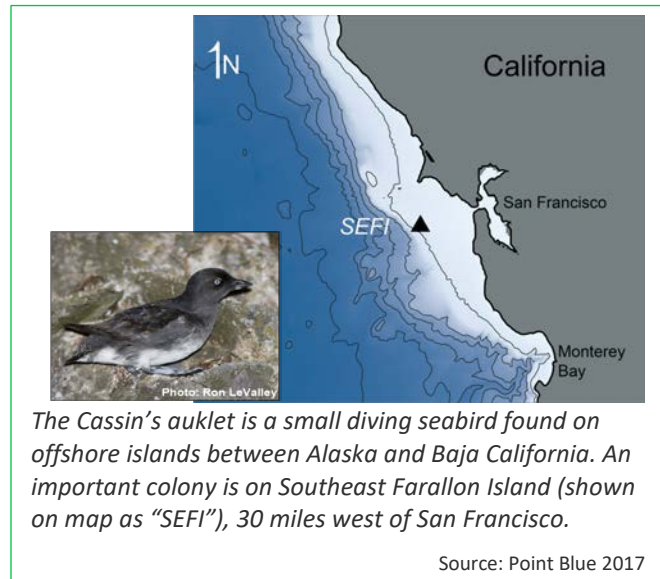


Cassin's auklet breeding success

Over a 45 year period, the breeding success of this seabird on the Southeast Farallon Island near San Francisco has become more variable. Breeding success is closely linked to the availability of their prey which is affected by ocean conditions.



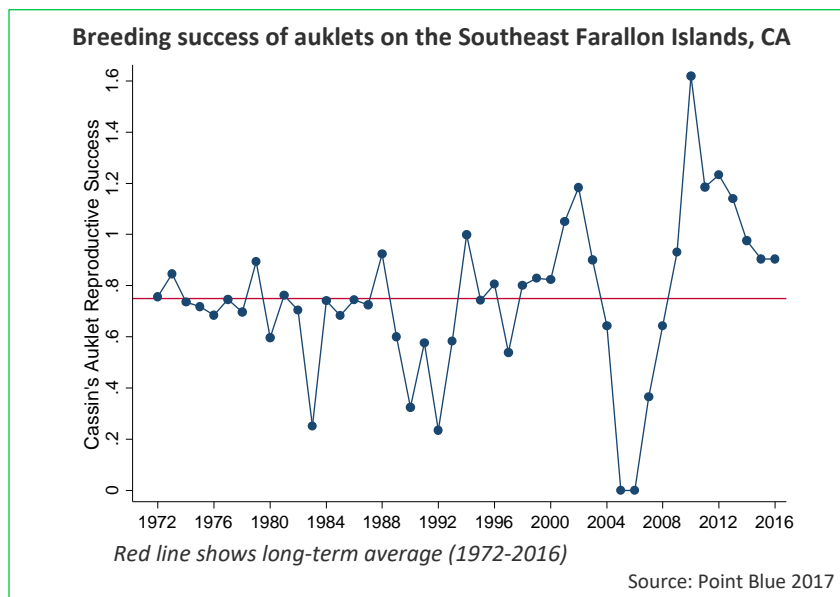
The breeding success of Cassin's auklets (*Ptychoramphus aleuticus*) in study sites on Southeast Farallon Island off San Francisco has become increasingly variable over time. Ocean warming and other forms of marine climate change are affecting the coastal food web, especially krill, which is a major food not only for seabirds, but also for salmon and other fish, and whales and other mammals. As one of the most conspicuous members of the marine ecosystem, seabirds are useful as indicators of food web changes.



What does the indicator show?

The graph below shows that breeding success – defined as the average number of offspring produced per year per breeding pair of Cassin's auklets – varied year-to-year over the period between 1972 and 2016. Breeding success declined slightly until about 1992 and increased afterwards. Recent years show increasing year-to-year variability: breeding success was three times more variable during the last 15 years compared to the first fifteen years studied.

Cassin's auklets lay one egg per breeding attempt, but can regularly lay a second egg after successfully fledging the first chick. This allows a population to produce an average of more than 1.0 chick per pair in exceptionally good years. There have only been six years when this population exceeded this threshold, all since 2000.





Why is the indicator important?

Changes in auklet breeding success may be part of a larger pattern of changes in the marine ecosystem. Seabirds respond to changes in the availability and quality of krill, their main prey. Seasonal, wind-driven upwelling processes off the California coast influence the productivity of the marine food web. Upwelling brings deep, nutrient-rich waters to the surface. These nutrients are vital to the growth of plankton, which form the base of the marine food chain. Ocean warming may reduce the efficacy of upwelling.

Auklet breeding success can serve as a signal of changes in ocean conditions. Years when the Cassin's auklet breeding success were high coincided with years when the krill species they feed on were abundant. The seabirds' breeding success has also been associated with salmon abundance, suggesting the effect of krill abundance on populations of other important species in the Pacific Ocean.



Krill are small (about 5 to 6 centimeters) shrimp-like crustaceans found throughout the ocean. Near the bottom of the food chain, they feed on phytoplankton and smaller zooplankton.

Photo: NOAA



Farallon National Wildlife Refuge

Photo: U.S. Fish and Wildlife Service

For more information about this and other climate change indicators, visit:

<https://oehha.ca.gov/climate-change/report/2018-report-indicators-climate-change-california>

