

Combining seabird diet, acoustics, and ecosystem surveys to assess forage fish

Jaime Jahncke
jjahncke@pointblue.org

The abundance and distribution of Northern anchovy (*Engraulis mordax*) and young of the year (YOY) rockfish (*Sebastes* spp.) are critical for seabirds, mammals, and predatory fish within the California Current Ecosystem. Traditional detection and quantification of forage fish by trawling can be time consuming, expensive, and limited to a few trawl locations.

In an effort to improve sampling of forage fish with higher resolution, we combined seabird diet and hydroacoustic surveys to quantify anchovy schools and YOY rockfish between 2004 and 2015.

For the hydroacoustic surveys, we developed new methods to identify anchovy schools and individual YOY rockfish. We used lengths of fish consumed locally by three piscivorous seabirds to estimate appropriate acoustic signals.

These acoustics indices of forage fish were significantly correlated with abundance catches from trawl data

collected by a separate survey, as well as with relative abundance estimated from breeding seabird diet data from the Farallon Islands. Inter-annual and seasonal indices of forage fish indicated strong anchovy occurrence during 2004–2008 and increased YOY rockfish from 2011 to 2015.

These observations confirm previously described changes in upwelling and forage fish variability off central California. Importantly, these results validate the use of acoustics to assess anchovy and YOY rockfish in the region, and provide new information on the vertical and cross-shelf distribution of anchovy schools. Combining acoustic methodologies with trawl data and predator diet can improve understanding of distribution and temporal variability of forage fish species to benefit conservation of top marine predators.

Main Points

This study presents new methods to quantify anchovy schools and YOY rockfish using hydroacoustic surveys.

Acoustics indices of forage fish were highly correlated with trawl catches and seabird diets.

This approach provides new information on the vertical and cross-shelf distribution of forage fish to inform management

Thayne, M.W., J.A. Santora, B. Saenz, P. Warzybok, J. Jahncke. 2018. Combining seabird diets, acoustics and ecosystem surveys to assess temporal variability and occurrence of forage fish. *Journal of Marine Systems* (2018), <https://doi.org/10.1016/j.jmarsys.2018.08.006>