Appendix S1

Fish feces reveal diverse nutrient sources for coral reefs

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Table S1. Macronutrient content in feces of 26 coral reef fish species arranged by trophic guild with mean ± standard deviation and sample size in parentheses. "NA" indicates no feces of that species were measured for that nutrient. DW = dry weight.

Species	Family	Water (%)	Protein (% DW)	Carbohydrate (%DW)	Lipid (% DW)	Ash (% DW)
Corallivore						
Amanses scopas	Monacanthidae	41.07 ± 6.71 (10)	1.78 ± 1.41 (8)	0.51 ± 0.67 (8)	1 ± 0 (4)	89.49 ± 8.5 (10)
Chaetodon ornatissimus	Chaetodontidae	72.77 ± 10.34 (25)	14.8 ± 7.58 (19)	1.11 ± 0.67 (19)	4.69 ± 2.1 (13)	51.89 ± 14.12 (13)
Chaetodon pelewensis	Chaetodontidae	62.34 ± 14.44 (10)	9.84 ± 4.35 (7)	1.52 ± 0.69 (4)	7 ± 10.44 (3)	NA
Chaetodon quadrimaculatus	Chaetodontidae	80.15 ± 7.99 (11)	10.52 ± 4.68 (10)	1.94 ± 1.48 (5)	5.2 ± 2.77 (5)	NA
Chaetodon reticulatus	Chaetodontidae	76.66 ± 3.51 (21)	13.66 ± 6.02 (18)	1.28 ± 0.57 (18)	6.88 ± 2.59 (8)	49.92 ± 5.43 (12)
Detritivore						
Acanthurus olivaceus	Acanthuridae	60.14 ± 5.64 (5)	1.36 ± 0.3 (5)	0.64 ± 0.28 (5)	2.6 ± 1.82 (5)	84.9 ± 4.83 (5)
Ctenochaetus binotatus	Acanthuridae	55.92 ± 8.2 (4)	2.25 ± 0.6 (4)	0.55 ± 0.1 (4)	5 ± 6.75 (5)	83.02 ± 3.66 (5)
Ctenochaetus flavicauda	Acanthuridae	46.65 ± 14.54 (19)	2.25 ± 0.98 (18)	0.75 ± 0.33 (18)	1.43 ± 1.02 (14)	83.17 ± 6 (13)
Ctenochaetus striatus	Acanthuridae	52.84 ± 6.95 (15)	1.83 ± 0.96 (14)	0.61 ± 0.37 (14)	1.91 ± 1.45 (11)	78.43 ± 20.72 (12)
Herbivore						
Acanthurus nigricans	Acanthuridae	81.32 ± 4.3 (5)	6.12 ± 1.53 (5)	4.74 ± 2.3 (5)	3.33 ± 0.58 (3)	56 ± 7.64 (2)
Acanthurus nigrofuscus	Acanthuridae	78.95 ± 10.71 (8)	6.89 ± 4.48 (8)	6.29 ± 3.87 (8)	4.43 ± 2.7 (7)	82.5 ± 5.8 (2)

