2020 Shearwater Nesting at Freeman Seabird Preserve: Highest breeding pairs, average chick success, and increasing occupation of ceramic homes

by

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We report on the ongoing monitoring and restoration efforts of the Freeman Seabird Preserve by Hawaii Audubon Society and Hawai‘i Pacific University since 2009, share findings from the 2020 breeding season, and briefly discuss the plans for future monitoring, habitat restoration, and predator control at the site.

Figure 1. A three-month chick exploring the world outside its nest, and getting ready to fledge (November 22, 2020).

2020 Update

This year we documented 358 active nests of Wedge-tailed Shearwaters (*Ardenna pacifica*, 'Ua'u kani) at the Freeman Seabird Preserve, 12.5 % higher than the count of 318 nests in 2019. This year's nest count is the highest to date, surpassing the previous peak documented in 2019 (Hyrenbach & Hester 2020). Overall, the annual population surveys continue to show a statistically significant trends ($F = 171.341$; $df = 1, 10$; $p < 0.001$) with an average increase of 23.4 (+/- 11.1 S.D.) nests per year, which captures 94 % of the year-to-year variability in the 12-year time series (2009-2020; Figure 2). Therefore, this trend suggests that the colony continues to grow, in part due to our restoration efforts.

The July 14 count of 358 nests (representing assumed parents incubating eggs) was followed by a count of 262 chicks on September 14. This represents a loss of 26.8 % of the nests during the two-month period spanning hatching and the first month of the chick's life. Furthermore, the weekly monitoring of 70 nests between July and November revealed that 2020 was characterized by low egg loss, with 15.7 % of the monitored eggs being lost. Chick mortality was also fairly low in 2020, with 12.3 % of the monitored chicks disappearing. In contrast with 2019, when some chicks starved later in the season (mid-September; Hyrenbach & Hester 2020), this year all the chick mortality happened early in the season (by August 28). These observations suggest that the foraging conditions for provisioning shearwaters were better this year.

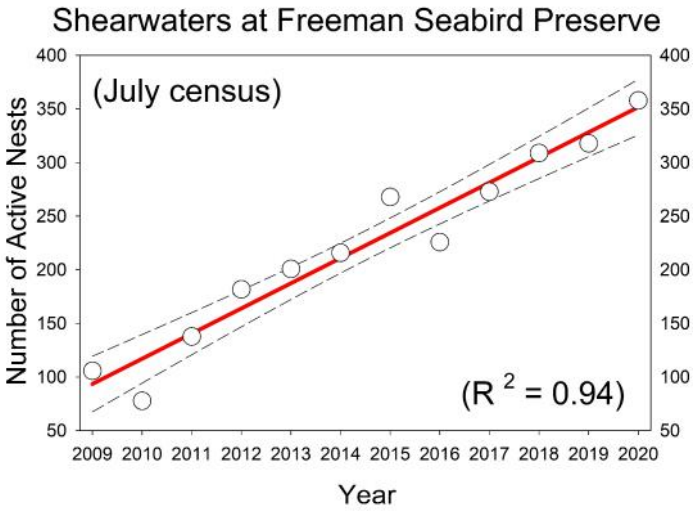

Figure 2. Trend in the number of Wedge-tailed Shearwater active nests at the Freeman Seabird Preserve, derived from the annual colony-wide census during the peak incubation period (July 14), showing the best-fit linear regression (solid line) and the 95% confidence interval envelope (dashed lines).

The weekly monitoring also revealed that 2020 was characterized by average timing of breeding (phenology), similar to previous years. In 2020, chick hatching dates spanned from July 28 to August 25, with a mean of August 5 (+/- 5.4 S.D. days).

Chick peak masses and growth patterns were also comparable to those recorded in the past. In 2020, the maximum chick weights ranged from 407 to 587 grams, with a mean of 511.3 (+/- 51.2 S.D. grams). Chick masses started declining in late October, and chicks started fledging the first week of November (Figure 3).

