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). The models had a binomial error structure to model the probability of survival and included random effects to account for the hierarchical structure of the experiment. Prior to statistical analysis, we made several necessary data exclusions and assessed potential effects of our experimental design on the interpretation of results.

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 (Figure 1). 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 (Appendix 1). There was no clear difference, so these individuals were excluded from the final dataset. We 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,* Appendix 1).

We lost prawns in two ways: 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. We could not collect end-of-trial data for these individuals. To investigate whether there was a bias in prawn loss, we evaluated the percentage of prawns lost in each treatment. There were slightly more losses at longer treatments times (Figure 2). To evaluate the influence of the potential bias in prawn loss, we simulated four scenarios for prawn loss: we lost no prawns; we lost only dead prawns; we lost only living prawns; we lost dead and living prawns with equal frequency. We then evaluated the difference in survival estimates between the four scenarios to address whether loss of prawns could confound our interpretation of how survival did or didn't differ across treatment groups. 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 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).

Figure 1 <- Unbanded per trial bar plot

Figure 2 <-

Appendix 1 <- multi-page trial summary

Table 1 <- Trial summary table

Table 2 <- BIC table