Guillemot Research Group

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Pigeon Guillemot Study

Whidbey Island, Washington 2013 Breeding Season

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Abstract

On Whidbey Island, Washington, three Pigeon Guillemot colonies were studied from June 25th, 2013 to August 31st, 2013 during breeding/nesting season. This is the fifth year of study. Pigeon Guillemots are the only seabird that regularly nest on Whidbey Island and remain in the Salish Sea year-round. The diet and behavior of these seabirds makes them an ideal indicator of the condition of the Salish Sea.

The objective of this study is to establish baseline data on the population of Pigeon Guillemots on Whidbey Island. The colonies were monitored and data recorded on prey fed to chicks, fledging success, and population. The three colonies involved are Shore Meadows, Mutiny Sands, and Rolling Hills. The average prey choice for all three colonies was 63% gunnel, 29% sculpin, and 8% other. Fledging success in 2013 averaged 55%. Average population was forty five PIGUs at Shore Meadows, fourteen at Mutiny Sands, and nineteen at Rolling Hills.

PIGU-Pigeon Guillemot

Introduction

Pigeon Guillemots (*Cepphus columba*) are medium sized seabirds of the Alcidae family. Their breeding plumage is blackish-brown from bill to tail, except for white upper wing patches with a black wedge. Adult PIGUs have bright red legs, feet, and inside lining of the mouth. There is

no apparent sexual dimorphism (Gaston and Jones 1998). PIGUs weigh between 450-530g (.99-1.16lbs) with an average body length of 325mm (12.8in) and wing cord between 176-197mm (6.93-7.75in) (Thoreson and Booth 1958, Gaston and Jones 1998). Populations of Pigeon Guillemots are found year-round along the West coast of the US from mid-California through Alaska and Aleutian Islands over to Russia. The estimated total population is 200,000-300,000 individuals (Gaston and Jones 1998).

Whidbey Island Pigeon Guillemots are diving predators foraging mainly in the epibenthic zone of the near shore environment. They have the ability to dive up to forty-five meters but seem to favor feeding in depths of ten to twenty meters. Their rounded wings allow for better thrust and maneuvering underwater (Scott et al. 1973). Normally considered to be generalist predators, they feed on an assortment of benthic fish and invertebrates. Despite this generalist feeding behavior, there is also evidence of prey preference. Individuals have been observed feeding on gunnel fish exclusively when available (Golet et al. 2000). Most prey is consumed underwater and is generally brought to the surface only when PIGUs are consuming large prey or feeding their chicks (Swennen and Duiven 1977, Clowater 1992).

PIGU breeding/nesting season on Whidbey Island begins late June and lasts through the end of August. These are colonial nesters where large numbers of both breeding and non-breeding birds are often present. At the Shore Meadows colony, the 2013 summer population count was as high as 106 birds with twenty- two active burrows and only one pair per burrow. Burrows are found all along the shores of Whidbey Island and are typically selected from existing cavities in high bluffs. Within the burrow PIGUs will form a shallow scrape with a few pebbles or shells pulled to the center. Established burrows are reused year-after-year as long as conditions are favorable (Drent 1965).

Burrow location is an important factor in avoiding egg and chick predation. Cavities found on steep sea cliffs with narrow openings appear to provide greater protection against intruders. The most common predators affecting PIGU eggs and chicks are glaucous-winged gulls (*Larus glaucescens*; Drent et al. 1964, Emms and Morgan 1989a), Northwestern crows (*Corvus caurinus*; Bent 1919, Emms and Morgan1989b, Vermeert et al. 1993), raccoons (*Procyon lotor*; Vermeer et al. 1993), and garter snakes (*Thamnophis elegans*; Emms and Morgan 1989a). Adult PIGU are known to be predated upon by bald eagles (*Haliaeetus leucocephalus*; Vermeer et al. 1989), peregrine falcons (*Falco peregrinus*; Nelson 1991), great horned owls (*Bubo virginianus*; Hayward et al. 1993),

orca whales (*Orcinus orca*; Stacey et al. 1990), and giant Pacific octopi (*Octopus dofleini martrini*; Sharpe et al. 1990).

A clutch of two is normal for PIGU but abnormal for other members of the Alcidae family where one is the standard. Both parents will take turns sitting on eggs during the incubation process (Ewins 1993). The incubation period for first and second laid eggs ranges from twenty six to thirty two days (Ainley and Broekelheide 1990). If eggs are lost PIGUs will re-lay within thirteen to eighteen days. Once hatched, chicks will be closely tended to until they are about seven days old (Drent 1965 a).

