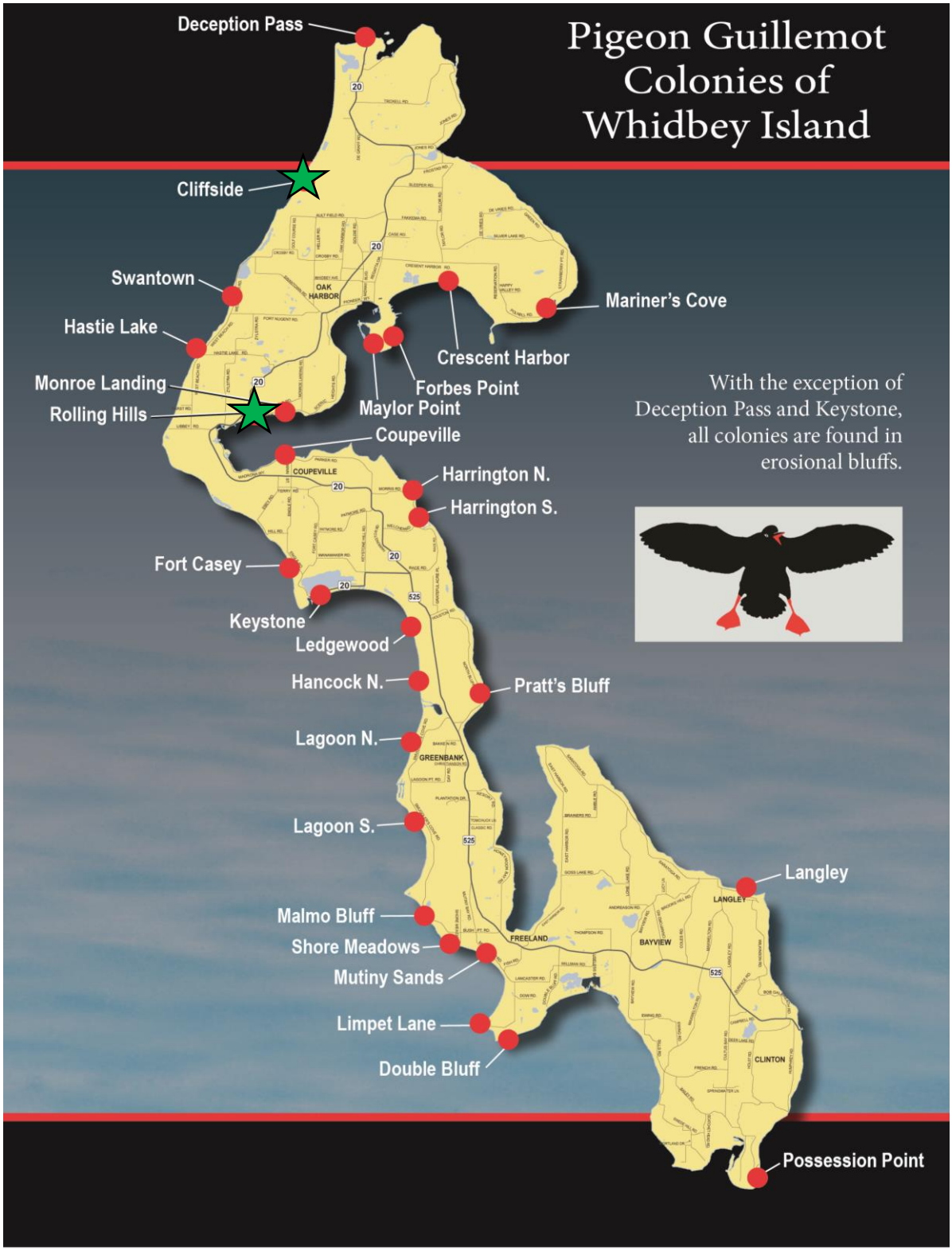

Figure 4. *Pigeon Guillemot Colonies of Whidbey Island.* 27 colonies are monitored on Whidbey Island. The colonies studied by the research intern, Rolling Hills and Cliffside, are indicated with a green star.