Chlorurus spilurus	Labridae	49.47 ± 13.3 (29)	2.42 ± 1.04 (27)	1.08 ± 0.54 (27)	3.33 ± 4.54 (18)	82.14 ± 7.07 (18)
Melichthys vidua	Balistidae	80.21 ± 4.74 (8)	6.47 ± 4.69 (10)	1.61 ± 2.15 (10)	4.2 ± 1.69 (10)	58.71 ± 11.55 (10)
Naso lituratus	Acanthuridae	89.76 ± 1.5 (15)	45.65 ± 11.48 (15)	5.75 ± 2.06 (14)	8 ± 3.08 (13)	31.54 ± 13.42 (5)
Plectroglyphidodon lacrymatus	Balistidae	66.17 ± 22.44 (16)	4.62 ± 3.57 (11)	5.66 ± 3.42 (9)	4 ± 3.56 (10)	49.5 ± 37.43 (5)
Scarus psittacus	Labridae	41.52 ± 7.02 (13)	1.47 ± 0.96 (12)	0.47 ± 0.39 (10)	1.6 ± 1.07 (10)	85.73 ± 6.24 (6)
Stegastes nigricans	Pomacentridae	74.51 ± 7.16 (11)	4.67 ± 1.71 (12)	1.87 ± 0.98 (12)	3.56 ± 1.81 (9)	67.53 ± 4.37 (3)
Zebrasoma scopas	Acanthuridae	86.98 ± 2.34 (10)	9.15 ± 3.61 (10)	3.57 ± 1.94 (10)	3.1 ± 1.29 (10)	48.38 ± 3.76 (5)
Invertivore						
Cantherhines sandwichiensis	Monacanthidae	75.42 ± 5.07 (5)	2.72 ± 1.23 (5)	1.42 ± 0.92 (5)	1.6 ± 0.89 (5)	76.85 ± 13.33 (4)
Paracirrhites arcatus	Cirrhitidae	45.24 ± 30.04 (13)	3.24 ± 1.42 (7)	3.1 ± 4.17 (4)	5.67 ± 4.73 (3)	NA
Sufflamen bursa	Balistidae	66.96 ± 6.11 (13)	1.91 ± 1.01 (13)	0.82 ± 0.24 (13)	4.08 ± 3.82 (13)	73.81 ± 11.8 (13)
Thalassoma hardwicke	Labridae	63.81 ± 15.02 (8)	12.3 ± 8.32 (7)	1.38 ± 0.6 (6)	5 ± 5.93 (6)	52.07 ± 35.18 (4)
Piscivore						
Cephalopholis argus	Serranidae	NA	2.7 ± 0.14 (2)	1.15 ± 0.07 (2)	3.5 ± 2.12 (2)	NA
Planktivore						
Dascyllus flavicaudus	Pomacentridae	67.03 ± 22.29 (9)	7.12 ± 1.51 (5)	2.96 ± 0.38 (5)	24 ± 7.81 (3)	NA
Myripristis amaena	Holocentridae	66.8 ± 21.29 (8)	8.32 ± 6.37 (4)	2.8 ± 0.46 (3)	24 ± 25.46 (2)	NA

Odonus niger	Balistidae	90.56 ± 4.65 (11)	5.55 ± 1.74 (7)	2.83 ± 1.6 (7)	9.43 ± 6.55 (7)	NA	

Table S2. Micronutrient concentration (ppm) in feces of 39 coral reef fish species with mean ± standard deviation and sample size in parentheses. "NA" indicates no feces of that species were measured for that nutrient.

Species	Family	Calcium	Copper	Iron	Magnesium	Manganese	Zinc
Corallivore							
Amanses scopas	Monacanthidae	398207.62 ± 10901.68 (4)	4.07 ± 2.85 (4)	24.13 ± 24.38 (4)	3115.83 ± 1010.63 (4)	0.55 ± 0.28 (4)	6.52 ± 3.11 (4)
Chaetodon citrinellus	Chaetodontidae	55051.47 ± 107067.92 (8)	9.53 ± 10.09 (5)	12386.83 ± 13956.68 (8)	25756.62 ± 12929.51 (8)	5.63 ± 3.94 (6)	30.39 ± 29.59 (5)
Chaetodon ephippium	Chaetodontidae	NA	15.13 ± 19.57 (4)	NA	16626.83 ± 7275.89 (5)	38.65 ± 19.61 (5)	84.14 ± 84 (6)
Chaetodon ornatissimus	Chaetodontidae	143017.66 ± 57251.75 (19)	13.64 ± 30.74 (19)	4951.15 ± 9975.24 (21)	34813.51 ± 11228.25 (14)	16.46 ± 7.59 (26)	81 ± 39.95 (26)
Chaetodon pelewensis	Chaetodontidae	120199.17 ± 55728.14 (2)	24.49 ± 14.77 (4)	42562.13 ± 64630.51 (4)	45039.36 ± 19451.86 (2)	16.96 ± 1.56 (3)	784.34 ± 842.85 (5)
Chaetodon quadrimaculatus	Chaetodontidae	101054.69 ± 27937.72 (7)	17.9 ± 10.79 (11)	5523.31 ± 7238.94 (12)	51831.01 ± 27629.89 (10)	12.08 ± 4.76 (11)	81.57 ± 53.15 (12)
Chaetodon reticulatus	Chaetodontidae	159752.79 ± 69411.13 (16)	4.75 ± 4.31 (21)	6019.26 ± 7151.37 (18)	30895.19 ± 9488.64 (16)	28.35 ± 12.8 (22)	149.25 ± 53.54 (22)
Chaetodon vagabundus	Chaetodontidae	62298.4 ± 36974.04 (6)	8.51 ± 3.24 (6)	1422.91 ± 1012.67 (6)	27029.46 ± 11971.65 (6)	25.2 ± 11.29 (6)	84.43 ± 29.18 (6)
Heniochus chrysostomus	Chaetodontidae	11234.31 ± 5201.34 (9)	4.27 ± 2.41 (4)	6758.63 ± 3298.97 (9)	33805.7 ± 11189.88 (9)	10.32 ± 14.34 (5)	52.37 ± 66.05 (5)
Detritivore							
Acanthurus olivaceus	Acanthuridae	351116.26 ± 22512.88 (5)	9.62 ± 13.58 (10)	1168.71 ± 344.91 (5)	24427.25 ± 7471.41 (10)	20.88 ± 11 (10)	40.85 ± 43.19 (10)
Acanthurus pyroferus	Acanthuridae	89225.55 ± 74141.05 (8)	NA	43015.1 ± 59879.6 (8)	14973.01 ± 10818.69 (8)	6.77 ± 8.09 (5)	11.42 ± 1.06 (2)

