

# Supplementary Materials

## Coral cover and species responses to heat exposure vary across contemporary Western Atlantic reefs

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### Sensitivity analysis

#### 1. Data treatment

Linking a specific change in coral cover to a single DHW peak is complicated by the fact that heat stress can have delayed and cumulative effects, and recent cooling events could also potentially promote recovery. To capture this time-integrated response, we derived loss rates from a decay-weighted cumulative DHW index combining maxDHW in the survey year and the two preceding years.

$$\text{weightedDHW} = w_0 \text{maxDHW}_t + w_1 \text{maxDHW}_{t-1} + w_2 \text{maxDHW}_{t-2}$$

where  $t$  is the year of the later survey;  $\text{maxDHW}_t$ ,  $\text{maxDHW}_{t-1}$  and  $\text{maxDHW}_{t-2}$  are the annual maximum DHW values in the current, previous, and two-years-prior periods; and  $w_0$ ,  $w_1$ ,  $w_2$  are weights that sum to 1. By construction, weightedDHW has the same units as DHW.

We use exponentially decaying baseline weights (recent years count more) with 3 years as a half-life to account for substantial carry over effects of heat stress.

Example (half-life  $H = 3$  years). The baseline decay weights are approximately  $w_0 = 0.41$ ,  $w_1 = 0.33$ ,  $w_2 = 0.26$ . If  $\text{maxDHW}_t = 6$ ,  $\text{maxDHW}_{t-1} = 10$  and  $\text{maxDHW}_{t-2} = 4$ , then

$$\text{weightedDHW} = 0.46 \times 6 + 0.33 \times 10 + 0.26 \times 4 = 6.9 \text{ DHW}$$

To account for surveys being carried out before or after the annual DHW peak and the interval between 2 survey years (1 or 2 years), we apply small, pre-specified timing adjustments to the weights ( $m_0$ ,  $m_1$  and  $m_2$ ):

### Surveys in Consecutive Years:

After peak. The baseline decay was applied to keep the ordering, but  $t$  and  $t-1$  were emphasised via multipliers  $m_0 = 1.40$ ,  $m_1 = 1$ ,  $m_2 = 0.90$ .

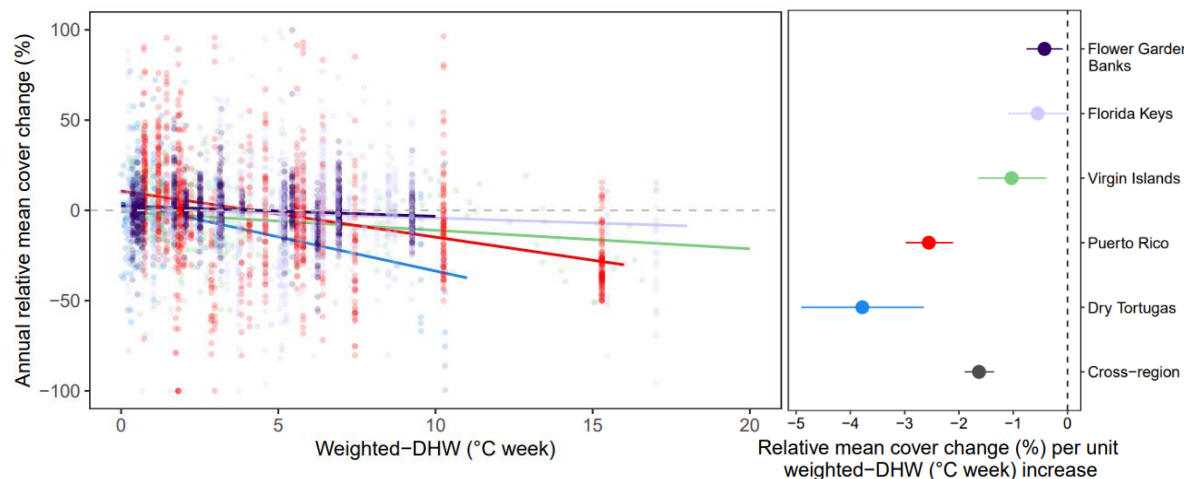
Before peak. The maxDHW of the current year was down-weighted and shifted influence to prior years ( $m_0 = 0.20$ ,  $m_1 = 1.80$ ,  $m_2 = 1.20$ ), reflecting that most stress relevant to the interval had not yet peaked in year  $t$ .

### Surveys Two Years Apart:

After peak: The current year remained largest but less dominant than in consecutive-year surveys;  $m_0 = 0.20$  and  $m_1 = m_2$  (equal weights for  $t-1$  and  $t-2$ ).

Before peak: Negligible weight was assigned to the current year ( $m_0 = 0.05$ ) and again equal weights for  $t-1$  and  $t-2$  were enforced ( $m_1 = m_2$ ), representing pre-peak sampling with a two-year interval.

For each event where DHW values reached 8 or higher we applied an extreme-event override where surveys conducted in the month preceding the peak DHW could also be assigned a larger weight for that current year. This approach accounted for the ramp-up period leading up to heatwave events (i.e., high DHW already occurring before the peak was reached), as seen during the 2023 and 2024 heatwaves, which recorded maximum DHW values of 18.89 °C-weeks in the Florida Keys, 14.34 °C-weeks in the Dry Tortugas, 11.91 °C-weeks at Flower Garden Banks (2023), and in 2024, 21.25 °C-weeks in Puerto Rico and 21.06 °C-weeks in the U.S. Virgin Islands.



