

Ecography

**E7326**

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**Supplementary material**

## Appendix 1

**Table A1:** Proportional consumption of 12 resource categories by four butterflyfishes across five locations. Data are pooled across  $n$  replicate feeding observations for each species of butterflyfish. Location abbreviations follow Fig 1.

Location	Site	$n$	Reef substrate	Soft coral	<i>A. hyacinthus</i>	<i>Staghorn Acropora</i>	<i>Other Acropora</i>	<i>Pocillopora sp.</i>	<i>Montipora sp.</i>	<i>Porites sp.</i>	<i>Favidae</i>	<i>Isopora sp.</i>	Other hard corals	Other
<i>C. vagabundus</i>														
HI	Blue Pools	22	98.7	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.4	0.4	0.0	0.0
	North Wistari	22	87.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	1.1	11.5
	2nd Point	22	95.8	0.0	0.0	0.0	0.6	0.3	0.0	0.3	0.0	0.0	0.0	2.9
LI	Bird Islet	20	91.4	0.0	0.5	0.3	6.8	0.0	0.0	0.0	1.0	0.0	0.0	0.0
	Lizard Head	31	95.0	1.5	0.5	0.0	0.3	0.8	0.0	0.3	0.8	0.0	0.0	1.0
	South Island	22	93.8	0.0	1.0	0.5	0.0	0.0	0.0	0.0	1.0	0.0	1.0	2.6
PNG	Christines	20	62.5	0.0	1.4	0.0	0.3	2.8	7.6	10.4	3.5	0.0	0.0	11.5
	Lubaluba	23	70.0	0.0	2.0	0.0	0.0	10.8	4.0	8.1	0.3	0.0	2.7	2.0
	Susans	21	50.0	0.0	1.4	0.0	2.5	5.2	22.4	6.0	4.4	0.3	0.3	7.7
NC	Ilot Nge	20	71.3	0.0	2.5	0.3	7.0	9.3	2.5	0.3	0.0	0.0	2.0	4.8
	Recif Senez	20	97.1	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	1.6
	Seche Croissant	20	48.8	0.0	0.0	0.3	0.3	8.2	0.0	1.5	0.9	0.0	3.2	36.8
FP	Motu Ahi	21	94.7	0.0	0.0	0.0	0.0	0.5	3.9	0.5	0.0	0.0	0.0	0.5
	Temea	20	89.8	0.0	0.0	0.0	0.0	2.5	2.5	5.3	0.0	0.0	0.0	0.0
	Tiahura	20	93.3	0.0	0.0	0.0	0.0	0.0	5.0	1.7	0.0	0.0	0.0	0.0
<i>C. citrinellus</i>														
HI	Blue Pools	24	63.0	0.0	6.6	0.9	1.7	3.2	4.6	0.9	4.9	7.2	5.2	2.0
	North Wistari	22	35.0	0.0	3.4	2.1	45.7	3.0	3.9	0.7	0.7	4.6	0.7	0.2
	2nd Point	20	35.9	0.2	5.5	7.6	26.8	8.4	1.1	0.4	0.0	6.5	0.4	7.2
LI	Bird Islet	20	21.1	1.1	16.7	1.8	8.8	31.4	7.5	1.0	4.1	3.7	0.3	2.4
	Lizard Head	20	34.2	6.8	11.4	0.0	15.6	23.5	1.8	0.5	1.4	1.1	0.6	3.1
	South Island	20	21.3	1.3	11.5	0.4	12.9	30.9	5.0	0.6	6.5	4.0	3.1	2.5
PNG	Christines	21	14.6	0.0	11.0	0.0	6.2	22.2	8.7	19.2	5.0	8.5	0.0	4.6
	Lubaluba	21	57.0	0.0	9.6	0.0	8.8	5.8	6.7	5.3	5.6	0.0	0.3	0.9
	Susans	20	11.5	0.0	16.8	0.0	8.1	32.4	21.0	6.4	1.5	0.5	1.7	0.0
NC	Ilot Nge	20	36.8	0.0	5.9	2.9	31.6	17.3	1.1	1.1	3.1	0.0	0.2	0.0

	Recif Senez	20	67.2	0.0	12.8	13.5	1.0	4.6	0.2	0.0	0.0	0.0	0.0	0.7
	Seche Croissant	20	55.9	0.0	2.0	2.6	9.3	2.6	19.8	0.2	0.0	0.0	0.2	7.6
FP	Motu Ahi	20	23.7	0.0	0.0	0.0	0.5	25.1	45.7	4.8	0.0	0.0	0.2	0.0
	Temea	21	75.8	0.0	0.8	0.0	0.0	7.7	7.1	7.9	0.5	0.0	0.0	0.2
	Tiahura	20	81.6	0.0	0.0	0.0	0.7	1.6	8.4	7.1	0.2	0.0	0.4	0.0

