Yaquina Head Seabird Colony Monitoring
2013 Season Summary

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Project Overview

Yaquina Head Outstanding Natural Area (YHONA) is home to some of Oregons's largest and most publically visible seabird colonies, including over 60,000 Common Murres (*Uria aalge*). The seabird colonies surrounding Yaquina Head present a unique opportunity for research and monitoring given their close proximity to viewing platforms and intensive oceanographic studies of surrounding waters. Additionally, this is one of the most rapidly growing and productive murre colonies on the Oregon coast. YHONA seabird studies are a joint project among Oregon State University, U.S. Fish and Wildlife Service, and the Bureau of Land Management. Summer 2013 was the 7th consecutive year of study by these collaborators. Combined with similar studies conducted by Julia Parrish (University of Washington) at YHONA from 1998 to 2002, we are now developing a much needed time series investigation for the Oregon Coast (currently at 12 years). 2013 was a mixed year in regards to environmental conditions. Following the La Niña influenced 2011, ENSO neutral conditions persisted in 2012 and 2013. The conditions in 2013 started with a mild winter and infrequent storms but also lower than average upwelling winds during April through June, similar to the conditions during 2007 and 2009. Observations of bottom water offshore from the Yaquina Head colonies were the saltiest and second coldest since 1997, and the lowest dissolved oxygen readings since 2005. There was also an unusual krill mass stranding observed on June 15-18, 2013 extending from Newport, Oregon to McKinleyville, California. Therefore, these continue to be interesting years to capture seabird responses to environmental variability on the central Oregon coast.

In general, we are interested in how seabird breeding chronology, reproductive success, diet, and foraging activities are affected by changing ocean conditions. Furthermore, we wish to quantify the effects of bald eagles and other sources of predation on or disturbance to seabirds during the breeding season. At YHONA, we monitored 12 plots on Colony Rock and Flattop Rock (Fig. 1) throughout the breeding season (April-August). Within these plots, we closely observed breeding birds (Fig. 2), watching and recording when eggs were laid and then following the success of each breeding pair through egg incubation and chick rearing. Simultaneously, we watched for disturbances to the breeding colony and recorded the frequency, duration, and consequences (e.g., loss of eggs or chicks) of these events. For prey identification, we used a digital camera and spotting scope (digiscoping; Fig. 3) to photograph fish in the bills of murres returning to the colony. This information allows us to analyze the birds' diet and provide information about foraging conditions and link to oceanographic investigations adjacent to these seabird colonies. We also conducted observations to estimate the time elapsed between chick feeding events, which can be used as a proxy for prey availability near the colony.

Results

In 2013 we logged 200 hours during 62 days of observations between 20 May and 8 August (Table 1). Common Murre chicks were first observed on 24 June and **median hatch date was 4 July, similar to some previous years but a week later than we observed in 2012.** Colony Rock and Flattop Rock were again relatively synchronous in median hatch date (Colony = 4 July, Flat Top = 2 July). Among plots, only 41% of the eggs laid hatched a chick (hatching success) and 24% of the eggs laid produced chicks

that fledged (reproductive success; chicks ≥ 15 days were considered fledged; Table 1). **Reproductive success in 2013 was similar to 2011 and 2012, but less than half of the previous 4 years (2007-2010, Table 1) and the third lowest recorded for this colony during 12 years of data collection**. Only the reproductive success in 2010 and during the very strong 1998 El Niño were slightly lower**.**

Like the previous two seasons, much of the reproductive loss in 2013 was due to egg and chick predators. The total number disturbances and the rate of murre egg and adult loss in 2013 were lower than the previous two years but higher than 2007-2010. Disturbance rates first began to increase in 2010, and then greatly escalated in 2011 and 2012. **In contrast, disturbances in 2013 were lower, particularly rates of egg and chick loss which were markedly less than the past two years (Table 1). The rate of adults killed per hour of observation was similar to those observed in both 2011 and 2012. Bald Eagles (*Haliaeetus leucocephalus*) were again the dominant disturbance source (Fig. 5, 93%, 75 of 80 disturbances), unlike in 2012 when bald eagles caused only half of the disturbances (47%, 104 of 220 disturbances).** Also in contrast to previous years, disturbances in 2013 were concentrated on Flat Top Rock rather than Colony Rock. A large group of sub-adult eagles was commonly observed roosting on the southern end of the headland, near Flat Top Rock, and the frequent disturbances to Flat Top resulted in a near total reproductive failure for those plots (reproductive success = 0.03 ± 0.03 SE). Unlike in 2012, there were no dramatic disturbances caused by brown pelicans, and pelicans were not observed landing on the colonies until the majority of murres had fledged. During nearly 200 hrs of observation, we witnessed 80 disturbance events where a minimum of 275 eggs, 40 chicks, and 33 adult murres were taken (Table 1).

