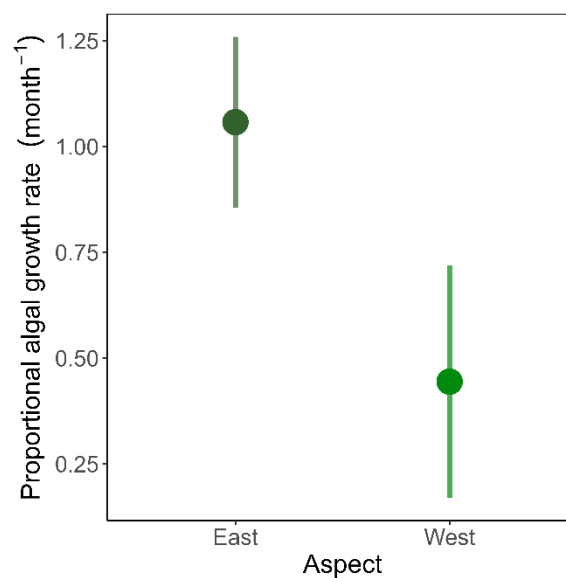


## Predators facilitate herbivory in nutrient-limited marine ecosystems

**Supplementary Material 1:** Linear mixed-effects model summary for proportional algal growth rate ( $n = 44$ ). Estimates correspond to scaled values of the predictors.

| <i>Formula</i>                                            | <i>Proportional Algal Growth Rate ~ Predator biomass (log) + Herbivore biomass (log) + Aspect + (1 Site)</i> |                   |                |                  |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-------------------|----------------|------------------|
| <i>Fixed effects</i>                                      | <i>Estimate</i>                                                                                              | <i>Std. Error</i> | <i>t value</i> | <i>p</i>         |
| <i>(Intercept)</i>                                        | 1.05                                                                                                         | 0.10              | 10.56          | <b>&lt;0.001</b> |
| <i>Predator biomass (log)</i>                             | 0.41                                                                                                         | 0.11              | 3.64           | <b>0.001</b>     |
| <i>Herbivore biomass (log)</i>                            | -0.16                                                                                                        | 0.10              | -1.72          | 0.094            |
| <i>Aspect [west]</i>                                      | -0.61                                                                                                        | 0.19              | -3.29          | <b>0.002</b>     |
| <i>Random effects</i>                                     |                                                                                                              |                   |                |                  |
| <i>Residual</i>                                           |                                                                                                              |                   | 0.11           |                  |
| <i>Site</i>                                               |                                                                                                              |                   | 0.03           |                  |
| <i>N<sub>site</sub></i>                                   |                                                                                                              |                   | 11             |                  |
| <i>Marginal R<sup>2</sup> / Conditional R<sup>2</sup></i> |                                                                                                              |                   | 0.36 / 0.53    |                  |

**Supplementary Material 2:** Proportional algal growth rate ( $n = 44$ ) was higher in the sheltered eastern aspect of the atolls compared to the exposed western aspect. The points represent the partial predicted values from the linear mixed-effects model with all other predictors set at their mean. The error bars represent the 95% confidence intervals.



**Supplementary Material 3:** Summary of the generalized linear mixed-effects model with gamma error distribution and log-link for herbivore productivity ( $n = 33$ ). Estimates are untransformed and correspond to scaled values of the predictors.

| <i>Herbivore productivity ~ Predator biomass (log) + Resource availability + Structural complexity + Aspect + (1 Site)</i> |                 |                   |                |              |
|----------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------|----------------|--------------|
| <b>Formula</b>                                                                                                             |                 |                   |                |              |
| <b>Fixed effects</b>                                                                                                       | <b>Estimate</b> | <b>Std. Error</b> | <b>z value</b> | <b>p</b>     |
| <b>(Intercept)</b>                                                                                                         | 5.12            | 0.16              | 32.71          | <0.001       |
| <b>Predator biomass (log)</b>                                                                                              | 0.34            | 0.14              | 2.47           | <b>0.013</b> |
| <b>Resource availability</b>                                                                                               | 0.22            | 0.13              | 1.66           | 0.097        |
| <b>Structural complexity</b>                                                                                               | 0.34            | 0.13              | 2.58           | <b>0.010</b> |
| <b>Aspect [west]</b>                                                                                                       | 0.57            | 0.33              | 1.72           | 0.086        |
| <b>Random effects</b>                                                                                                      |                 |                   |                |              |
| <b>Residual</b>                                                                                                            |                 |                   | 0.26           |              |
| <b>Site</b>                                                                                                                |                 |                   | 0.01           |              |
| <b>N<sub>site</sub></b>                                                                                                    |                 |                   | 11             |              |
| <b>Marginal R<sup>2</sup> / Conditional R<sup>2</sup></b>                                                                  |                 |                   | 0.44 / 0.46    |              |

**Supplementary Material 4:** Linear model output for reef-wide herbivory rates ( $n = 44$ ). Estimates correspond to scaled values of the predictors.