Parents feed chicks throughout daylight hours with the highest feeding concentration during morning hours (Drent 1965 b). Chicks are fed whole fish thus, fish size increases as chicks grow (Emms and Verbeek 1991). On Whidbey Island, chicks are mostly fed gunnel (*Pholidae*) and sculpin (*Cottidae*) but a variety of other fish and invertebrates have also been noted. Invertebrates and other fish such as flatfish (*Pleuronectoidei, Soleoidei*) ratfish (Chimeridae), perch (*Percidae*), and cod (*Gadidae*) have been observed as prey being fed to chicks.

Chicks, on average, fledge between thirty-three to thirty-seven days (Thorenson and Booth 1958). Fledging, in most cases, takes place at night where they inelegantly fly or fall out of the burrow and make their way to the water (Drent 1965 a, Emms and Morgan 1989a). Survival rate from post-fledged PIGU to breeding age is 40% (Nelson 1991). PIGU become sexually mature at approximately three years of age (Gaston and Jones 1998).

The marine waters surrounding Whidbey Island are abundant with life. Pigeon Guillemots are an essential part of this system and an ideal species for monitoring the condition of the Salish Sea. The local population of Pigeon Guillemots inhabit these protected, inland waters year-round and are the only seabird that regularly nests on Whidbey Island (Ainley and Boekelheide 1990). This is also a highly visible and accessible marine species. Their cliff dwelling, colonial behavior allows whole populations to be studied from shore while, at the same time, provide a window into an environment that is otherwise concealed by water (Frederiksen et al. 2007). Also, due to their generalist feeding behavior and high trophic level, these birds provide information on a number of different prey species in various trophic levels (Montevecchi 1993, Furness and Camphuysen 1997). The visible connections PIGU exhibit between marine and near-shore ecosystems make them a sentinel species able to reveal anthropogenic and environmental impacts to the Salish Sea.

Materials and Methods

Three PIGU colonies were studied on Whidbey Island over a ten week period from June 25th, 2013 to August 31st, 2013. The purpose is to observe and record information about prey fed to chicks, fledging success, and population numbers. The three colonies studied in 2013 were Shore Meadows, Mutiny Sands, and Rolling Hills.

Each colony was photographed and active burrows numbered. A burrow is considered active when PIGU are observed completely entering a burrow with prey. Fledging success is determined by prey being delivered to a burrow for three consecutive weeks. Anthropogenic and predator disturbances to the colony were also recorded along with other remarkable behaviors. Equipment used to aid with observations was 8x42 power binoculars, digital video camera, and a digital still camera.

Each colony was monitored for five hours, one day per week. Monitoring began at sunrise, from the center of the colony, as far out from the cliff bottom as allowed by tide height. A population count of PIGU in the area was recorded every thirty minutes. Each prey delivery to chicks was recorded along with the time, type of prey and burrow number. If prey was not identified as a gunnel or sculpin, it was noted as "other".

Study Sites

Shore Meadows is located on the west side of Whidbey Island in Mutiny Bay. This location has the highest bluffs of the all study sites at approximately twenty-six meters. A landslide was noted at the center of this site. The beach had less human activity as compared to the other sites but birds seemed to be more affected by human and predator presence. The PIGU population at Shore Meadows was consistently much higher than the other colonies. On the first day of the survey, 13 immature bald eagle disturbances were recorded. Two-to-three bald eagles per day were spotted throughout the remainder of the study.

Mutiny Sands is also located in Mutiny Bay about one mile (by beach) south of Shore Meadows. The bluffs at this site are approximately twelve meters. Human disturbance on this section of beach was considerably high as compared to the other colonies. This is most likely because the site is located within a housing community. The average population of PIGU at Mutiny Sands was comparably smaller but had the highest fledging success rate. Recorded predator disturbances this year at Mutiny Sands was much lower than last year. In 2012, seven deceased

PIGU were recorded (Rosling 2012). On August 2nd, 2013, two PIGU chick carcasses were discovered at the bottom of the bluff. One of the chicks is believed to have been killed by a raccoon.

Rolling Hills is located on the east side of Whidbey Island on the north side of Penn Cove. The bluffs at this colony are comparable in height to those at Mutiny Sands (about 12 meters). This site is located near a boat launch and public access. A large portion of human disturbance at this site was related to boat traffic and clam digging. The average PIGU population at this colony falls in-between that of Shore Meadows and Mutiny Sands. Bald eagles were spotted but did not seem to have as much effect on the PIGU population as the other two colonies. See Note: Penn Cove Oil Spill May, 2012 page 11.

Results and Discussions

Average prey choice was calculated as a combination of prey deliveries for all study sites over the course of each study year. In 2013, the percentage of gunnel fish fed to chicks is highest at 72% over any previous year. The percent of sculpin fed this year is lower than the last three years but within 1% of 2009.

