

Response of Moorea reef to marine heatwaves: spatiotemporal heterogeneity in geomorphology, water depth, and community dynamics

Weiqli Li^{1,2} · Xiuling Zuo^{1,2}

Corresponding author: Xiuling Zuo, zuoxl@gxu.edu.cn

Table S1 Results of the generalized linear mixed model (GLMM) for coral cover

a. Effects of thermal Stress, water Depth, and geomorphology on coral cover

	Estimate	St. Error	z value	p
max_DHW	-0.118345	0.094345	-1.254	0.209702
Depth	-0.030496	0.009806	-3.110	0.001872**
Backreef	-1.065495	0.164548	-6.475	9.46e-11***
Fringing reef	-1.384812	0.174352	-7.943	1.98e-15***
Forereef	-1.039714	0.211255	-4.922	8.58e-07***
max_DHW: Fringing reef	0.017299	0.108925	0.159	0.873844
max_DHW: Forereef	0.372444	0.111506	3.340	0.000837***

b. Effect of thermal stress on coral cover across different geomorphologies

Backreef	Estimate	St. Error	z value	p
max_DHW	-0.12059	0.05724	-2.107	0.0351*

Fringing reef	Estimate	St. Error	z value	p
max_DHW (no LTER5)	-0.23905	0.09649	-2.477	0.0132*
max_DHW (only LTER5)	0.17682	0.06690	2.643	0.00821**

Forereef	Estimate	St. Error	z value	p
max_DHW	0.22464	0.09107	2.467	0.0136*

c. Pairwise differences in coral cover by the emmeans package and Tukey's method for p-value adjustment

Pairwise differences of reef types	Estimate	St. Error	DF	p
Backreef: Forereef	-0.130	0.151	Inf	0.6657
Backreef: Fringing reef	0.314	0.105	Inf	0.0079***
Forereef: Fringing reef	0.444	0.131	Inf	0.0019***

Pairwise differences of forereef depths	Estimate	St. Error	DF	p
10m: 17m	0.314	0.0758	Inf	< 0.001***

Pairwise differences of fringing reef depths	Estimate	St. Error	DF	p
3m: 4m	1.641	0.163	Inf	< 0.001***
3m: 6m	1.465	0.160	Inf	< 0.001***
3m: 7m	1.960	0.204	Inf	< 0.001***
4m: 6m	-0.176	0.146	Inf	0.6228
4m: 7m	0.319	0.192	Inf	0.3444
6m: 7m	0.495	0.190	Inf	0.0452

Table S2 The outbreak of crown-of-thorns starfish (COTS) in the fringing reef during 2005–2024.

Year	Site	COTS	Year	Site	COTS
2008	LTER2	12	2011	LTER4	3
2008	LTER3	1	2012	LTER1	1
2009	LTER1	4	2012	LTER4	2
2009	LTER2	3	2013	LTER5	1
2010	LTER1	1	2014	LTER4	1
2010	LTER3	3	2023	LTER6	12
2011	LTER1	2	2024	LTER2	5
2011	LTER3	2	2024	LTER3	2