

State of the Estuary Report 2015

Summary and Technical Information

PROCESSES – Feeding Chicks: Brandt’s Cormorant

Note: for Herons and Egrets, please see the combined Technical Appendix in
WILDLIFE – Herons and Egrets

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Ecological Processes: Brandt's Cormorant Reproductive Success Indicator

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Brandt's Cormorant Reproductive Success Indicator.

Brief description of indicator and benchmark; background

The indicator is the number of fledged young produced per breeding pair at the breeding colony on Alcatraz Island, in San Francisco Bay. The indicator provides a measure of the health of the aquatic foodweb in San Francisco Bay estuary. Brandt's Cormorants are piscivorous, and the reproductive success of breeding pairs reflects availability of food for the young. This indicator is distinguished from the heron and egret food web indicator in that cormorants reflect the more open-water, pelagic Bay food web, while the wading birds reflect more shallow-water and wetland food webs.

The indicator has been studied on Alcatraz Island since 1995. A comparable time series has been collected at the Brandt's Cormorant colony on the Farallon Islands since 1972. The specific calculation used is the mean for the most recent 3 years. We compare that value to the reproductive success required to maintain a stable population, which is the benchmark criterion for Good. If the indicator value exceeds the latter, the indicator is scored Good. The criterion for Poor was 60% that of Good. If the indicator is below the benchmark criterion for Poor the criterion is scored Poor.

Indicator status and trend measurements

Whereas the indicator exhibited a recent decline, in the two most recent years (2013, 2014), the indicator has shown a sharp rebound. As a result, there is no significant ($P > 0.05$) linear trend. The most recent three year-mean is 1.67; therefore, the indicator is scored Good.

Brief write-up of scientific interpretation

What is this indicator?

The indicator is the number of fledged young produced per breeding pair at the breeding colony on Alcatraz Island, in San Francisco Bay. This colony has been studied since 1995 (Robinson et al. 2014) using standardized focal site surveys, comparable to studies conducted on the Farallon Islands (Nur and Sydeman 1999a).

Why is it important?

There are two essential reasons for tracking and evaluating the reproductive success of the Brandt's Cormorant in San Francisco Bay. Above all, this metric provides a reliable index of

prey availability for foraging seabirds in the bay, and thus provides an indicator of functioning of the aquatic foodweb in the bay. Brandt's Cormorant are piscivorous (Ainley and Boekelheide 1990), and, moreover, are apex marine predators. That the ability of parent birds to adequately feed their chicks is a good measure of prey availability has been well established through numerous studies, including long-term studies on the Farallon Islands nearby (Nur and Sydeman 1999a). Secondly, success at rearing chicks is a requirement for healthy, self-sustaining populations (Nur and Sydeman 1999b).

What is the benchmark? How was it selected?

The benchmark for Good is the level of reproductive success that produces a stable population (given what is known regarding all other relevant demographic parameters). On the basis of calculations in Nur & Sydeman (1999), this value is 1.50 chicks fledged per breeding pair. The criterion for Poor is 60% that of Good. Thus, a reproductive success below 0.90 chicks per pair is the criterion for Poor. Reproductive success below 0.90 chicks for an extended period of time would have marked population consequences. We note that three recent years (2009, 2010, 2012) were below the Poor benchmark value.

Status and Trends

The most recent three-year mean is 1.67 young fledged per pair, which is scored Good. In fact, the most two recent years (2013, 2014) were 2.3 and 2.1 young fledged, respectively, which is in the top half of all results, whereas 2012 was an especially low value. Thus, after a four-year period of moderate to low reproductive success, Brandt's Cormorant success appears to have fully rebounded.

An earlier linear declining trend (through 2012) has been partially reversed; over the entire period 1995-2014 there was no significant linear trend.

Significance/Interpretation

Starting in 2008, Brandt's Cormorants displayed a declining trend in reproductive success, which in 2009, 2010, and 2012, reached extremely low levels. Similarly low reproductive success was observed on the Farallon Islands during this time. Such low success indicated especially low prey availability, and thus suggested a poorly functioning foodweb. In 2013 and 2014, reproductive success was very high, demonstrating a complete reversal of the earlier decline. Thus, a well-functioning foodweb, supporting forage fish and their predators, is indicated for the most recent years. Monitoring of breeding pairs in 2015 will be required to confirm whether the situation continues to be so favorable.

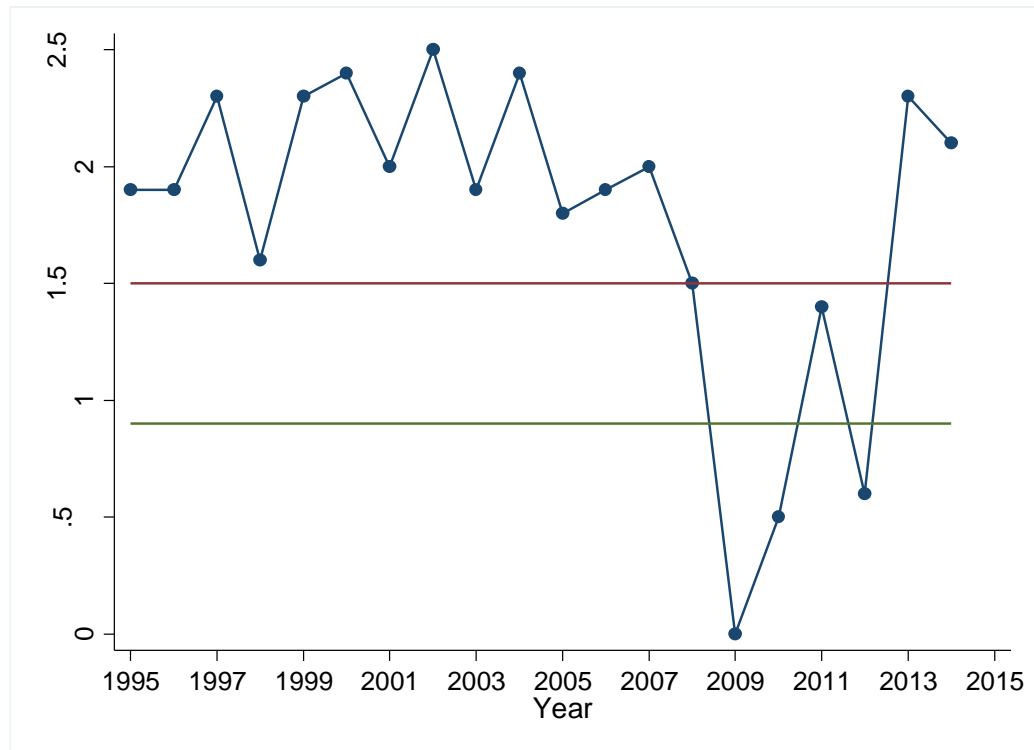


Figure 1. Brandt's Cormorant Reproductive Success Index. Values are shown for each year. The Benchmark Value for Good is 1.50 fledged young per pair (see text). The criterion for Poor is 60% of Good, i.e., 0.90 fledged young per pair.

References

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