

Supplementary Information

Table S1. Salinity, dissolved trace metals and P concentrations in water, total and intracellular particulate metals to P ratios, P and chlorophyll composition of *Trichodesmium* colonies, in samples collected in the West Tropical North Atlantic Ocean (April-May 2003). Salinity, chlorophyll and total metal concentrations in *Trichodesmium* colonies were previously reported by Tovar-Sanchez et al. (2006). Elemental composition normalized to phosphorous are given in mol:mol except for Chla, which is given in μg Chla per nmol P. Phosphorous in *Trichodesmium* are in nmol per colonies. Upper and the lower italic numbers are the total and intracellular composition of *Trichodesmium* colonies, respectively. Bold station numbers are a set of samples collected during a 24 hours period in the Amazon plume. n.m.: not measured; n.d.: not detected.

Table S2. Principal component analysis results. PCA denotes the factor loadings for each parameter analyzed in this study. Dissolved elements: dAg, dCd, dCo, dCu, dFe, dMo, dNi, dP, dPb and dV; salinity: S; nitrogen fixation: N₂Fix; mixed layer depth: MLD; biological drawdown of DIC: DIC Bio; chlorophyll per colony: Chla:col; intracellular composition of *Trichodesmium*: Cd:P, Chla:P, Co:P, Cu:P, Fe:P, Mn:P, Mo:P, Ni:P, and V:P.

Figure S1. Salinity (triangles), dissolved metals and P (black dots) distributions measured in the western Tropical Atlantic Ocean. Inserts are dissolved concentrations plotted again salinity for six stations (stations 30-35) sampled during a 24 hour period in

the Amazon plume (except for dissolved P (Panel F) where no samples were collected for that analysis).

Table S1.

