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Pigeon Guillemot Study  
Whidbey Island, 2011 Breeding Season

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Abstract

A monitoring study of breeding Pigeon Guillemots was conducted on two beaches of Whidbey Island. The objective of this study is to continue building a data baseline of the Pigeon Guillemot population on Whidbey Island. Colony behavior, active burrows, prey selection, frequency of deliveries, and fledging success are documented. Pigeon Guillemots are predominantly benthic feeders (gunnel and sculpin fish). Their breeding success has been correlated with the overall health of Puget Sound. The data show an average choice of 55% gunnel, 40% sculpin and 5% other. 320 prey deliveries were recorded indicating a 75% fledging success.

Introduction

Pigeon Guillemots (*Cepphus columba*) are in the alcid/auk family. They are a small seabird, with an average wingspan of 23 inches, and weigh just over one pound. Pigeon Guillemots populate the North Pacific Ocean, ranging year round from arctic Alaska to Southern California, with an estimated population of 235,000. The Pigeon Guillemot is a specialized underwater swimmer, with a compact body, short wings and short tail. It dives, in pursuit of prey using its wings and feet for steering and propulsion. (Seattle Audubon). They are local residents of the Salish Sea, coming to the shores of Whidbey Island to nest in cliff burrows, breeding from late June to late August. Pairs return to the same area and re-use the same nest from year to year. The average clutch size of the Pigeon Guillemot is two eggs: if the first eggs fail they will re-lay. Pigeon Guillemots have an average life span of 6 years, and typically do not breed until the third or fourth year (Gaston & Jones, 1998). Only 40% of Pigeon Guillemots will survive to breeding age. They are vulnerable to predation (raptors, octopi, crows etc.), water pollution, and gill netting. When the time comes to fledge, the young Pigeon Guillemot stumbles out of the cliff burrow for the first time and heads for the water; it's wings are not fully developed (Ewins, 1993; Vermeer, Morgan and Smith 1993).

Over 25 Pigeon Guillemot colonies have been documented on Whidbey Island (a population of 1,000 individuals). Of the 25 Whidbey colonies, two colonies were selected for detailed monitoring.

2011 marks the fourth year of the Pigeon Guillemot survey. This monitoring entails prey choice, frequency of burrow deliveries and fledging success. In the years 2008, 2009, and 2010 colonies at 5 beaches were surveyed: Shore Meadows, Harrington Lagoon North, Harrington Lagoon South, Mutiny Sands and Rolling Hills.

Due to funding constraints the Pigeon Guillemot Study in 2011 focused monitoring to just two colonies; Mutiny Sands and Rolling Hills. These two colonies were chosen because they were the most active with the largest populations (average of 20 birds).

Mutiny Sands is located on the South Western side of Whidbey Island. The bluffs of Mutiny Sands are approximately 40 feet (12 meters). Despite a high frequency of beach walkers with dogs, Mutiny Sands continues to be a successful breeding colony. Rolling Hills colony is located on the Eastern side of Central Whidbey on the North shore of Penn Cove. Rolling Hills is a rocky beach, with minimal human presence. The bluff height of Rolling Hills is similar to Mutiny Sands, ranging at 40 feet (12 meters), and its population is also similar to Mutiny Sands.

The two main prey choices of Whidbey Pigeon Guillemots are small sized sculpin and gunnel fish. Sculpin are a small spiny fish with a large head in the Cottidae family, typically measuring less than 15cm. Their diet consists of small invertebrates. There are 35 species of sculpin found in the shallow waters of the Salish Sea.

Gunnels are an eel shaped fish in the Pholidae family. Although gunnel can be large, those chosen as Pigeon Guillemot prey are typically no more than 15 cm. Like scuplins, the diets of the gunnel fish consist of small invertebrates. There are six species of gunnels found locally in shallow near shore waters (University of Washington).

#### Materials and Methods

This study took place from June 21 to August 25, 2011. Each of the beach sites was observed from sunrise to approximately 11:00 a.m. (five hours each day). Mutiny Sands was observed on Tuesday, Rolling Hills on Friday. 8X42 power binoculars, 60X spotting scope, video camera, and digital still camera were used at each site to aid in recording observations. A Treetop™ camera was also employed to look into specific burrows.

Population counts of Pigeon Guillemots were recorded every 30 minutes. Each selection of prey was documented. Pigeon Guillemot prey that could not be identified, or prey that did not consist of sculpin or gunnel fish (i.e. perch, crab, shrimp), were cataloged as "other." An active burrow was deemed active only when a Pigeon Guillemot was observed entering that burrow with prey. Frequency of deliveries, anthropogenic and raptor disturbances, as well as other interactions between birds was recorded as they occurred. If a burrow received prey deliveries for at least three weeks that burrow was considered having a successful fledging.

## Results and Discussion

The data show an overall prey choice of 55% gunnel fish, 40% sculpin fish and 5% other in 2011. Note the 2011 prey percentages are from Mutiny Sands and Rolling Hills only. (Table1). The data for 2011 and 2010 prey choice has a marked decrease in “Other Fish” and an increase in Sculpin prey. Overall, gunnel fish have remained as a prey choice accounting for approximately 50% of choices (Table1).

Prey choice per colony shows a noticeable decrease in “Other” fish for the last three years. 2009 results show an unusual high percentage of gunnel choices (Table 2, 3).

Combined fledging percent for Mutiny Sands and Rolling Hills has remained average through the years, even though the number of active and successful burrows has varied (Table 4).

Fledging success per colony has varied compared to its previous year (Table 5).