Ctenochaetus binotatus	Acanthuridae	333622.24 ± 23568.84 (5)	1.38 ± 1.35 (5)	1449.31 ± 259.77 (5)	14939.29 ± 674.75 (5)	14.32 ± 1.79 (5)	11.73 ± 13.8 (5)
Ctenochaetus flavicauda	Acanthuridae	306482.23 ± 35064.37 (8)	0 ± 0 (8)	1227.94 ± 171.36 (8)	12507.85 ± 1803.39 (8)	13.69 ± 1.76 (8)	3.52 ± 2.95 (8)
Ctenochaetus striatus	Acanthuridae	298610.06 ± 30307.24 (14)	1.08 ± 1.53 (14)	1144.07 ± 430.93 (14)	14382.42 ± 3337.33 (14)	15.53 ± 10.29 (14)	10.9 ± 8.44 (14)
Herbivore							
Acanthurus achilles	Acanthuridae	40481.9 ± 22829.82 (8)	13.84 ± 5.67 (2)	14239.67 ± 4766.17 (8)	23946.74 ± 11182.43 (8)	17.13 ± 30.51 (5)	84.85 ± 87.32 (2)
Acanthurus guttatus	Acanthuridae	62498.12 ± 38785.94 (9)	NA	21980.13 ± 10805.49 (9)	32302.83 ± 22318.39 (9)	3.32 ± 2.21 (5)	NA
Acanthurus nigricans	Acanthuridae	143151.31 ± 62239.73 (7)	4.81 ± 6.91 (8)	1288.28 ± 1297.67 (7)	18544.33 ± 11867.65 (5)	16.36 ± 7.17 (8)	44.59 ± 38.28 (8)
Acanthurus nigrofuscus	Acanthuridae	158352.24 ± 79591.39 (8)	9.25 ± 4.9 (8)	872.72 ± 110.97 (8)	18585.99 ± 4061.21 (8)	13.56 ± 2.06 (8)	35.4 ± 17.96 (8)
Acanthurus triostegus	Acanthuridae	53860.61 ± 27070.46 (10)	6.65 ± 1.72 (7)	5743.12 ± 10321.52 (10)	23143.25 ± 13916.17 (10)	10.03 ± 6.49 (10)	31.84 ± 18.15 (8)
Chlorurus spilurus	Labridae	324310.19 ± 39660.44 (7)	0 ± 0 (7)	313.41 ± 124.47 (7)	14272.54 ± 2893.98 (7)	5.12 ± 1.54 (7)	1.91 ± 3.22 (7)
Melichthys niger	Balistidae	87842.17 ± 9640.95 (4)	NA	25559.3 ± 3684.1 (4)	50294.3 ± 7122.58 (4)	3.59 ± 3.19 (4)	NA
Melichthys vidua	Balistidae	114959.21 ± 83797.97 (14)	18.14 ± 18.13 (14)	579.9 ± 550.17 (14)	17026.1 ± 13792.54 (14)	28.87 ± 15.65 (14)	35.71 ± 22.61 (14)
Naso lituratus	Acanthuridae	53635.56 ± 62434.03 (18)	24.78 ± 19.9 (16)	1672.68 ± 4123.16 (18)	7611.19 ± 8467.28 (18)	24.93 ± 17.59 (18)	31.74 ± 17.13 (17)
Plectroglyphidodon lacrymatus	Balistidae	222476.83 ± 58973.99 (8)	0.1 ± 0.27 (8)	1329.01 ± 143.23 (8)	19719.4 ± 3760.92 (8)	19.07 ± 3.62 (8)	5.1 ± 4.12 (8)
Scarus psittacus	Labridae	311540.88 ± 20678.35 (8)	0 ± 0 (8)	194.66 ± 211.54 (8)	11109.01 ± 2506.64 (8)	5.03 ± 2.65 (8)	0.44 ± 1.26 (8)
Stegastes nigricans	Pomacentridae	186740.15 ± 128778.46 (16)	0.77 ± 1.28 (13)	5037.94 ± 7424.82 (16)	15588.49 ± 7786.79 (16)	17.23 ± 13.26 (15)	12.31 ± 13.35 (15)
Zebrasoma scopas	Acanthuridae	70725.4 ± 43324.86 (34)	11.6 ± 16.56 (21)	8154.43 ± 8031.12 (34)	30240.28 ± 20456.34 (34)	20.14 ± 12.9 (34)	22.23 ± 15.39 (27)
Invertivore							