St	Date	Lat N Lon W	Salinity	Chla:P	dP nM	P:col nM	dAg pM	Ag:P	Al:P	dCd nM	Cd:P	dCo pM	Co:P	dCu nM	Cu:P	dFe nM	Fe:P	Mn:P	dMo μM	Mo:P	dNi nM	Ni:P	dPb pM	Pb:P	dV nM	V:P
1	4/18/99	11,30.03 56,30.21	33.66	2.36	n.d.	2.97 0.59	11.16	5.1E-07	1.8E-02	0.41	2.0E-05 5.3E-05	34.16	1.5E-05 5.8E-05	1.91	4.9E-04 8.2E-04	0.59	5.6E-03 1.6E-02	9.2E-04 3.0E-04	0.110	9.0E-04 1.7E-03	1.39	1.1E-03 7.1E-04	14.79	3.6E-06	25.88	4.5E-03 4.7E-04
2	4/19/99	11,14.32 54,35.37	32.36	4.42	27.49	0.98 0.09	12.17	2.7E-06	2.8E-02	0.43	2.2E-05 6.8E-05	31.73	2.8E-05 1.4E-04	2.65	1.0E-03 1.8E-03	0.64	6.9E-03 4.4E-02	1.3E-03 2.9E-03	0.108	1.1E-03 1.4E-03	1.3	2.4E-03 2.5E-03	10.09	6.6E-06	22.63	4.9E-03 2.2E-03
3	4/20/99	10,46.97 52,16.90	35.99	4.41	32.99	2.39 0.41	10.48	n.d.	4.9E-03	0.36	3.1E-05 6.5E-05	n.d.	9.4E-06 3.8E-05	1.32	4.1E-04 1.6E-03	n.d.	2.5E-03 4.4E-03	8.6E-04 2.0E-04	0.123	2.4E-03 9.7E-03	1	1.0E-03 5.1E-03	n.d.	8.4E-06	29.72	6.1E-03 3.1E-03
4	4/21/99	08,52.57 52,01.11	36.22	4.18	n.d.	4.73 0.43	9.66	1.5E-05	1.3E-03	0.40	2.6E-05 2.7E-05	172.68	4.1E-06 1.5E-05	0.70	2.9E-04 1.9E-04	3.22	2.9E-03 1.6E-02	7.4E-04 1.3E-04	0.111	9.1E-04 1.5E-03	1.68	9.9E-04 1.9E-03	n.d.	1.2E-06	27.43	3.3E-03 7.4E-04
5	4/22/99	06,53.06 52,01.95	25.3		11.78	n.m.	10.31	n.m.	n.m.	0.35	n.m.	96.90	n.m.	4.27	n.m.	2.95	n.m.	n.m.	0.095	n.m.	1.68	n.m.	53.19	n.m.	24.58	n.m.
6	4/23/99	06,59.97 49,59.35	35.87	3.15	26.56	1.58 0.97	9.19	2.6E-07	1.1E-02	0.43	2.4E-05 2.8E-05	144.73	1.5E-05 1.9E-05	0.72	3.9E-04 2.2E-04	4.84	4.8E-03 2.9E-02	4.9E-04 2.3E-05	0.118	4.8E-04 1.3E-03	1.62	8.4E-04 1.9E-03	n.d.	2.9E-05	30.74	2.6E-03 8.4E-04
7	4/24/99	08,18.32 51,41.08	34.3	2.07	n.d.	4.54 0.86	11.56	n.d.	7.4E-03	0.43	4.1E-05 2.1E-05	47.43	9.8E-06 2.7E-05	1.28	1.8E-04 2.2E-04	1.39	5.8E-03 2.9E-02	4.2E-04 2.3E-05	0.124	2.5E-03 1.3E-03	1.21	5.7E-04 1.9E-03	25.40	4.1E-06	30.35	1.9E-03 2.2E-03
8	4/25/99	09,48.55 54,04.95	34.24	2.72	19.30	2.11 0.36	10.57	n.d.	3.4E-03	0.42	1.1E-05 7.6E-05	32.16	1.1E-05 3.0E-05	1.79	4.6E-04 1.1E-03	0.41	4.3E-03 1.8E-02	1.1E-03 5.3E-04	0.113	7.3E-04 1.9E-03	1.64	1.1E-03 5.0E-03	17.70	7.5E-06	25.89	9.3E-03 5.3E-03
9	4/26/99	11,04.85 56,15.14	33.74	2.88	11.77	2.53 0.38	8.61	n.d.	9.2E-03	0.39	2.0E-05 2.2E-05	21.34	9.6E-06 3.0E-05	1.50	5.4E-04 1.1E-03	0.67	3.1E-03 n.d.	1.2E-03 6.8E-04	0.102	1.1E-03 1.3E-03	0.88	1.2E-03 6.0E-03	15.67	5.9E-06	22.68	8.9E-03 4.9E-03
10	4/29/99	12,59.96 55,57.86	34.59	2.94	n.d.	2.34 0.42	11.18	n.d.	3.5E-03	0.39	2.8E-05 7.1E-05	155.63	1.0E-05 4.2E-05	1.37	3.3E-04 1.3E-03	2.43	2.3E-03 4.9E-03	6.8E-04 1.6E-03	0.120	7.2E-04 2.4E-03	1.01	8.4E-04 4.2E-03	n.d.	4.0E-06	26.32	5.6E-03 7.0E-03
