Supplementary Material

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|  |  | **Percent Recoveries for Isotopes Used in Analysis** |
|  | **USGS Standard** | **25Mg** | **27Al** | **43Ca** | **52Cr** | **55Mn** | **56Fe** | **59Co** | **62Ni** | **63Cu** | **66Zn** | **75As** | **111Cd** |
| **Field Samples January** | T-221 | 97.3 | 97.7 | 107.2 | 110.4 | 106.1 | 110.4 | 103.6 | 78.0 | 101.7 | 99.0 | 96.9 | 72.1 |
| T-239 | 102.9 | 104.8 | 111.3 | 114.6 | 113.1 | 112.7 | 107.0 | 115.6 | 100.9 | 108.2 | 101.5 | 103.2 |
| T-231 | 102.1 | 101.7 | 116.2 | 120.4 | 108.1 | 112.0 | 101.4 | 111.1 | 101.8 | 99.5 | 94.1 | 96.5 |
| T-235 | 101.1 | 100.4 | 111.3 | 125.2 | 108.3 | 112.8 | 103.3 | 110.9 | 106.4 | 100.2 | 100.0 | 79.1 |
| Average | 100.8 | 101.1 | 111.5 | 117.6 | 108.9 | 112.0 | 103.8 | 103.9 | 102.7 | 101.7 | 98.2 | 87.7 |
| **Field Samples July** | T-221 | 66.2 | 70.5 | 79.1 | 85.3 | 79.8 | 81.4 | 86.1 | 58.2 | 91.0 | 92.2 | 78.7 | 96.0 |
| T-239 | 70.7 | 74.4 | 81.9 | 87.0 | 84.7 | 85.9 | 88.4 | 82.5 | 96.1 | 103.5 | 81.8 | 107.3 |
| T-231 | 69.1 | 72.9 | 84.3 | 107.5 | 82.2 | 84.9 | 85.7 | 59.1 | 89.8 | 94.3 | 76.5 | 100.6 |
| T-235 | 68.1 | 69.8 | 80.4 | 93.2 | 81.2 | 82.0 | 86.1 | 73.1 | 92.5 | 111.4 | 81.4 | 92.6 |
| Average | 68.5 | 71.9 | 81.4 | 93.2 | 82.0 | 83.5 | 86.6 | 68.2 | 92.3 | 100.4 | 79.6 | 99.1 |

**Supplementary Table 1.** The percent recovery from four different USGS standards run in duplicate for the two runs of the ICP-MS, and the average recovery for each isotope, are shown. For isotopes where there was a greater than 10% difference between the sample recoveries from January and July sampling, numbers are shown in red.

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| --- | --- | --- |
|  |  | **Percent Recovery for DOLT-5 Standard Reference Material** |
|  | **Recovery** | **25Mg** | **27Al** | **43Ca** | **52Cr**  | **55Mn**  | **56Fe**  | **59Co**  | **62Ni**  | **63Cu**  | **66Zn**  | **75As**  | **111Cd**  |
| **Field Samples January** | **Average** | 98.7 | 31.2 | 10.8 | 39.8 | 90.7 | 95.2 | 84.0 | 45.4 | 95.2 | 90.9 | 75.9 | 89.8 |
| **SD** | 9.9 | 9.8 | 1.0 | 2.9 | 3.8 | 3.7 | 4.9 | 3.5 | 3.9 | 8.1 | 2.3 | 1.8 |
| **SD between digests** | 3.7 | 9.5 | 0.3 | 2.9 | 1.5 | 1.4 | 4.2 | 3.3 | 1.9 | 3.0 | 0.9 | 1.3 |
| **Field Samples July** | **Average** | 78.2 | 25.1 | 9.4 | 41.6 | 83.0 | 85.4 | 82.1 | 47.6 | 89.8 | 89.6 | 77.5 | 91.1 |
| **SD** | 13.8 | 4.5 | 1.5 | 5.4 | 8.6 | 8.0 | 5.5 | 4.5 | 7.5 | 5.9 | 4.9 | 1.7 |
| **SD between digests** | 8.6 | 2.5 | 1.0 | 3.9 | 5.2 | 4.8 | 3.5 | 1.2 | 4.4 | 3.7 | 3.1 | 0.9 |

**Supplementary Table 2.** The percent recovery from DOLT-5 dogfish liver standard reference material. The average percent recovery for the ICP-MS run, the SD between the DOLT-5 sample recoveries, and the SD between the mean recovery from each tissue digestion batch, are included for the two runs of the ICP-MS. For isotopes where there was a greater than 10% difference between the recoveries from January and July, numbers are shown in red.