Murre diets have varied annually. Preliminary results of forage fish species consumed in 2013 included smelt (Osmeridae) and secondarily Pacific herring or sardine (Clupeidae) and Pacific sand lance (*Ammodytes hexapterus*) (Fig. 6). Since we focus our diet data collections on Flat Top rock, the total failure of Flat Top about half way through chick rearing provided an added challenge for diet data collection this year. We were still able to collect sufficient samples by making observations of birds returning to Colony Rock, but the longer distance between our observation point and the birds reduced the quality of the photos. **A notable difference in diets among the past six years was the dominance of sand lance in 2008, and the dominance of smelt in 2010, and the increased consumption of flatfishes in 2011. Preliminary results show 2013 as intermediate in composition among these years, with smelts comprising about half the diet.**

For a fourth year we also conducted chick provision rate watches. Typically, we conduct four per year throughout chick rearing, and we were able to complete all four watches in 2013. Observers recorded the frequency that adult murres were delivering food to chicks at selected nests. Chick feeding rates (also foraging trip duration) are a good overall measure of food availability and will be a valuable metric to compare among years. We also collected feathers of beach-cast murre chick carcasses for stable isotope analyses of diet composition and nutrient sources. Interesting patterns are developing from analyses of these data that we look forward to reporting on.

We analyzed video from remote colony cameras collected during the previous breeding season in 2012. We collected daylight video of Colony Rock at Yaquina Head

on 83 out of 95 possible days between 26 April – 30 July. On these days, 1134 usable hours (90% of total hours) of video were analyzed for disturbance events. Altogether 219 disturbances were recorded, with a rate of 0.2 disturbances per hour. Of the total number of disturbances, 138 were caused by bald eagles, 27 by turkey vultures, 11 by California brown pelicans, one by a peregrine falcon, 38 by unknown reasons, and four by other causes. On average 29% (range 1-100%) of Colony Rock cleared per disturbance event. The video also contained images of the Japanese tsunami dock passing Yaquina Head before landing on Agate Beach in 2012 (see news stories below).

Bald eagles were by far, the dominant cause of disturbances to the common murre breeding colony at Yaquina Head in 2012. A maximum of three bald eagles were observed causing a single disturbance, with an average of 0.8 eagles per disturbance. Adult bald eagles (n=139) and sub-adult bald eagles (n=9) both caused disturbances, either alone or in combination over the course of the season. Statistical tests are being conducted to determine whether there are regional differences in the impacts of predators on murre breeding colonies. Preliminary results suggest the number and rate of bald eagle disturbances at Yaquina Head differed from sites studied on the north and south coast of Oregon during the 2012 breeding season.

We deployed a time lapse camera at Yaquina Head in 2013 as a pilot study. We were primarily interested in conducting proof of concept testing this year, and were generally pleased with the durability of the system and quality of the photographs. We hope to employ similar time lapse cameras both at Yaquina Head and other locations to collect a wide variety of demographic and diet information.

Summary and Future Directions – Project Integration

Murre diets over the past few years reflected more warm water associated smelt in 2010 vs. cooler water associated sand lance (and fewer smelt) in 2011, which is consistent with El Nino vs. La Nina influenced summers, respectively. During both 2012 and 2013 the El Nino conditions were neutral, and the diets also reflected an intermediate proportion of prey species and both years were relatively similar in murre diet composition. We continue to see shifting dynamics between murres and eagles, along with secondary predators. It is unclear why the predation activity was lower this year compared to the past two years, whether this decrease is temporary or represents a change in the previous trend. It may be that the cause(s) leading to increased predator activity at seabird colonies in 2011 and 2012 were larger, regional-scale factors affecting predator distribution or their alternative prey. It is unknown whether the decrease in predation in 2013 was widespread throughout the region, or a more local shift that affected just central coast seabird colonies. We hope to also investigate these new questions in the coming years.