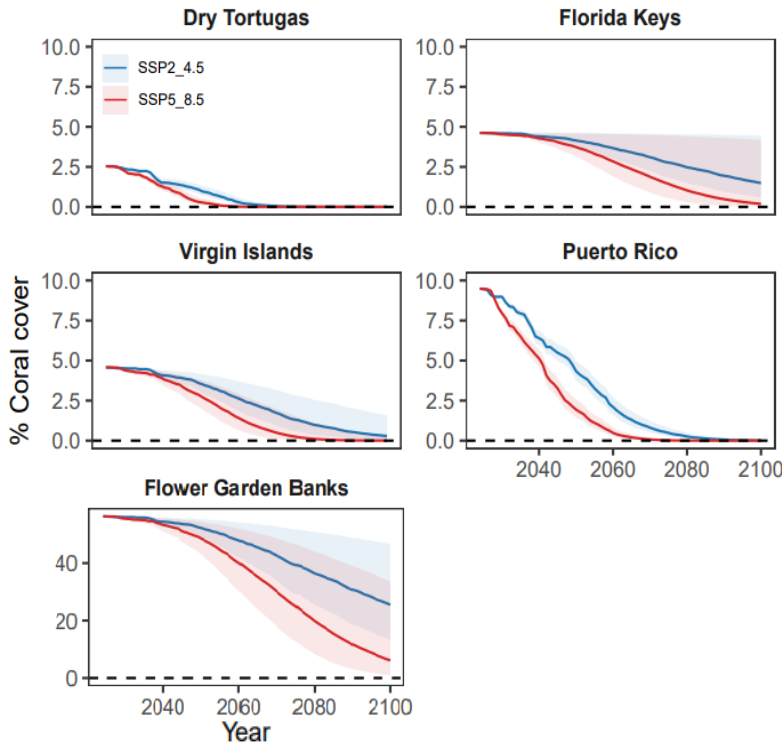
**Figure S1.** A) Predicted annual rate of relative change in mean coral cover (%) as a function of weighted-DHW for each location. Each point represents the annual relative change in mean coral cover at an individual site within each location. B) Effect sizes (slopes) from generalised mixed linear models (GLMMs), with each point representing the annual rate of relative change in mean coral cover per unit increase in weighted-DHW for each location. Error bars indicate 95% confidence intervals and slopes are significantly different from zero if their 95% CIs do not overlap with the vertical dashed line at zero.

## 2. Projections

To explore the application of our work, we projected the 2024 mean coral cover at each location. To avoid a scale mismatch, coral cover loss parameters (slopes) were translated from the weighted index scale to the maxDHW scale via a simple linear calibration. For each location, a linear regression was fit between the calculated weighted-DHW and the measured maxDHW, where the slope  $a = \text{Cov}(\text{weightedDHW}, \text{maxDHW}) / \text{Var}(\text{maxDHW})$  quantifies how much the index slope changes per 1-unit increase in maxDHW. The index-scale slope  $\beta$  (percent relative cover change per unit weighted-DHW) was then converted to a maxDHW-scale slope  $\alpha = \beta \times a$ .

Projection error was quantified by multiplying the lower and upper confidence-limit estimates of the weighted-DHW slope by  $a$ . Coral cover is influenced by multiplying the rate of change (slope coefficient  $a$ ) by the projected DHW values, assuming corals do not adapt to rising DHW.

Converted rates rates were -2.42% (95% CI: -3.14, -1.70) for the Dry Tortugas, -0.28% (95% CI: -0.54, -0.01) for the Florida Keys, -0.72% (95% CI: -1.16, -0.28) for the Virgin Islands, -1.30% (95% CI: -1.52, -1.08) for Puerto Rico and -0.21% (95% CI: -0.38, -0.05) for the Flower Garden Banks.