**Supplementary Figure 1.** pH, temperature, and dissolved oxygen from July 2018-July 2019 at each of the four sampled sites (combination of buoy and model data).

|  |  |  |
| --- | --- | --- |
| **Oysters** |  | **Mussels** |
| **Carr Inlet 20m** | **Carr Inlet 5m** | **Dabob Bay 5m** | **Point Wells 5m** | **Metal (p value)** | **Carr Inlet 20m** | **Carr Inlet 5m** | **Dabob Bay 5m** | **Point Wells 5m** |
| **January** | **Mg** | **January** |
| 1.69E-01 | 1.14E-01 | 9.92E-02 | 1.25E-01 | **Mg (0.004)🡪** | 2.07E-01 | 1.15E-01 | 1.31E-01 | 1.69E-01 |
| 2.61E-02 | 8.15E-03 | 5.31E-03 | 1.74E-02 | **🡨Al (0.737)** | 2.83E-02 | 6.34E-03 | 6.31E-03 | 1.26E-02 |
| 1.58E-01 | 2.45E-02 | 1.15E-02 | 6.53E-02 | **🡨Ca (0.065)** | 8.25E-02 | 5.07E-03 | 1.01E-02 | 1.78E-02 |
| 3.14E-05 | 8.80E-06 | 9.78E-06 | 2.35E-05 | **🡨Cr (0.916)** | 3.26E-05 | 8.25E-06 | 1.11E-05 | 2.02E-05 |
| 2.91E-03 | 9.00E-04 | 4.88E-04 | 1.63E-03 | **🡨Mn (0.147)** | 2.52E-03 | 6.55E-04 | 3.32E-04 | 1.01E-03 |
| 1.35E-02 | 5.52E-03 | 5.94E-03 | 1.24E-02 | **🡨Fe (0.325)** | 1.44E-02 | 3.84E-03 | 5.09E-03 | 9.27E-03 |
| 9.72E-06 | -7.72E-08 | 3.77E-06 | 1.04E-05 | **Co (0.157) 🡪** | 1.17E-05 | 4.00E-06 | 6.58E-06 | 1.09E-05 |
| 2.37E-05 | 1.33E-05 | 1.66E-05 | 2.64E-05 | **Ni (0.015) 🡪** | 4.87E-05 | 1.42E-05 | 1.92E-05 | 3.58E-05 |
| 4.39E-03 | 1.30E-03 | 1.14E-03 | 3.25E-03 | **🡨Cu (4.17E-09)** | 1.52E-04 | 7.91E-05 | 9.31E-05 | 1.33E-04 |
| 6.24E-02 | 2.56E-02 | 2.48E-02 | 4.41E-02 | **🡨Zn (4.51E-11)** | 3.53E-03 | 1.71E-03 | 2.48E-03 | 2.56E-03 |
| 1.24E-04 | 1.09E-04 | 1.11E-04 | 1.04E-04 | **🡨As (0.220)** | 1.22E-04 | 7.83E-05 | 8.83E-05 | 1.28E-04 |
| 1.02E-04 | 5.41E-05 | 5.31E-05 | 1.02E-04 | **🡨Cd (0.405)** | 6.73E-05 | 4.34E-05 | 9.44E-05 | 7.64E-05 |
| **July** |  | **July** |
| 1.08E-01 | 1.16E-01 | 1.13E-01 | 8.90E-02 | **Mg (0.003) 🡪** | 1.47E-01 | 1.04E-01 | 1.22E-01 | 1.44E-01 |
| 5.36E-03 | 1.41E-02 | 3.98E-03 | 2.35E-03 | **🡨Al (0.077)** | 2.67E-03 | 5.92E-04 | 4.28E-04 | 1.24E-03 |
| 1.41E-02 | 6.20E-02 | 4.96E-02 | 2.83E-02 | **🡨Ca (0.131)** | 5.37E-02 | 6.40E-03 | 1.07E-02 | 2.14E-02 |
| 2.02E-05 | 5.79E-06 | 1.36E-05 | 1.09E-05 | **🡨Cr (0.110)** | 1.16E-05 | 5.34E-06 | 6.04E-06 | 6.38E-06 |
| 1.66E-03 | 9.93E-04 | 6.78E-04 | 7.67E-04 | **🡨Mn (0.005)** | 1.53E-03 | 2.69E-04 | 1.49E-04 | 5.04E-04 |
| 5.28E-03 | 4.34E-03 | 5.76E-03 | 3.27E-03 | **🡨Fe (1.58E-09)** | 3.09E-03 | 1.22E-03 | 1.55E-03 | 1.82E-03 |
| 5.29E-06 | 1.24E-06 | 5.61E-06 | 7.98E-06 | **Co (0.032) 🡪** | 9.59E-06 | 3.99E-06 | 7.44E-06 | 9.46E-06 |
| 7.74E-05 | -3.90E-06 | 1.99E-05 | 6.06E-05 | **🡨Ni (0.421)** | 3.90E-05 | 1.23E-05 | 1.81E-05 | 1.74E-05 |
| 4.47E-03 | 2.27E-03 | 2.20E-03 | 1.71E-03 | **🡨Cu (8.67E-10)** | 1.18E-04 | 9.41E-05 | 6.36E-05 | 8.90E-05 |
| 7.42E-02 | 5.21E-02 | 4.72E-02 | 3.23E-02 | **🡨Zn (1.92E-10)** | 3.04E-03 | 2.46E-03 | 1.41E-03 | 1.38E-03 |
| 9.90E-05 | 1.11E-04 | 7.54E-05 | 9.20E-05 | **As (0.504) 🡪** | 1.12E-04 | 8.93E-05 | 9.69E-05 | 9.66E-05 |
| 7.73E-05 | 6.39E-05 | 7.33E-05 | 5.92E-05 | **Cd (0.132) 🡪** | 9.26E-05 | 6.01E-05 | 9.57E-05 | 5.81E-05 |