11	4/30/99	11,35.43 55,41.06	34.46	7.66	18.90	2.11 0.21	10.10	5.5E-06	5.2E-03	0.42	1.1E-05 2.3E-05	31.87	1.3E-05 8.3E-05	1.33	4.0E-04 8.2E-04	0.89	8.7E-03 n.d.	1.1E-03 1.4E-03	0.111	6.3E-04 2.2E-03	1.13	1.1E-03 6.1E-03	18.07	3.1E-06	30.17	6.3E-03 3.8E-03
12	5/1/99	10,20.87 55,06.07	33.16	3.21	3.31	2.90 0.62	10.50	n.d.	1.2E-02	0.38	1.0E-05 9.0E-06	n.d.	1.1E-05 2.8E-05	1.78	5.4E-04 1.1E-03	4.20	9.0E-03 2.4E-02	1.5E-03 4.6E-04	0.105	1.8E-03 1.6E-03	1.41	1.3E-03 3.8E-03	n.d.	4.1E-06	24.81	1.1E-02 8.0E-03
13	5/2/99	08,21.15 55,40.48	31.84	3.95	7.90	2.07 0.48	10.37	5.8E-06	6.4E-04	0.36	1.6E-05 9.2E-06	31.75	1.3E-05 3.6E-05	3.32	6.1E-04 1.0E-03	1.05	4.8E-03 1.3E-02	1.4E-03 1.7E-04	0.119	2.0E-03 3.6E-03	n.d.	1.3E-03 4.4E-03	26.26	5.8E-06	28.14	7.4E-03 4.9E-03
14	5/3/99	07,30.62 54,11.92	27.22		n.d.	n.m.	10.66	n.m.	n.m.	0.36	n.m.	56.14	n.m.	4.92	n.m.	2.17	n.m.	n.m.	0.097	n.m.	1.63	n.m.	61.83	n.m.	24.57	n.m.
15	5/3/99	07,46.54 54,21.07	27.53		n.d.	n.m.	10.17	n.m.	n.m.	0.35	n.m.	47.07	n.m.	4.51	n.m.	1.75	n.m.	n.m.	0.100	n.m.	1.71	n.m.	27.93	n.m.	26.99	n.m.
16	5/4/99	09,29.39 55,40.59	32.59	6.59	30.88	1.17 0.14	10.02	n.d.	1.4E-02	0.44	2.4E-05 2.7E-05	72.78	1.8E-05 1.3E-04	2.26	8.4E-04 1.5E-03	2.41	5.6E-03 2.9E-02	2.1E-03 n.m.	0.114	2.4E-03 1.0E-02	1.36	1.8E-03 1.1E-02	n.d.	5.9E-06	32.07	1.1E-02 7.6E-03
17	5/5/99	12,06.89 56,03.56	34		5.10	n.m.	9.84	n.m.	n.m.	0.40	n.m.	143.46	n.m.	1.32	n.m.	2.50	n.m.	n.m.	0.114	n.m.	1.01	n.m.	32.31	n.m.	29.19	n.m.
18	5/9/99	11,20.50 56,30.51	32.83	6.61	6.05	1.92 0.35	9.51	2.1E-06	1.3E-02	0.39	1.8E-05 4.7E-05	66.02	1.8E-05 4.1E-05	2.08	5.8E-04 1.6E-03	2.43	7.8E-03 n.m.	1.4E-03 3.0E-03	0.105	1.9E-03 5.3E-03	1.33	1.2E-03 6.8E-03	n.d.	3.9E-06	25.01	1.0E-02 1.1E-02
19	5/10/99	10,38.74 54,16.55	34.49		12.10	n.m.	9.83	n.m.	n.m.	0.44	n.m.	85.27	n.m.	1.55	n.m.	3.34	n.m.	n.m.	0.116	n.m.	1.41	n.m.	n.d.	n.m.	27.86	n.m.
20	5/10/99	10,46.48 53,58.69	34.33		28.65	n.m.	10.35	n.m.	n.m.	0.44	n.m.	36.40	n.m.	1.51	n.m.	2.33	n.m.	n.m.	0.131	n.m.	n.d.	n.m.	50.18	n.m.	29.70	n.m.
21	5/11/99	10,42.26 52,31.65	34.83	1.52	22.13	2.67 0.41	8.90	n.d.	4.1E-03	0.42	2.5E-05 3.1E-05	36.02	1.0E-05 4.0E-05	0.94	3.1E-04 6.7E-04	0.73	6.2E-03 n.m.	9.0E-04 3.7E-04	0.119	1.7E-03 3.6E-03	1.54	1.0E-03 5.2E-03	37.81	2.4E-06	28.49	7.4E-03 5.7E-03
22	5/11/99	10,42.25 51,43.64	36.3		28.91	n.m.	10.02	n.m.	n.m.	0.44	n.m.	17.32	n.m.	0.54	n.m.	1.03	n.m.	n.m.	0.126	n.m.	n.d.	n.m.	40.37	n.m.	35.69	n.m.