Figure 1 and Figure 10 graph show a high spike in gunnel prey. This occurred at Rolling Hills on July 22nd. This was an unusually busy delivery day, when 50 gunnels were observed being delivered to burrows. (To compare Rolling Hills prey deliveries more easily with previous years, the Rolling Hills graph has this outlier removed, see Figure 11).

The prey deliveries for Mutiny Sands and Rolling Hills without this large gunnel prey is average compared to 2010 (Figures 1, and 2).

Prey selection per site for 2011 has a decrease in number of deliveries, compared to 2010 with gunnel fish being chosen more frequently (Figure 3, and 4).

Rate of fish deliveries per hour at Mutiny Sands in the 2011 season show a decrease in the number of fish delivered per hour, and a peak of deliveries occurring at a later date compared to 2010 (Figure 5 and 6).

Mutiny Sands prey deliveries in 2011 show a notable decrease in the number of prey being delivered compared to 2010 and 2009. The Mutiny Sands Pigeon Guillemot colony in 2011 was two weeks later in establishing burrow breeding activity this season compared to Rolling Hills, and from previous years (Figure 7,8,9,10).

Rolling Hills Prey Deliveries over the last three years show a marked decrease in number of prey in 2010. 2011 deliveries averages with 2009 deliveries with a high number of gunnel prey (Figure 10, 12, 13).

Rate of fish delivery at Rolling Hills show one high point of gunnel deliveries (Figure 14, 15).

In 2011 Rolling Hills increased its fledging success by 15% compared to 2010, even with a decrease of 5 active burrows. (16 burrows in 2010, and 11 burrows in 2011). Numerous Bald Eagles were seen at Rolling Hills including seven Bald Eagles along the beach at one time and others routinely perching on snags at the top of the bluff. A successful Bald Eagle strike on a swimming Pigeon Guillemot was witnessed. Despite a high presence of raptors, Rolling Hills continues to be a busy colony, with 77% fledging success average over the last three years.

In 2011 Mutiny Sands has decreased its fledging success by 14% compared to 2010. (13 burrows in 2010, and 9 burrows in 2011). This decrease can be connected to Mutiny Sands having a late start in the breeding season, and not as many active burrows.

A few raptors have been spotted at Mutiny Sands (Bald Eagle, Peregrine Falcon and Barn Owl) Most disturbances recorded at the Mutiny Sands colony are anthropogenic; beach walkers with dogs, and boaters. Mutiny Sands also continues to be a successful colony with 80% fledging success average over the last three years.

It is recommended that the Pigeon Guillemot study continue. The study is in its fourth year monitoring population, prey deliveries, and active burrows. This is a unique study with over 4,000 deliveries recorded. The 2011 study was downsized to monitor two colonies; however, continuing the study to all five colonies would gain a more complete sample of Whidbey Island. There is a spectrum of differences in number of burrows and fledging success between each colony and it is recommended that funding allow all five colonies to be monitored in the future. Having expanded data sheets may shed light on the health of breeding Pigeon Guillemots and the Salish Sea habitat. Studies to date show a fluctuation of Pigeon Guillemot populations; further observations and data collection may allow a deeper understanding of overall patterns.

It is unclear why one prey rather than another is selected, nor why some burrows are successful and others fail. It is likely there is many variables, which determine fledging success, including weather, prey abundance, burrow condition and availability of burrows, as well as population of predators, all of which may effect the success of breeding Pigeon Guillemot colonies.

#### Acknowledgements

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### Average Prey Choice of Pigeon Guillemots Per Year in Five Colonies

Year	Gunnel	Sculpin	Other
2008	55%	24%	21%
2009	57%	18%	25%
2010	50%	44%	6%
2011*	55%	40%	5%

Table 1. Percentage Of sculpin and gunnel prey choice

\*Prey Choice average in 2011 combined for Mutiny Sands and Rolling Hills only.

### Average Prey Choice for Mutiny Sands

Mutiny Sands	Gunnel	Sculpin	Other
2008	46%	37%	17%
2009	80%	15%	5%
2010	45%	51%	4%
2011	52%	41%	7%

Table 2. Prey choice per colony over four years.

### Average Prey Choice for Rolling Hills

Rolling Hills	Gunnel	Sculpin	Other
2008	44%	32%	24%
2009	65%	29%	6%
2010	46%	44%	10%
2011	57%	40%	3%

Table 3. Prey choice per colony over four years.

### Combined Burrow Success and Average Fledging % of Mutiny Sands and Rolling Hills Pigeon Guillemots Per Year

Year	Total Number of Burrows	Total Number of Fledged	% Fledged
2009	19	15	78%
2010	29	21	72%
2011	20	15	75%

Table 4. Combined average fledging % and colony burrows over three years.

### Fledging Success Per Colony

Year	Harrington N.	Harrington S.	Mutiny Sands	Shore Meadows	Rolling Hills
2009	83%	57%	71%	50%	100%
2010	25%	60%	92%	66%	58%
2011	Not Monitored	Not Monitored	78%	Not Monitored	73%

Table 5. Fledging percent per colony over three years.