We will continue at least a portion of the study in 2014 with the ultimate goal of continuing long-term monitoring at Yaquina Head. We will continue to explore using remote cameras for data collection and with the extension of fiber optic cables to the headland in the near future we will evaluate possibilities to connect field cameras to the internet. This would enhance both our data collection opportunities and provide an excellent public education and outreach tool.

Long-term research and monitoring efforts at YHONA are becoming increasingly valuable to oceanographic research and monitoring off Oregon, such as the Newport Hydrographic Line (sampled twice monthly at stations 1-25 nm offshore) and a wide

array of other research conducted by NOAA Fisheries and Oregon State University, including the planned cabled ocean observing system offshore of Yaquina Head

In the News

Tsunami Dock:

KMTR - http://www.kmtr.com/news/local/Before-it-was-famous-File-video-shows-Agate-Beach-tsunami-dock-afloat-216085721.html
Yahoo News - http://news.yahoo.com/footage-tsunami-dock-found-202545344.html
Live Science - http://www.livescience.com/38303-japan-tsunami-dock-new-footage.html
Phys.org - http://phys.org/news/2013-07-student-tsunami-dock-video-year.html
OSU Press Release – http://oregonstate.edu/ua/ncs/archives/2013/jul/osu-student-researcher-discovers-floating-tsunami-dock-video-one-year-later%E2%80%A6
HMSC Blog - http://blogs.oregonstate.edu/currents/2013/07/18/osu-student-researcher-cheryl-horton-discovers-floating-tsunami-dock-on-video-one-year-later/
OregonCoastDailyNews.com - http://oregoncoastdailynews.wordpress.com/2013/08/06/tsunami-dock-discovered-in-video/
News Times - http://www.newportnewstimes.com/v2_news_articles.php?heading=0&story_id=40056&page=72
The Oregon Herald - http://www.oregonherald.com/news/show-story.cfm?id=377608&Science-News=New-Footage-of-Tsunami-Dock-Found.htm
Cape Meares News – http://www.topix.com/city/cape-meares-or

Bald Eagle and Common Murre interactions:

OSU News Release: http://oregonstate.edu/ua/ncs/archives/2013/aug/bald-eagles-increasing-impact-murre-colony-yaquina-head
KGW.com Portland Local News: http://www.kgw.com/news/local/Bald-eagles-threaten-seabirds-on-Oregon-coast-220285601.html
HMSC: http://hmsc.oregonstate.edu/
CBNB.com: http://cbnb.info/index.php/Coastal-News/eagles-vs-murres-on-central-oregon-coast-aug-20.html
KEX : http://www.1190kex.com/articles/portland-local-news-123543/growing-number-of-bald-eagles-find-11588198/
Newport News Times: http://www.newportnewstimes.com/v2_news_articles.php?heading=0&story_id=40252&page=79
COASST Blog: http://blogs.uw.edu/coasst/tag/murre/

Acknowledgements

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Table 1. Preliminary summary metrics from studies of Common Murres at the Yaquina Head colony, 2007-2013.

	Observation			Hatch Date					Predation Rate # per hour[c] (total #)		
Year	Hours	Days	# plots	1st	Med	Hatching success[a]	Reproductive success[b]	# disturbances	Egg	Chick	Adult
2007	149	30	11[d]	6/20	6/27	0.70 (± 0.05 SE)	0.54 (± 0.07 SE)	23	0.21 (32)	0.00 (0)	0.06 (9)
2008	117	35	11[d]	6/10	6/23	0.86 (± 0.04 SE)	0.77 (± 0.05 SE)	20	0.21 (25)	0.00 (0)	0.04 (5)
2009	140	53[f]	10[e]	6/17	6/24	0.86 (± 0.03 SE)	0.77 (± 0.04 SE)	27	0.36 (50)	0.00 (0)	0.04 (6)
2010	223	56	11[d]	6/24	7/8	0.87 (± 0.04 SE)	0.68 (± 0.04 SE)	20	1.07 (239)	0.04 (10)	0.00 (0)
2011	372	79	11[d]	6/28	7/8	0.36 (± 0.07 SE)	0. 22 (± 0.05 SE)	186	2.78 (1034)	0.38 (142)	0.19 (70)
2012	264	53	12	6/25	6/28	0.46 (± 0.09 SE)	0.27 (± 0.06 SE)	220	2.69 (710)	1.16 (305)	0.17 (46)
2013	200[g]	62	12	6/24	7/4	0.41 (± 0.09 SE)	0.24 (± 0.09 SE)	80	1.47 (275)	0.22 (40)	0.18 (33)