Pigeon Guillemot Study
2017 Breeding Season
Whidbey Island, Washington

Caitlyn Connolly

Abstract

Burrow activity, prey selection, delivery to chicks, colony behavior, and population were monitored of breeding Pigeon Guillemots on two beaches on North Whidbey Island, a West facing beach, Cliffside and an East side beach, Rolling Hills. The goal of this study was to continue building a data baseline of the Pigeon Guillemot population on Whidbey Island. Colony behavior, active burrows, prey selection to chicks, frequencies of delivery to chicks were recorded, and probable fledgling success was estimated. Pigeon Guillemots have been correlated with the overall health of the Salish Sea. The data show prey choice of 54% Gunnel/Prickleback, 40% Unknown/Other, and 6% Sculpin.

Introduction

Pigeon Guillemots (*Cepphus columba)* are small black and white seabirds in the auk family (Alcidae) that nest in cavities or burrows along coastlines between Southern California and Northwestern Alaska (Ewings et al. 1994). Pigeon Guillemots are specialized underwater swimmers. They use their short wings, tail, and compact body to easily dive and maneuver underwater. Adult Pigeon Guillemot breeding plumage is black with a signature white wing patch with a black wedge. The inside of the mouth, the legs and feet are bright red. There is an estimated worldwide population of between 200,000 and 300,000 Pigeon Guillemots (Gaston and Jones. 1998). Whidbey Island, Washington, provides home to a large population of Pigeon Guillemots. Our study was focused on the late spring and summer breeding season (Bishop et al., 2016).

Typically secondary cavity nesters, Pigeon Guillemots choose to occupy burrows or cavities along cliff sides, in tree roots, or other burrow-type cracks and crevices where they lay their eggs. Usually two eggs are laid in these burrows, which is unlike the other birds in the Alcidae family which only lay one (Konyukhov. 2000). Incubation is carried out by both parents, and takes an average of 30 days for the eggs to begin hatching. Fledging usually occurs at night or early morning when the chicks are just over a month old (Konyukhov. 2000). Pigeon Guillemots will not begin breeding until their third or fourth year.

Pigeon Guillemots are unique to other species in the auk family. They lay more eggs than others and their foraging range is smaller (Litzow et al. 2004). Pigeon Guillemots feed more on demersal and benthic fish types than other members of the Alcidae family (Litzow et al. 2004). This may be due to the fact that these fish types are more predictable, and therefore, easy prey

for the Pigeon Guillemots to catch. They fish in small groups or solitarily as opposed to their relatives who stay in larger groups while looking for food, and primarily select schooling fish (Golet et al. 2000).

Pigeon Guillemots are indicator species, feeding on organisms in the lower trophic level that are affected by water quality such as acidity, nutrients, and other factors (Ewings. 1993). Pigeon Guillemots are common seabirds that breed throughout the Puget Sound and Salish Sea, including all around Whidbey Island, starting in May. Studying these birds and determining their breeding abundance and success can indicate the health of the Salish Sea (Rosling. 2010). Creating a baseline of population and breeding data can help show how the Pigeon Guillemots are surviving year-to-year.

There are 25 Pigeon Guillemot Colonies on Whidbey Island, with a population of over 1,000, that are being monitored yearly by volunteers. Specific colonies are chosen for extensive detailed monitoring by interns or contractors until all the chicks have fledged, leave the burrows. The data are collected and reported yearly on an online database (http://www.pigeonguillemotdata.org).

Materials and Methods

This study took place from June 12th, 2017 to August 25th, 2017. Starting at Rolling Hills each beach was visited every other day from 6:00am to 10:00am. Binoculars with a power of 8.5 x 44 were used to survey the birds. Any Pigeon Guillemots carrying fish were noted and identification of the fish type was made into one of three groups; Sculpin, Gunnel/Prickleback, or Other/Unknown, this category includes other types of fish and fish that could not be identified. A population count was recorded at the start of the survey and every 30 minutes. Throughout the survey time, burrows were recorded when a Pigeon Guillemot successfully delivered prey to the burrow. Change in colony behavior due to disturbances (i.e. people walking on the beach or predatory birds flying by) and the duration of the disturbances were recorded. If a burrow was seen receiving prey for a minimum of three weeks, that burrow was considered as having a successful fledging. Estimated fledging is an interpretation of the observations.

Results and Discussion

Interns survey every weekday, alternating survey locations, for at least four hours in the morning. Interns conducted a population count every thirty minutes and recorded visits to burrows when prey was being delivered and the prey type was recorded. Any disturbance to the colony was recorded including what the disturbance was, how the Pigeon Guillemots acted (fly off the water, dive, calling, flee the beach, etc.) and the duration the Pigeon Guillemots were disturbed for. At the end of the survey a walk under the burrows was also made to look for any broken egg shells, rejected prey, dead chicks, or anything else.