Average Prey Choice of Pigeon Guillemots Per Year in Multiple Colonies

Year	Gunnel	Sculpin	Other
2013	72%	19%	9%
2012*	55%	32%	14%
2011*	55%	40%	5%
2010	50%	44%	6%
2009	57%	18%	25%

Table 1. Percentage of Gunnel and Sculpin prey choice

*Prey choice average in 2011, 2012 combined for Mutiny Sands and Rolling Hills only (Kreamer 2009) (Rosling 2010-2012)

Originally, in 2009, five colonies were part of the study however the number of colonies studied depends upon funding available each year. At Mutiny Sands, since 2010, there appears to be a downward trend in fledging success rates. Shore Meadows was not monitored in 2011 or 2012 but data shows a declined success rate from 2010 to 2013. Rolling Hills has been very consistent through the last four years until this year. The success rate was 75% in 2012 while in 2013 it hit a low of 46%.

Fledging Success in each colony over five years

Year	Harrington N.	Harrington S.	Mutiny Sands	Shore Meadows	Rolling Hills
2013	Not Monitored	Not Monitored	60%	38%	46%
2012	Not Monitored	Not Monitored	66%	Not Monitored	75%
2011	Not Monitored	Not Monitored	78%	Not Monitored	73%
2010	25%	60%	92%	66%	58%
2009	83%	57%	71%	50%	100%

Table 2. Fledging success in each colony over five years (Kreamer 2009) (Rosling 2010-2012)

Population counts were recorded every thirty minutes during a survey. Daily averages were calculated for each day a colony was surveyed.

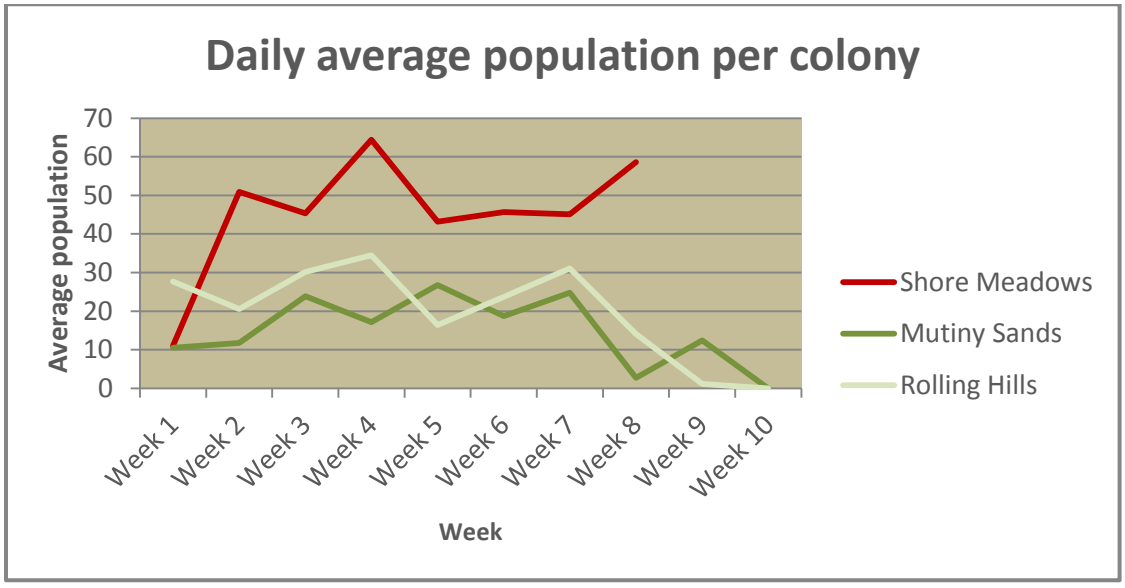

Figure 1. Daily average population over ten weeks at Shore Meadows, Mutiny Sands, and Rolling Hills.

Shore Meadows PIGU showed a preference for gunnel at 49% followed by sculpin at 45% and "other" at 6%. Most other colonies on Whidbey Island exhibited a preference for gunnel as well.