[a]Chicks hatched per eggs laid (mean among plots)

[b]Chicks fledged (≥15 days old) per eggs laid (mean among plots)

[c]Total # observed taken/total # observation hours

[d]Two adjacent plots (CR5 & CR6) were combined because of a low number of visible eggs to follow

[e]Two sets of adjacent plots (CR2 & CR3, CR5 & CR6) were combined because of a low number of visible eggs to follow

[f]Thick fog limited observations to very short time periods or prevented observations altogether during some days in July – much more so than in previous years.

[g]Observation hours for disturbance were lower (186 hours, 58 days) because a data book was lost in the field and could not be recovered.

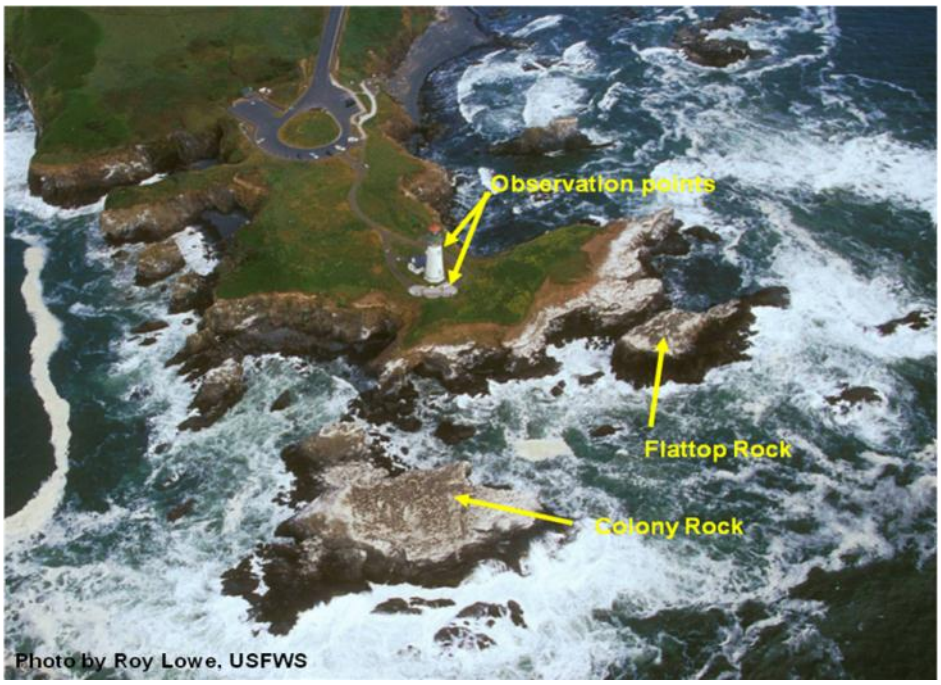

Figure 1. Study plots on Colony and Flat Top Rocks.