The data show for the two intern monitored colonies that Pigeon Guillemots made prey choice to chicks comprising of 54% Gunnel/Prickleback, 40% Other/Unknown, and ~6% Sculpin fish types.

Percentage of prey deliveries in Rolling Hills and Cliffside Combined

Year	Sculpin	Gunnel/Prickleback	Unknown/Other
2017	5.69%	54.11%	40.18%

Table 1. data table showing the percent of fish type delivered as prey to chicks

Fledgling success in table 2 is determined by prey being delivered to a burrow for three consecutive weeks, divided by the total number of burrows.

Total Burrows, burrow success and % fledging from Cliffside

Year	Total Number of Burrows	Total Number of Estimated Successful Burrow Fledging	% Estimated Fledged
2017	6	5	83.33%

Table 2. Total number of burrows and the percent of estimated successful fledges from Cliffside

Estimated % Successful fledged from Rolling Hills Intern data

Year	Estimated Fledging Success
2017	82%
2016, 2015, 2014	Colony not monitored by intern
2013	46%
2012	75%
2011	73%
2010	58%

Table 3. Estimated successful fledging from Rolling Hills

Success can be affected by burrows becoming inaccessible from landslides, other species occupying the burrows, environmental factors affecting availability of prey, and predation of chicks from raptors or crows. No deceased chicks or adult Pigeon Guillemots were observed this 2017 breeding season during surveys at either Cliffside or Rolling Hills, however, a carcass washed up somewhat near the Rolling Hills Colony.

Rolling Hills frequency of prey deliveries was high early in the breeding season. The 2017 survey started on June 12th which was very close to the peak of activity for this colony (Figure 1). The first three weeks were the most active for the Rolling Hills colony with the peak of prey delivered per hour occurring in the third week of the survey (Figure 2).

