

Phe-IC procedural blank					Phenylalanine					Glu-IC procedural blank				Glutamic acid					
concentration of produced N <sub>2</sub> O (μM)	s.d.	corrected δ <sup>15</sup> N (‰)	s.d.		concentration of produced N <sub>2</sub> O (μM)	s.d.	corrected δ <sup>15</sup> N (‰)	propagated error	Certified δ <sup>15</sup> N (‰)	concentration of produced N <sub>2</sub> O (μM)	s.d.	corrected δ <sup>15</sup> N (‰)	s.d.	concentration of produced N <sub>2</sub> O (μM)	s.d.	corrected δ <sup>15</sup> N (‰)	propagated error	Certified δ <sup>15</sup> N (‰)	Trophic position
std1	1.05	0.07	-3.10	2.70	6.66	0.41	0.44	0.64	1.00	0.99	0.09	-0.75	2.06	11.76	0.48	-4.90	0.34	-4.52	
std2	1.01	0.07	4.18	0.78	7.04	0.31	25.33	0.36	23.47	0.99	0.11	-0.82	2.66	10.25	2.66	12.85	0.35	14.97	
std3	0.85	0.09	1.77	1.47	6.78	0.46	40.53	0.67	39.51	0.95	0.06	3.50	1.49	12.48	0.49	28.19	0.29	29.85	
std4	0.79	0.05	1.28	1.30	4.47	0.31	56.04	0.53	55.90	0.86	0.04	7.96	1.14	11.22	0.64	46.16	0.27	47.55	
M-Std	1.05	0.12	5.59	1.05	7.73	0.40	8.63	0.33	9.17	0.93	0.09	-3.47	2.74	4.84	0.13	-4.50	0.74	-4.13	
Cyano	1.98	0.01	6.19	0.88	7.77	0.57	7.86	0.40	7.41	1.30	0.03	4.00	2.05	18.19	0.85	9.05	0.36	7.64	0.71
Zoop	1.46	0.06	6.52	0.11	6.21	0.30	4.18	0.27		1.53	0.23	5.57	0.32	20.61	2.90	20.62	0.39		2.72
GoCA	1.01	0.10	-4.24	0.60	7.00	0.80	8.48	0.37		1.68	0.06	-4.10	0.41	12.43	0.61	20.55	0.39		2.14
LIS	1.28	0.11	-13.26	1.91	6.08	0.30	8.08	0.67		1.46	0.19	-7.26	1.30	11.76	0.53	13.66	0.53		1.29

Table 1. Concentrations of N<sub>2</sub>O converted from nitrite via the azide reaction. Phe-IC procedural blank was collected before the Phe peak, and Glu-IC procedural blank was collected after the Glu peak (Fig 2 in main text) on ionexchange chromatography. Nitrite was produced either from blank or amino acids via the NaClO oxidation. Corrected δ<sup>15</sup>N values are blank-corrected (Std1-4) or calibrated by isotopic standards (natural samples). Certified δ<sup>15</sup>N values are either EA-IRMS values (Glu, USGS) or produced by persulfate oxidization method (Phe, Knapp et al 2005) or provided by McCarthy Lab (M-std and Cyano). Std1-4 are mixtures of 16 amino acids with different δ<sup>15</sup>N<sub>Phe</sub> and δ<sup>15</sup>N<sub>Glu</sub> values. M-std: standard mixture of 15 amino acids with known δ<sup>15</sup>N values from the Matt McCarthy lab (UCSC, δ<sup>15</sup>N<sub>Phe</sub> and δ<sup>15</sup>N<sub>Glu</sub> are 9.17‰ and -4.13‰, respectively). Cyano: a cyanobacteria sample provided by Matt McCarthy lab (UCSC, δ<sup>15</sup>N<sub>Phe</sub> and δ<sup>15</sup>N<sub>Glu</sub> are 7.41±0.83‰ and 7.64±0.62‰, respectively). Zoop: a zooplankton sample collected near Bermuda. LIS: a sinking particle sample collected by a sediment trap in Long Island Sound, NY. GoCA: a surface sediment sample collected from the Gulf of California under the oxygen deficient zone. Trophic positions of various samples were calculated based on equation 3. Propagated errors include those from both the azide reaction blank and IC procedural blank (see detailed calculation procedures above).