Predator Diet Indicators Project

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Summary

In the California Current, forage fish have been identified as a key link between lower and upper trophic level species and changes at the forage fish level may signal more widespread changes in the ecosystem. It may be possible to track these food web changes using diet and fitness parameters of mid- to upper-trophic level predators, including Chinook salmon. Our study will examine a suite of potential indicator species, evaluating the utility of single and multi-species indicators of ecosystem-wide responses to changes in oceanographic conditions. The stomach samples collected by Project CROOS fishermen will be analyzed alongside stomachs of coho salmon, black rockfish, and halibut collected by recreational and charter vessels. Studies in other regions have shown the diets of predatory fish and seabirds to signal seasonal and interannual change in forage fish. Managers in some regions have already incorporated predator diet information into their management strategies; diets of seabirds and predatory fish have been used in central California to establish a multivariate index of forage fish abundance.

Collecting diet samples in collaboration with local fishing fleets will greatly enhance our knowledge of how changes in ocean conditions affect forage fish predator-prey populations. While this approach is no replacement for scientific net sampling, it is a highly valuable supplement al effort and has the potential to greatly augment traditional efforts by providing data on forage fish populations that is less expensive to obtain, with more frequent sampling, over a much broader geographic scale. The ease of sample collection and analysis in our study design could provide a model for middle-trophic level ecosystem monitoring efforts throughout the California Current Large Marine Ecosystem.

Progress

→ Stomach contents for the majority of Chinook stomachs collected in 2006 have been identified in the lab (by Dr. Laurie Weitkamp, NOAA), and will inform further analysis.
→ Seabird diet information has been gathered at Yaquina Head (in collaboration with Dr. Julia Parrish, University of Washington) for seven years (1999-2002, 2007-2009).
→ Seabird reproductive success data has been gathered for eight years (in collaboration with Dr. Parrish; 1998-2002, 2007-2009).
→ Expanded sampling strategy has been developed to include additional species (coho, black rockfish, halibut) during the 2010 & 2011 seasons.

Results to Date

→ A comparison between the Chinook stomachs collected in 2006 and the seabird diet shows dietary overlap.
→ Seabird diets are highly correlated with other ocean ecosystem indicators, like Bill Peterson's copepod indices, NOAA's multivariate El Nino/Southern Oscillation Index, and coastal upwelling index.

Future Actions

→ We will expand diet sampling to include Chinook, coho, black rockfish, halibut and common murre diets during 2010.
→ Field crews will collect common murre diet and reproductive data at Yaquina Head.
→ A summer intern from the National Science Foundation's Research Experience for Undergraduates (NSF REU) program will work with Oregon State University scientists in Newport to examine dietary preferences and prey quality of one of the focal predator species.
→ We will evaluate the feasibility of expanding predator diet sampling to additional ports in future years.

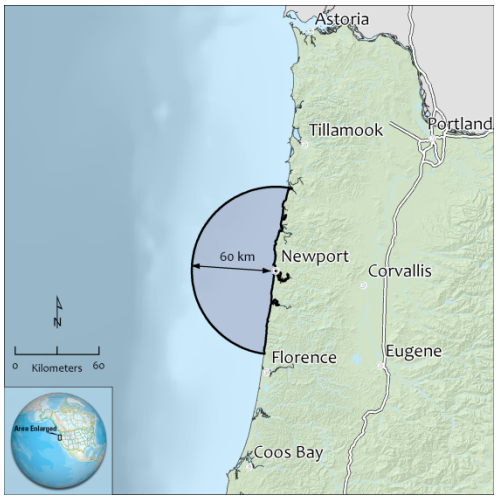

Figure 1. Since common murres nesting at Yaquina Head could be foraging up to 60 km away to feed their chicks, fish stomach sampling will be focused on fish landed in Newport, Oregon.

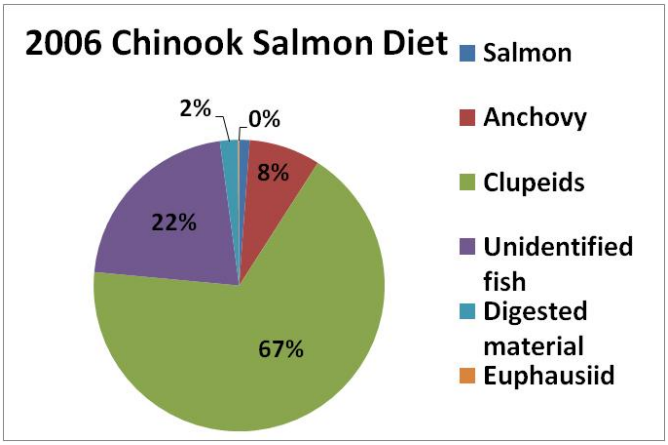

Figure 2. Stomach contents of Chinook salmon collected in 2006 show overlap with common murre in important prey items, such as Clupeids (herring, sardines).

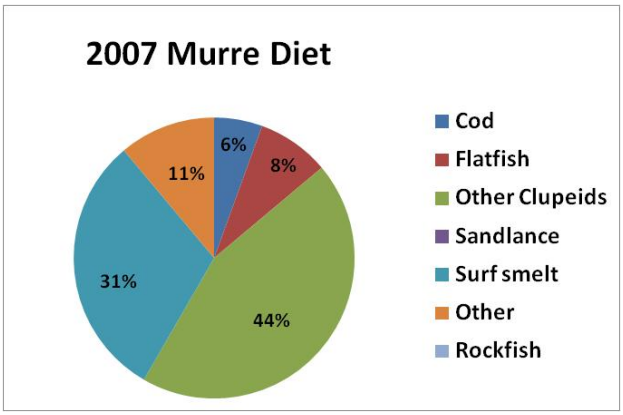

Figure 3. Common murre diet from 2007 shows overlap with Chinook salmon.

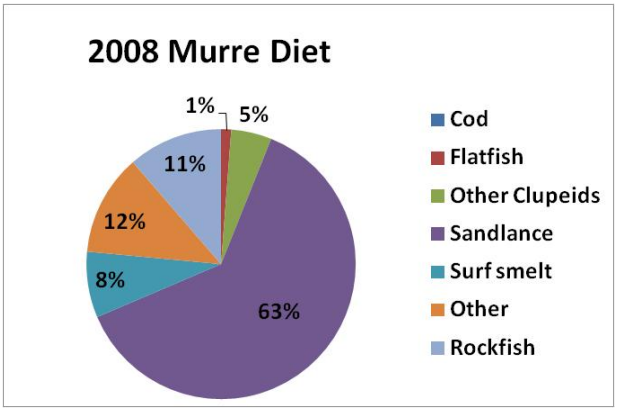

Figure 4. Common murre diet from 2008 shows inter-annual variability in diet, which suggests differences in available prey species composition.