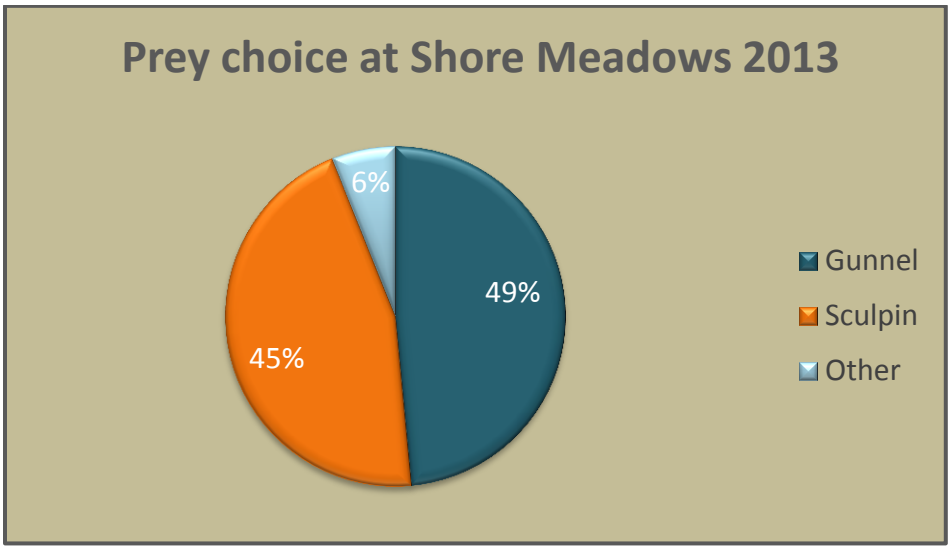

Figure 2. Total percent of prey choice at Shore Meadows in 2013

Figure 3 shows the number of gunnel, sculpin, and "other" prey delivered on the date specified. The choice of sculpin peaked on July 23rd at ten fish being delivered. The peak feeding of gunnel was one week later on July 30th with twelve deliveries. "Other" prey kept a fairly low profile topping out at two deliveries on July 30th.

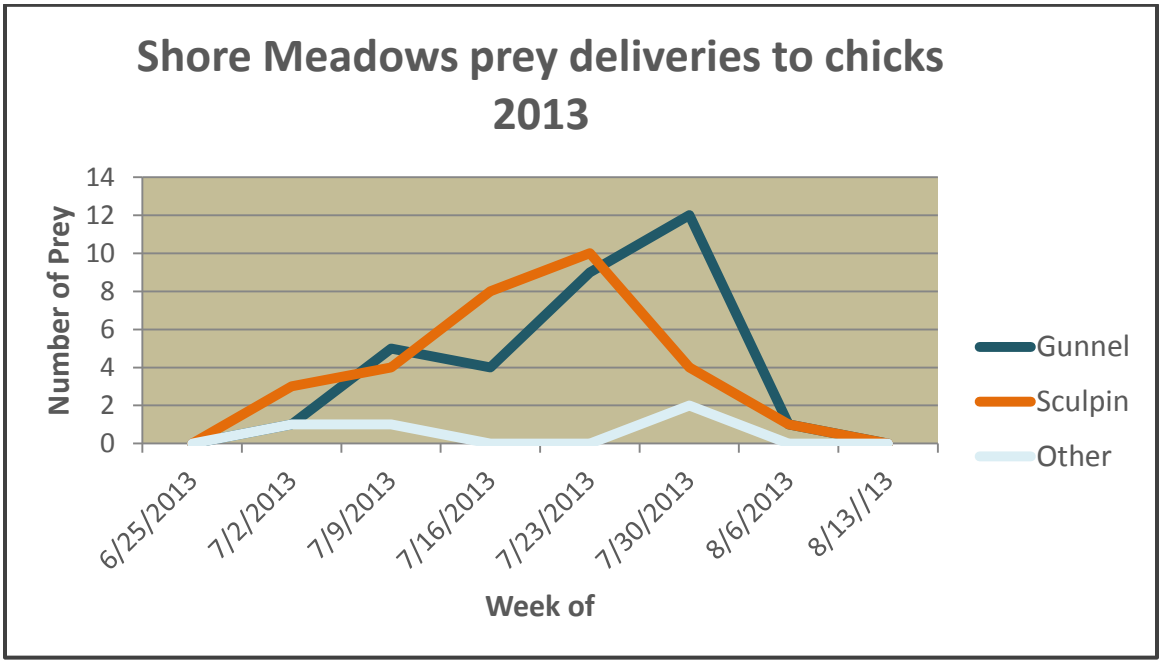

Figure 3. Number of gunnel, sculpin, or "other" prey delivered per day at Shore Meadows