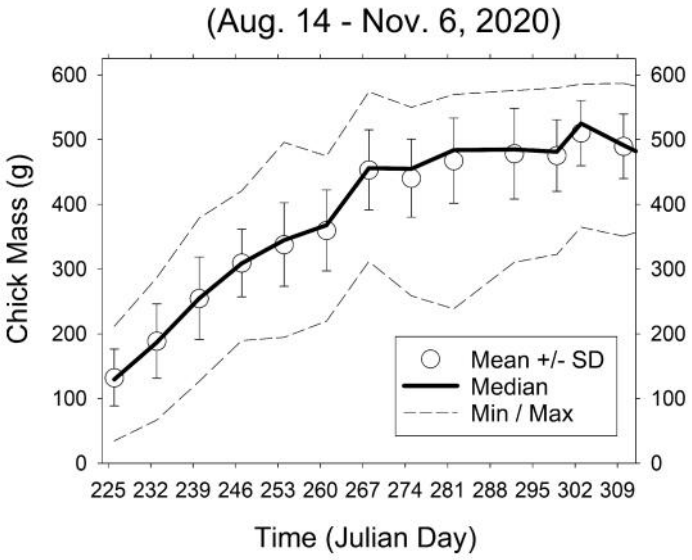

Figure 3. Time series of chick mass collected during the 2020 breeding season, showing the mean +/- S.D., the median, and the range (maximum – minimum) of weekly measurements. Sample size = 40 chicks.

We continue to learn how ocean conditions impact shearwater breeding success and 2020 added another La Niña year (the cool phase of the El Niño-Southern Oscillation climate pattern) to the time series. While La Niña conditions have persisted through mid-February 2021, forecasters estimate about a 60% chance that neutral conditions will return in April – June 2021 (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 2021 will be another "average" year for Wedge-tailed Shearwater breeding at the Freeman Seabird Preserve.

Ongoing Efforts

Habitat restoration efforts continued during 2020. From January through March, while the Wedge-tailed Shearwaters were at sea, Hawaii Audubon Society members and other volunteers worked to remove alien plant species and improve natural nesting sites. This was also the second season the newly designed ceramic nests were deployed before shearwaters returned to prospect for breeding sites. In 2020, we monitored these 14 artificial nest sites weekly for occupancy and daily with motion-activated infrared cameras.

Ten of the fourteen (71.4 %) artificial nests were occupied by pairs who laid eggs. Because most burrowing seabirds return to the same nest site every year, it can take many years for breeders to select new artificial nests. We are encouraged by the quick acceptance of the customized modules. We also documented this rapid occupation with the original artificial sites created with roofing tiles.

All ten eggs hatched and eight successfully fledged from the ceramic nests, with a hatching success of 100.0 % and a fledging success of 80.0 %. Overall, the reproductive success, expressed as the proportion of pairs that laid an egg in July and successfully fledged a chick in November, were not significantly different (Fisher's Exact Test, Chi-squared = 0.23688, df = 1, p = 1), with 80.0 % (8 of 10) in the ceramic nests and 72.7 % (48 of 66) in the control nests. Thus, for the second year in a row, these results suggest that the breeding performance in the new ceramic nests is similar to that from existing natural and roof tile nests at the Freeman Seabird Preserve (Hyrenbach & Hester 2020).

Additional restoration and management efforts in 2021 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. Additionally, the irrigation system originally installed at the site in 2008 will be replaced with new pipes and faucets.

Colony Monitoring: Population censusing and nest monitoring for phenology, chick growth and reproductive success will continue in 2021, to augment the ongoing time series started in 2009.

Predator Control: Ongoing surveillance for predators is planned during the 2021 nesting season, to minimize and document predation by rats, cats and mongooses on breeding shearwaters.

Acknowledgements

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Literature Cited

Hyrenbach, K.D., and Hester, M.M. 2020. 2019 Shearwater Nesting at Freeman Seabird Preserve: Highest breeding pairs, average chick success, and first eggs in ceramic homes. 'Elepaio 80(2): 13-14.