Supplementary Materials

Restoration and coral adaptation delay, but do not prevent, climate-driven reef framework erosion of an inshore site in the Florida Keys.

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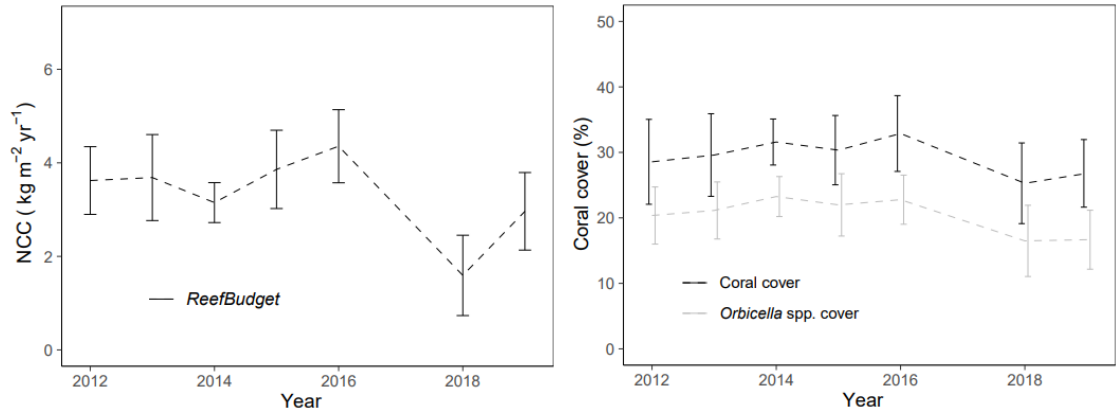

Figure S1. Carbonate budget rates (in kg m^{-2} yr^{-1}) and percent coral cover at Cheeca Rocks from 2012 to 2019. In the right panel, percent cover for all corals is depicted in black while the percent cover of the *Orbicella* species complex is illustrated in grey. Data was not collected in 2017 which was the year when hurricane Irma hit the Keys. The decrease in coral cover is likely linked to the hurricane and to tissue loss disease.