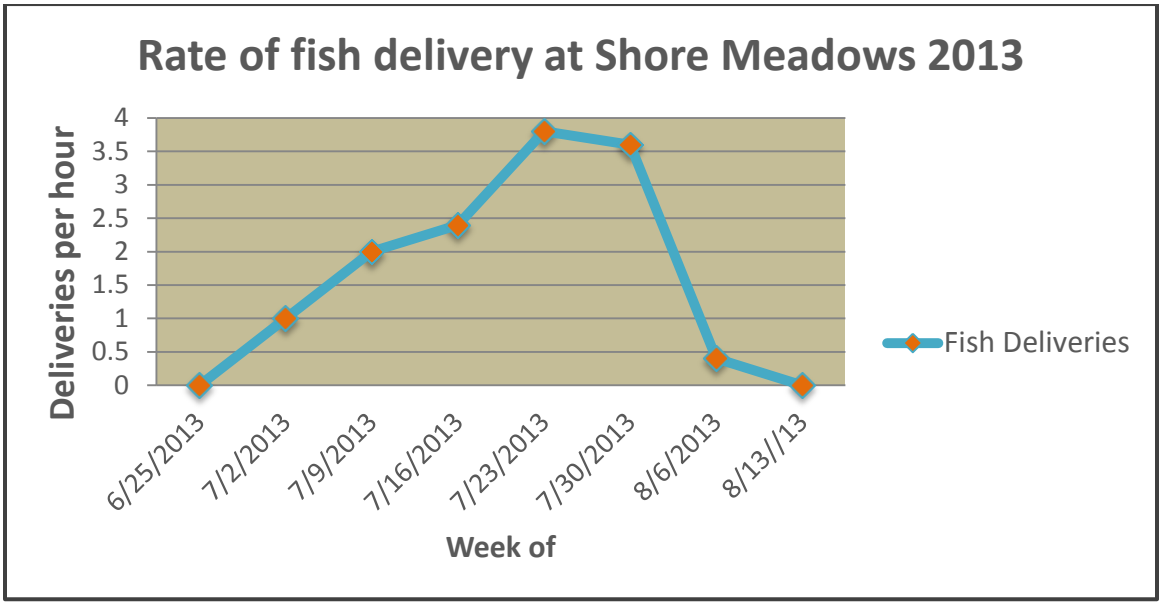

Figure 4. The rate of fish delivered was determined by the ratio of total prey delivered per five hour survey.

2013 Mutiny Sands PIGU prey choice for gunnel was 72%, sculpin 19%, and "other" 9%.

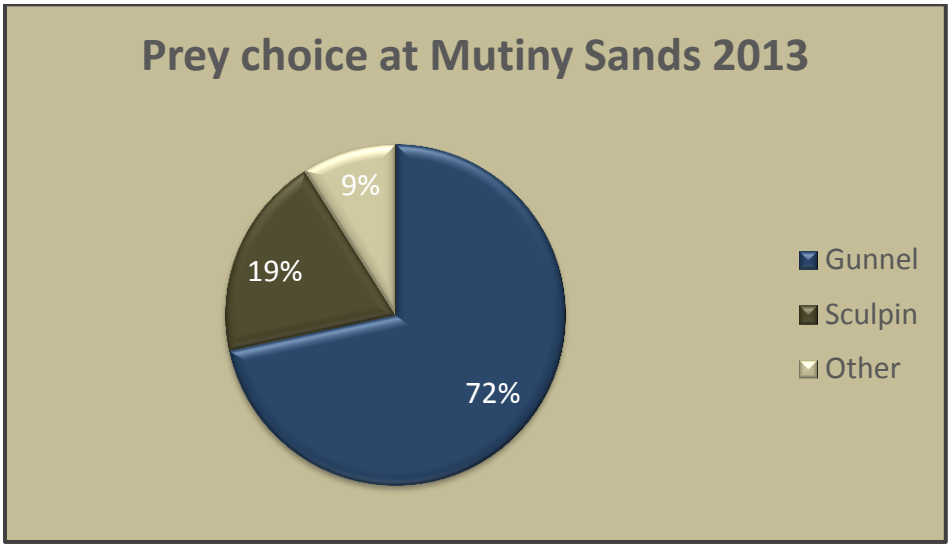

Figure 5. Total percent of prey choice at Mutiny Sands in 2013

At Mutiny Sands, a peak of twenty-nine gunnel were delivered on July 24th. Sculpin deliveries reached a peak of nine on July 17th. "Other" prey stayed consistently low all season topping out at 4 deliveries on August 16th.

