

## Abundance estimates for management of endangered false killer whales in the main Hawaiian Islands

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### Abstract

Data limitations frequently result when monitoring endangered populations that are rare, cryptic, or inaccessible. Effectively using the best available data to meet management mandates for these populations is a common conservation challenge. False killer whales (*Pseudorca crassidens*) occur as three distinct populations in Hawaiian waters, including a population resident to the main Hawaiian Islands (MHI) that is endangered under the U.S. Endangered Species Act and strategic under the U.S. Marine Mammal Protection Act. A longitudinal, photo-identification dataset representing 574 yearly encounters (i.e., identifications compiled at an annual scale) of 171 distinctive individuals and open mark-recapture methods were used to estimate current MHI false killer whale abundance as needed for management of this population. The data are from dedicated and opportunistic surveys conducted from 2000-2015 around the MHI and reflect unquantified spatiotemporal biases imposed by constraints on sampling (e.g., rough sea conditions on windward sides of islands). Accounting for temporal variation and especially social group affiliation was important in modeling capture probability. Sensitivity analyses found the resulting time series of 16 abundance estimates is robust to some forms of sampling variability and bias. However, because the study area was partially sampled each year, the annual abundance estimates apply only to the portion of the population using the sampled area and may underestimate true population abundance. Nonetheless, the resulting estimates and supporting evidence indicate the MHI false killer whale population is relatively small; for example, only 167 (SE = 23, 95% CI = 128-218) individuals were estimated to have used the sampled area in 2015. Until data are available to estimate or overcome existing sampling biases, the present estimation framework offers a tool for using data that have been regularly collected each year to produce current abundance estimates that are improvements over existing inputs to management.