| <i>Herbivory Rate ~ Predator Biomass (log) + Turf-feeding Herbivore Biomass (log) + Percentage algal cover + Aspect + (1 Site)</i> |                 |                   |                |                  |
|------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------|----------------|------------------|
| <b>Formula</b>                                                                                                                     |                 |                   |                |                  |
| <b>Fixed effects</b>                                                                                                               | <b>Estimate</b> | <b>Std. Error</b> | <b>t value</b> | <b>p</b>         |
| <b>(Intercept)</b>                                                                                                                 | 2.79            | 0.21              | 13.794         | <b>&lt;0.001</b> |
| <b>Predator biomass (log)</b>                                                                                                      | 0.64            | 0.26              | 2.504          | <b>0.017</b>     |
| <b>Herbivore biomass (log)</b>                                                                                                     | -0.31           | 0.20              | -1.507         | 0.140            |
| <b>Percentage algal cover</b>                                                                                                      | -0.01           | 0.19              | -0.064         | 0.949            |
| <b>Aspect [west]</b>                                                                                                               | -0.72           | 0.39              | -1.858         | 0.071            |
| <b>Random effects</b>                                                                                                              |                 |                   |                |                  |
| <b>Residual</b>                                                                                                                    |                 |                   | 0.94           |                  |
| <b>Site</b>                                                                                                                        |                 |                   | 0.00           |                  |
| <b>N<sub>site</sub></b>                                                                                                            |                 |                   | 11             |                  |
| <b>Marginal R<sup>2</sup> / Conditional R<sup>2</sup></b>                                                                          |                 |                   | 0.20 / 0.20    |                  |

**Supplementary Material 5:** Summary of the generalized linear mixed-effects model with gamma error distribution and log-link for community-level herbivory rates ( $n = 33$ ). Estimates are untransformed and correspond to scaled values of the predictors.

| <b>Formula</b>                                            | <i>Herbivory ~ Predator Biomass (log) +<br/>Percentage algal cover + Structural<br/>complexity + Aspect + (1 Site)</i> |                   |                |                  |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-------------------|----------------|------------------|
| <b>Fixed effects</b>                                      | <b>Estimate</b>                                                                                                        | <b>Std. Error</b> | <b>z value</b> | <b>p</b>         |
| <b>(Intercept)</b>                                        | 1.00                                                                                                                   | 0.13              | 4.86           | <b>&lt;0.001</b> |
| <b>Predator biomass (log)</b>                             | 0.41                                                                                                                   | 0.13              | 2.56           | <b>0.001</b>     |
| <b>Percentage algal cover</b>                             | -0.02                                                                                                                  | 0.11              | -0.37          | 0.869            |
| <b>Structural complexity</b>                              | 0.26                                                                                                                   | 0.12              | 1.71           | <b>0.028</b>     |
| <b>Aspect [west]</b>                                      | 0.12                                                                                                                   | 0.28              | 0.63           | 0.653            |
| <b>Random effects</b>                                     |                                                                                                                        |                   |                |                  |
| <b>Residual</b>                                           |                                                                                                                        |                   | 0.26           |                  |
| <b>Site</b>                                               |                                                                                                                        |                   | 0.00           |                  |
| <b>N<sub>site</sub></b>                                   |                                                                                                                        |                   | 11             |                  |
| <b>Marginal R<sup>2</sup> / Conditional R<sup>2</sup></b> |                                                                                                                        |                   | 0.34 / 0.34    |                  |

**Supplementary Material 6:** Summary of the generalized linear mixed-effects model with beta error distribution and logit-link for proportion of time spent in vigilance ( $n = 110$ ). Estimates are untransformed and correspond to scaled values of the predictors.

| <b>Formula</b>                                            | <i>Vigilance Time ~ Predator biomass (log) +<br/>herbivore biomass (log) + Resource<br/>availability + Structural complexity +<br/>Aspect + (1 Site)</i> |                   |                 |          |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------|----------|
| <b>Fixed effects</b>                                      | <b>Estimate</b>                                                                                                                                          | <b>Std. Error</b> | <b>z value</b>  | <b>p</b> |
| <b>(Intercept)</b>                                        | -1.25                                                                                                                                                    | 0.43              | -2.92           | 0.004    |
| <b>Predator biomass (log)</b>                             | 0.06                                                                                                                                                     | 0.13              | 0.47            | 0.637    |
| <b>Herbivore biomass (log)</b>                            | 0.01                                                                                                                                                     | 0.10              | 0.07            | 0.945    |
| <b>Resource availability</b>                              | 0.01                                                                                                                                                     | 0.11              | 0.05            | 0.964    |
| <b>Structural complexity</b>                              | -0.01                                                                                                                                                    | 0.01              | -1.23           | 0.218    |
| <b>Aspect [west]</b>                                      | 0.10                                                                                                                                                     | 0.17              | 0.57            | 0.566    |
| <b>Random effects</b>                                     |                                                                                                                                                          |                   |                 |          |
| <b>Residual</b>                                           |                                                                                                                                                          |                   | -0.07           |          |
| <b>Site</b>                                               |                                                                                                                                                          |                   | 0.00            |          |
| <b>N<sub>site</sub></b>                                   |                                                                                                                                                          |                   | 11              |          |
| <b>Marginal R<sup>2</sup> / Conditional R<sup>2</sup></b> |                                                                                                                                                          |                   | -1.673 / -1.673 |          |