**Supplement 2 – Results**

Riparian species

*Melaleuca rhaphiophylla* was recorded right across the catchment, with population densities greatest near the river mouth and the upper Catchment. The GLMM identified differences in the relative frequency of immature to mature *M. rhaphiophylla* with flood duration, change in duration and their interaction, but as a low number of immature individuals were recorded these parameters were not statistically significant (Table 2a). *Eucalyptus rudis* was well represented by both mature and immature individuals and demonstrated the widest rainfall range of the riparian species examined in this study, but once again, the relative frequency of immature and mature individuals did not differ significantly in relation to the local hydrological gradients, or regional rainfall gradient (Table 2a).

Models failed to converge for the remaining three obligate riparian species, *M. cuticularis*, *M. viminea* and *Taxandria juniperina* due to the narrow range of observed variation in responses to predictors. Both *M. cuticularis* and *M. viminea* were recorded in just two and three transect sites, respectively, with extremely narrow rainfall ranges of just 534 to 538 mm pa. The flood plains inhabited by these species have low topographical variation, thus the estimated duration and frequency of flooding varied little within a site. In both *M. cuticularis* and *M. viminea* immatures were recorded at higher relative frequencies (57 immature: 16 mature and 53 immature: 38 mature, respectively) across the surveyed sites. *T. juniperina* was recorded in six transects, all within a narrow rainfall band (1190 to 1214 mm pa). Although flood duration and frequency varied between individuals, the juvenile frequency was strongly biased to one transect, where 20 of the total 21 immatures were recorded, thus limiting the power of the model.

Upland species

Just two of the upland species showed differences in recruitment along the hydrological and rainfall gradients, *Trymalium odoratissimum* subsp. *trifidum* and *M. incana* (Table 2b). For the other five common upland species (the Fabaceae shrubs *Acacia pulchella* and *Hovea elliptica*, the Ericaceae heaths *Leucopogon obovatus* subsp. *revolutus* and *L. propinquus*, and the Dilleniaceae shrub *Hibbertia cuneiformis*), the proportion of immature to mature individuals was relatively consistent across the hydrological and rainfall gradients, and fitted models containing rainfall and/or flow regime predictors failed to provide greater explanatory power than the null models.

**Table S2.1.** Model selection using AICc scores to compare generalised linear mixed effects models testing the relative frequency of immature to mature individuals as a function of mean annual rainfall (Rn) and inundation (comparing the fit of a duration model, containing flood duration (D) and change in duration (ΔD), versus the fit of the flood frequency model, containing frequency (F) and change in frequency (ΔF)). The D and F measures were highly collinear so could not be included in the same model. Variation in forest structure is described at transect and individual level as the covariates T_PC1 and T_PC2, and I_PC1 and I_PC2, respectively. *k* denotes the number of parameters included in the model, AICc is a measure of goodness of fit scaled to the number of parameters in the model. Models with the lowest AICc denote the best model fit: the most parsimonious model < 2 AIC was selected and is indicated in bold.

| **Model - *Acacia pulchella*** | ***k*** | **Log likelihood** | **AICc** | **Δ AICc** |
|---|---|---|---|---|
| I_PC2 | 3 | -30.54 | 67.60 | 0.00 |
| T_PC1 + I_PC2 | 4 | -29.52 | 67.90 | 0.31 |
| T_PC1 + I_PC1 | 4 | -29.74 | 68.35 | 0.75 |
| I_PC1 | 3 | -30.96 | 68.43 | 0.83 |
| Rn | 4 | -30.05 | 68.96 | 1.37 |
| **Null** | **2** | **-32.43** | **69.11** | **1.51** |
| I_PC1 + I_PC2 | 4 | -30.24 | 69.35 | 1.75 |
| **Model - *Agonis flexuosa*** | | | | |
| I_PC1 + Rn + F + ΔF + Rn: F + Rn: ΔF + F: ΔF | 9 | -359.84 | 737.92 | 0.00 |
| **Rn + F + ΔF + Rn: F + Rn: ΔF + F: ΔF** | **8** | **-361.81** | **739.81** | **1.89** |
| I_PC1 + Rn + F + ΔF + Rn: F + Rn: ΔF + F: ΔF + F: ΔF: Rn | 10 | -359.78 | 739.86 | 1.94 |
| Null | 2 | -384.58 | 773.17 | 35.25 |
| **Alternate best fit** | | | | |
| D + ΔD + Rn + ΔD: Rn | 6 | -367.69 | 747.49 | - |
| **Model - *Astartea leptophylla*** | | | | |
| I_PC1 + Rn + ΔF | 5 | -111.87 | 234.00 | 0.00 |
| I_PC1 + T_PC1 + Rn + ΔF | 6 | -111.10 | 234.50 | 0.55 |
| I_PC1 + Rn + F + ΔF + Rn:ΔF | 7 | -110.57 | 235.60 | 1.61 |
| I_PC1 + Rn + F + ΔF | 6 | -111.77 | 235.90 | 1.89 |
| I_PC1 + I_PC2 + Rn + ΔF | 6 | -111.81 | 236.00 | 1.98 |
| I_PC1 + Rn + ΔF + Rn:ΔF | 6 | -111.81 | 236.00 | 1.98 |
| Null | 2 | -121.63 | 247.32 | 13.35 |
| **Alternate best fit** | | | | |
| T_PC1 + I_PC1 + Rn | 5 | -114.63 | 239.50 | - |
| **Model - *Banksia seminuda*** | | | | |
| T_PC1 + Rn + F + ΔF + F:ΔF | 7 | -41.69 | 98.68 | 0.00 |
| T_PC1 + Rn + F | 5 | -44.08 | 98.85 | 0.17 |
| T_PC1 + T_PC2 + Rn + F | 6 | -43.02 | 99.00 | 0.32 |
| T_PC1 + T_PC2 + Rn + F + ΔF + F:ΔF | 8 | -40.74 | 99.18 | 0.50 |
| T_PC1 + I_PC1 + Rn + F | 6 | -43.62 | 100.20 | 1.52 |
| T_PC1 + Rn + F + ΔF + Rn:ΔF + F:ΔF + F:Rn + F:ΔF:Rn | 10 | -38.79 | 100.24 | 1.56 |
| T_PC1 + Rn + F + ΔF | 6 | -43.67 | 100.30 | 1.62 |
| T_PC1 + T_PC2 + Rn + F + ΔF | 7 | -42.51 | 100.31 | 1.63 |
| Null | 2 | -52.77 | 109.68 | 11.00 |
| **Alternate best fit** | | | | |
| T_PC1 + D + Rn | 5 | -44.48 | 99.63 | - |