Cantherhines sandwichiensis	Monacanthidae	309691.23 ± 50137.52 (5)	5.18 ± 5.87 (7)	995.25 ± 511.72 (5)	19598.85 ± 3448.17 (10)	12.64 ± 6.73 (8)	26.08 ± 23.37 (10)
Forcipiger flavissimus	Chaetodontidae	30466.89 ± 18421.75 (7)	10.05 ± 8.26 (4)	14254.33 ± 5650.89 (7)	32499.04 ± 20159.08 (7)	7.89 ± 4.02 (7)	43.7 ± 35.83 (5)
Paracirrhites arcatus	Cirrhitidae	183842.19 ± 77961.06 (5)	0.18 ± 0.41 (5)	226.62 ± 255.28 (5)	32002.22 ± 13780.71 (5)	8.24 ± 7.61 (5)	50.45 ± 58.24 (5)
Sufflamen bursa	Balistidae	249814.7 ± 110509.07 (10)	14.84 ± 16.22 (9)	3228.47 ± 7638.83 (9)	33155.02 ± 9944.79 (9)	16.63 ± 1.66 (9)	51.97 ± 18 (9)
Thalassoma hardwicke	Labridae	0 ± 0 (8)	162.93 ± 100.43 (9)	876.68 ± 1513.63 (10)	4324.68 ± 9689.63 (11)	166.9 ± 96.77 (9)	153.56 ± 98.97 (10)
Piscivore							
Cephalopholis argus	Serranidae	159184.85 ± 100371.89 (7)	50.96 ± 80.17 (6)	2552.41 ± 4174.88 (7)	32661.23 ± 14460.01 (7)	12.12 ± 11.63 (6)	166 ± 84.12 (6)
Epibulus insidiator	Labridae	128239.44 ± 71859.81 (7)	59.25 ± 30.04 (7)	996.5 ± 779.14 (7)	18005.18 ± 10268.15 (7)	5.31 ± 2.81 (7)	108.11 ± 37.4 (7)
Lutjanus fulvus	Lutjanidae	NA	68.83 ± 60.28 (4)	NA	29602.16 ± 5238.4 (4)	7.85 ± 4.91 (4)	89.09 ± 58.14 (4)
Planktivore							
Chromis xanthura	Pomacentridae	23048.16 ± 28355.22 (13)	34.14 ± 42.14 (4)	17866.66 ± 39795.03 (16)	65863.24 ± 73898.21 (16)	66.82 ± 111.19 (3)	274.56 ± 290.02 (6)
Dascyllus flavicaudus	Pomacentridae	42041.28 ± 42165.61 (9)	1.76 ± 3.93 (5)	2529.51 ± 4260.87 (9)	14134.76 ± 10494.76 (9)	13.42 ± 6.75 (5)	35.37 ± 19.81 (5)
Myripristis violacea	Holocentridae	NA	99 ± 45.83 (9)	18097.9 ± 2275.72 (3)	31712.11 ± 5027.92 (4)	15.98 ± 12.39 (9)	228.43 ± 92.53 (9)
Odonus niger	Balistidae	10706.06 ± 20729.19 (14)	105.96 ± 113.17 (14)	5881.38 ± 11363.2 (14)	11398.85 ± 21158.02 (14)	136.03 ± 101.52 (13)	168.88 ± 142.97 (13)

Content S3: Additional details on analytical methods.