23	5/12/99	10,33.44 50,04.37	35.97	3.06	n.d.	2.72 0.49	8.43	7.2E-07	4.8E-03	0.42	1.2E-05 9.2E-06	94.13	4.7E-06 1.6E-05	0.62	2.6E-04 4.0E-04	1.99	2.7E-03 4.1E-03	1.0E-03 1.9E-04	0.113	1.7E-03 2.4E-03	1.29	1.3E-03 3.9E-03	47.11	1.9E-06	23.82	5.8E-03 5.3E-03
24	5/12/99	10,34.94 49,41.50	36.04		14.55	n.m.	9.76	n.m.	n.m.	0.46	n.m.	49.19	n.m.	0.67	n.m.	1.02	n.m.	n.m.	0.120	n.m.	1.26	n.m.	44.76	n.m.	29.74	n.m.
25	5/13/99	10,26.42 48,18.12	36.17		21.31	n.m.	9.21	n.m.	n.m.	0.43	n.m.	50.47	n.m.	0.46	n.m.	0.79	n.m.	n.m.	0.121	n.m.	1.16	n.m.	31.59	n.m.	28.33	n.m.
26	5/13/99	09,40.92 48,20.06	35.86		n.d.	n.m.	9.02	n.m.	n.m.	0.46	n.m.	n.d.	n.m.	0.64	n.m.	2.43	n.m.	n.m.	0.127	n.m.	1.26	n.m.	49.02	n.m.	31.89	n.m.
27	5/14/99	08,14.00 48,29.45	36.03	5.58	19.26	2.11 1.14	9.63	3.5E-06	8.6E-03	0.45	1.7E-05 1.2E-05	40.18	0.67	3.8E-04	1.23	7.3E-03 4.1E-03	1.4E-03 3.1E-04	0.120	1.5E-03 9.5E-04	1.39	1.8E-03 2.8E-03	62.38	5.1E-06	30.55	7.9E-03 1.4E-03	
28	5/15/99	07,51.41 50,03.96	35.66	1.71	21.76	2.53 0.41	9.94	n.d.	5.7E-03	0.40	1.4E-05 2.6E-05	90.68	7.2E-06 3.2E-05	0.75	3.7E-04 7.1E-04	1.29	5.3E-03 2.6E-03	1.2E-03 2.7E-04	0.119	1.5E-03 5.6E-03	1.11	1.4E-03 5.5E-03	43.59	2.0E-06	29.66	7.8E-03 6.1E-03
29	5/15/99	07,42.95 50,26.49	35.65		n.d.	n.m.	10.12	n.m.	n.m.	0.43	n.m.	42.99	n.m.	0.75	n.m.	1.83	n.m.	n.m.	0.121	n.m.	1.22	n.m.	42.89	n.m.	30.43	n.m.
30	5/16/99	06,47.97 52,46.22	24.44		n.d.	n.m.	14.92	n.m.	n.m.	0.31	n.m.	80.14	n.m.	6.10	n.m.	n.d.	n.m.	n.m.	0.080	n.m.	1.95	n.m.	13.30	n.m.	21.67	n.m.
31	5/16/99	07,12.6 53,23.2	22.4		33.72	n.m.	15.50	n.m.	n.m.	0.31	n.m.	82.23	n.m.	7.69	n.m.	8.70	n.m.	n.m.	0.079	n.m.	1.93	n.m.	77.77	n.m.	22.53	n.m.
32	5/16/99	07,40.13 54,09.59	26.41		n.d.	n.m.	10.62	n.m.	n.m.	0.34	n.m.	95.35	n.m.	5.32	n.m.	3.80	n.m.	n.m.	0.088	n.m.	n.d.	n.m.	36.01	n.m.	21.46	n.m.
33	5/16/99	07,53.18 54,32.4	29.88		8.82	n.m.	10.10	n.m.	n.m.	0.40	n.m.	94.20	n.m.	3.91	n.m.	3.27	n.m.	n.m.	0.098	n.m.	n.d.	n.m.	24.96	n.m.	28.09	n.m.
34	5/17/99	08,07.90 55,07.6	32.38		n.d.	n.m.	n.d.	n.m.	n.m.	0.40	n.m.	50.13	n.m.	2.46	n.m.	0.94	n.m.	n.m.	0.105	n.m.	1.68	n.m.	n.d.	n.m.	25.98	n.m.
35	5/17/99	08,19.08 55,37.7	30.95		n.d.	n.m.	10.16	n.m.	n.m.	0.41	n.m.	49.22	n.m.	3.12	n.m.	1.24	n.m.	n.m.	0.098	n.m.	1.73	n.m.	14.88	n.m.	n.m.	n.m.
36	5/17/99	08,37.95 56,11.99	31.6		3.76	n.m.	11.97	n.m.	n.m.	0.53	n.m.	78.35	n.m.	3.66	n.m.	1.62	n.m.	n.m.	0.120	n.m.	n.d.	n.m.	40.52	n.m.	32.86	n.m.
37	5/18/99	08,54.63 56,47.82	31.69		2.31	n.m.	10.31	n.m.	n.m.	0.39	n.m.	60.63	n.m.	2.77	n.m.	2.05	n.m.	n.m.	0.105	n.m.	1.6	n.m.	34.17	n.m.	n.m.	n.m.
38	5/18/99	09,55.59 57,53.71																								

