2019 Shearwater Nesting at Freeman Seabird Preserve: Highest breeding pairs, average chick success, and first eggs in ceramic homes.

by

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Figure 1. A one-week old chick inside one of the new ceramic nest modules, first used by breeding shearwaters during the 2019 season.

We report on the ongoing monitoring and restoration efforts of the Freeman Seabird Preserve by Hawai'i Audubon and Hawai'i Pacific University since 2009, share findings from the 2019 breeding season, and briefly discuss the plans for future monitoring, habitat restoration, and predator control at the site.

2019 Update

This year we documented 318 active nests of Wedge-tailed Shearwaters (*Ardenna pacifica*, 'Ua'u kani) at the Freeman Seabird Preserve, 1.6 % higher than the count of 313 nests in 2018. In fact, this year's nest count is the highest to date, surpassing the previous peak documented in 2018 (Hyrenbach 2019). Overall, the annual population surveys continue to show a statistically significant trend ($F = 116.611$; $df = 1, 9$; $p < 0.001$) with an average increase of 23.1 (+/- 7.1 S.D.) nests per year, which captures 92 % of the year-to-year variability in the 11 year time series (2009-2019; Fig. 2). Therefore, despite two short-term declines in the number of shearwaters that attempted to nest during the 2009-10 and the 2015-16 El Niño events, the colony continues to grow.

The July 14 count of 318 nests (representing assumed parents incubating eggs) was followed by a count of 218 chicks on September 14. This represents a loss of 31.4 % of the nests during the two-month period spanning hatching and the first month of the chick's life. Furthermore, the weekly monitoring of 60 nests between July and November revealed that 2019 was characterized by very low egg loss, with 13.3 % of the monitored eggs being lost. However, chick mortality was high in 2019, with 25.0 % of the monitored chicks being lost. While the majority of the chick mortality happened early in the season (before August 30), three older chicks died during a two-week period in mid-September (13 to 27) due to a lack of food, at a time when chicks tend to gain mass at a fast rate and start growing their flight feathers (Fig. 3). This observation suggests that some of the nests failed due to poor foraging conditions at sea.

Nevertheless, the weekly monitoring also revealed that 2019 was characterized by average phenology, similar to previous years. In 2019, chick hatching dates spanned from July 27 to August 20, with a mean of August 5 (+/- 6.1 S.D. days). Chick peak masses and growth patterns were also comparable to those recorded in the past. In 2019, peaks in weight ranged from 425 to 583 grams, with a mean of 504.6 (+/- 38.7 S.D. grams) and chick mass started declining in late November before fledging (Fig. 3). This pattern contrasts with 2018, when chicks continued to gain mass through the beginning of November suggesting parents had more difficulty feeding chicks that year and provisioned them longer (Hyrenbach 2019).

In summary, the monitoring data suggest that 2019 was another year of average phenology and chick productivity, in the context of the available time series (2009 – 2019). The ENSO-neutral conditions currently underway are expected to continue through the summer of 2020 (See NOAA's Climate Prediction Center ENSO Diagnostic Discussion,

www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/). Based on these model predictions, we anticipate that 2020 will be another "average" year for Wedge-tailed Shearwater breeding at the Freeman Seabird Preserve.

Ongoing Efforts

Habitat restoration efforts continued during 2019. From January through March, while the Wedge-tailed Shearwaters were at sea, Hawai'i Audubon Society members and other volunteers worked to remove alien plant species and improve natural nesting sites. Also, more artificial ceramic nests were created and installed with multiple partners (HPU, Oikonos, California College of the Arts, Windward Community College) and ceramic artists (Nathan Lynch and Bryce Meyers). This was the first season the newly designed ceramic nests were deployed before shearwaters returned to prospect for breeding sites. Each nest has three components: the nesting chamber, a sun shield, and an entrance. In 2019, we experimented with two entrance designs: 7 clay tunnels and 7 rock piles. Starting in March 2019, we monitored these 14 artificial nest sites weekly for occupancy and daily with motion-activated infrared cameras.

Six of the seven (85.7 %) nests with rock pile entrances were occupied by prospecting shearwaters, compared to none (0 of 7) of the nests with clay tunnels. Because most burrowing seabirds have nesting site fidelity, it can take many years for breeders to select artificial nests. We are encouraged by the quick acceptance of the newly designed modules. We also documented this rapid occupation with the original artificial sites created with roofing tiles. Also, we learned that the clay tunnel entrances are likely too small in diameter for the adults to feel comfortable walking completely inside. We observed adults prospecting around the tunnels but only sticking their heads inside the entrances. The rock-pile entrances were larger and more similar to their natural sites.

All five eggs hatched and four successfully fledged from the ceramic nests, with a fledging rate (4 of 5, of 80.0 %) comparable to that in the control nests (39 of 52, or 75.0%) (Fisher's Exact Test, Chi-squared = 0.168, df = 1, p = 0.6945). Furthermore, the reproductive success, expressed as the proportion of eggs laid in July that successfully fledged as a chick in November, were not significantly different (Fisher's Exact Test, Chi-squared = 0.463, df = 1, p = 0.6549), with 80.0 % (4 of 5) in the ceramic nests and 65.0 % (39 of 60) in the control nests, respectively. Thus, despite the small sample sizes, these results suggest that the fledging and reproductive success from these new ceramic nests are similar to those from the existing natural and roof tile nests at the Freeman Seabird Preserve.

Additional restoration and management efforts in 2020 will involve monitoring the colony and enhancing the breeding habitat at the Freeman Seabird Preserve.

Habitat Restoration: From January through March, volunteers will remove alien plant species and will improve some of the existing rock nesting sites on the terrace.

