STATUS OF SEABIRDS ON SOUTHEAST FARALLON ISLAND DURING THE 2009 BREEDING SEASON

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INTRODUCTION

PRBO Conservation Science biologists, in partnership with USFWS and the Farallon National Wildlife Refuge, have monitored the population size and reproductive success of seabirds on Southeast Farallon Island (SEFI) continuously since 1971. We also collect information on survival, phenology (timing of breeding), chick growth, environmental conditions (weather and sea surface temperature) and prey use (diet composition). These long-term data give us a unique ability to examine trends over multiple time scales and look at variability in the context of long-term patterns and trends.

This status report contains general information on the reproductive performance and population trends of seabirds on Southeast Farallon Island (SEFI; Farallon National Wildlife Refuge) and West End Island (WEI), California, during 2009. We monitored twelve species: Ashy Storm-petrel, Double-crested Cormorant, Brandt’s Cormorant, Pelagic Cormorant, Western Gull, California Gull, Black Oystercatcher, Common Murre, Pigeon Guillemot, Tufted Puffin, Rhinoceros Auklet, and Cassin’s Auklet. We determined reproductive performance for nine of these species by monitoring nest sites from initiation until chick fledging. Productivity (number of chicks fledged per pair) was determined for first attempts and for all attempts (including first attempts, relays, and second-broods). We compared productivity for all attempts to values from the previous season as well as to the long-term average for each species. Due to inaccessibility of Puffin crevices and California Gull nest sites and poor visibility of Double-crested Cormorant nesting areas, no reproductive data were collected for these species.

WEATHER AND OCEAN

Mean monthly sea-surface temperatures (SST) at the Farallones from March to August were generally cool; approximately 0.3 degrees warmer than last season but still below the long-term average of 12.0 °C for these months. Sea-surface temperature was at or below the long-term mean for all months except June. Anomalously warm and calm conditions during the end of May and the first two weeks of June resulted in suppressed upwelling and higher SSTs during this period. Generally, relatively cool SSTs are correlated with greater ocean productivity in this area and higher reproductive
success for seabirds. However, this was not the case during 2009. Although moderate to strong northwesterly winds persisted for much of the spring and summer and there was strong and productive upwelling along the coast, several species suffered very low reproductive success. This likely resulted from low prey abundance during the chick rearing period. Euphausiids (krill) appeared abundant as a result of strong upwelling and high primary productivity but forage fishes, such as rockfish, anchovy, and sardine, were largely absent.

Rockfish comprised almost three-quarters of the diet for Common Murres during 2009, the highest proportion of rockfish observed since 2002 and the second highest since the late 1980's. However, they were only a minor component of the diet for Pigeon Guillemots and Rhinoceros Auklet. A high proportion of rockfish in the diet typically correlates with high productivity, but this was not the case in 2009. Feeding rates were very low for murres and guillemots and the total number of feedings observed was down by 45% when compared to last season. So while rockfish made up a greater proportion of prey delivered to chicks, there just weren’t many prey items delivered. This suggests that foraging adults were required to spend more time locating prey and expend more energy to provision dependent offspring. It seems that while rockfish were available and taken more frequently than other prey items, it was not a result of rockfish being overly abundant. Similarly, less abundant species such as squid, smelt, greenling, and lanternfishes made a significant contribution to chick diet but were not necessarily more abundant than usual. Instead, it appears that these species were the only prey available and the birds were working hard to find them.

Anchovies, which have been the most important component of chick feedings for murres and auklets since 2002, were virtually absent this season; comprising only 5% of murre diet and less than 1% of auklet diet. This lack of anchovy in the diet, coupled with the continued low abundance of other prey species, was likely a major factor in the poor reproductive performance of Common Murres, Brandt’s Cormorants and possibly Western Gulls.
REPRODUCTIVE PERFORMANCE

The reproductive performance of seabirds on SEFI during 2009 was extremely variable among species. Cassin’s Auklets, Pigeon Guillemots, Pelagic Cormorants, and Ashy Storm-petrels all exhibited higher reproductive success than last season. In contrast, Common Murres, Western Gulls, Rhinoceros Auklets experienced significantly lower success this season and Brandt’s Cormorants suffered complete reproductive failure (Fig. 1).