Sample preparation: We freeze dried samples in a Labconco lyophilizer. To ensure full water loss, we removed five random samples after 32 h, weighed, and re-weighed the samples at 36 h, each which had <1% change in mass. Following 36 h, we removed and re-weighed all samples to calculate percent water loss. Samples were then covered with parafilm and stored in plastic freezer bags in -20°C until further use. Samples were prepared for proteins and carbohydrates within one month of freeze-drying.

Proteins: We measured protein using modifications from Mann and Gallager (1985), Barbarino and Lourenco (2005), and ThermoScientific BCA assay support. To ensure complete precipitation, we initially ran standards and a subset of samples in triplicate with and without TCA and confirmed its consistency. We only used standard curves with an $R^2 > 0.98$. For samples outside the standard curve, we re-ran samples with a 200-500 dilution and re-ran samples with triplicates measuring a covariance value > 5%.

Carbohydrates: To confirm the presence of interfering substances, we initially followed the protocol with and without TCA precipitation in triplicate. We only used standard curves with an $R^2 > 0.98$ and re-ran samples with triplicates measuring a covariance value > 10%.

Lipids: Samples were stored at -20°C for ~1 year and to ensure all water was removed before lipid assays, we again freeze-dried samples and manually homogenized samples. The methods are a modified micro version of the Folch method, which uses phase separation to quantify total lipid (Folch, 1957).

Table S4. Best fit generalized linear model outputs based on Bayesian Information Criterion (ΔBIC < 7) and ANOVA parameters (χ^2, P-value) with main effects (family, genus, species, body mass, and trophic guild) tested independently, additively, and interactively (family*log(mass), genus*log(mass), species*log(mass), trophic guild*log(mass)) for each macronutrient (ash, carbohydrate, protein, or lipid) with collection site as a random effect. Fixed effects with significant p-values (< 0.05) are bolded.

Nutrient	Model	BIC	ΔBIC	Fixed effect	χ^2 (df)	p-value	R^2	R^2 conditional
Ash	log(ash) ~ genus + (1 | site)	247.3	0	**genus**	164.94 (17)	**< 0.0001**	0.523	0. 529
Carbohydrate	log(carbohydrate) ~ trophic guild + log(mass) + (1 | site)	274.5	0	**trophic guild**	46.03 (5)	**< 0.0001**	0.229	0.517
				log(mass)	13.86 (1)	**< 0.001**		
	log(Carbohydrate) ~ trophic guild + (1 | site)	278.7	4.23	**trophic guild**	38.83 (5)	**< 0.0001**	0.191	0.437
Protein	log(protein) ~ genus + log(mass) + (1 | site)	470.4	0	**genus**	677.85 (18)	**< 0.0001**	0.730	0.795
				log(mass)	14.68 (1)	**< 0.0001**		
	log(protein) ~ genus + (1 | site)	474.4	3.99	**genus**	666.89 (18)	**< 0.0001**	0.744	0.779
Lipid	log(lipid) ~ trophic guild + (1 | site)	301.0	0	**trophic guild**	39.57 (5)	**< 0.0001**	0.228	0.283

Table S5. PairwiseAdonis results for macro- and micronutrient concentration differences across the trophic guilds, and across species within the Corallivore and Herbivore trophic guilds and *Acanthurus* and *Chaetodon* genus for micronutrients. 'pairs' indicates the groups (trophic guild, species) being compared, 'Df' = degrees of freedom, 'SumsOfSqs' = sums of squares, 'F.model' = F-values, 'p.adjusted' = p-values adjusted according to holm to account for multiple comparisons, and 'sig' indicating p adjusted significance < 0.05.