Colony Monitoring: Population censusing and nest monitoring for phenology, chick growth and reproductive success will continue in 2020, to augment the ongoing time series started in 2009.

Predator Control: Ongoing surveillance for predators is planned during the 2020 nesting season, to minimize and document predation by rats, cats and mongooses on breeding shearwaters.

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Literature Cited

Hyrenbach, K.D. 2019. Peak Colony Count During Another Year of Average Productivity and Provisioning at the Freeman Seabird Preserve. 'Elepaio 79(2): 13-14.

Figures

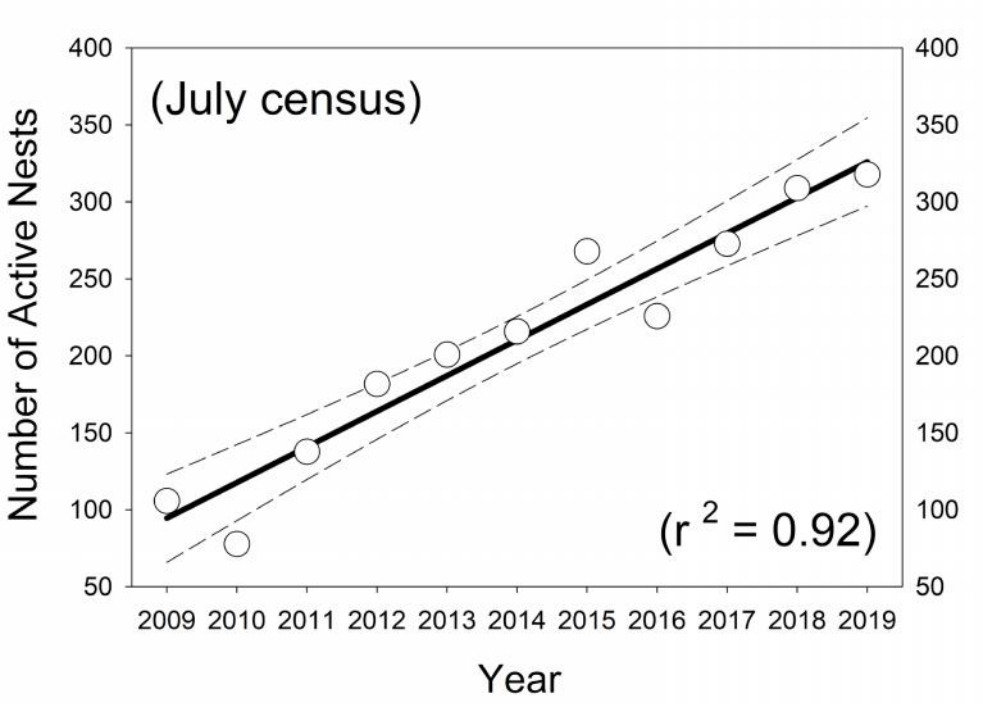

Figure 2. Trend in the number of Wedge-tailed Shearwater active nests at the Freeman Seabird Preserve, from the annual colony-wide census during the peak incubation period (July 14), showing the best-fit linear regression (solid line) and the 95% confidence interval envelope (dashed lines).

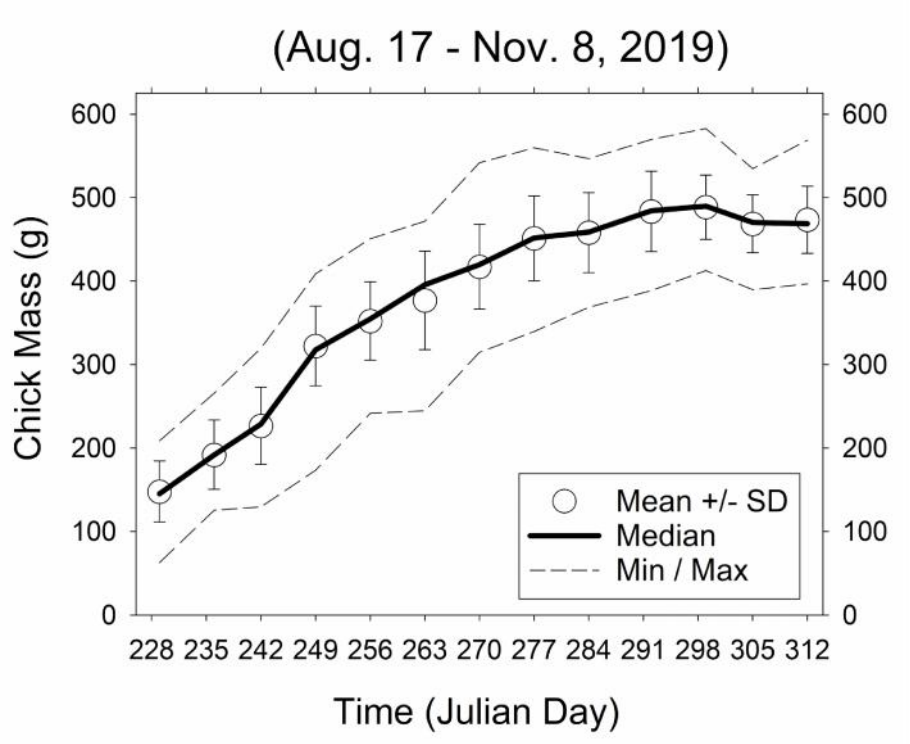

Figure 3. Time series of chick mass collected during the 2019 breeding season, showing the mean +/- S.D., the median and the range of values (maximum – minimum). Sample size = 36 chicks.