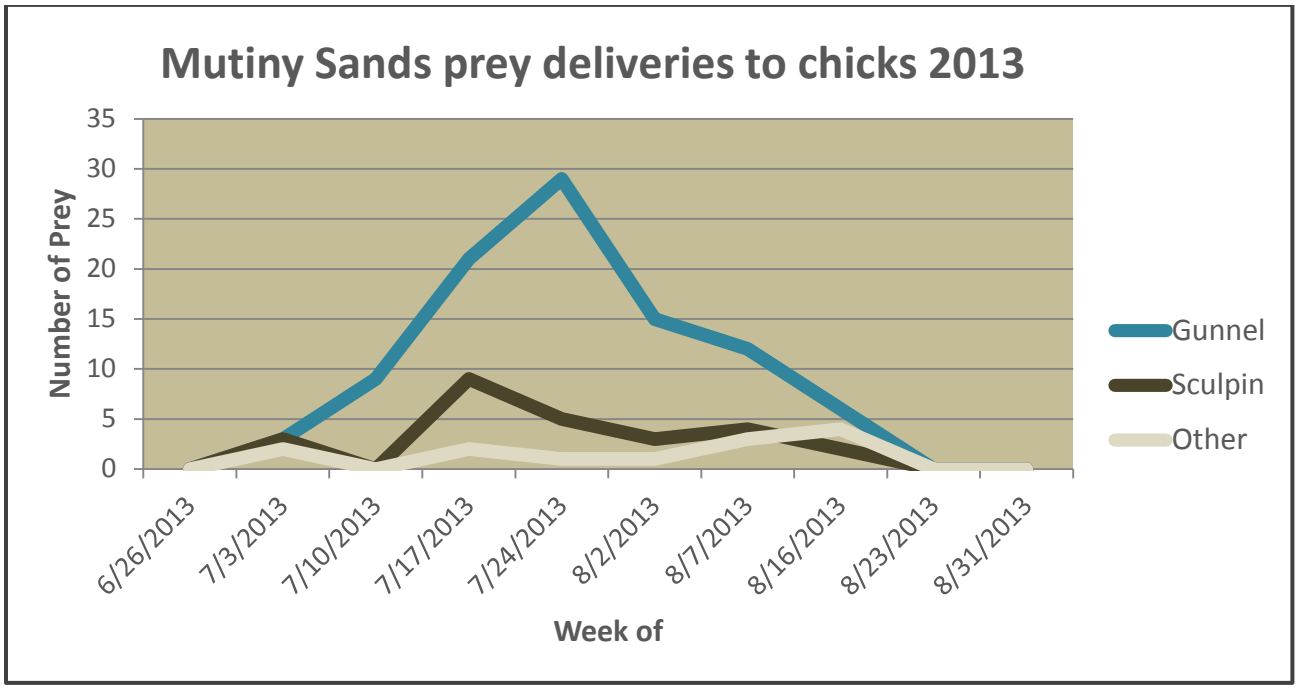

Figure 6. Number of gunnel, sculpin, or "other" prey delivered per day at Mutiny Sands

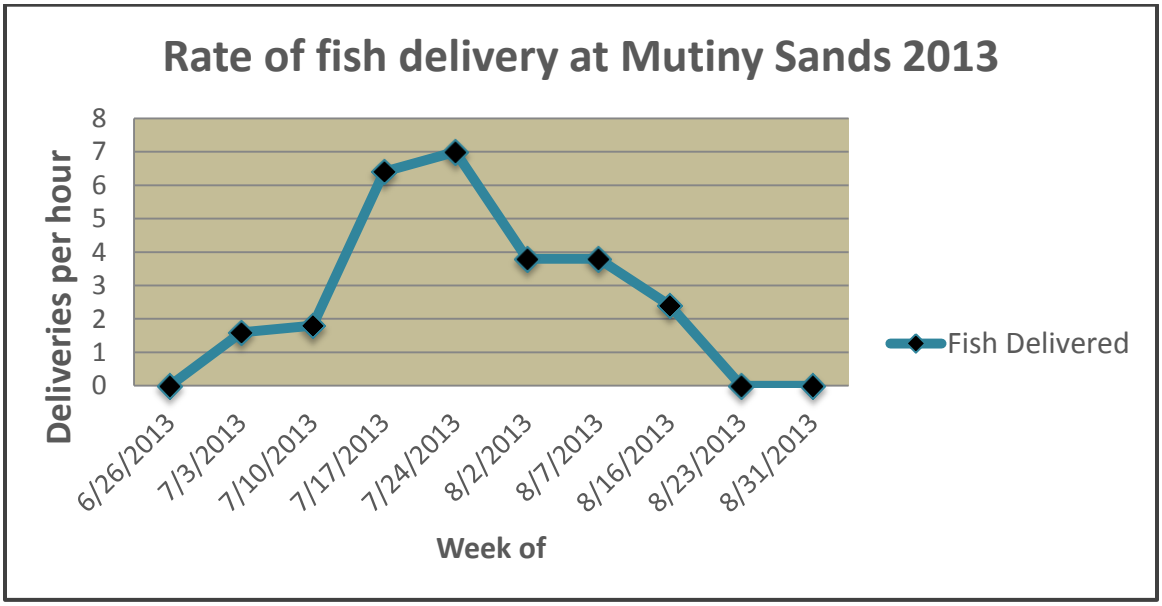

Figure 7. The rate of fish delivered was determined by the ratio of total prey delivered per five hour survey.

At Rolling Hills the preferred prey was gunnel at 63%. Sculpin followed at 32% and "other"at 7%.