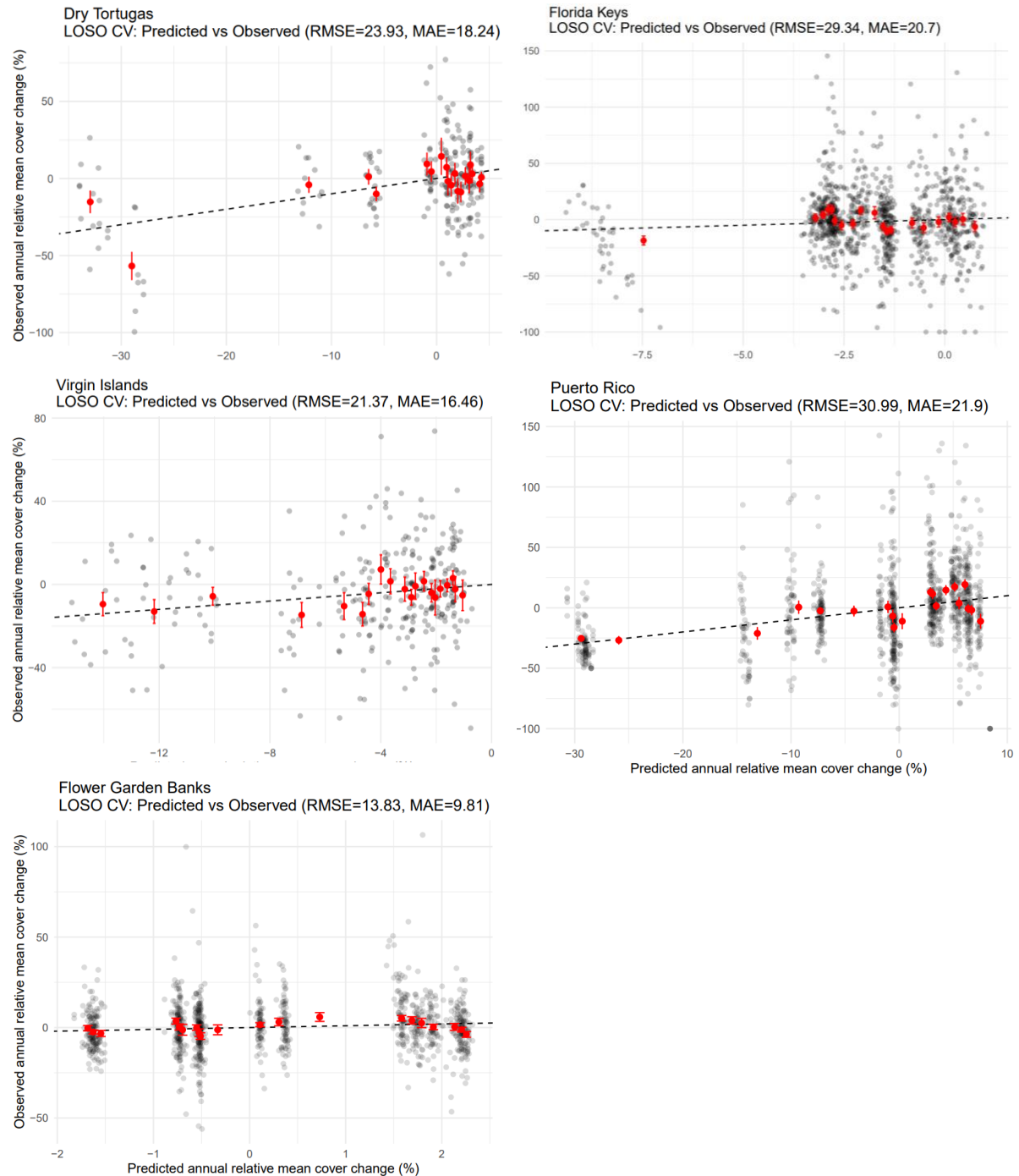


**Figure S2.** Coral cover projections based on site-specific Degree Heating Weeks (DHW) projections. Loss parameters were established on the weighted-DHW index scale and translated to the maxDHW scale. Mean coral cover projections at each location, under the SSP5–8.5 (red) and SSP2–4.5 (blue) scenarios. Error is calculated using lower and upper confidence intervals of the slope to inform coral cover change. Note that the Flower Garden Banks future coral cover is depicted with a different y-axis scale compared to the other sites.

### Leave-one-site-out cross-validation (LOSO)

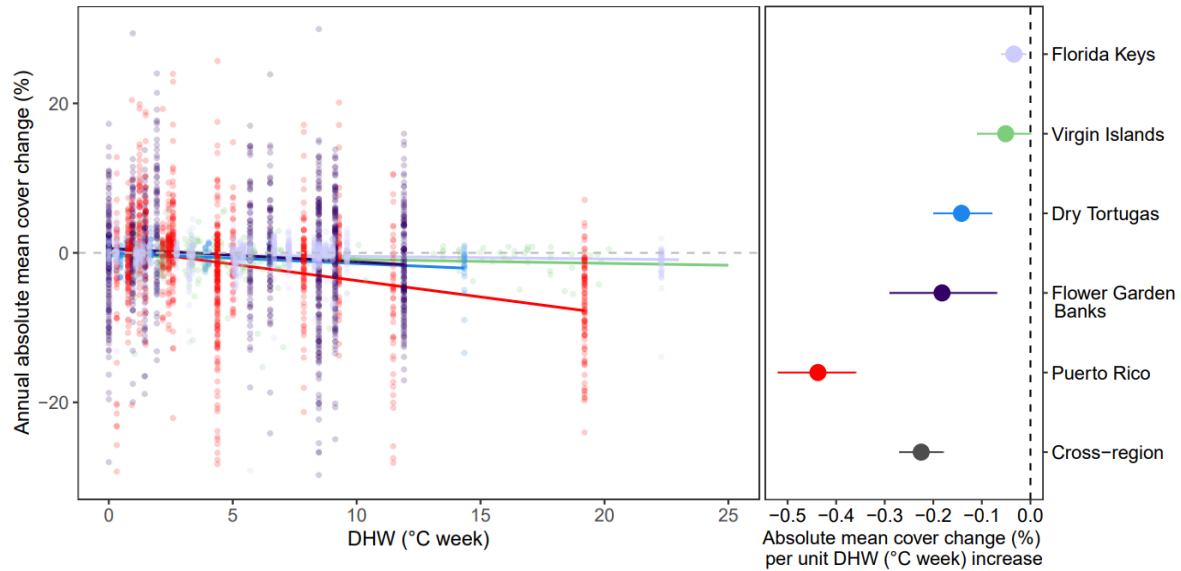
We assessed model generalisation using leave-one-site-out cross-validation (LOSO), in which models were trained on all but one site and then used to predict the held-out site using only fixed effects. Predictive performance was quantified with root mean squared error (RMSE) and mean absolute error (MAE) between predicted and observed annual relative mean cover change. As expected for field-based ecological data, individual point-level predictions exhibited high variability. To better visualise

model calibration, we aggregated predictions into bins of similar predicted values and compared mean observed outcomes against mean predictions. These binned means ( $\pm$  standard error) closely followed the 1:1 line, indicating that while fine-scale predictions are noisy and point-wise errors (RMSE, MAE) are large due to scatter in the data, the model captures the correct average trend across the prediction range.