C. lunulatus

HI	Blue Pools	21	2.7	0.0	15.5	4.6	35.8	3.1	2.7	7.0	0.5	16.7	10.9	0.5
	North Wistari	24	1.1	0.0	6.3	13.6	10.3	8.5	3.7	19.3	0.2	29.5	7.4	0.0
	2nd Point	20	0.3	0.0	31.2	13.3	5.9	1.3	1.2	4.4	3.4	38.7	0.3	0.0
LI	Bird Islet	21	0.5	0.4	13.3	22.3	8.0	7.3	11.5	1.9	8.0	22.7	3.7	0.5
	Lizard Head	23	0.8	0.0	19.9	29.1	8.7	2.5	4.6	2.6	0.0	30.3	1.5	0.0
	South Island	23	0.8	0.2	31.3	28.2	3.7	4.5	5.1	2.2	1.8	20.4	1.6	0.0
PNG	Christines	21	0.0	0.0	14.4	9.4	16.9	27.3	3.9	14.1	0.3	9.7	3.3	0.8
	Lubaluba	23	0.2	0.0	0.0	1.4	9.7	32.9	3.1	0.5	0.5	8.5	42.2	0.9
	Susans	22	0.0	0.0	18.2	25.1	14.9	17.7	1.6	1.6	9.0	11.0	0.9	0.0
NC	Ilot Nge	20	1.4	0.0	19.5	35.0	9.5	14.9	1.9	0.0	3.5	13.3	1.1	0.0
	Recif Senez	20	0.3	0.0	51.2	1.6	8.6	0.0	0.0	0.0	33.9	4.4	0.0	0.0
	Seche Croissant	20	0.9	0.0	9.1	7.3	42.6	6.8	0.0	0.0	8.0	20.9	4.5	0.0
FP	Motu Ahi	21	3.0	0.0	0.0	4.9	38.5	46.2	0.0	0.0	0.0	3.0	4.3	0.0
	Temea	20	0.9	0.0	0.6	8.8	36.9	52.9	0.0	0.0	0.0	0.0	0.0	0.0
	Tiahura	20	5.7	0.0	0.0	0.3	21.9	65.6	0.5	0.0	0.0	0.0	6.2	0.0

C. trifascialis

HI	Blue Pools	26	0.0	0.0	57.3	1.8	36.1	0.0	4.1	0.0	0.0	0.6	0.0	0.0
	North Wistari	26	0.0	0.0	23.5	11.5	63.5	0.0	0.9	0.0	0.5	0.2	0.0	0.0
	2nd Point	21	0.0	0.0	72.0	5.1	22.0	0.4	0.0	0.0	0.5	0.0	0.0	0.0
LI	Bird Islet	20	0.0	0.0	77.7	5.0	10.0	7.3	0.0	0.0	0.0	0.0	0.0	0.0
	Lizard Head	23	0.6	0.0	76.3	0.2	18.3	4.6	0.0	0.0	0.0	0.0	0.0	0.0
	South Island	21	0.0	0.0	64.7	3.7	21.9	9.6	0.0	0.0	0.0	0.0	0.0	0.0
PNG	Christines	21	0.0	0.0	89.6	0.7	6.3	2.5	0.4	0.2	0.0	0.4	0.0	0.0
	Lubaluba	20	0.0	0.0	83.4	0.0	8.4	7.7	0.0	0.5	0.0	0.0	0.0	0.0
	Susans	20	0.0	0.0	72.9	0.0	14.7	11.4	0.5	0.5	0.0	0.0	0.0	0.0
NC	Ilot Nge	20	0.0	0.0	42.6	27.9	27.7	0.0	0.7	0.0	0.0	1.1	0.0	0.0
	Recif Senez	20	0.0	0.0	75.2	12.4	12.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0
	Seche Croissant	20	0.0	0.0	10.0	21.6	64.2	0.0	4.2	0.0	0.0	0.0	0.0	0.0
FP	Motu Ahi	20	0.0	0.0	0.7	0.0	42.6	26.7	24.8	5.3	0.0	0.0	0.0	0.0

Temea	20	0.0	0.0	22.6	1.0	36.3	28.1	8.9	3.1	0.0	0.0	0.0	0.0
Tiahura	20	0.0	0.0	2.2	16.6	47.8	19.9	9.7	3.0	0.0	0.0	0.8	0.0

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**Table A2:** MANOVA results for variation in dietary composition of four butterflyfish species between nine sites nested within five locations. Significant values at Bonferroni corrected  $\alpha=0.004$  are shown in bold.