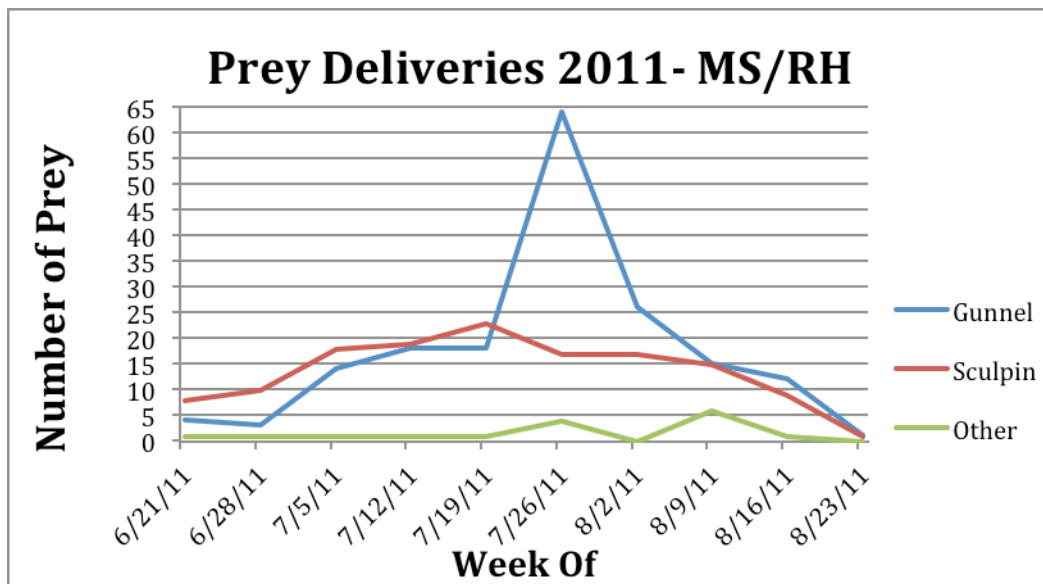


Figure 1. Combined number of prey delivered in 2011 by week in two colonies.

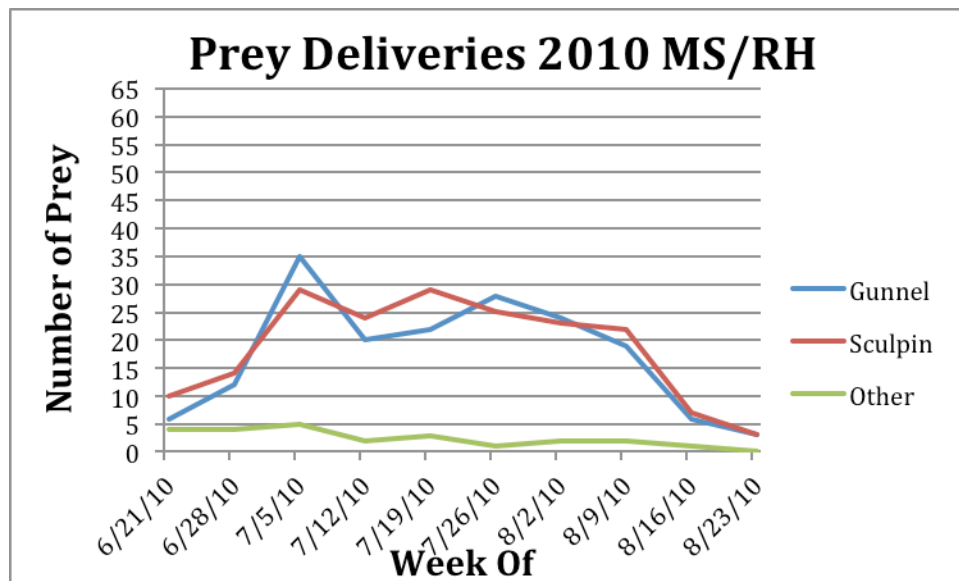


Figure 2. Combined number of prey delivered in 2010 by week in two colonies.

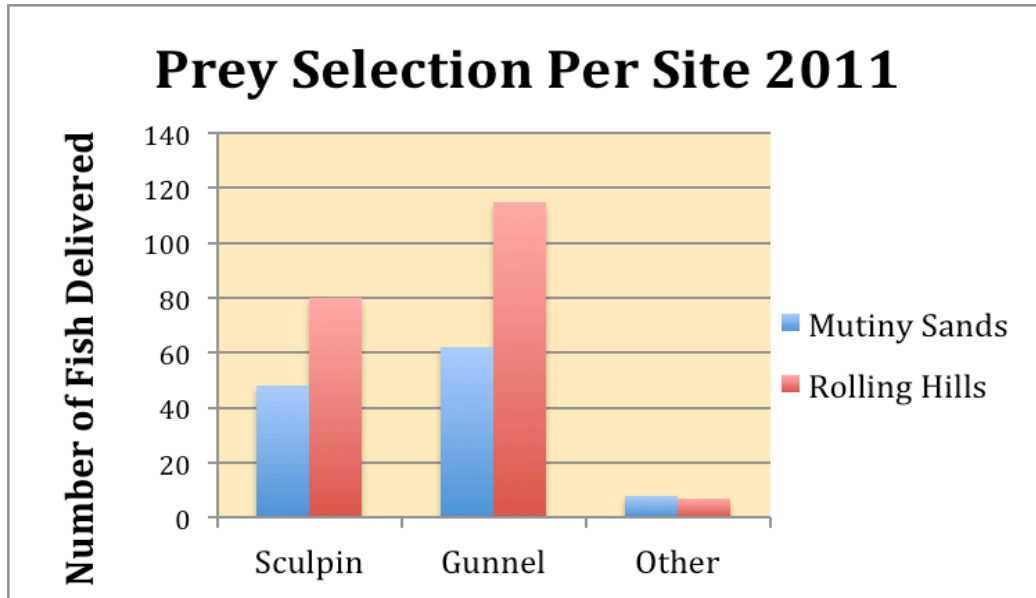


Figure 3. Comparison of prey selection of Mutiny Sands and Rolling Hills colonies.