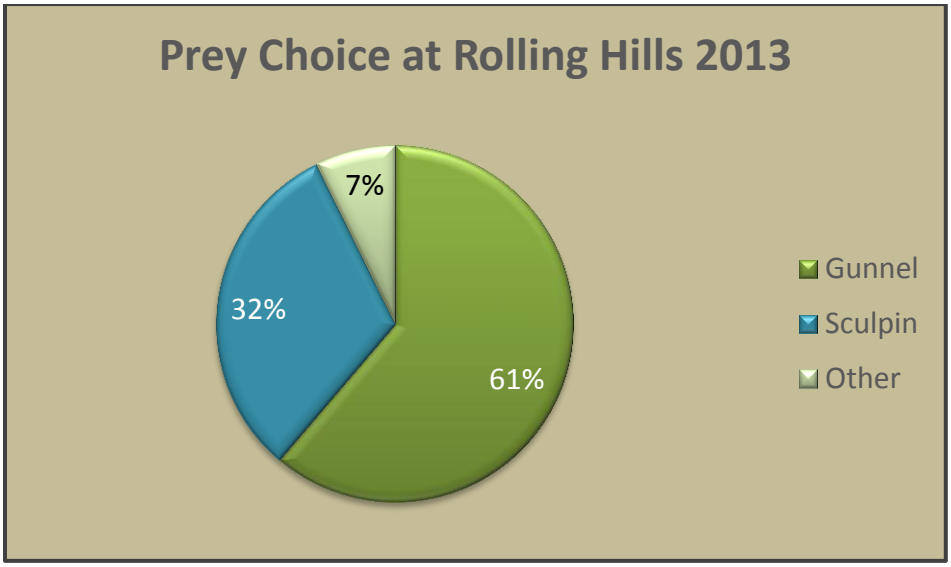

Figure 8. Total percent prey choice at Rolling Hills in 2013

The Rolling Hills colony appears to start the breeding/nesting cycle earlier than the other colonies. Prey deliveries started at a high rate in 2013 similar to 2012. On June 27th, 2013 there were a total of twenty-three gunnel and two sculpin delivered. There is a notable drop in deliveries on July 25th. This drop is due to an incident at the beach where it was unsafe for the contractor to continue monitoring that day. It likely would have been the peak of delivery for this colony

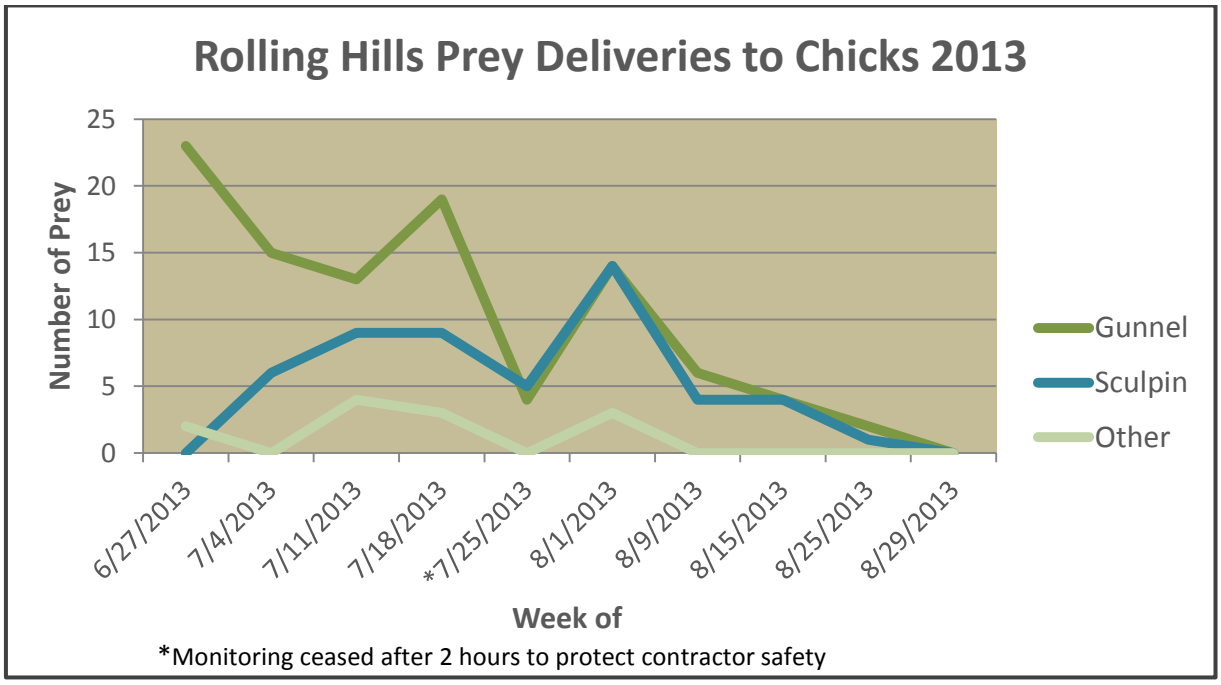

Figure 9. Number of gunnel, sculpin, or "other" prey delivered per day at Rolling Hills