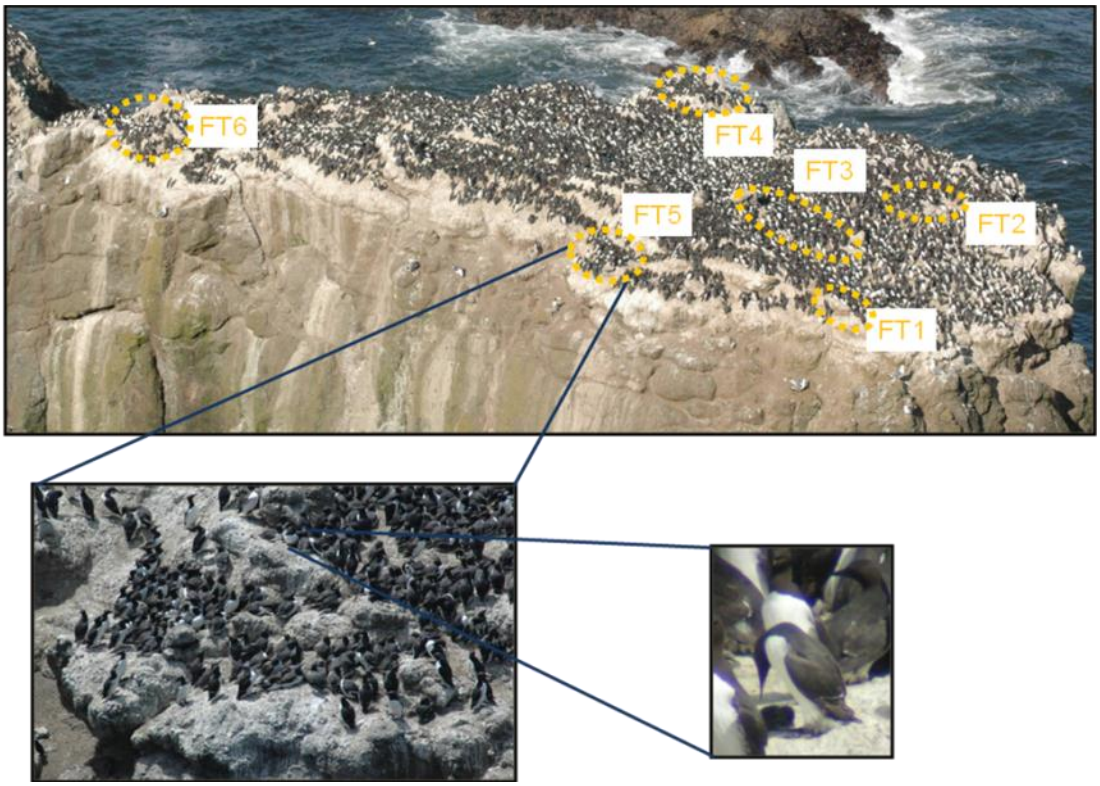

Figure 2. Close-up of Flat Top Rock, plot #5, and an adult with a young chick

Figure 3. Digiscoping techniques for photographing and identifying forage fish delivered by adult murres to feed their chicks on the colony.

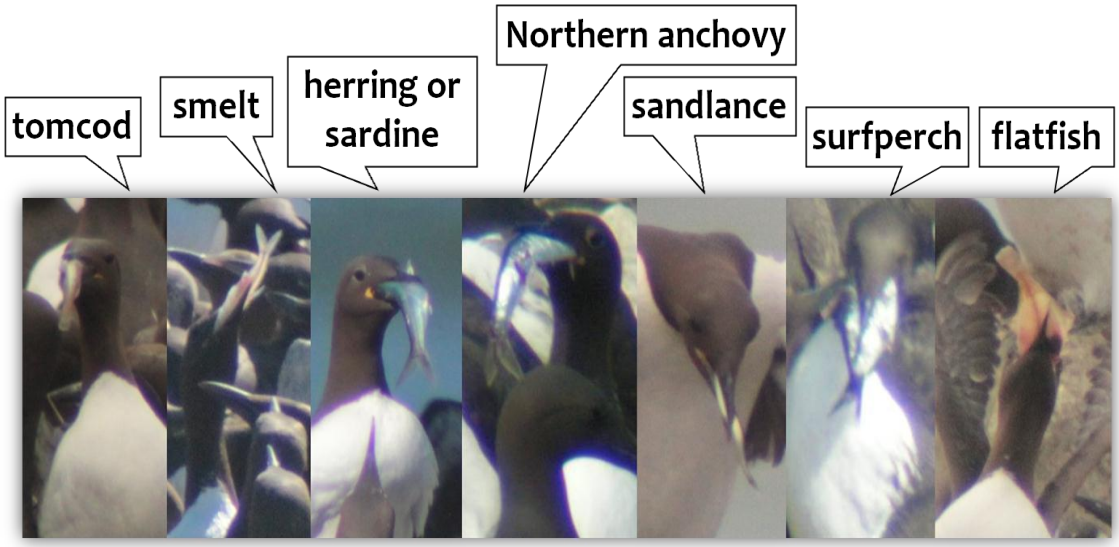

Figure 4. Prey photos taken from the observation deck at the base of the lighthouse.

