Novel Open Time to Event (OTTE) Model for Low-cost and Long term Marine Population Abundance Estimates from Remote Underwater Video (RUV) Stations

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This paper proposes a novel Open Time to Event (OTTE) model to derive open population estimates of a target marine species, in a chosen sampling region with RUV cameras present in it. It uses just two data points from each camera's viewshed – first arrival time and first departure time of the target species – to obtain its population estimate for the sampling region. Open population computer simulations were used to test the model's accuracy in both benthic (close to the seabed) and pelagic (open ocean) environments. Each simulation was conducted for a total sampling time of 250 steps, using 10 simulated RUV cameras with 5x5x5 (arbitrary units) viewsheds, at high and low species population densities, and varying maximum swimming speeds. Each simulation was repeated over 10 replicates. T-tests at 95% significance level were conducted to identify significant differences between the actual and estimated populations within the chosen sampling regions in each environment. The tests revealed that the model remains robust regardless of the environment. Its accuracy is dependent on the target species' swimming speed and general population density, which can be accounted for by manipulating the size of the sampling region, the number of cameras used and total sampling time.

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