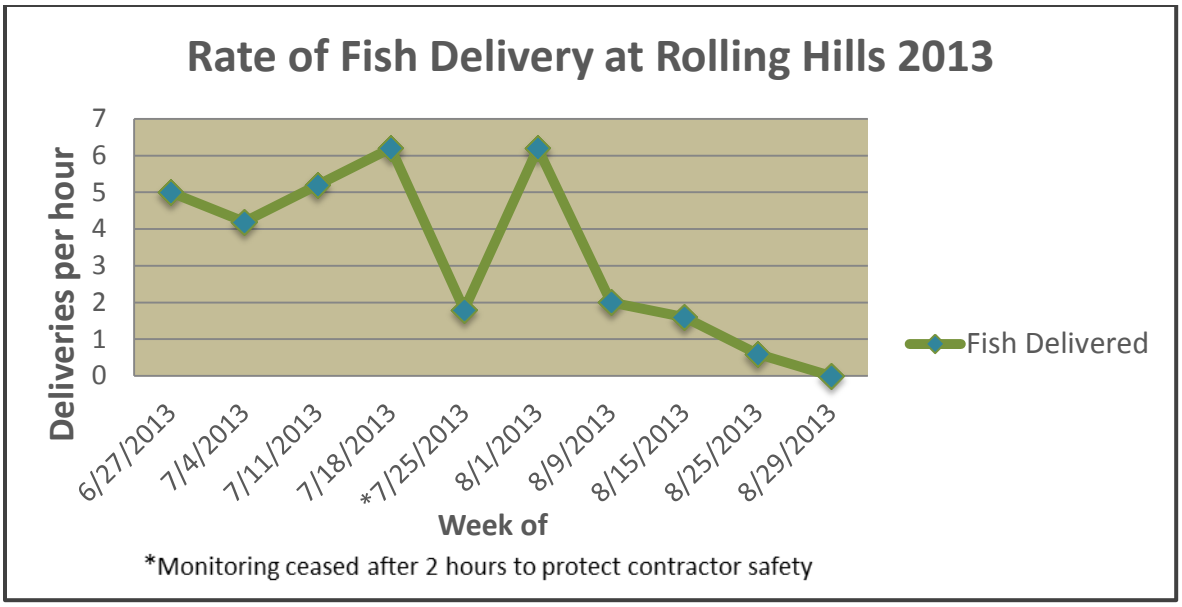

Figure 10. The rate of fish delivered was determined by the ratio of total prey delivered per five hour survey.

Note

On May 12th, 2012 a derelict fishing boat caught fire and consequently sunk in Penn Cove near Coupeville, WA. On board the boat was 8,655 gallons of diesel fuel. The Department of Ecology (DOE) and other local and federal entities were able to recover 3,100 gallons of fuel from the vessels' tank underwater. There was a total of 5,555 gallons that released into the waters of Penn Cove. 4,166 gallons of fuel was recovered from the surface of the water. Total amount of diesel fuel not recovered was 1,389 gallons. Oil sheen was present near the sunken vessel for twenty two days (DOE 2012).

The Department of Ecology had air quality concerns regarding the hydrocarbons released into the air from the diesel fuel. Contact with high concentrations of this substance can cause a variety of health issues. The highest concentration was found near the vessel and DOE does not believe surrounding populations were at risk. A computer model was run by DOE to see where most of the 1,389 gallons went into the local environment. 40% of the fuel was most likely evaporated into the air within 6 hours of reaching the surface. The remaining 60% was likely to have dissolved into the water, where it moved into the local ecosystem including micro-organisms and surrounding shoreline. Another portion of it could possibly have photo-oxidized where it would have degraded into other forms (DOE 2012).

Tests were performed by NOAA (National Oceanic and Atmospheric Administration) on the mussels found in the adjacent area including from the Penn Cove Mussel Farm. The first sampling of mussels was conducted on May 18th, 2012, six days after the incident. Samples were tested for polycyclic aromatic hydrocarbons (PAHs). The result of the first sampling showed 7 parts per million (ppm). By November 13th, the PAH level decreased to less than 3 ppm. By May, 2013 the levels had decreased to 1 ppm which is believed to be a normal value for the Penn Cove area (NOAA 2013).

The Rolling Hills colony was not observably affected by this spill. The actuality of this event is an estimated 60% of the unrecovered 1,389 gallons dissolved into the near-shore environment where PIGU were breeding, nesting, and feeding their young. The experience and knowledge of the departments involved with the cleanup rescued 85% of the total fuel lost. This could have been much worse. This incident demonstrates the importance of baseline studies for comparison following catastrophic events.

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ISLAND COUNTY
MARINE RESOURCES

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WHIDBEY AUDUBON SOCIETY
Protecting Whidbey's Wildlife

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