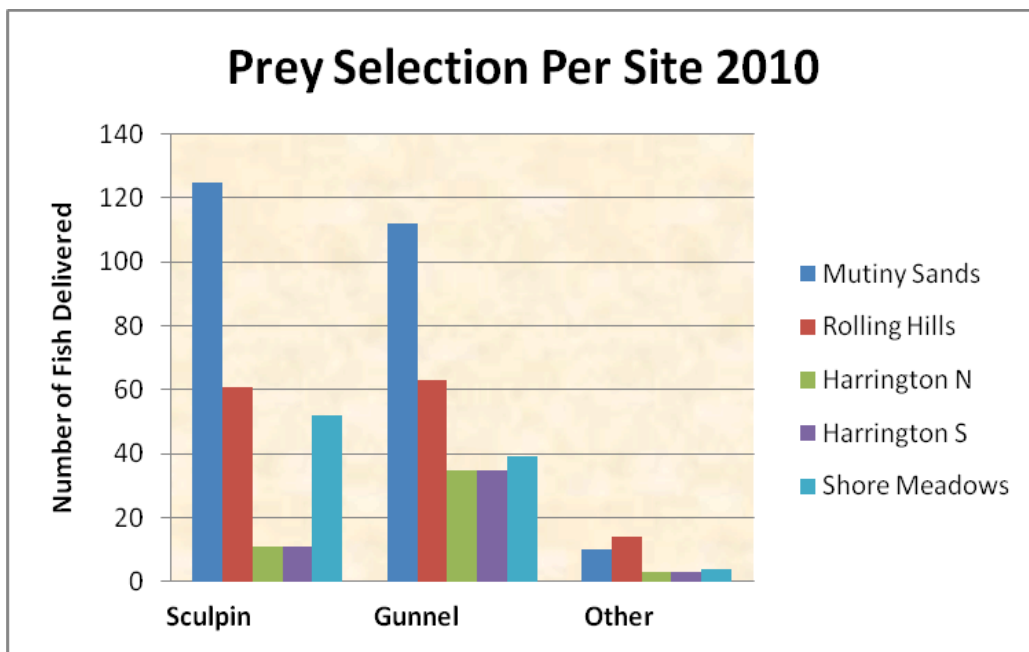


Figure 4. Comparison of prey selection of all five colonies.



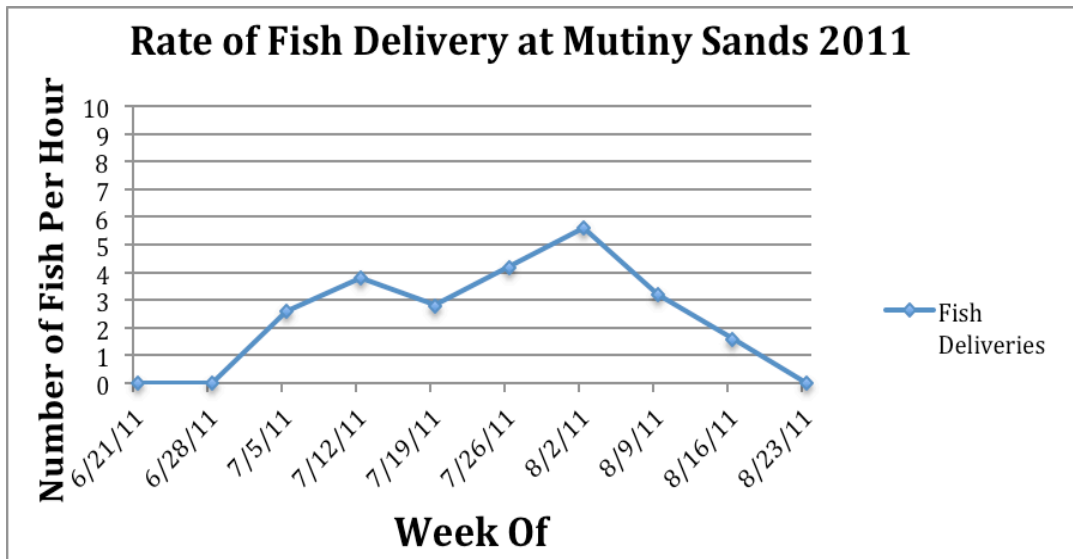


Figure 5. The rate of fish delivered at Mutiny Sands 2011.