All fish: macronutrient ~ trophic guild							
pairs	Df	SumsOfSqs	F.Model	R2	p.value	p.adjusted	sig
Herbivore vs Detritivore	1	1.108	25.105	0.189	0.001	0.01	*
Herbivore vs Corallivore	1	0.187	4.039	0.039	0.009	0.04	.
Herbivore vs Invertivore	1	0.279	5.589	0.052	0.005	0.03	.
Herbivore vs Planktivore	1	0.062	1.255	0.015	0.262	0.262	
Detritivore vs Corallivore	1	0.742	29.849	0.388	0.001	0.01	*
Detritivore vs Invertivore	1	0.171	5.167	0.095	0.004	0.028	.
Detritivore vs Planktivore	1	0.441	19.205	0.368	0.001	0.01	*
Corallivore vs Invertivore	1	0.189	5.222	0.115	0.008	0.04	.
Corallivore vs Planktivore	1	0.057	2.337	0.089	0.071	0.142	
Invertivore vs Planktivore	1	0.165	4.136	0.137	0.02	0.06	
All fish: micronutrient ~ trophic guild							
pairs	Df	SumsOfSqs	F.Model	R2	p.value	p.adjusted	sig
Herbivore vs Detritivore	1	0.463	8.586	0.067	0.005	0.04	.
Herbivore vs Corallivore	1	0.080	1.539	0.012	0.209	0.627	
Herbivore vs Invertivore	1	0.185	2.630	0.022	0.094	0.38	
Herbivore vs Piscivore	1	0.012	0.187	0.002	0.703	1	
Herbivore vs Planktivore	1	0.845	11.499	0.098	0.001	0.015	.
Detritivore vs Corallivore	1	0.121	26.059	0.277	0.001	0.015	.
Detritivore vs Invertivore	1	0.735	21.266	0.268	0.001	0.015	.
Detritivore vs Piscivore	1	0.117	80.598	0.691	0.001	0.015	.
Detritivore vs Planktivore	1	1.530	48.035	0.516	0.001	0.015	.
Corallivore vs Invertivore	1	0.296	8.934	0.116	0.003	0.027	.
Corallivore vs Piscivore	1	0.031	4.651	0.092	0.012	0.084	
Corallivore vs Planktivore	1	0.972	31.725	0.366	0.001	0.015	.
Invertivore vs Piscivore	1	0.015	0.270	0.007	0.655	1	
Invertivore vs Planktivore	1	0.251	3.355	0.069	0.076	0.38	
Piscivore vs Planktivore	1	0.266	4.305	0.158	0.032	0.192	

Herbivores: micronutrient ~ species							
pairs	Df	SumsOfSqs	F.Model	R2	p.value	p.adjusted	sig
A. nigricans vs A. nigrofuscus	1	0.009	6.812	0.382	0.004	0.1	
A. nigricans vs A. triostegus	1	0.012	7.620	0.432	0.006	0.138	
A. nigricans vs C. spilurus	1	0.018	11.554	0.536	0.007	0.147	
A. nigricans vs M. vidua	1	0.226	4.188	0.218	0.05	0.65	
A. nigricans vs N. lituratus	1	0.590	9.592	0.375	0.01	0.18	
A. nigricans vs P. lacrymatus	1	0.011	8.572	0.438	0.001	0.045	.
A. nigricans vs S. psittacus	1	0.033	21.172	0.658	0.002	0.06	
A. nigricans vs S. nigricans	1	0.009	1.166	0.072	0.348	1	
A. nigricans vs Z. scopas	1	0.249	3.961	0.234	0.088	0.968	
A. nigrofuscus vs A. triostegus	1	0.007	10.010	0.435	0.001	0.045	.
A. nigrofuscus vs C. spilurus	1	0.052	73.516	0.850	0.001	0.045	.
A. nigrofuscus vs M. vidua	1	0.151	3.384	0.158	0.089	0.968	
A. nigrofuscus vs N. lituratus	1	0.522	10.147	0.348	0.012	0.192	
A. nigrofuscus vs P. lacrymatus	1	0.023	39.227	0.737	0.002	0.06	
A. nigrofuscus vs S. psittacus	1	0.084	109.359	0.887	0.001	0.045	.
A. nigrofuscus vs S. nigricans	1	0.023	3.910	0.178	0.003	0.078	
A. nigrofuscus vs Z. scopas	1	0.166	3.274	0.170	0.093	0.968	
A. triostegus vs C. spilurus	1	0.054	63.606	0.841	0.002	0.06	
A. triostegus vs M. vidua	1	0.122	2.574	0.132	0.241	1	
A. triostegus vs N. lituratus	1	0.438	8.051	0.309	0.02	0.28	
A. triostegus vs P. lacrymatus	1	0.046	64.968	0.833	0.001	0.045	.
A. triostegus vs S. psittacus	1	0.081	89.748	0.873	0.001	0.045	.
A. triostegus vs S. nigricans	1	0.034	5.558	0.246	0.001	0.045	.
A. triostegus vs Z. scopas	1	0.131	2.418	0.139	0.205	1	
C. spilurus vs M. vidua	1	0.532	11.268	0.399	0.007	0.147	
C. spilurus vs N. lituratus	1	1.179	21.679	0.546	0.001	0.045	.
C. spilurus vs P. lacrymatus	1	0.018	25.672	0.664	0.001	0.045	.
C. spilurus vs S. psittacus	1	0.002	2.271	0.149	0.143	1	
C. spilurus vs S. nigricans	1	0.018	2.889	0.145	0.051	0.65	
C. spilurus vs Z. scopas	1	0.573	10.602	0.414	0.01	0.18	
M. vidua vs N. lituratus	1	0.137	1.777	0.072	0.21	1	
M. vidua vs P. lacrymatus	1	0.407	9.141	0.337	0.006	0.138	
M. vidua vs S. psittacus	1	0.632	14.148	0.440	0.004	0.1	
M. vidua vs S. nigricans	1	0.447	10.957	0.332	0.002	0.06	
M. vidua vs Z. scopas	1	0.002	0.026	0.001	0.97	1	
N. lituratus vs P. lacrymatus	1	0.992	19.277	0.504	0.001	0.045	.
N. lituratus vs S. psittacus	1	1.358	26.312	0.581	0.001	0.045	.
N. lituratus vs S. nigricans	1	1.134	24.283	0.514	0.001	0.045	.