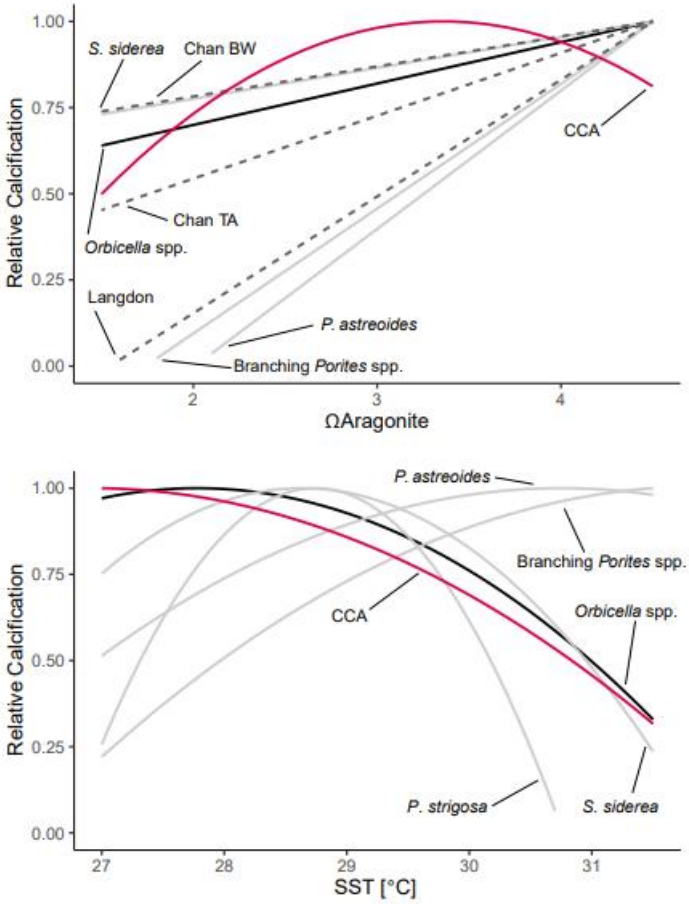

Figure S2. Main coral calcification response curves to aragonite saturation state (Ω_{Ar}) in the upper panel and to sea surface temperature (SST) in the lower panel. The data source utilized to build these response curves can be found in Table S1. In the upper panel, the dashed lines were added for comparison and represent response curves describe in Langdon et al. (2005)[1] and curves described in Chan and Conolly (2013)[2] using both the buoyant weight (BW) and the alkalinity anomaly (TA) techniques. CCA response curve is depicted in pink.

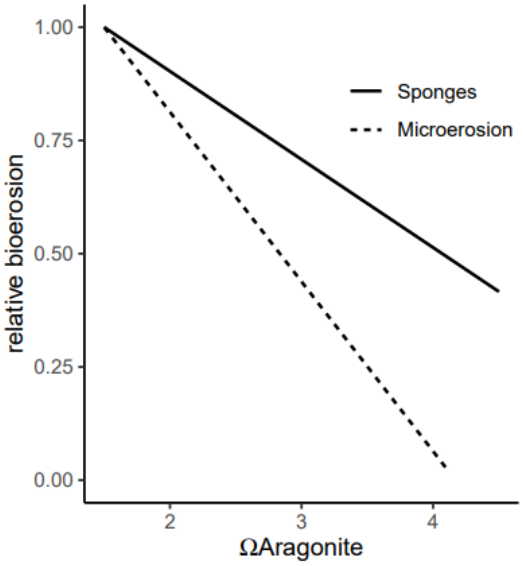

Figure S3. Relationship between seawater aragonite saturation state (Ω_{Ar}) and sponge bioerosion rates and coral microbioerosion rates. The data source utilized to build these response curves can be found in Table S1.

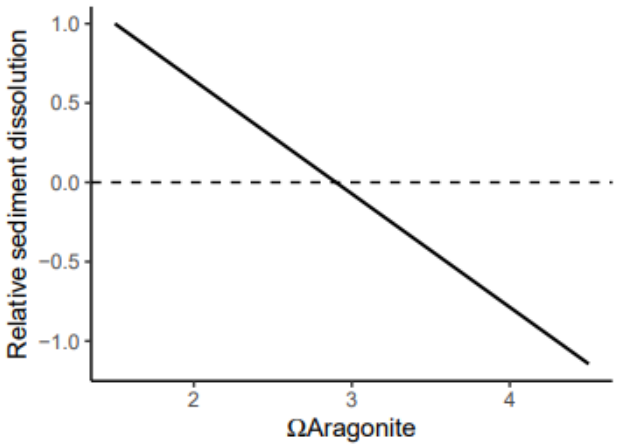

Figure S4. Relationship between seawater aragonite saturation state (Ωar) and reef carbonate precipitation/dissolution rates. The data source utilized (Table S1) to build this response curve come from Eyre et al. 2018[3].

Table S1. References for response curves in Figure S1, S2, and S3

Group	Stressor	Main data source
Coral calcification	OA	Jury et al. 2010[4]; Horvath et al. 2016[5]; Okazaki et al. 2017[6]; Bove et al. 2019[7]; Aichelman et al. 2020[8]
	SST	Jury et al. 2010; Grottoli et al. 2014[9]; Horvath et al. 2016[5]; Okazaki et al. 2017[6]; Bove et al. 2019[7]; Aichelman et al. 2020
CCA calcification	OA	Comeau et al. 2014a[10]; Comeau et al. 2014b[11]
	SST	Comeau et al. 2014a[10]; Comeau et al. 2016a[12] and 2016b; Johnson and Carpenter 2012[13]; Tanaka et al. 2017[14] and 2016; Vasquez et al. 2015[15]
Sponge bioerosion	OA	Fang et al. 2013[16]; Morris et al. Pers com; Wisshak et al. 2013[17]; Webb et al. 2017[18]
Micro bioerosion	OA	Enochs and Morris Pers com, Reyes-Nivia et al. 2013[19]; Tribollet et al. 2019[20]
Sand dissolution	OA	Cyronak et al. 2013[21]; Trnovsky 2016; Yates and Halley, 2003[22]; Andersson et al. 2007[23]; Fink et al. 2017[24]; Eyre et al. 2018[3]