Source	Variable	SS	d.f.	MS	F	P
<u><i>C. vagabundus</i></u>						
Location	Non-coral substrate	19.292	4	4.823	33.899	<b>&lt;0.001</b>
	Soft coral	0.000	4	<0.001	0.508	0.730
	<i>Acropora hyacinthus</i>	0.014	4	0.003	2.654	0.033
	Staghorn <i>Acropora</i>	0.000	4	<0.001	1.502	0.201
	Other <i>Acropora</i>	0.024	4	0.006	1.499	0.202
	<i>Pocillopora sp.</i>	0.198	4	0.049	5.146	<b>0.001</b>
	<i>Montipora sp.</i>	0.433	4	0.108	12.688	<b>&lt;0.001</b>
	<i>Porites sp.</i>	0.237	4	0.059	15.341	<b>&lt;0.001</b>
	Favidae	0.034	4	0.009	8.276	<b>&lt;0.001</b>
	<i>Isopora sp.</i>	0.000	4	0.000	0.859	0.489
	Other hard corals	0.005	4	0.001	1.379	0.241
	Other	1.388	4	0.347	8.612	<b>&lt;0.001</b>
Site(Location)	Non-coral substrate	9.724	10	0.972	6.835	<b>&lt;0.001</b>
	Soft coral	0.001	10	<0.001	0.593	0.820
	<i>Acropora hyacinthus</i>	0.002	10	0.000	0.175	0.998
	Staghorn <i>Acropora</i>	0.000	10	<0.001	0.744	0.683
	Other <i>Acropora</i>	0.097	10	0.010	2.425	0.009
	<i>Pocillopora sp.</i>	0.150	10	0.015	1.557	0.119
	<i>Montipora sp.</i>	0.411	10	0.041	4.817	<b>&lt;0.001</b>
	<i>Porites sp.</i>	0.030	10	0.003	0.770	0.658
	Favidae	0.018	10	0.002	1.784	0.063
	<i>Isopora sp.</i>	0.001	10	0.000	0.984	0.457
	Other hard corals	0.011	10	0.001	1.129	0.340
	Other	2.932	10	0.293	7.280	<b>&lt;0.001</b>
<u><i>C. citrinellus</i></u>						
Location	Non-coral substrate	11.916	4	2.979	24.116	<b>&lt;0.001</b>
	Soft coral	0.068	4	0.017	9.553	<b>&lt;0.001</b>
	<i>Acropora hyacinthus</i>	0.555	4	0.139	5.052	<b>0.001</b>
	Staghorn <i>Acropora</i>	0.246	4	0.061	5.520	<b>&lt;0.001</b>
	Other <i>Acropora</i>	1.938	4	0.484	14.969	<b>&lt;0.001</b>
	<i>Pocillopora sp.</i>	2.436	4	0.609	15.772	<b>&lt;0.001</b>
	<i>Montipora sp.</i>	1.556	4	0.389	20.452	<b>&lt;0.001</b>
	<i>Porites sp.</i>	0.509	4	0.127	16.616	<b>&lt;0.001</b>
	Favidae	0.092	4	0.023	5.764	<b>&lt;0.001</b>
	<i>Isopora sp.</i>	0.202	4	0.051	7.151	<b>&lt;0.001</b>
	Other hard corals	0.022	4	0.006	3.255	0.012
	Other	0.029	4	0.007	1.591	0.177

Site(Location)	Non-coral substrate	15.903	10	1.590	12.874	<b>&lt;0.001</b>
	Soft coral	0.040	10	0.004	2.264	0.015
	<i>Acropora hyacinthus</i>	0.253	10	0.025	0.920	0.515
	Staghorn <i>Acropora</i>	2.424	10	0.242	7.492	<b>&lt;0.001</b>
	Other <i>Acropora</i>	0.269	10	0.027	2.410	0.009
	<i>Pocillopora sp.</i>	1.738	10	0.174	4.501	<b>&lt;0.001</b>
	<i>Montipora sp.</i>	3.512	10	0.351	18.470	<b>&lt;0.001</b>
	<i>Porites sp.</i>	0.329	10	0.033	4.297	<b>&lt;0.001</b>
	Favidae	0.077	10	0.008	1.937	0.040
	<i>Isopora sp.</i>	0.162	10	0.016	2.289	0.013
	Other hard corals	0.070	10	0.007	4.111	<b>&lt;0.001</b>
	Other	0.114	10	0.011	2.495	0.007

