Modelling Methods draft 1

To evaluate the influence of time out of water, air temperature, and carapace length on the post-release survival of *P. platyceros* captured in trap fisheries, we used generalized linear mixed-effects models (GLMMs). We included random effects to account for the hierarchical structure of the experiment, with a binomial error structure to model the probability of survival. [transition sentence]

Due to missing data, we excluded 488 of the prawns for which survival data was collected (n = 5053) . A small portion of the prawns (273) lost their coloured band during the release stage of the experiment. As the band colour denoted treatment group, prawns missing bands could not be assigned to a treatment. To ensure we were not confounding our results, we compared the size distribution of these prawns to that of the prawns that retained their band. There was no clear difference, so these individuals were excluded from the final dataset. We further excluded an additional 215 prawns, which had damage on their carapace such that we could not obtain an accurate length measurement. We found no correlation between carapace damage and treatment group (*insert t-test statistics, cite supplementary figure*).

Some prawns were lost from the traps during the experiment, either through the mesh of the bags used during the treatment stage or through the mesh of the traps during the release stage of the trial, resulting in missing end-of-trial data for these individuals. To investigate whether there was a bias in prawn loss, we evaluated the percentage of prawns lost varied by treatment There were slightly more losses at higher treatments times (*refer to supplementary figure here)*. To evaluate the potential influence of this bias on the experiment results, we compared the ‘observed’ survival against ‘true’ survival of a theoretical trial where 20% of prawns are lost. ‘True’ survival was calculated based on three different assumptions: only living prawns were lost, only dead prawns were lost, and dead and living prawns were lost with equal frequency. This analysis showed that even if living or dead prawns were lost more frequently, the effect on the estimated survival was minor.

We took a model selection approach to evaluate the relative importance of three fixed effects and their two-way interactions: time out of water, air temperature, and carapace length. In total, we considered a suite of 18 candidate models (Table 1) to predict prawn survival. We did not include the three-way interaction term because it is difficult to interpret. All models included a random effect on the intercept to account for variation in survival caused by the trap a prawn was in; there were 123 levels. We expected survival may vary between traps because there were many differences between traps including location, time, and orientation on the ground. Model fitting was done with the lme4 (Gaussian Quadrature) and glmmTMB (Laplace approximation) R packages. To prioritise simplicity and interpretability, we compared models using Bayesian Information Criterion (BIC) (Table 1).