Temporal and spatial isotopic and genetic variation reveal the ecological history of an endangered seabird

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Since the arrival of humans, the Hawaiian Islands have lost at least 59 species of native birds, a number roughly equal to the N. American Pleistocene mammal extinctions. The Hawaiian Petrel offers an important proxy for understanding the fate of Pacific seabirds as it dominates the ancient Hawaiian sub-fossil record, yet declined in numbers until near extinction by the mid 20th century. We explored temporal and spatial trends in isotopic and genetic data from tissues of this endangered and poorly studied seabird. While there is only one stomach content study, at sea sightings indicate that the Hawaiian Petrel is concentrated SE of the Hawaiian Islands in fall. Among islands there is little variation in the $\delta^{13}C$ of modern birds. There is a large departure in $\delta^{15}N$ of birds from Hawaii (≤ 3 ‰) relative to birds from other islands. In the absence of elevated $\delta^{13}C$, the uniquely high $\delta^{15}N$ is not simply related to trophic level but is characteristic of a zone of denitrification in the Eastern Tropical North Pacific The $\delta^{15}N$ of > 500 year old bones from Hawaii is also elevated relative to other islands. Thus, foraging habits are a temporally persistent phenomenon. A decline in $\delta^{15}N$ between ancient and modern individuals reflects declining trophic level. Such shifts signify wide-spread alteration to the NE Pacific marine ecosystems.

Investigating the petrogenesis of the Apollo 12 pigeonite suite basalts

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In this study we examine the petrogenetic history of the Apollo 12 pigeonite suite basalts 12007, 12011, 12017, 12019, 12039, 12043, 12052, 12053, and 12055. We use a combination of Crystal Size Distributions (CSDs), major element data via electron microprobe (EM), and laser ablation inductively coupled mass spectrometry (LA-ICPMS) on multiple phases. CSDs are a statistical analysis of the number, size, and shape of a particular phase within a thin section [1, 2]. They are plotted as the crystal size versus the natural log of the population density. A concave up CSD will indicate crystal accumulation within the magma chamber, concave down will indicate crystal fractionation, a linear CSD indicates a simple history, and a kinked CSD indicates magma mixing [1, 2].

We first perform CSDs on pyroxene, plagioclase, and olivine (when present) to allow for the identification of possible multiple crystal populations. Thin sections are photographed and crystals are traced in Adobe Photoshop. They are then analyzed using ImageTool [3], CSDslice [4], and CSDcorrections [3]. Major elements are obtained for crystal cores and rims using EM, and trace elements using LA-ICPMS.

CSDs have been calculated for 12021 and 12031 (Figure 1). The pyroxene CSD is linear, indicating simple history. However, both plagioclase CSDs are concave up, indicating crystal accumulation. CSDs of the rest of the suite, along with EM and LA-ICPMS, will be completed by the conference.

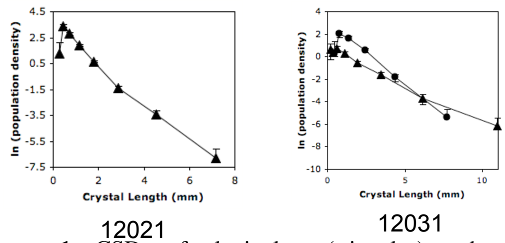

Figure 1: CSDs of plagioclase (triangles) and pyroxene (circles) for 12021 and 12031.

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