*C. lunulatus*

Location	Non-coral substrate	0.034	4	0.008	3.138	0.015
	Soft coral	0.000	4	<0.001	1.801	0.129
	<i>Acropora hyacinthus</i>	2.724	4	0.681	13.006	<b>&lt;0.001</b>
	Staghorn <i>Acropora</i>	1.056	4	0.264	28.969	<b>&lt;0.001</b>
	Other <i>Acropora</i>	4.161	4	1.040	20.000	<b>&lt;0.001</b>
	<i>Pocillopora sp.</i>	1.287	4	0.322	9.022	<b>&lt;0.001</b>
	<i>Montipora sp.</i>	2.692	4	0.673	14.364	<b>&lt;0.001</b>
	<i>Porites sp.</i>	17.906	4	4.477	72.773	<b>&lt;0.001</b>
	Favidae	0.219	4	0.055	9.121	<b>&lt;0.001</b>
	<i>Isopora sp.</i>	0.791	4	0.198	11.349	<b>&lt;0.001</b>
	Other hard corals	0.766	4	0.191	9.927	<b>&lt;0.001</b>
	Other	0.001	4	0.000	1.425	0.226

Site(Location)	Non-coral substrate	0.038	10	0.004	1.414	0.173
	Soft coral	0.000	10	<0.001	0.636	0.783
	<i>Acropora hyacinthus</i>	4.473	10	0.447	8.542	<b>&lt;0.001</b>
	Staghorn <i>Acropora</i>	1.309	10	0.131	14.357	<b>&lt;0.001</b>
	Other <i>Acropora</i>	0.822	10	0.082	1.581	0.111
	<i>Pocillopora sp.</i>	3.074	10	0.307	8.621	<b>&lt;0.001</b>
	<i>Montipora sp.</i>	3.087	10	0.309	6.588	<b>&lt;0.001</b>
	<i>Porites sp.</i>	1.861	10	0.186	3.026	<b>0.001</b>
	Favidae	0.072	10	0.007	1.205	0.287
	<i>Isopora sp.</i>	0.682	10	0.068	3.912	<b>&lt;0.001</b>
	Other hard corals	2.742	10	0.274	14.222	<b>&lt;0.001</b>
	Other	0.002	10	0.000	1.269	0.247

*C. trifascialis*

Location	Non-coral substrate	<0.001	4	<0.001	0.974	0.422
	Soft coral	0	4	0		
	<i>Acropora hyacinthus</i>	30.490	4	7.622	54.829	<b>&lt;0.001</b>
	Staghorn <i>Acropora</i>	1.403	4	0.351	10.820	<b>&lt;0.001</b>
	Other <i>Acropora</i>	8.726	4	2.182	15.484	<b>&lt;0.001</b>

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	<i>Pocillopora sp.</i>	4.383	4	1.096	23.645	<b>&lt;0.001</b>
	<i>Montipora sp.</i>	0.679	4	0.170	24.209	<b>&lt;0.001</b>
	<i>Porites sp.</i>	0.101	4	0.025	10.384	<b>&lt;0.001</b>
	Favidae	0.000	4	<0.001	1.089	0.362
	<i>Isopora sp.</i>	0.001	4	0.000	0.814	0.517
	Other hard corals	0.001	4	0.000	0.793	0.530
	Other	0	4	0		
Site(Location)	Non-coral substrate	<0.001	10	<0.001	0.982	0.459
	Soft coral	0	10	0		
	<i>Acropora hyacinthus</i>	13.801	10	1.380	9.927	<b>&lt;0.001</b>
	Staghorn <i>Acropora</i>	1.310	10	0.131	4.039	<b>&lt;0.001</b>
	Other <i>Acropora</i>	8.317	10	0.832	5.903	<b>&lt;0.001</b>
	<i>Pocillopora sp.</i>	0.199	10	0.020	0.430	0.931
	<i>Montipora sp.</i>	0.150	10	0.015	2.135	0.022
	<i>Porites sp.</i>	0.024	10	0.002	0.972	0.468
	Favidae	0.000	10	<0.001	1.058	0.395
	<i>Isopora sp.</i>	0.002	10	0.000	1.063	0.391
	Other hard corals	0.002	10	0.000	0.969	0.470
	Other	0	10	0		