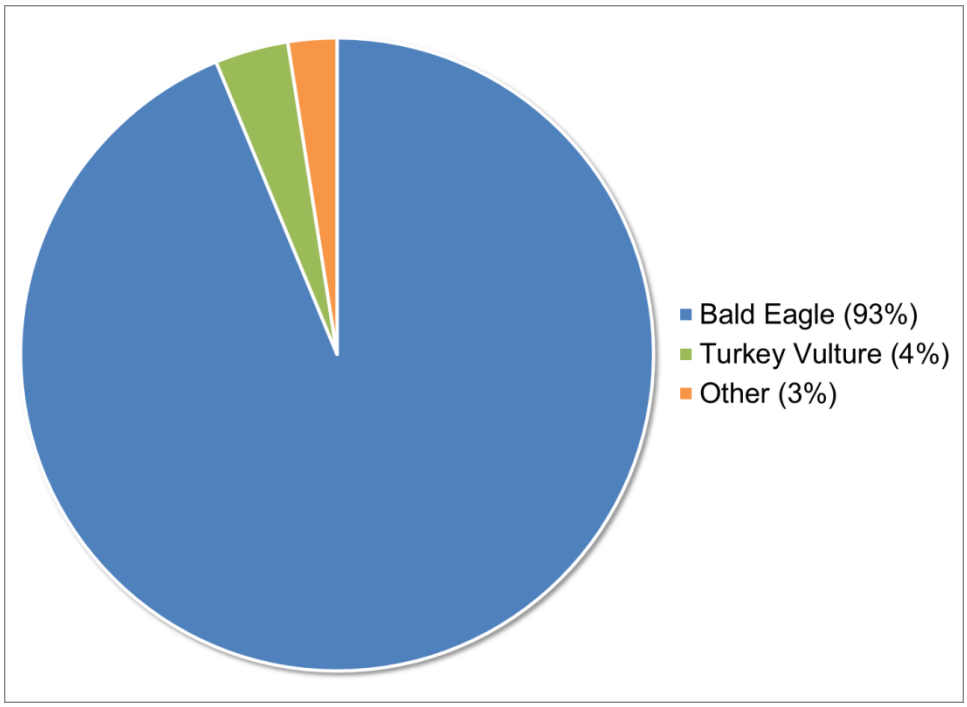

Figure 5. Sources of disturbance to Common Murres at Yaquina Head in 2013. A total of 80 disturbances were recorded.

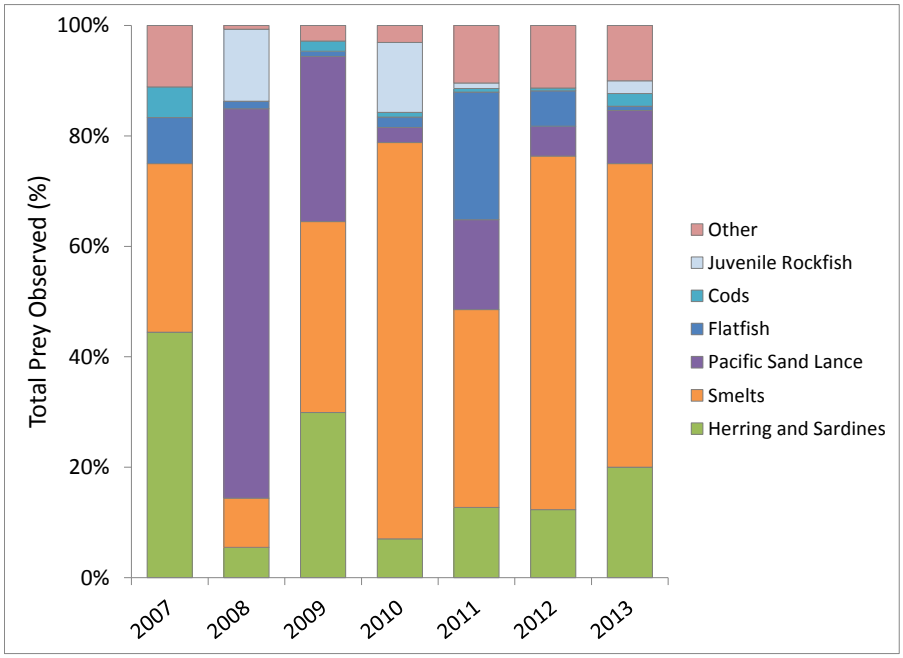

Figure 6. Diets of Common Murres (% occurrence) during 2007-2013. Diet in 2008 stands out as a remarkable year for sandlance, 2010 diets had a remarkably high percentage of smelts and unusually high amount of juvenile rockfish, 2011 is notable for an increased consumption of flatfish, and preliminary data show 2013 as more intermediate with smelts comprising about half the diet.