**Figure S3.** Leave-one-site-out cross-validation (LOSO) predicted vs. observed plot for each location. Grey points = raw predictions, red points  $\pm$  SE = binned means. Dashed line = 1:1 line.

## Absolute cover change



**Figure S4. A)** Predicted annual rate of absolute change in mean coral cover (%) as a function of maxDHW for each location. Each point represents the annual absolute change in mean coral cover at an individual site within each location. **B)** Effect sizes (slopes) from GLMMs, with each point representing the annual rate of absolute change in mean coral cover per unit increase in DHW for each location. Error bars indicate 95% confidence intervals.

**Table S1.** Table showing the number of species and sites within each location included in the analyses of absolute coral cover change in relation to DHW, along with GLMM-derived p-values and slopes, as well as confidence intervals derived from the test\_predictions() function. The number of species included depended on the amount of data available to run the models. All GLMMs incorporated random intercepts for sites to account for spatial non-independence.

| LOCATIONS                       | Florida Keys     | Dry Tortugas     | Puerto Rico      | Virgin Islands   | Flower Garden Banks |
|---------------------------------|------------------|------------------|------------------|------------------|---------------------|
| <i>Sites</i>                    | 46               | 11               | 18               | 23               | 2                   |
| <i>Stations</i>                 | 46               | 11               | 42               | 23               | 78                  |
| <i>Species used in analysis</i> | 13               | 13               | 14               | 13               | 12                  |
| <i>Distribution</i>             | gaussian         | gaussian         | gaussian         | gaussian         | gaussian            |
| <i>Total species</i>            | 33               | 30               | 24               | 17               | 23                  |
| <i>Slope</i>                    | -0.03            | -0.14            | -0.44            | -0.05            | -0.18               |
| <i>Lower CI</i>                 | -0.06            | -0.2             | -0.52            | -0.11            | -0.29               |
| <i>Upper CI</i>                 | -0.01            | -0.08            | -0.36            | 0                | -0.07               |
| <i>SE</i>                       | 0.014            | 0.029            | 0.042            | 0.028            | 0.058               |
| <i>p</i>                        | <b>0.015</b>     | <b>&lt;0.001</b> | <b>&lt;0.001</b> | 0.070            | <b>0.002</b>        |
| <i>SD Random Int.</i>           | <b>&lt;0.001</b> | <b>&lt;0.001</b> | 0.2504           | <b>&lt;0.001</b> | <b>&lt;0.001</b>    |

## Species-level GLMMS

**Table S2.** Species-specific loss parameters (slopes) in coral cover change at all five locations. Slopes were estimated using GLMMs with site included as a random effect. For each species, the table reports the slope estimate, 95% confidence interval (CI), unadjusted p value, and false discovery rate-adjusted p value (FDR). Results are presented for both relative cover change and absolute cover change.

| FLORIDA KEYS                |                                  |        |          |          |         |             |
|-----------------------------|----------------------------------|--------|----------|----------|---------|-------------|
|                             | Species                          | Slope  | CI Lower | CI Upper | P Value | P Value FDR |
| Relative<br>cover<br>change | <i>Acropora cervicornis</i>      | -4.309 | -10.586  | 1.968    | 0.178   | 0.387       |
|                             | <i>Acropora palmata</i>          | -0.899 | -5.463   | 3.665    | 0.699   | 0.827       |
|                             | <i>Colpophyllia natans</i>       | -0.996 | -2.434   | 0.441    | 0.174   | 0.387       |
|                             | <i>Millepora alcicornis</i>      | -0.993 | -1.811   | -0.176   | 0.017   | 0.075       |
|                             | <i>Montastraea cavernosa</i>     | 0.092  | -0.739   | 0.923    | 0.828   | 0.894       |
|                             | <i>Orbicella annularis</i>       | -0.376 | -1.250   | 0.497    | 0.399   | 0.576       |
|                             | <i>Porites astreoides</i>        | -0.840 | -1.510   | -0.170   | 0.014   | 0.075       |
|                             | <i>Porites porites</i>           | -1.400 | -2.543   | -0.257   | 0.016   | 0.075       |
|                             | <i>Pseudodiploria strigosa</i>   | 0.236  | -3.226   | 3.698    | 0.894   | 0.894       |
|                             | <i>Siderastrea siderea</i>       | 0.505  | -0.053   | 1.063    | 0.076   | 0.247       |
|                             | <i>Stephanocoenia intersepta</i> | -0.567 | -1.546   | 0.411    | 0.256   | 0.456       |
|                             | <i>Agaricia spp.</i>             | -0.422 | -1.628   | 0.784    | 0.493   | 0.641       |
| Absolute<br>cover<br>change | <i>Acropora cervicornis</i>      | -0.013 | -0.061   | 0.035    | 0.603   | 0.844       |
|                             | <i>Acropora palmata</i>          | -0.010 | -0.149   | 0.129    | 0.886   | 0.886       |
|                             | <i>Colpophyllia natans</i>       | -0.020 | -0.049   | 0.009    | 0.186   | 0.350       |
|                             | <i>Millepora alcicornis</i>      | -0.013 | -0.018   | -0.007   | 0.000   | 0.000       |
|                             | <i>Montastraea cavernosa</i>     | 0.002  | -0.009   | 0.013    | 0.714   | 0.844       |
|                             | <i>Orbicella annularis</i>       | -0.032 | -0.056   | -0.008   | 0.009   | 0.044       |
|                             | <i>Porites astreoides</i>        | -0.009 | -0.015   | -0.002   | 0.010   | 0.044       |
|                             | <i>Porites porites</i>           | -0.006 | -0.013   | 0.000    | 0.054   | 0.141       |
|                             | <i>Pseudodiploria strigosa</i>   | 0.002  | -0.018   | 0.023    | 0.824   | 0.886       |
|                             | <i>Siderastrea siderea</i>       | 0.002  | -0.006   | 0.009    | 0.642   | 0.844       |
|                             | <i>Stephanocoenia intersepta</i> | -0.004 | -0.009   | 0.002    | 0.188   | 0.350       |
|                             | <i>Agaricia spp.</i>             | -0.004 | -0.007   | 0.000    | 0.054   | 0.141       |

