Projecting impacts of mortality events on a Western Gull population

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We present a case-study of the potential impacts of a one-time mortality event on Western gulls (*Larus occidentalis*), potentially resulting from exposure to rodenticide directed at eradicating house mice at the Farallon Islands National Wildlife Refuge.

Using Point Blue’s long-term datasets, we conducted a population viability analysis (PVA) to model future population trends while specifically accounting for stochastic variation in demographic parameters driven by environmental conditions.

We first modeled population trends under three environmental scenarios defined by the probability of future breeding failure: “optimistic” (no failure), “realistic” (long-term average rate), and “pessimistic” (increased frequency as in recent years).

Assuming no additional mortality, under “optimistic” scenario, our model predicted that the population would grow by 12.4% after 20 years. The population is expected to decline by 6.6% under “realistic” scenario; and decline by 26% under the “pessimistic” scenario.

Secondly, we assessed the potential impacts of a one-time mortality event by re-running the PVA with varying levels of additional mortality to determine the maximum level that would yield population trends indistinguishable from trends in the absence of the eradication project (≥ 95% overlap in expected outcomes after 20 years).

The models suggest that a mortality event of up to 3.3% of the population under the “realistic” scenario, 2.8% in the “optimistic” scenario, or 4.2% in the “pessimistic” scenario would be unlikely to alter projected population trends. These results demonstrate that the greater the stochastic variation, the greater the mortality event must be to be able to discriminate a long-term effect against the backdrop of environmental variability. Note that these values do not represent any actual estimate of anticipated mortality but rather provide a threshold of detectability to evaluate potential mortality events.

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| **Main Points** |
| * Gull population trends are dependent on environmental conditions and likelihood of breeding failure. * Additional mortality up to 3.3% of the population would not significantly alter existing trends. * It is critical to incorporate stochasticity into population models to realistically project future trends. |

Nur, N. Bradley, R.W., Lee, D.E., Warzybok, P., Jahncke, J. 2019. Projecting long-term impacts of mortality events on vertebrates: Incorporating stochasticity in population assessment. *Journal of Environmental Management*. (in review)