Cassin's Auklets exhibited their greatest productivity since 2002, averaging just less than 1 chick fledged per pair. Chicks appeared to be growing well and were fledging at the highest weights we have seen in several years. Generally low sea-surface temperatures and favorable upwelling appeared to yield exceptional euphausiid production, resulting in high reproductive success for the Cassin’s Auklets. Diet samples collected throughout the season were dominated by krill, although larval fish and fish eggs were also important during late May and early June when anomalously warm and calm conditions led to reduced upwelling and local productivity.

Pelagic Cormorants had their greatest breeding success since 2004 with almost 2 chicks fledged per pair (Fig. 1). This is also the first time that they have been above the long-term mean in the last 5 years. Although adults began attending sites and building nests during March, the first eggs were not observed until May and peak breeding activity did not occur until late June. Many sites were still active with chicks well into September.

Pigeon Guillemots also exhibited increased breeding success relative to last year, but remained below the long-term mean (Fig. 1). Feeding rates were low, chicks took a long time to fledge, and only three sites were able to successfully fledge both chicks. Sculpins comprised the majority of the diet this season with small amounts of gunnel, brotula, flatfish, and juvenile rockfish.

In contrast, Brandt’s Cormorants suffered complete reproductive failure during 2009, the first such occurrence since the 1992 El Niño. Breeding propensity was also reduced. A small number of birds built nests and laid eggs, but nests were abandoned shortly thereafter and none of the eggs hatched. Prey abundance, particularly the lack of anchovies, likely caused the Brandt’s Cormorants to reduce their breeding effort and
abandon nests. Major breeding colonies throughout central California also exhibited suppressed breeding populations and little, if any, breeding success.

Reproductive success of Common Murres was among the lowest observed in the last 38 years and the lowest ever recorded during a year that did not contain an El Niño event (Fig. 1). Murres struggled to find prey for chicks and although rockfish were the dominant prey item observed, low feeding rates and high chick mortality suggest that there simply weren’t enough of them around to compensate for the loss of anchovies in the region. Although rarely observed in the past, egg and chick abandonment was common in all of our study plots this season. There were also many observed cases of infanticide in which neighboring adults would peck at and kill chicks that had been left alone in the colony while the parents were out foraging. Of the four study plots followed on the island, only the Upper Shubrick Point study plot fledged any chicks.

Rhinoceros Auklets also suffered reduced breeding success this season. RHAU had their highest reproductive performance in over 15 years during 2008, but had productivity values closer to the long-term mean this season. Although most chicks met the criteria for fledging, growth rates and fledging weights were low, suggesting relatively poor foraging conditions for auklets during the chick rearing period. It is unknown whether the low fledging weights will affect survival of juveniles through the fall and winter.

Productivity of Western Gulls further declined during 2009 and was among the lowest ever observed (Fig. 1). High rates of intraspecific predation and low prey abundance likely led to the overall poor success. Much like the cormorants, breeding effort was also reduced this season with fewer nests and smaller clutches, including a high proportion of one egg nests.
POPULATIONS

Population size was estimated for all species except Ashy Storm-petrels and Rhinoceros Auklets and is presented in Fig. 2. Breeding populations were higher than the 2008 estimates for Cassin’s Auklets, Pelagic Cormorants, and Tufted Puffins, while down for all other species.

Farallon Cassin’s Auklets declined considerably from 1972-1998 (Fig. 2), and remain at less than one-third of the population estimate made in 1972. This population suffered substantial mortality during the strong 1997/1998 El Niño event and reached its lowest abundance (10,458 birds) in 1998. Between 2001 and 2004, the population was increasing rapidly. However, the breeding population suffered substantial declines during 2005 and 2006, coinciding with reduced breeding effort and lowered reproductive success before rebounding somewhat last season. Burrow density in our index plots was higher than in 2008, but the overall population trend indicates a continuing decline. Burrow density has declined an average of 3.27% per year since 1991; though there have been varying periods of growth and decline (PRBO unpublished data). The slight increase observed this season likely resulted from the return of birds which had skipped breeding during previous poor seasons.

Ashy Storm-petrels are difficult to census, but appear to have been increasing at the Farallones in recent years based on a greater number of birds banded each season and increasing capture rates during our mist netting effort. Detailed analyses of mark/recapture data which more accurately modeled capture rates to account for year and date effects demonstrate a positive non-linear trend in the number of birds captured per hour of netting effort. Capture rates during 2009, however, were lower than the previous two years. In contrast, we located the greatest number of breeding sites since 1975.