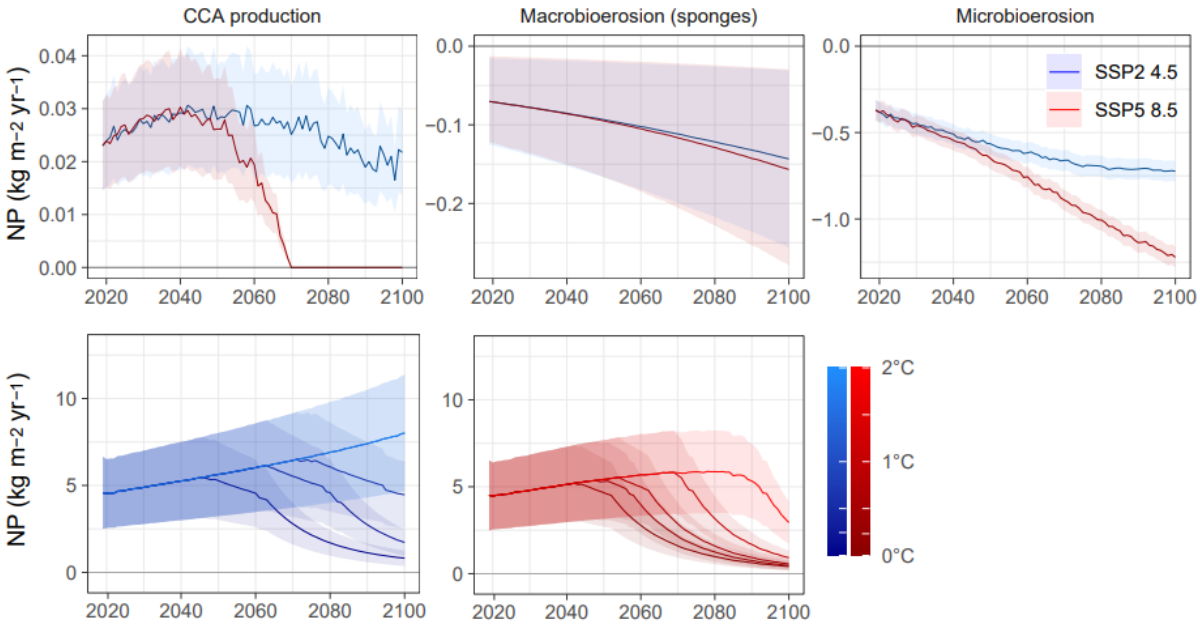

Figure S5. Mean relative contribution to net carbonate budget trajectories under the SSP2 4.5 (in blue) and SSP5 8.5 (in red) emission scenarios. The upper panels show relative contribution of secondary calcification (calcifying coralline algae production), sponge bioerosion and microbioerosion. The lower panels depict net carbonate production by corals where 0. 0.25, 0.5, 1 and 2 ˚C adaptation levels were incorporated in the projections. Shaded areas represent standard deviation from the mean of all six transects.