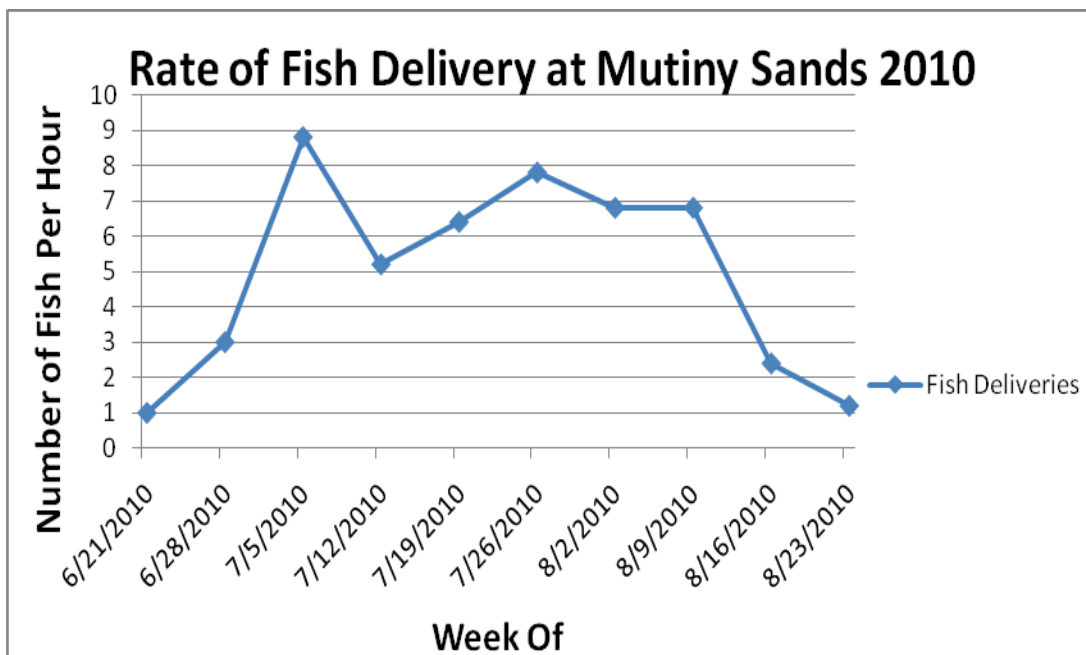


Figure 6. The rate of fish delivered at Mutiny Sands 2010.

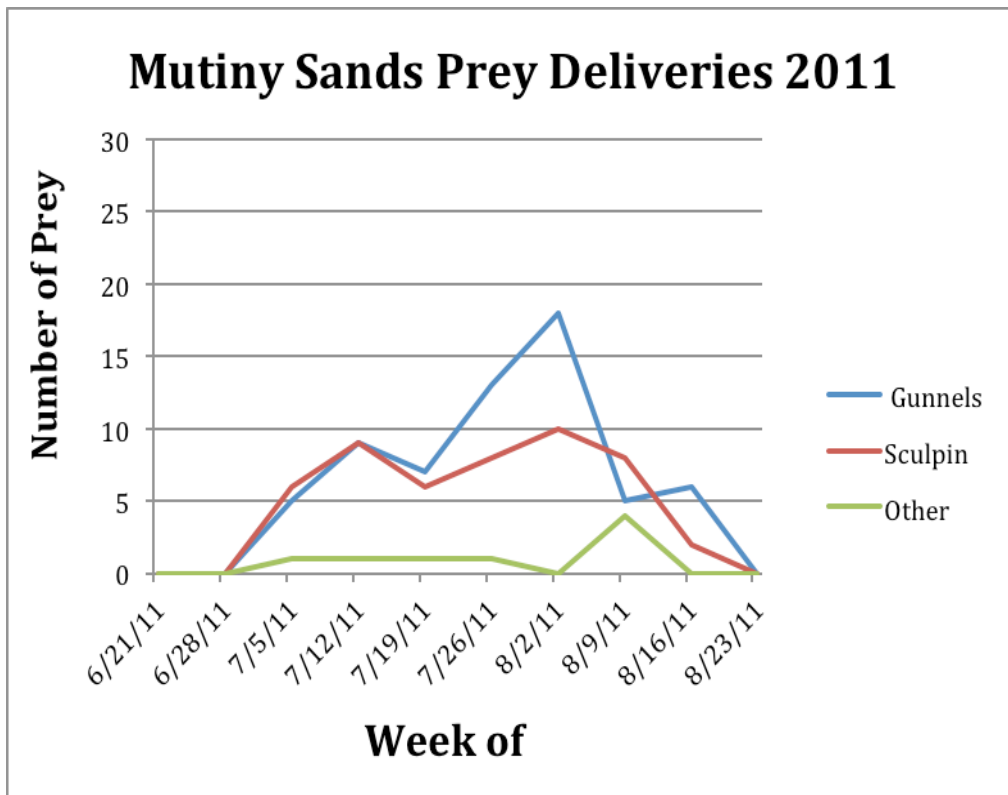


Figure 7. The number and division of prey selection at Mutiny Sands, 2011.

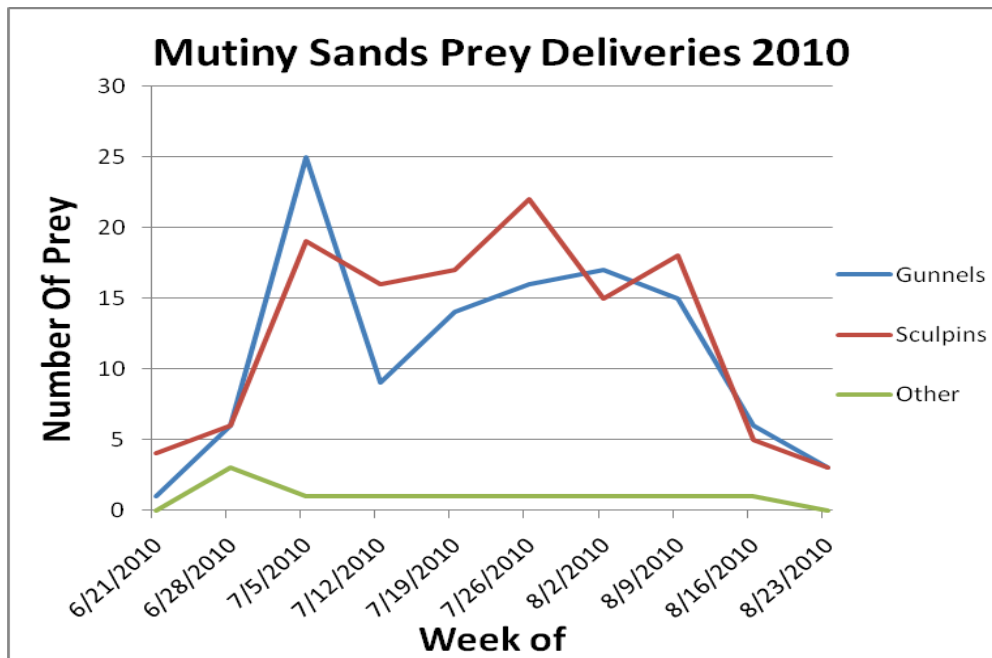


Figure 8. The number and division of prey selection at Mutiny Sands, 2010.