DRY TORTUGAS

|                                      | Species                          | Slope  | CI Lower | CI Upper | P Value | P Value FDR |
|--------------------------------------|----------------------------------|--------|----------|----------|---------|-------------|
| <b>Relative<br/>cover<br/>change</b> | <i>Acropora cervicornis</i>      | -5.179 | -9.911   | -0.447   | 0.032   | 0.091       |
|                                      | <i>Acropora palmata</i>          | -4.962 | -7.822   | -2.103   | 0.001   | 0.003       |
|                                      | <i>Colpophyllia natans</i>       | -2.541 | -6.998   | 1.916    | 0.264   | 0.410       |
|                                      | <i>Millepora alcicornis</i>      | -3.355 | -4.775   | -1.935   | <0.001  | 0.000       |
|                                      | <i>Montastraea cavernosa</i>     | -0.413 | -2.888   | 2.062    | 0.744   | 0.863       |
|                                      | <i>Orbicella annularis</i>       | -1.775 | -3.781   | 0.230    | 0.083   | 0.165       |
|                                      | <i>Porites astreoides</i>        | -2.243 | -4.687   | 0.200    | 0.072   | 0.165       |
|                                      | <i>Porites porites</i>           | -2.811 | -6.296   | 0.674    | 0.114   | 0.199       |
|                                      | <i>Pseudodiploria clivosa</i>    | 13.349 | 1.103    | 25.596   | 0.033   | 0.091       |
|                                      | <i>Pseudodiploria strigosa</i>   | 2.998  | -5.003   | 10.999   | 0.463   | 0.589       |
|                                      | <i>Siderastrea siderea</i>       | -0.040 | -1.880   | 1.800    | 0.966   | 0.966       |
|                                      | <i>Stephanocoenia intersepta</i> | 1.994  | -1.910   | 5.898    | 0.317   | 0.443       |
|                                      | <i>Agaricia spp.</i>             | -0.602 | -5.301   | 4.096    | 0.802   | 0.863       |
| <b>Absolute<br/>cover<br/>change</b> | <i>Acropora cervicornis</i>      | -0.012 | -0.036   | 0.013    | 0.352   | 0.548       |
|                                      | <i>Acropora palmata</i>          | -0.362 | -0.523   | -0.201   | 0.000   | 0.000       |
|                                      | <i>Colpophyllia natans</i>       | 0.005  | -0.019   | 0.029    | 0.690   | 0.743       |
|                                      | <i>Millepora alcicornis</i>      | -0.029 | -0.041   | -0.017   | 0.000   | 0.000       |
|                                      | <i>Montastraea cavernosa</i>     | -0.005 | -0.024   | 0.015    | 0.646   | 0.743       |
|                                      | <i>Orbicella annularis</i>       | -0.023 | -0.050   | 0.005    | 0.105   | 0.183       |
|                                      | <i>Porites astreoides</i>        | -0.005 | -0.011   | 0.001    | 0.085   | 0.169       |
|                                      | <i>Porites porites</i>           | -0.006 | -0.013   | 0.000    | 0.063   | 0.147       |
|                                      | <i>Pseudodiploria clivosa</i>    | 0.013  | 0.003    | 0.024    | 0.014   | 0.049       |
|                                      | <i>Pseudodiploria strigosa</i>   | 0.003  | -0.005   | 0.010    | 0.515   | 0.721       |
|                                      | <i>Siderastrea siderea</i>       | 0.002  | -0.008   | 0.013    | 0.678   | 0.743       |
|                                      | <i>Stephanocoenia intersepta</i> | 0.005  | 0.000    | 0.009    | 0.048   | 0.135       |
|                                      | <i>Agaricia spp.</i>             | 0.000  | -0.003   | 0.003    | 0.946   | 0.946       |