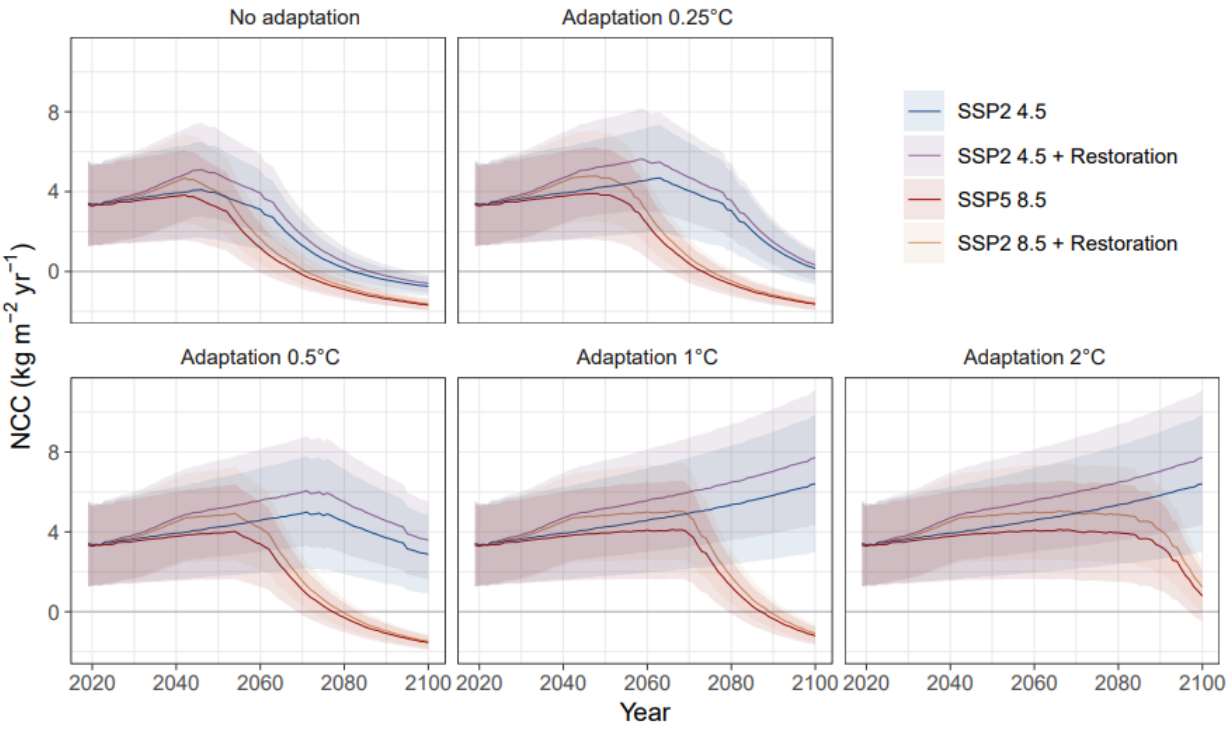

Figure S6. Trajectories of net carbonate budgets at Cheeca Rocks from 2019 to 2100 under the SSP2 4.5 (blue) and SSP5 8.5 (red) scenarios. Panels depict net community calcification (NCC) rates in scenarios where 0. 0.25, 0.5, 1 and 2 ˚C adaptation levels were incorporated in the projections. The green and orange lines illustrate net carbonate budgets trajectories when M:IR restoration cover targets are incorporated into the projections under SSP2 4.5 and SSP5 8.5 respectively.

RAP_{max} calculation considerations

Converting carbonate production rates to accretion potential rates is complicated25 and without true measure of reef porosity at Cheeca Rocks, caveats arise in their quantification. Here, we assume a porosity of 30% based on Perry et al. (2018)26 although Toth et al. (2022)27 calculated average porosity in the Florida Keys to be 59% for massive framework. However, sampled cores did not include patch reef habitat and large temporal variability was measured throughout the cores. Additionally, their method did not allow for distinction between true framework porosity from framework infilled with sediment due to the latter getting blown out during the coring process. RAPmax estimates are already considered optimistic because the quantification method does not consider physical or storm-driven episodic removal of framework28 and therefore in this study we conservatively assumed 30% porosity for Cheeca Rocks.

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