Table S2. Principal component analysis results. PCA denotes the factor loadings for each parameter analyzed in this study. Dissolved elements: dAg, dCd, dCo, dCu, dFe, dMo, dNi, dP, dPb and dV; salinity: S; nitrogen fixation: N₂Fix; mixed layer depth: MLD; biological drawdown of DIC: DIC Bio; chlorophyll per colony: Chla:col; intracellular composition of *Trichodesmium*: Cd:P, Chla:P, Co:P, Cu:P, Fe:P, Mn:P, Mo:P, Ni:P, and V:P.

	PCA1	PCA2	PC3	Number	Engivalues	Percent	Cum Percent
S	-0.277	-0.033	-0.215	1	10.57	45.97	45.97
N2 Fix	-0.003	0.383	0.101	2	5.32	23.12	69.09
Chla:col	0.300	0.085	-0.001	3	3.85	16.74	85.83
Fe:P	0.299	0.049	0.103	4	1.94	8.45	94.28
Mo:P	-0.060	-0.337	0.004	5	1.32	5.72	100.00
Cd:P	0.243	0.105	-0.157	6	0	0	100
V:P	-0.008	-0.300	0.367	7	0	0	100
Mn:P	0.283	-0.150	0.007	8	0	0	100
Co:P	0.294	0.037	-0.118	9	0	0	100
Ni:P	-0.111	-0.339	0.143	10	0	0	100
Cu:P	0.226	0.265	0.032	11	0	0	100
dP	-0.045	-0.095	-0.238	12	0	0	100
dMo	-0.187	0.091	-0.213	13	0	0	100
dAg	0.282	0.034	0.043	14	0	0	100
dCd	-0.006	0.181	-0.449	15	0	0	100
dPb	-0.110	0.155	0.419	16	0	0	100
dV	-0.219	0.116	-0.142	17	0	0	100
dFe	-0.135	0.246	0.347	18	0	0	100
dCo	-0.190	0.119	0.298	19	0	0	100
dNi	-0.070	0.403	0.093	20	0	0	100
dCu	0.294	0.053	0.131	21	0	0	100
DIC Bio	0.306	0.031	0.014	22	0	0	100
MLD	-0.188	0.298	-0.052	23	0	0	100

Figure S1