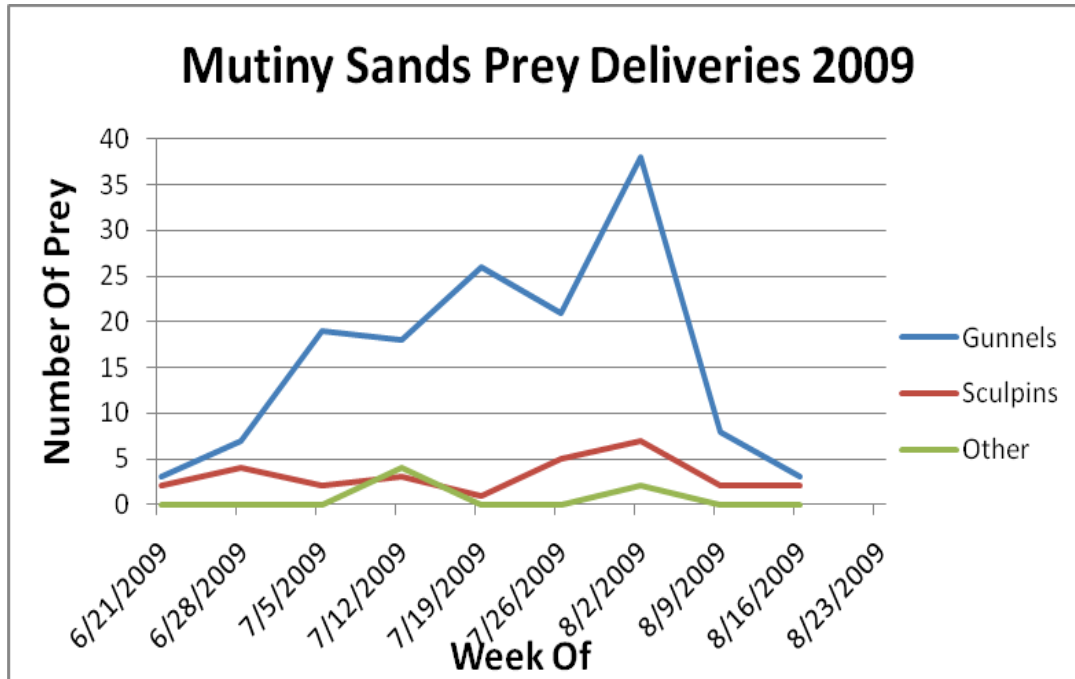


Figure 9. The number and division of prey selection at Mutiny Sands, 2009.

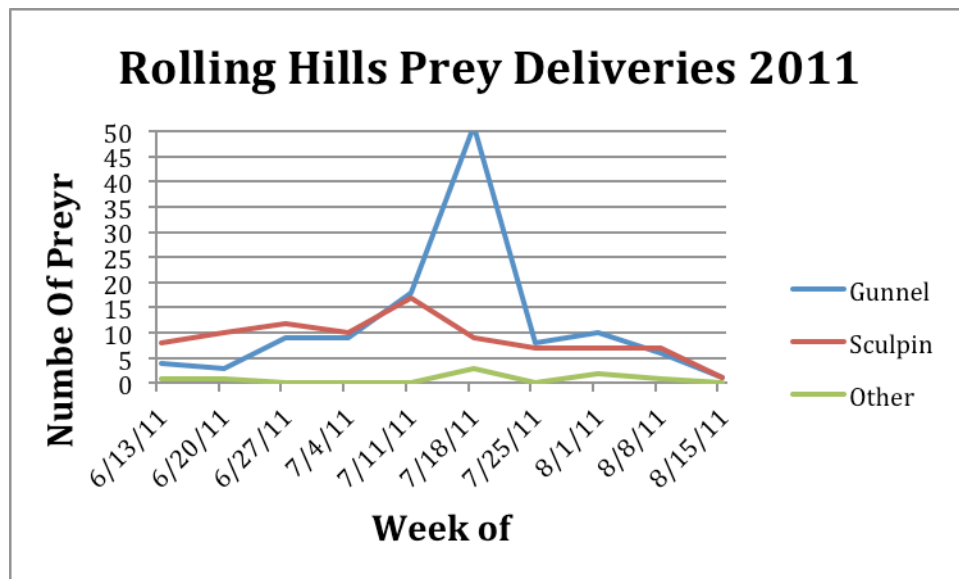


Figure 10. The number and division of prey selection at Rolling Hills, 2011.

