

Mayfield et al. (*Platax-2021*)-online supplemental material

Table S1. Non-parametric multivariate ANOVA for assessing environmental (ENV) effects on benthic structure. In this analysis, factor loading scores (n=37) derived from factor analysis of the original 82 benthic categories were used in place of raw data from these 82 bins. For ENV featuring only two groupings, lagoon and reef emergence, the “exact *F*” statistics have been shown; all others are approximations (“approximate *F*” statistics).

ENV	df	<i>F</i>	<i>p</i>	Trend
Island: Ha’apai, Va’vau, Niuatoputapu	2	4.53	<0.01	Ha’apai≠Va’vau≠Niuatoputapu
Site: 59 reef sites	58	2.05	<0.01	
Latitude	58	6.02	<0.01	
Longitude	58	5.41	<0.01	
Reef exposure: intermediate, protected, or exposed	2	4.37	<0.01	intermediate≠protected≠exposed
Reef zone: back reef, fore reef, or lagoon	2	2.68	<0.01	backreef=lagoonal≠fore reef
Reef type: barrier, fringing, patch, or other				other(a)=barrier(ab)=fringing(b)≠patch(c)
				inside≠outside
Reef emergence: emergent vs. submergent				emergent≠submergent
Survey date: 20 survey days				covaries with site, island, latitude, longitude
Survey time: morning, midday, or afternoon				covaries with site
Depth (m): five bins (<8 m [D1], 8-12 m [D2], 12-18 m [D3], 18-25 m [D4], or >25 m [D5])				D1(a)≠all others(b)
Temperature (°C): scaled continuously (16 unique values)				
Salinity (unitless): scaled continuously (four unique values)				

Table S2. Failed partial least squares (PLS) models. In all cases, these approaches “failed” because the PLS (NIPALS algorithm) “predicted residual sum of squares” (PRESS) was minimized with zero factors (i.e., no meaningful analytical solution found); **Table 2** instead features those analyses in which the modeling parameters passed quality control criteria (using a kfold validation of 7). The data types include the coral physiological data (CPD; n=17), the environmental (ENV) data (14 parameters), and the ecological (ECO; i.e., benthic) data (82 categories). The coral-specific analyses were carried out with the data sheet “Coral sample data” while the lone ENV vs. ECO analysis (“Environmental effects on reef ecology”) was undertaken with the 266-row “Benthic

data” datasheet of the online supplemental data file (**OSDF**). “CPD (4 factors)” features the loading scores from a factor analysis aimed at reducing dataset complexity while preserving predictor power (**Table 2**). Third-order factorials were not computationally possible on a computer with 32 GB of RAM for the ECO or ENV+ECO datasets since the number of model terms was too great (>500,000).

Modeling goal	Model Y (#)	Model X's (#)
Environmental effects on coral health	CPD (17)	ECO (82)
Environmental effects on coral health	CPD (17)	ECO (82 ²)
Environmental effects on coral health	CPD (17)	ECO (82 ³)
Environmental effects on coral health	CPD (17)	ECO-response surface (82)
Environmental effects on coral health	CPD (17)	ECO (28 factors)
Environmental effects on coral health	CPD (17)	ECO (28 factors ²)
Environmental effects on coral health	CPD (17)	ECO (28 factors ³)
Environmental effects on coral health	CPD (17)	ECO-response surface (28)
Environmental effects on coral health	CPD (4 factors)	ECO (82)
Environmental effects on coral health	CPD (4 factors)	ECO (82 ²)
Environmental effects on coral health	CPD (4 factors)	ECO-response surface (82)
Environmental effects on coral health	CPD (4 factors)	ECO (28 factors)
Environmental effects on coral health	CPD (4 factors)	ECO (28 factors ²)
Environmental effects on coral health	CPD (4 factors)	ECO-response surface (28)
Environmental effects on coral health	CPD (4 factors)	(ENV (14)+ECO (82)) ²
Environmental effects on coral health	CPD (4 factors)	ENV+ECO-response surface (96)
Environmental effects on reef ecology	ECO (82)	ENV (14)

Online supplemental data file. A tab-delineated Microsoft Excel file posted online includes all data found in the manuscript, not limited to raw benthic data (“Benthic data” datasheet; in percentages) and coral health data (“Coral sample data” datasheet) for a subset of 70 pocilloporid coral samples. Other analyses not depicted in the main text, such as the factor analyses and multivariate plots (principal components analysis & multi-dimensional scaling) of the ECO and CPD, have also been shown.