PUERTO RICO

|                                      | Species                          | Slope  | CI Lower | CI Upper | P Value | P Value FDR |
|--------------------------------------|----------------------------------|--------|----------|----------|---------|-------------|
| <b>Relative<br/>cover<br/>change</b> | <i>Agaricia spp.</i>             | -3.024 | -4.228   | -1.819   | <0.001  | <0.001      |
|                                      | <i>Colpophyllia natans</i>       | -1.138 | -2.677   | 0.401    | 0.147   | 0.270       |
|                                      | <i>Diploria labyrinthiformis</i> | -0.610 | -3.228   | 2.008    | 0.648   | 0.891       |
|                                      | <i>Montastraea cavernosa</i>     | -0.179 | -1.235   | 0.878    | 0.740   | 0.904       |
|                                      | <i>Orbicella annularis</i>       | -2.572 | -3.213   | -1.931   | <0.001  | <0.001      |
|                                      | <i>Porites astreoides</i>        | -1.234 | -1.979   | -0.490   | 0.001   | 0.004       |
|                                      | <i>Porites porites</i>           | -2.951 | -5.017   | -0.885   | 0.005   | 0.014       |
|                                      | <i>Pseudodiploria strigosa</i>   | -2.141 | -4.069   | -0.212   | 0.030   | 0.065       |
|                                      | <i>Siderastrea siderea</i>       | 0.129  | -1.079   | 1.338    | 0.834   | 0.917       |
|                                      | <i>Stephanocoenia intersepta</i> | -1.189 | -3.246   | 0.868    | 0.257   | 0.404       |
|                                      | <i>Agaricia spp.</i>             | -0.038 | -0.055   | -0.021   | 0.000   | <0.001      |
| <b>Absolute<br/>cover<br/>change</b> | <i>Colpophyllia natans</i>       | -0.026 | -0.054   | 0.002    | 0.068   | 0.149       |
|                                      | <i>Diploria labyrinthiformis</i> | -0.023 | -0.043   | -0.003   | 0.024   | 0.066       |
|                                      | <i>Montastraea cavernosa</i>     | 0.010  | -0.012   | 0.032    | 0.374   | 0.553       |
|                                      | <i>Orbicella annularis</i>       | -0.235 | -0.304   | -0.167   | 0.000   | <0.001      |
|                                      | <i>Porites astreoides</i>        | -0.020 | -0.034   | -0.006   | 0.005   | 0.017       |
|                                      | <i>Porites porites</i>           | -0.002 | -0.043   | 0.040    | 0.936   | 0.936       |
|                                      | <i>Pseudodiploria strigosa</i>   | -0.018 | -0.040   | 0.003    | 0.098   | 0.180       |
|                                      | <i>Siderastrea siderea</i>       | -0.008 | -0.026   | 0.010    | 0.402   | 0.553       |
|                                      | <i>Stephanocoenia intersepta</i> | -0.001 | -0.005   | 0.004    | 0.831   | 0.914       |
|                                      | <i>Agaricia spp.</i>             | -0.038 | -0.055   | -0.021   | 0.000   | <0.001      |

VIRGIN ISLANDS

|                             | Species                          | Slope  | CI Lower | CI Upper | P Value | P Value FDR |
|-----------------------------|----------------------------------|--------|----------|----------|---------|-------------|
| Relative<br>cover<br>change | <i>Agaricia spp.</i>             | -0.003 | -1.940   | 1.934    | 0.998   | 0.998       |
|                             | <i>Colpophyllia natans</i>       | -0.658 | -3.667   | 2.352    | 0.669   | 0.998       |
|                             | <i>Diploria labyrinthiformis</i> | -0.061 | -3.607   | 3.484    | 0.973   | 0.998       |
|                             | <i>Madracis decactis</i>         | 0.121  | -1.368   | 1.611    | 0.873   | 0.998       |
|                             | <i>Montastraea cavernosa</i>     | -0.197 | -1.330   | 0.936    | 0.733   | 0.998       |
|                             | <i>Orbicella annularis</i>       | -0.616 | -1.802   | 0.570    | 0.309   | 0.998       |
|                             | <i>Orbicella faveolata</i>       | 0.159  | -1.284   | 1.601    | 0.829   | 0.998       |
|                             | <i>Orbicella franksi</i>         | 0.144  | -1.167   | 1.456    | 0.829   | 0.998       |
|                             | <i>Porites astreoides</i>        | -0.380 | -1.077   | 0.317    | 0.286   | 0.998       |
|                             | <i>Porites porites</i>           | 0.437  | -0.843   | 1.716    | 0.504   | 0.998       |
|                             | <i>Pseudodiploria strigosa</i>   | -2.256 | -4.491   | -0.021   | 0.048   | 0.670       |
|                             | <i>Siderastrea siderea</i>       | 0.228  | -0.616   | 1.073    | 0.596   | 0.998       |
| Absolute<br>cover<br>change | <i>Agaricia spp.</i>             | 0.009  | -0.005   | 0.023    | 0.227   | 0.793       |
|                             | <i>Colpophyllia natans</i>       | -0.033 | -0.071   | 0.005    | 0.091   | 0.793       |
|                             | <i>Diploria labyrinthiformis</i> | 0.003  | -0.035   | 0.040    | 0.894   | 0.927       |
|                             | <i>Madracis decactis</i>         | -0.004 | -0.016   | 0.008    | 0.526   | 0.863       |
|                             | <i>Montastraea cavernosa</i>     | -0.001 | -0.019   | 0.018    | 0.927   | 0.927       |
|                             | <i>Orbicella annularis</i>       | -0.023 | -0.077   | 0.032    | 0.413   | 0.863       |
|                             | <i>Orbicella faveolata</i>       | -0.012 | -0.045   | 0.021    | 0.480   | 0.863       |
|                             | <i>Orbicella franksi</i>         | 0.012  | -0.048   | 0.071    | 0.701   | 0.863       |
|                             | <i>Porites astreoides</i>        | -0.009 | -0.022   | 0.004    | 0.181   | 0.793       |
|                             | <i>Porites porites</i>           | 0.006  | -0.015   | 0.026    | 0.597   | 0.863       |
|                             | <i>Pseudodiploria strigosa</i>   | -0.030 | -0.071   | 0.012    | 0.164   | 0.793       |
|                             | <i>Siderastrea siderea</i>       | -0.002 | -0.014   | 0.010    | 0.740   | 0.863       |