Historically, the population of Common Murres on the Farallones was estimated to be between 400,000 and 1 million birds, but egg collecting, oil spills, gill net entanglement, and human disturbance drastically reduced their numbers. This population has recovered substantially since the islands became a refuge and is currently the largest in California. This population was exhibiting rapid growth (an average of 27% per year) between 2000 and 2007 (Fig 2) due to favorable
oceanographic conditions and abundant prey, coupled with relatively strong reproductive success and probable high juvenile survival between 2000 and 2004. However, this growth seems to have leveled off the last two seasons. Due to the large number and high density of murres, we were not able to conduct a full island census. Instead, we estimated a population trend based on the relative change in the number of birds counted in a series of index plots established around the island. The results from these plots indicated a 2% decrease in murre numbers when compared to last season. Overall poor foraging conditions this year likely caused many birds to skip breeding this season. Poor productivity in 2005 and 2006 may also have reduced the number of potential new recruits, thereby slowing the population growth.

Pigeon Guillemot numbers have also been increasing over the last several years based on morning raft counts and continued to be high during 2009. Occupancy of monitored guillemot crevices was higher in 2009 when compared to 2008 and there were more eggs laid, suggesting a greater breeding effort. It is difficult to contrast these results with historic estimates since our methods have changed, but the current population of 2,500 to 3,000 birds is likely the highest it has been since the 1970’s (Fig. 2).

The Brandt’s Cormorants breeding population during 2009 was the lowest ever recorded on the Farallones, with approximately one quarter the number of breeders observed last season (and only 6% of the population from 2007; Fig. 2). While much of this apparent decline is a result of birds either skipping breeding due to unfavorable conditions or moving to a different colony, mass adult mortality also likely plays some role. An unusually large number of dead Brandt’s were found on central California beaches during April including 14 banded birds from the Farallon colony. Considering that only a small percentage of the population is banded, we would expect that many more Farallon birds perished during this event. These birds were all emaciated.

The Pelagic Cormorant breeding population declined between the mid 1980’s and 1999. It then began to increase in the early part of this decade, but crashed following the 2004 season and remained low for three seasons. The 2008 population, however, expanded by approximately 300% and moderate growth continued during 2009. Although this growth is encouraging, the population remains only approximately one
third of the level observed during 2004. It is likely that many birds simply did not breed between 2004 and 2007 due to poor ocean conditions, though the lack of a full recovery indicates that some mortality is also impacting this population and its ability to recover.

Tufted Puffins also appeared to have a very good season. During the 2009 surveys, we observed over 100 active sites and confirmed chicks at almost a quarter of those based on observations of birds delivering fish to the site. This is more than twice as many active sites as were observed during 2008. It should be noted however, that our late season survey had greater effort than in previous seasons. We surveyed for two additional days and put a greater effort into looking for feedings. This allowed us to detect a few more sites that otherwise would not have been considered active and greatly increased the number of feedings observed compared to previous years.

In summary, 2009 was a difficult year for most seabirds on the Farallones. Cassin’s Auklets and Ashy Storm-petrels had very productive seasons and seemed to benefit from the strong winds and high zooplankton production. Pelagic Cormorants and Pigeon Guillemots also exhibited higher reproductive success than in previous seasons and we had the highest population of Tufted Puffins ever recorded on the island. In contrast, Brandt’s Cormorants failed to rear any chicks this season and had the lowest breeding population numbers ever recorded. Common Murres and Western Gulls had some of the lowest productivity years on record for those species; and Rhinoceros Auklets had reduced productivity and poor chick growth. Cool sea surface temperatures and strong winds resulted in upwelling and correspondingly high zooplankton productivity, but this did not translate into abundant food resources for most species. It seems that an overall depletion in the abundance of anchovies and other forage fish species resulted in very poor foraging conditions, reduced breeding success, reduced breeding effort, and increased adult mortality. Low productivity and reduced survival, coupled with a crash in forage fish populations, and a projected El Niño for the coming year are likely to impact seabird populations for the next several seasons. The continuing decline of Brandt’s Cormorants and the increasing unpredictability of prey resources are of great concern.
Fig. 1  Standardized productivity anomalies (annual productivity - long term mean) for 8 species of seabirds on SEFI, 1971-2009. The dashed lines represent the 80% confidence interval for the long term mean.
Fig. 2  Population trends for 8 species of seabirds on Southeast Farallon Island, 1972-2009. Populations were determined by counting either individuals or nests on all visible areas on SEFI and West End. Please note the different scales on the Y-axis and the different methodology used for COMU population estimates beginning in 2007 (denoted by red points, see text) and PIGU morning census numbers (denoted by green points).