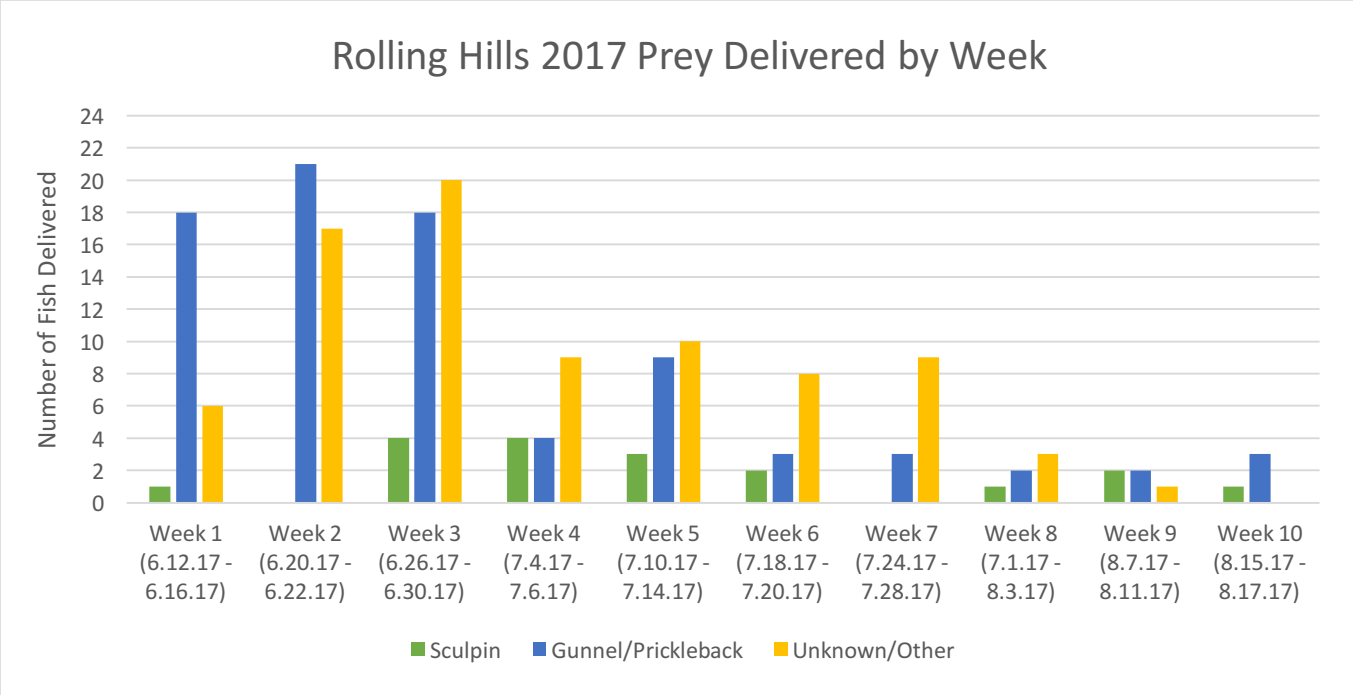

Figure 1. Prey delivery for each fish type per week at Rolling Hills for the 2017 breeding season.

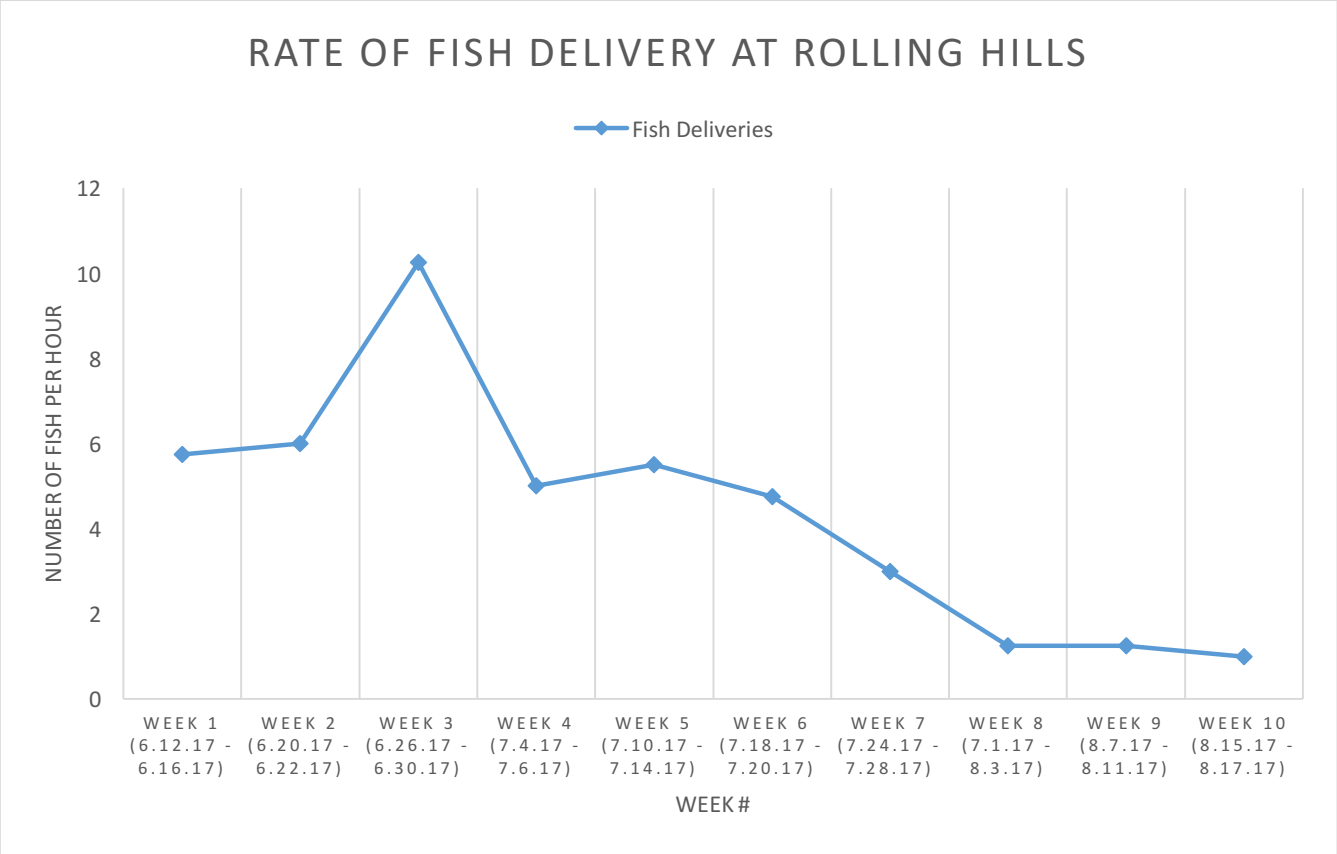

Figure 2. Rate of Fish delivered at Rolling Hills per hour for the 2017 breeding season.