***Table S2.1.*** *continued.*

| **Model - *Callistachys lanceolata*** | ***k*** | **Log likelihood** | **AICc** | **Δ AICc** |
|---|---|---|---|---|
| Rn + F + ΔF | 5 | -20.08 | 51.20 | 0.00 |
| Rn + F + ΔF + Rn: ΔF | 6 | -19.11 | 51.69 | 0.49 |
| I_PC1 + Rn + F + ΔF | 6 | -19.30 | 52.08 | 0.88 |
| Rn + F + ΔF + F: ΔF | 6 | -19.80 | 53.08 | 1.88 |
| Rn + F + ΔF + Rn: F | 6 | -19.82 | 53.10 | 1.90 |
| I_PC2 + Rn + F + ΔF | 6 | -19.83 | 53.13 | 1.93 |
| Null | 2 | -25.96 | 56.11 | 4.91 |
| **Alternate best fit** | | | | |
| ΔD | 3 | -23.99 | 54.38 | - |
| **Model - *Eucalyptus rudis*** | | | | |
| ΔF | 3 | -125.06 | 256.24 | 0 |
| ΔF + Rn + ΔF:Rn | 5 | -123.15 | 256.59 | 0.35 |
| I_PC2 + ΔF | 4 | -124.35 | 256.91 | 0.67 |
| I_PC2 + ΔF + Rn + ΔF:Rn | 6 | -122.33 | 257.09 | 0.85 |
| T_PC1 + I_PC2 + ΔF | 5 | -123.40 | 257.10 | 0.86 |
| T_PC1 + ΔF | 4 | -124.59 | 257.38 | 1.15 |
| **Null** | **2** | **-126.83** | **257.72** | **1.48** |
| T_PC1 + I_PC2 + ΔF + Rn | 6 | -122.68 | 257.78 | 1.55 |
| T_PC1 + ΔF + Rn | 5 | -123.76 | 257.81 | 1.57 |
| T_PC1 + ΔF + Rn + ΔF:Rn | 6 | -122.73 | 257.88 | 1.65 |
| T_PC1 + I_PC1 + ΔF + Rn + ΔF:Rn | 7 | -121.70 | 257.96 | 1.72 |
| **Alternate best fit** | | | | |
| I_PC2 | 3 | -126.10 | 258.33 | - |
| **Model - *Hakea oleifolia*** | | | | |
| I_PC1 + D + ΔD | 5 | -82.26 | 174.93 | 0 |
| I_PC1 + ΔD | 4 | -83.54 | 175.35 | 0.42 |
| I_PC1 + D + ΔD + D: ΔD | 6 | -82.14 | 176.86 | 1.93 |
| Null | 2 | -90.13 | 184.35 | 9.42 |
| **Alternate best fit** | | | | |
| I_PC1 + F | 4 | -85.40 | 179.08 | - |
| **Model - *Hibbertia cuneiformis*** | | | | |
| **I_PC2** | **3** | **-38.72** | **83.85** | **0.00** |
| I_PC2 + I_PC1 | 4 | -37.61 | 83.90 | 0.05 |
| I_PC2 + Rn + F + ΔF + Rn: F + Rn: ΔF | 8 | -32.91 | 84.44 | 0.59 |
| I_PC2 + ΔF | 4 | -38.46 | 85.59 | 1.74 |
| Null | 2 | -41.02 | 86.25 | 2.40 |
| **Model - *Hovea elliptica*** | | | | |
| Rn + F + Rn: F | 5 | -57.70 | 126.12 | 0.00 |
| I_PC1 + Rn + F + Rn: F | 6 | -56.61 | 126.24 | 0.12 |
| F | 3 | -60.28 | 126.84 | 0.72 |
| **Null** | **2** | **-61.54** | **127.23** | **1.11** |
| I_PC1 | 3 | -60.60 | 127.47 | 1.36 |
| I_PC1 + F | 4 | -59.61 | 127.70 | 1.58 |
| **Model - *Leucopogon obovatus* subsp. *revolutus*** | | | | |
| **Null** | **2** | **-25.71** | **55.64** | **0.00** |
| I_PC2 + Rn | 4 | -23.65 | 56.07 | 0.42 |
| Rn | 3 | -24.86 | 56.18 | 0.53 |
| I_PC2 | 3 | -24.93 | 56.31 | 0.66 |
| Rn + F | 4 | -24.04 | 56.85 | 1.20 |
| T_PC2 + Rn | 4 | -24.35 | 57.48 | 1.83 |
| I_PC1 | 3 | -25.58 | 57.62 | 1.98 |
| **Model - *Leucopogon propinquus*** | | | | |
| **Null** | **2** | **-64.36** | **132.84** | **0.00** |
| I_PC2 | 3 | -63.82 | 133.90 | 1.06 |
| I_PC1 | 3 | -64.21 | 134.68 | 1.84 |
| Rn | 3 | -64.21 | 134.68 | 1.84 |
| T_PC1 | 3 | -64.30 | 134.84 | 2.00 |