N. lituratus vs Z. scopas	1	0.098	1.158	0.052	0.257	1	
P. lacrymatus vs S. psittacus	1	0.034	45.095	0.763	0.001	0.045	.
P. lacrymatus vs S. nigricans	1	0.005	0.782	0.042	0.56	1	
P. lacrymatus vs Z. scopas	1	0.441	8.721	0.353	0.007	0.147	
S. psittacus vs S. nigricans	1	0.036	6.032	0.251	0.014	0.21	
S. psittacus vs Z. scopas	1	0.669	13.177	0.452	0.001	0.045	.
S. nigricans vs Z. scopas	1	0.473	10.442	0.343	0.001	0.045	.

Corallivores: micronutrient ~ species

pairs	Df	SumsOfSqs	F.Model	R2	p.value	p.adjusted	sig
A. scopas vs C. citrinellus	1	0.111	62.325	0.912	0.034	0.207	
A. scopas vs C. ornatissimus	1	0.078	33.307	0.769	0.002	0.04	.
A. scopas vs C. quadrimaculatus	1	0.107	118.360	0.929	0.004	0.056	
A. scopas vs C. reticulatus	1	0.112	67.849	0.860	0.002	0.04	.
A. scopas vs C. vagabundus	1	0.095	67.693	0.919	0.034	0.207	
A. scopas vs H. chrysostomus	1	0.123	60.670	0.910	0.027	0.207	
C. citrinellus vs C. ornatissimus	1	0.026	10.665	0.516	0.002	0.04	.
C. citrinellus vs C. quadrimaculatus	1	0.023	24.077	0.728	0.004	0.056	
C. citrinellus vs C. reticulatus	1	0.032	18.638	0.629	0.004	0.056	
C. citrinellus vs C. vagabundus	1	0.014	9.096	0.603	0.025	0.207	
C. citrinellus vs H. chrysostomus	1	0.001	0.554	0.085	0.611	0.611	
C. ornatissimus vs C. quadrimaculatus	1	0.006	3.651	0.219	0.007	0.07	
C. ornatissimus vs C. reticulatus	1	0.005	2.456	0.141	0.026	0.207	
C. ornatissimus vs C. vagabundus	1	0.006	2.679	0.211	0.079	0.207	
C. ornatissimus vs H. chrysostomus	1	0.028	10.951	0.523	0.003	0.045	.
C. quadrimaculatus vs C. reticulatus	1	0.013	11.252	0.446	0.001	0.021	.
C. quadrimaculatus vs C. vagabundus	1	0.006	8.842	0.496	0.002	0.04	.
C. quadrimaculatus vs H. chrysostomus	1	0.029	25.845	0.742	0.006	0.066	
C. reticulatus vs C. vagabundus	1	0.006	4.078	0.270	0.023	0.207	
C. reticulatus vs H. chrysostomus	1	0.032	17.411	0.613	0.002	0.04	.
C. vagabundus vs H. chrysostomus	1	0.014	8.089	0.574	0.032	0.207	

***Acanthurus*: micronutrient ~ species**

pairs	Df	SumsOfSqs	F.Model	R2	p.value	p.adjusted	sig
A. nigricans vs A. nigrofuscus	1	0.009	6.812	0.382	0.002	0.008	*
A. nigricans vs A. olivaceus	1	0.010	7.487	0.483	0.006	0.008	*
A. nigricans vs A. triostegus	1	0.012	7.620	0.432	0.002	0.008	*
A. nigrofuscus vs A. olivaceus	1	0.007	17.093	0.608	0.003	0.008	*
A. nigrofuscus vs A. triostegus	1	0.007	10.010	0.435	0.001	0.006	*
A. olivaceus vs A. triostegus	1	0.020	35.684	0.781	0.001	0.006	*