Cliffside had a slower start as compared to Rolling Hills, with activity not peaking until week 8 (Figure 3). The peak of prey delivered per hour happened in the 9th week of the survey before starting to decline. The survey started at Cliffside on June 13th with no burrow activity for that first week (Figure 1). It was interesting to see that there were no Sculpin fish type delivered to any burrows at Cliffside. The majority of the fish type delivered to Cliffside was Gunnel/Prickleback. There were many deliveries of Sand Lances which fall under the Other/Unknown fish type, which can often be confused as a Gunnel/Prickleback fish type, but there were never any instances of a Pigeon Guillemot with a Sculpin at Cliffside (Figure 4).

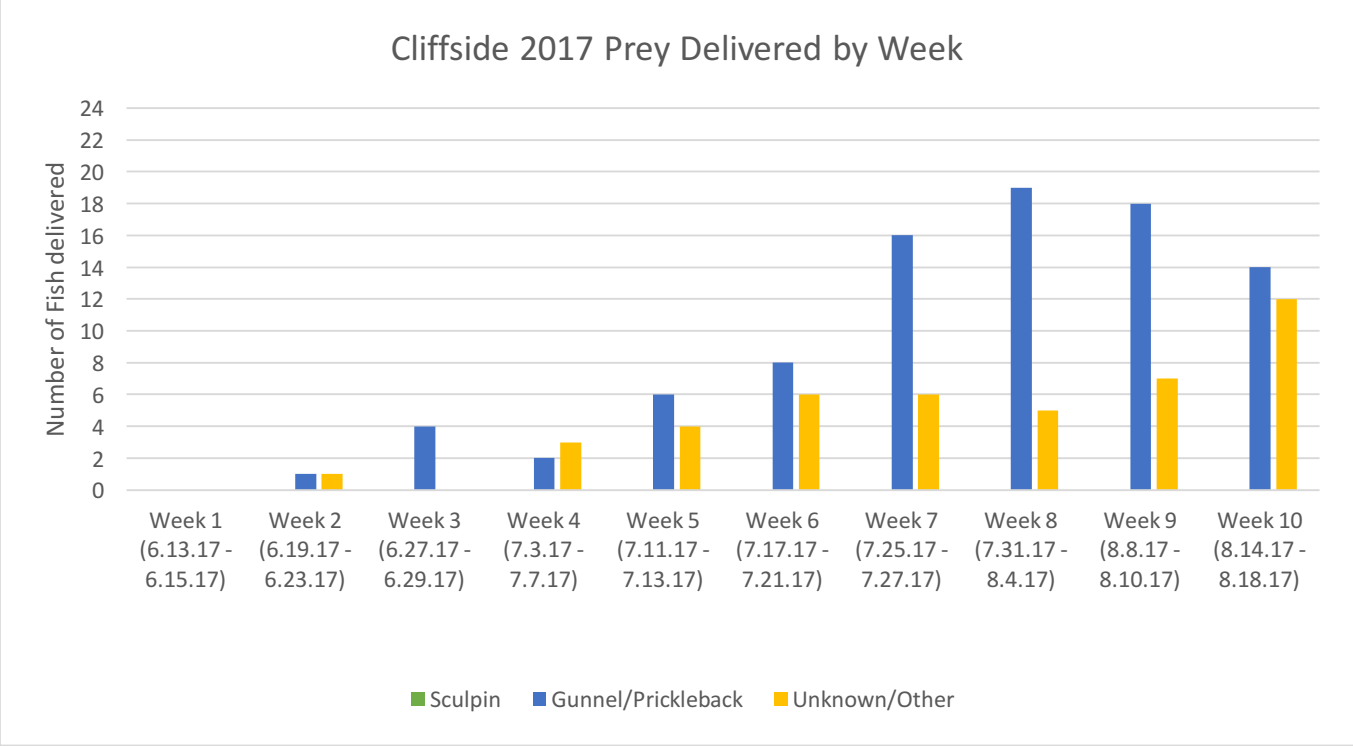

Figure 3. Prey delivery for each fish type per week at Cliffside for the 2017 breeding season.