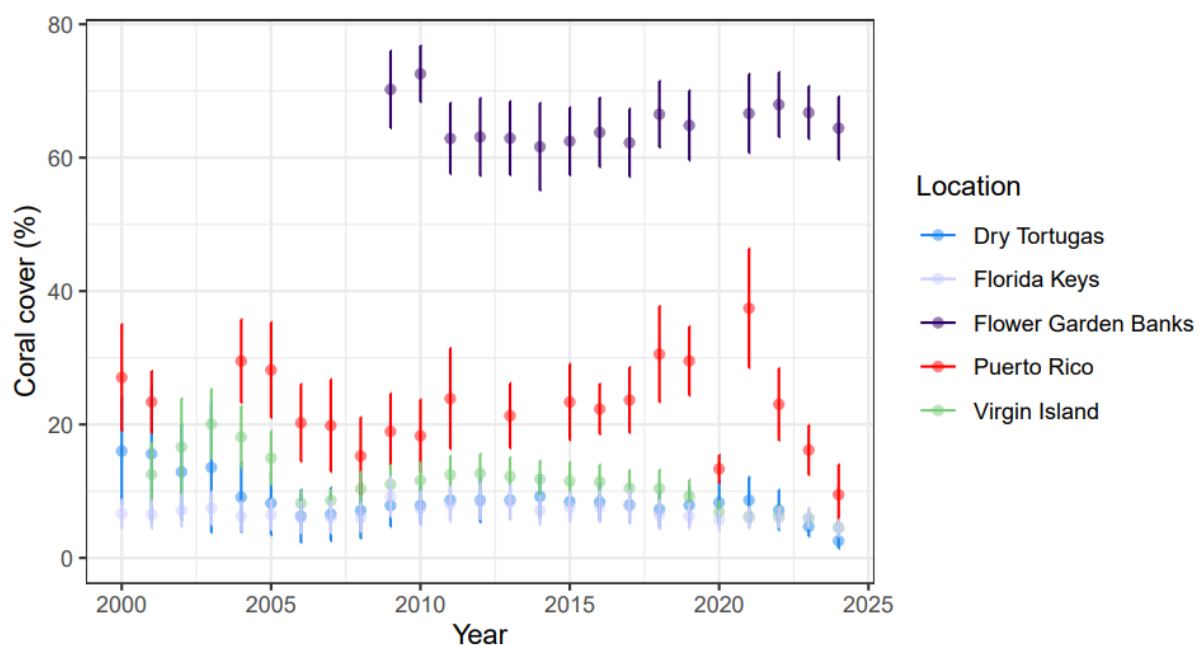
EAST AND WEST FLOWER GARDEN BANKS

|                             | Species                          | Slope  | CI Lower | CI Upper | P Value | P Value FDR |
|-----------------------------|----------------------------------|--------|----------|----------|---------|-------------|
| Relative<br>cover<br>change | <i>Agaricia spp.</i>             | 1.69   | -1.168   | 4.548    | 0.247   | 0.612       |
|                             | <i>Colpophyllia natans</i>       | -0.53  | -2.125   | 1.066    | 0.515   | 0.67        |
|                             | <i>Madracis decactis</i>         | 0.362  | -2.494   | 3.218    | 0.804   | 0.925       |
|                             | <i>Millepora alcicornis</i>      | 1.973  | -1.97    | 5.916    | 0.327   | 0.612       |
|                             | <i>Montastraea cavernosa</i>     | -0.017 | -1.16    | 1.126    | 0.977   | 0.977       |
|                             | <i>Orbicella annularis</i>       | -0.272 | -3.165   | 2.621    | 0.854   | 0.925       |
|                             | <i>Orbicella faveolata</i>       | -1.637 | -3.157   | -0.117   | 0.035   | 0.341       |
|                             | <i>Orbicella franksi</i>         | -0.23  | -0.619   | 0.159    | 0.247   | 0.612       |
|                             | <i>Porites astreoides</i>        | 0.392  | -0.662   | 1.445    | 0.466   | 0.67        |
|                             | <i>Pseudodiploria strigosa</i>   | -0.553 | -1.396   | 0.29     | 0.198   | 0.612       |
|                             | <i>Siderastrea siderea</i>       | -0.978 | -3.568   | 1.611    | 0.459   | 0.67        |
|                             | <i>Stephanocoenia intersepta</i> | -1.183 | -3.559   | 1.194    | 0.329   | 0.612       |
| Absolute<br>cover<br>change | <i>Agaricia spp.</i>             | 0.028  | -0.038   | 0.094    | 0.404   | 0.813       |
|                             | <i>Colpophyllia natans</i>       | -0.027 | -0.103   | 0.05     | 0.496   | 0.813       |
|                             | <i>Madracis decactis</i>         | -0.019 | -0.077   | 0.039    | 0.515   | 0.813       |
|                             | <i>Millepora alcicornis</i>      | 0.034  | -0.068   | 0.137    | 0.512   | 0.813       |
|                             | <i>Montastraea cavernosa</i>     | 0.016  | -0.07    | 0.102    | 0.721   | 0.937       |
|                             | <i>Orbicella annularis</i>       | -0.329 | -0.772   | 0.115    | 0.147   | 0.636       |
|                             | <i>Orbicella faveolata</i>       | -0.157 | -0.326   | 0.012    | 0.069   | 0.446       |
|                             | <i>Orbicella franksi</i>         | -0.191 | -0.321   | -0.061   | 0.004   | 0.053       |
|                             | <i>Porites astreoides</i>        | 0.002  | -0.049   | 0.053    | 0.949   | 0.996       |
|                             | <i>Pseudodiploria strigosa</i>   | -0.004 | -0.084   | 0.076    | 0.922   | 0.996       |
|                             | <i>Siderastrea siderea</i>       | -0.176 | -0.549   | 0.198    | 0.357   | 0.813       |
|                             | <i>Stephanocoenia intersepta</i> | -0.021 | -0.091   | 0.05     | 0.563   | 0.813       |

