Conservación de Islas

Reproductive success of seabird species on Baja California Pacific islands and its relationship with environmental anomalies

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Figure 1. The seven groups of islands monitored.

Figure 3. Brown Pelican and Brandt's Cormorant at Natividad Island.

Introduction

During the last fifteen years we have been developing a comprehensive program focused on seabird restoration and monitoring in the Mexican islands of the Pacific Ocean and the Gulf of California. Since 2013 the monitoring of the seabird populations became more systematic, particularly on seven groups of islands off the Baja California Peninsula along the California Current (Fig. 1). Two of our target species are the Brown Pelican (*Pelecanus occidentalis*) and Brandt's Cormorant (*Phalacrocorax penicillatus*), which have given cause for concern for the last years due to unusual nesting and reproductive behaviors throughout the Pacific. We are examining relationships between nest numbers and ongoing environmental anomalies. In particular, we explore the relationship between prey abundance/availability and the seabirds' reproductive performance in this US-Mexico binational ecoregion[1]. The overall time-space context encompasses anomalous warm ocean temperatures and low organic productivity in the California Current.

Figure 2. Brown Pelican (a) and Brandt's Cormorant (b).

Methods

An area 1000 km^2 surrounding each of the islands was selected from **monthly satellite images**

A 13-year-long time series of monthly averages was obtained from spatial averages

The average year was calculated for both variables

The difference between a specific year and the average year was computed

Yearly anomalies were defined as the average of the monthly differences

Results and discussion

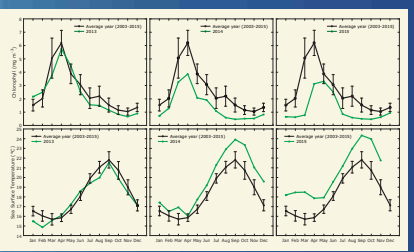

Figure 4. Sea surface temperature (°C) and chlorophyll a (mg m-3) from 2013 to 2015 (green) compared with an average (black) in the surrounding waters of the seven Mexican islands.

In 2014 and 2015 we observed Sea Surface Temperature (SST) that was warmer than average (Fig. 4 and 5) and the average Chlorophyll a (Chl-a) concentration was lower during the whole period (2013-2015) with respect to the typical year (Fig. 4 and 5). Yet, 2015 represents the year with the lowest Chl-a concentration.

Overall, the Brown Pelican and Brandt's Cormorant showed a decrease in the total number of nests during 2014 and 2015 (Fig. 6). Massive abandonments were recorded in 2014-2015 (Fig. 7). In 2015, abandonments of 38% and 50% were recorded for the Brown Pelican and Brandt's Cormorant, respectively. It is in this same year that we found the strongest SST anomalies and the lowest primary productivity.

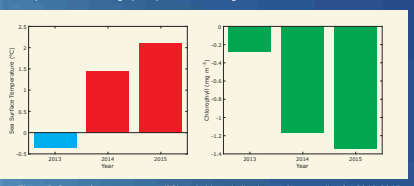

Figure 5. Sea surface temperature (°C) and chlorophyll a (mg m-3) anomalies for 2013-2015 with respect to an average from 2003 to 2015 for an area surrounding seven Mexican islands.

Changes in nesting distributions, reproductive efforts and survivorship of seabirds are most probably due to food availability during warm climatic anomalies, as has been recorded before[2]. Long-lived species respond to environmental constraints by adjusting their breeding effort; however, their own survival should be buffered against environmental variability[3]. Medium and long-term outcomes of these responses on population trends should be assessed in order to increase the biological knowledge of these species and to improve future conservation actions.

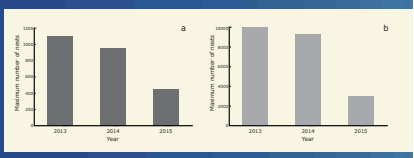

Figure 6. Maximum number of nests of Brown Pelicans (a) and Brandt's Cormorants (b) during the last three years.

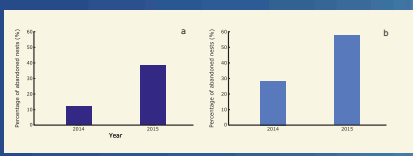

Figure 7. Brown Pelican (a) and Brant's Cormorant (b) nest abandonment.

Ongoing and future research

We are conducting comprehensive and long-term research on seabirds on these seven island groups including: nest censuses, productivity analyses, feeding behavior studies, and at-sea movement patterns. As well, we will continue to assess the relationships between sea and atmospheric conditions with breeding success and migration patterns. The analysis of the marine bird metapopulations of the California Current ecoregion as a whole will better explain the relationships between environmental changes or anomalies and reproductive success and other population parameters.

Figure 8. Brandt's Cormorant chicks

Figure 9. Brown Pelican chicks

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