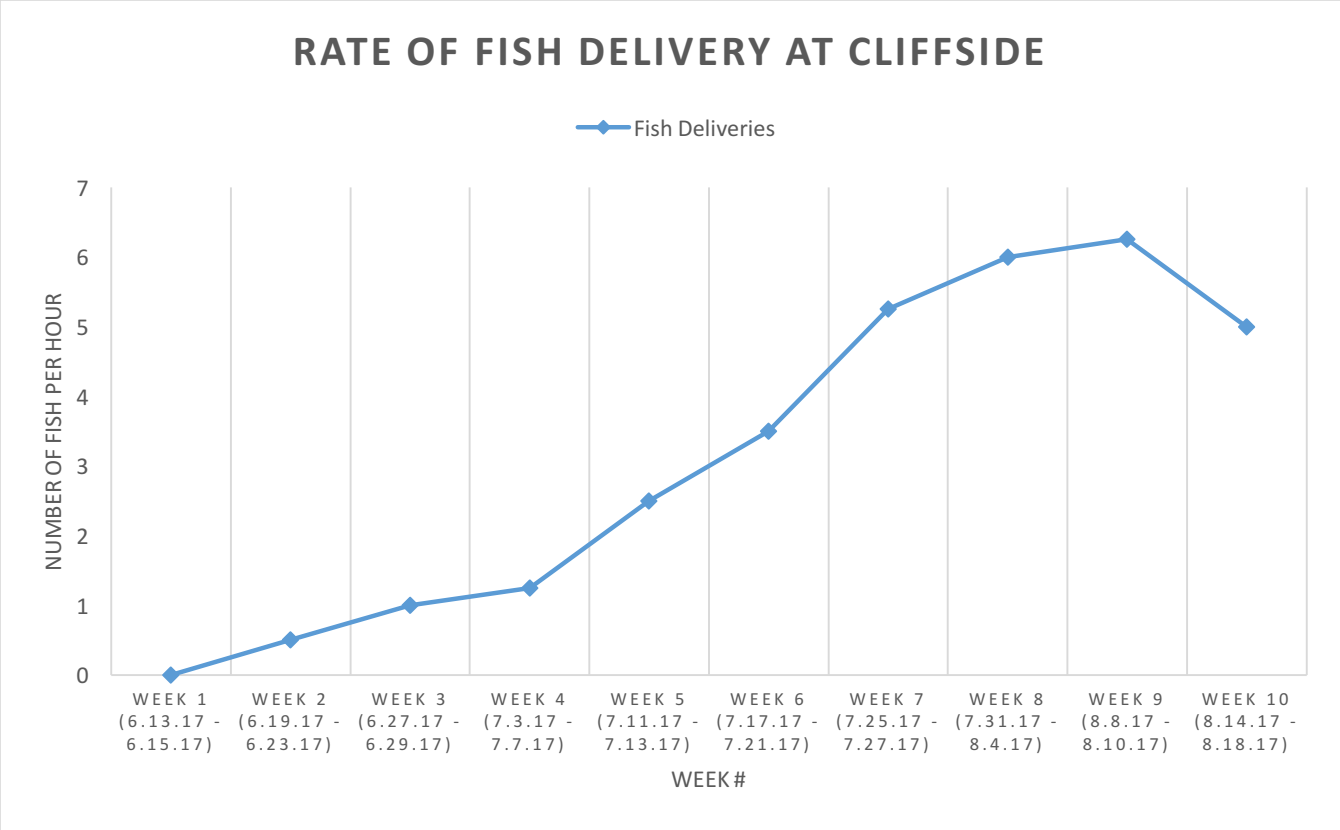

Figure 4. Rate of fish delivered at Cliffside per hour for the 2017 breeding season.

Pigeon Guillemots are the only common seabird to regularly nest on Whidbey Island. By studying their breeding behaviors, chick diet, and potential fledging success, we can learn much about the health of the marine ecosystem. Since there has not been extensive data collected on these species it is imperative that we continue accruing data on these birds to get a better understanding of the marine ecosystem that they, and we, are a part of. A baseline can help us understand the "normal" health of the Salish Sea and when and how it is affected by outside factors such as climate change, oil spills, and more. Further observations and data are needed to provide a better understanding of the health of the Salish Sea where an extremely large variety of creatures live.

Acknowledgements

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