***Table S2.1***. *continued.*

| **Model - *Melaleuca cuticularis*** | ***k*** | **Log likelihood** | **AICc** | **Δ AICc** |
|---|---|---|---|---|
| NA - model convergence failure | | | | |
| **Model - *Melaleuca incana*** | | | | |
| **I_PC1 + I_PC2 + F** | **5** | **-213.78** | **437.63** | **0.00** |
| I_PC1 + F | 4 | -214.90 | 437.85 | 0.21 |
| I_PC1 + I_PC2 + F + ΔF | 6 | -212.99 | 438.10 | 0.47 |
| I_PC1 + I_PC2 + F + ΔF + F: ΔF | 7 | -212.23 | 438.61 | 0.98 |
| I_PC1 + F + ΔF | 5 | -214.55 | 439.18 | 1.55 |
| I_PC1 + F + ΔF + F: ΔF | 6 | -213.72 | 439.55 | 1.92 |
| **Alternate model - *Melaleuca incana*** | | | | |
| I_PC1 + I_PC2 + ΔD | 5 | -213.76 | 437.60 | 0.00 |
| I_PC1 + ΔD | 4 | -215.12 | 438.29 | 0.68 |
| I_PC1 + I_PC2 + D + ΔD | 6 | -213.40 | 438.91 | 1.31 |
| I_PC1 + D + ΔD | 5 | -214.47 | 439.02 | 1.42 |
| Null | 2 | -221.40 | 446.82 | - |
| **Model - *Melaleuca rhaphiophylla*** | | | | |
| I_PC1 +I_PC2 + D + ΔD + D: ΔD | 7 | -33.98 | 82.77 | 0 |
| **I_PC2 + D + ΔD + D: ΔD** | **6** | **-35.44** | **83.48** | **0.71** |
| I_PC1 + D + ΔD + D: ΔD | 6 | -35.87 | 84.36 | 1.59 |
| Null | 2 | -41.37 | 86.83 | 5.27 |
| **Alternate best fit** | | | | |
| ΔF | 3 | -40.76 | 87.70 | - |
| **Model - *Melaleuca viminea*** | | | | |
| NA - model convergence failure | | | | |
| **Model - *Taxandria juniperina*** | | | | |
| NA - model convergence failure | | | | |
| **Model - *Trymalium odoratissimum* subsp. *trifidum*** | | | | |
| **I_PC1 + Rn + ΔF + Rn: ΔF** | **6** | **-61.46** | **135.29** | **0.00** |
| I_PC1 + Rn | 4 | -64.61 | 137.39 | 2.10 |
| Rn + ΔF + Rn: ΔF | 5 | -63.88 | 138.03 | 2.73 |
| I_PC1 + Rn + ΔF | 5 | -64.51 | 139.28 | 3.98 |
| Rn | 3 | -67.54 | 141.19 | 5.90 |
| I_PC1 | 3 | -67.68 | 141.46 | 6.16 |
| I_PC1 + ΔF | 4 | -66.85 | 141.88 | 6.58 |
| Rn + ΔF | 4 | -67.76 | 143.70 | 8.40 |
| Null | 2 | -70.40 | 144.84 | 9.55 |
| ΔF | 3 | -69.44 | 144.97 | 9.68 |
| **Alternate best fit** | | | | |
| I_PC1 + Rn | 4 | -64.61 | 137.39 | 0.00 |