

State-space mark-recapture estimates of regional movement and abundance of Fiordland bottlenose dolphins (*Tursiops truncatus*)

The bottlenose dolphins (terehu, *Tursiops truncatus*) of Ata Whenua-Fiordland National Park, Aotearoa-New Zealand, form an isolated, critically endangered population near the southern limit of the species' range. The Doubtful Sound sub-population is one of three recognized in this region, and has been considered resident within the Patea-Doubtful/Te Awa-o-Tu-Thompson complex. Since dedicated annual monitoring began in 1990, abundance estimates have fluctuated between 50 and 80 individuals, with the most recent (2020) estimate being 55 (95% CI: 53–58), a 19% decrease from the year before. The data have previously been analysed as a series of independent, closed population experiments by applying the Lincoln-Petersen estimator with the Chapman modification; however, in at least the last decade, there have been several opportunistic sightings of individuals from this population in neighbouring fiord habitats, including areas not currently considered part of their range. This study considers the capture histories across years and applies state-space mark-recapture open population models within a Bayesian framework to estimate trends in yearly abundance, and to explore movement between different areas where only sparse data exist. The methods applied here include retrospective yearly captures between an individual's first and last sighting to provide an informed time-series. Through the use of multiple data streams, we can separately estimate mortality, temporary emigration, and fecundity, and assess the impact that factors such as habitat degradation and demographic stochasticity have on these processes. This study has the potential to inform effective conservation management of Fiordland bottlenose dolphins as impacts from climate change and anthropogenic activities increase in the region.