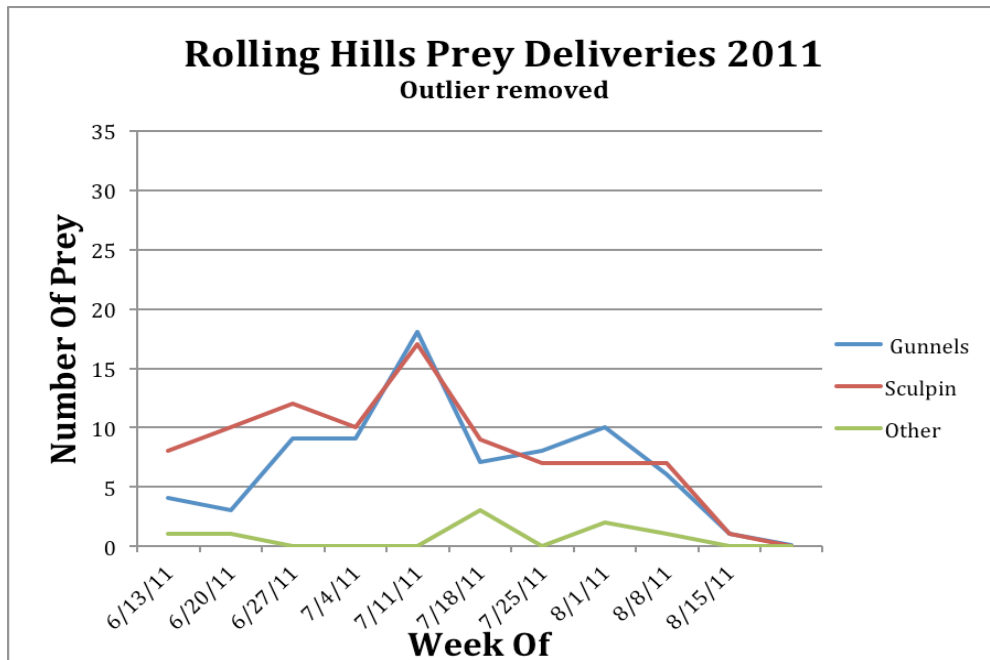


Figure 11. The number and division of prey deliveries with outlier removed, Rolling Hills 2011.

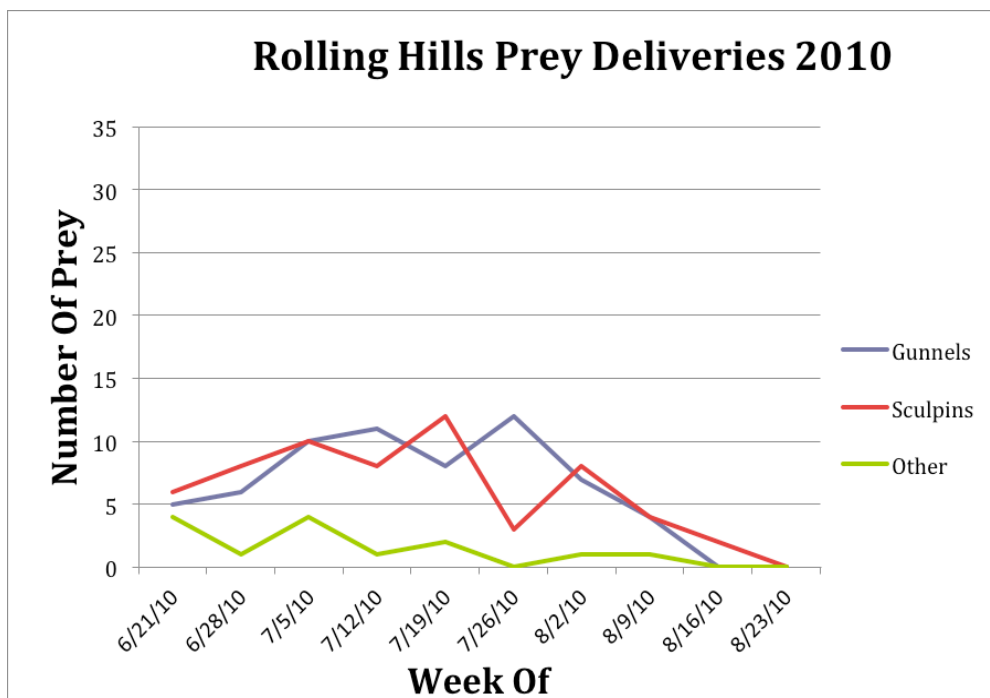


Figure 12. The number and division of prey selection at Rolling Hills, 2010.

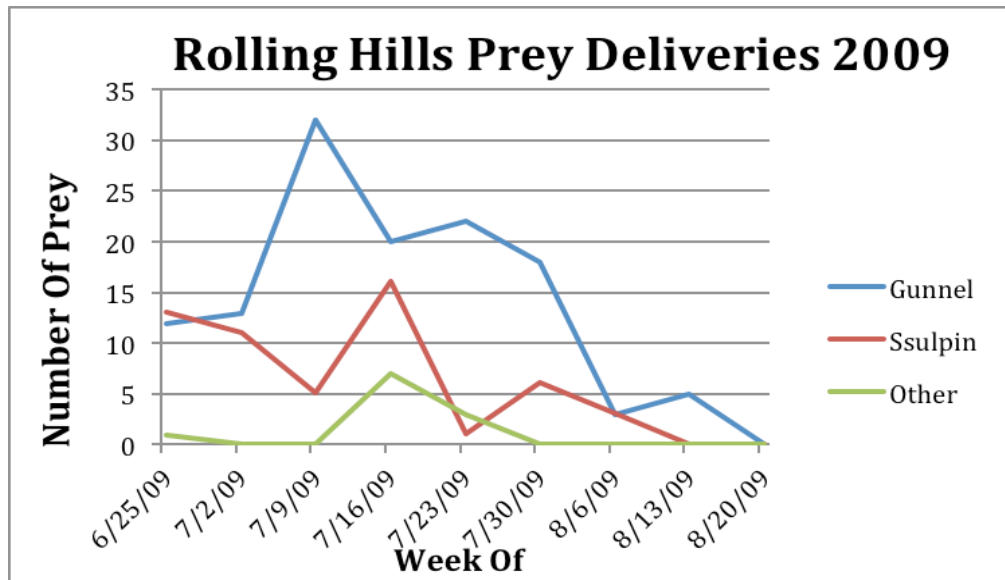


Figure 13. The number and division of prey selection at Rolling Hills, 2010.