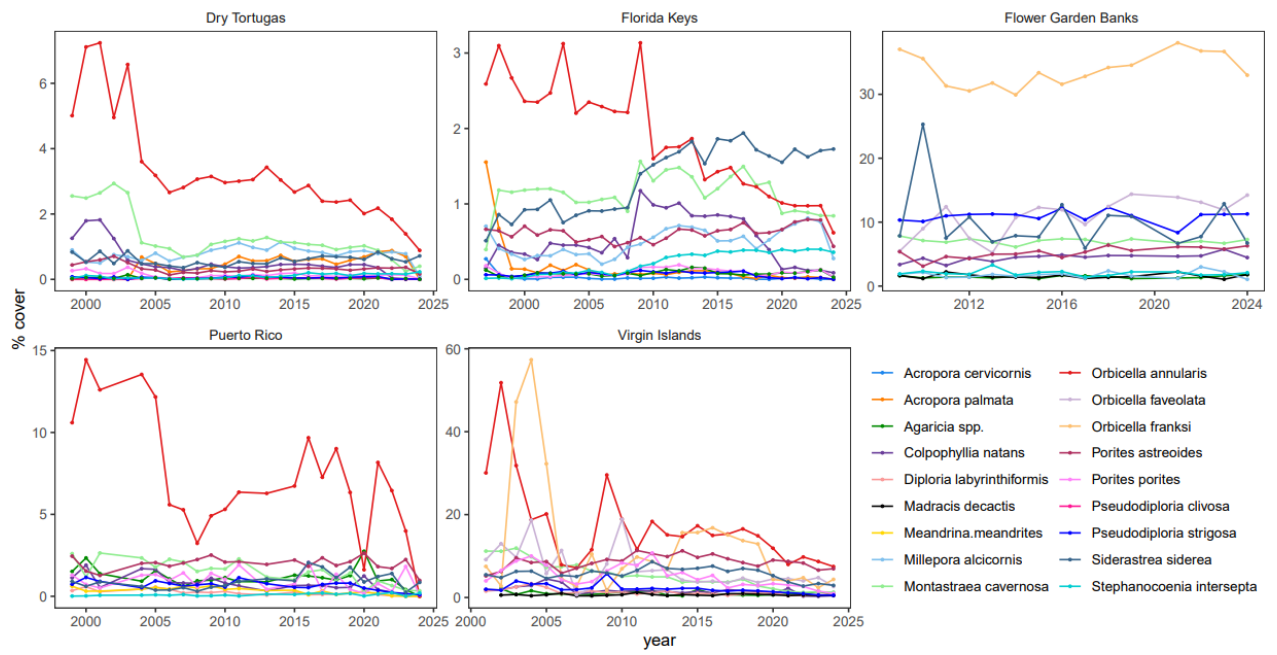
## Supporting Tables and Figures

**Table S3.** Table showing the number of species and sites within each location included in the analyses, along with p-values and slopes from the GLMMs, as well as confidence intervals derived from the test\_predictions() function. The number of species included depended on the amount of data available to run the models. All GLMMs incorporated random intercepts for sites.

| LOCATIONS                       | Florida Keys | Dry Tortugas     | Puerto Rico      | Virgin Islands | Flower Garden Banks |
|---------------------------------|--------------|------------------|------------------|----------------|---------------------|
| <i>Sites</i>                    | 46           | 11               | 18               | 23             | 2                   |
| <i>Stations</i>                 | 46           | 11               | 42               | 23             | 78                  |
| <i>Species used in analysis</i> | 13           | 13               | 14               | 13             | 12                  |
| <i>Distribution</i>             | gaussian     | gaussian         | gaussian         | gaussian       | gaussian            |
| <i>Total species</i>            | 33           | 30               | 24               | 17             | 23                  |
| <i>Slope</i>                    | -0.41        | -2.41            | -1.94            | -0.72          | -0.32               |
| <i>Lower CI</i>                 | -0.81        | -3.15            | -2.29            | -1.19          | -0.52               |
| <i>Upper CI</i>                 | -0.01        | -1.67            | -1.59            | -0.24          | -0.12               |
| <i>SE</i>                       | 0.204        | 0.377            | 0.177            | 0.244          | 0.102               |
| <i>p</i>                        | <b>0.043</b> | <b>&lt;0.001</b> | <b>&lt;0.001</b> | <b>0.003</b>   | <b>0.002</b>        |
| <i>SD Random Int.</i>           | 0.001        | <0.001           | 2.955            | <0.001         | <0.001              |



**Figure S5.** Mean total coral cover (%) and 95% confidence intervals over time at each location.



**Figure S6.** Percent cover of main 18 species found in study locations.