***Chaetodon*: micronutrient ~ species**

pairs	Df	SumsOfSqs	F.Model	R2	p.value	p.adjusted	sig
C. citrinellus vs C. ornatissimus	1	0.026	10.665	0.516	0.003	0.021	.
C. citrinellus vs C. quadrimaculatus	1	0.023	24.077	0.728	0.002	0.018	.
C. citrinellus vs C. reticulatus	1	0.032	18.638	0.629	0.002	0.018	.
C. citrinellus vs C. vagabundus	1	0.014	9.096	0.603	0.033	0.096	
C. ornatissimus vs C. quadrimaculatus	1	0.006	3.651	0.219	0.008	0.04	.
C. ornatissimus vs C. reticulatus	1	0.005	2.456	0.141	0.027	0.096	
C. ornatissimus vs C. vagabundus	1	0.006	2.679	0.211	0.07	0.096	
C. quadrimaculatus vs C. reticulatus	1	0.013	11.252	0.446	0.001	0.01	*
C. quadrimaculatus vs C. vagabundus	1	0.006	8.842	0.496	0.003	0.021	.
C. reticulatus vs C. vagabundus	1	0.006	4.078	0.270	0.024	0.096	

Table S6. Best fit generalized linear model outputs based on Bayesian Information Criterion (ΔBIC < 7) and ANOVA parameters (χ^2, P-value) with main effects (family, genus, species, body mass, and trophic guild) tested independently, additively, and interactively for each micronutrient with collection site as a random effect. Fixed effects with significant p-values (< 0.05) are bolded.

Nutrient	Model	BIC	ΔBIC	Fixed effect	χ^2 (df)	P-value	R^2	R^2 conditional
Calcium	log(Ca) ~ trophic guild + (1 | site)	685.6	0	**trophic guild**	76.92 (5)	**< 0.0001**	0.138	0.678
	log(Ca) ~ trophic guild + log(mass) + (1 | site)	691.0	5.45	**trophic guild**	69.34 (5)	**< 0.0001**	0.144	0.681
				log(mass)	3.65 (1)	0.056		
Copper	log(Cu) ~ trophic guild + (1 | site)	618.1	0	**trophic guild**	96.54 (5)	**< 0.0001**	0.334	0.499
	log(Cu) ~ genus + (1 | site)	624.1	5.99	**genus**	179.86 (18)	**< 0.0001**	0.510	0.585
	log(Cu) ~ trophic guild + log(mass) + (1 | site)	624.9	6.78	**trophic guild**	91.22 (5)	**< 0.0001**	0.336	0.503
				log(mass)	0.69 (1)	0.407		
Iron	log(Fe) ~ genus + (1 | site)	1063.9	0	**genus**	173.06 (22)	**< 0.0001**	0.209	0.748
	log(Fe) ~ species + (1 | site)	1068.8	4.86	**species**	290.78 (37)	**< 0.0001**	0.305	0.793
	log(Fe) ~ genus + log(mass) + (1 | site)	1070.2	6.33	**genus**	154.02 (22)	**< 0.0001**	0.209	0.748
				log(mass)	1.82 (1)	0.177		
Magnesium	log(Mg) ~ family + (1 | site)	609.3	0	**family**	67.11 (9)	**< 0.0001**	0.188	0.343
Manganese	log(Mn) ~ genus + (1 | site)	767.1	0	**genus**	249.04 (22)	**< 0.0001**	0.379	0.646
	log(Mn) ~ genus + log(mass) (1 | site)	773.2	6.09	**genus**	252.82 (22)	**< 0.0001**	0.378	0.652
				log(mass)	2.91 (1)	**0.**088		
Zinc	log(Zn) ~ genus + (1 | site)	780.4	0	**genus**	277.96 (23)	**< 0.0001**	0.468	0.682
	log(Zn) ~ genus + log(mass) + (1 | site)	785.9	5.53	**genus**	282.79 (23)	**< 0.0001**	0.469	0.685
				log(mass)	2.73 (1)	0.099		
	log(Zn) ~ trophic guild + (1 | site)	786.1	5.67	**trophic guild**	116.33 (5)	**< 0.0001**	0.282	0.504