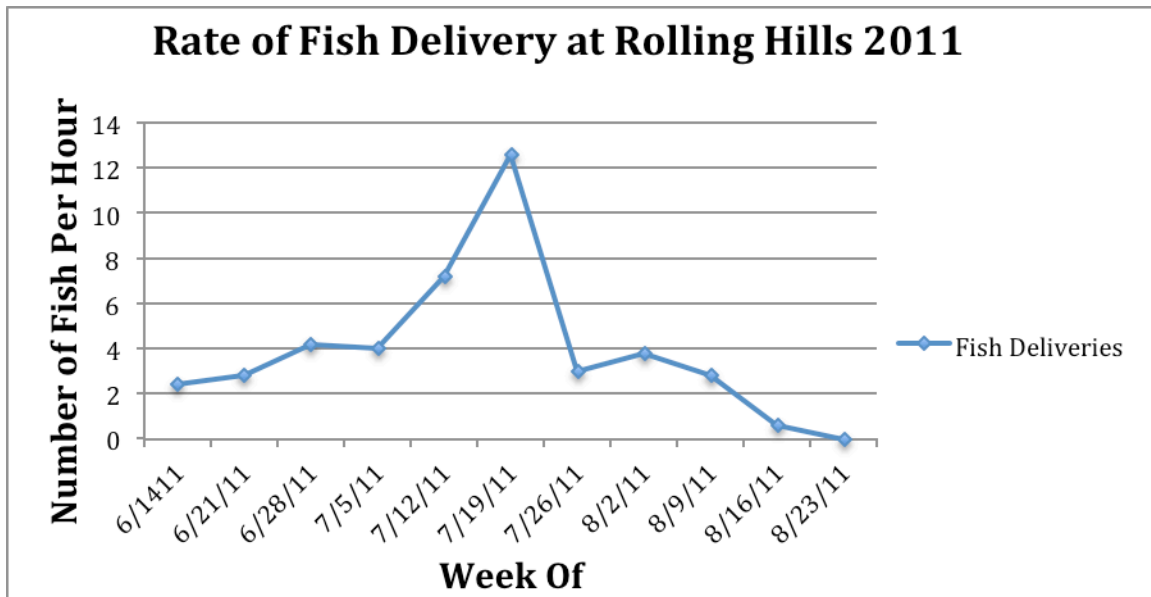


Figure 14. The rate of fish delivered at Rolling Hills, 2011.

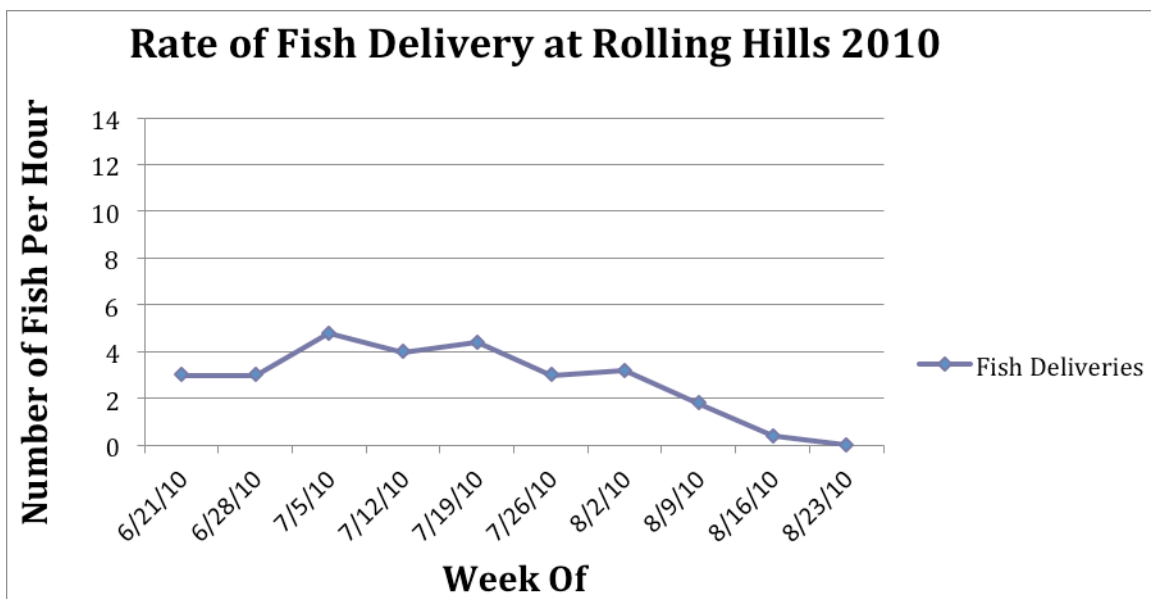


Figure 15. The rate of fish delivered at Rolling Hills, 2010.

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[http://www.whidbeyaudubon.org/pg/guillemot\\_survey.htm](http://www.whidbeyaudubon.org/pg/guillemot_survey.htm)
- Seattle Audubon Birdweb website with a summary of the Pigeon Guillemot retrieved from <http://www.birdweb.org/birdweb/bird>
- University of Washington website of gunnel and sculpin species from the Burke Museum webpage, retrieved from [www.washington.edu/burke](http://www.washington.edu/burke)