**Supplementary Table 3.** Summary of mean trace metal concentrations in oyster and mussel tissues for each of the four locations at the two time points (mmol/g). P-values are from Welch’s Two Samples T-test for each metal comparing the two species across all four cage locations. Arrow indicates which species had the larger mean concentration of metals, and red color indicates the difference between species was significant (alpha level of 0.004 was chosen after Bonferroni correction).

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| **Oysters** | **Mussels** |
| Magnesium |
|  | CI20 | CI5 | PW5 | DB5 |  | CI20 | CI5 | PW5 | DB5 |
| CI20 | 0.0014\* | 0.0016\* | 0.0141 | <0.0001\* | CI20 | 0.0006\* | <0.0001\* | 0.0491 | <0.0001\* |
| CI5 | 0.9500 | 1.0000 | 0.8598 | 0.7002 | CI5 | 0.0098 | 0.9920 | 0.0027\* | 0.6680 |
| PW5 | 0.5593 | 0.2681 | 0.1977 | 0.2573 | PW5 | 0.9972 | 0.0198 | 0.6244 | 0.0504 |
| DB5 | 0.9872 | 0.9981 | 0.4074 | 0.9806 | DB5 | 0.1895 | 0.5265 | 0.2910 | 0.9960 |
| Aluminum |
|  | CI20 | CI5 | PW5 | DB5 |  | CI20 | CI5 | PW5 | DB5 |
| CI20 | 0.0409 | 0.0013\* | 0.2153 | 0.0002\* | CI20 | <0.0001\* | <0.0001\* | <0.0001\* | <0.0001\* |
| CI5 | 0.7081 | 0.9835 | 0.1694 | 0.9163 | CI5 | <0.0001\* | 0.0032\* | 0.0121 | 1.0000 |
| PW5 | 0.9823 | 0.4816 | 0.2953 | 0.0433 | PW5 | <0.0001\* | 0.0233 | <0.0001\* | 0.0117 |
| DB5 | 0.9985 | 0.6481 | 0.9976 | 1.0000 | DB5 | <0.0001\* | 0.8593 | 0.0024\* | 0.0016\* |
| Calcium |
|  | CI20 | CI5 | PW5 | DB5 |  | CI20 | CI5 | PW5 | DB5 |
| CI20 | <0.0001\* | 0.0042 | 0.0688 | 0.0015\* | CI20 | 0.9445 | 0.0693 | 0.1633 | 0.0986 |
| CI5 | 0.0240 | 0.8879 | 0.6807 | 0.9842 | CI5 | 0.0682 | 1.0000 | 0.9749 | 0.9984 |
| PW5 | 0.8097 | 0.1671 | 0.8949 | 0.4628 | PW5 | 0.3160 | 0.8568 | 1.0000 | 0.9942 |
| DB5 | 0.1728 | 0.8818 | 0.5922 | 0.9087 | DB5 | 0.0975 | 0.9956 | 0.9365 | 1.0000 |
| Chromium |
|  | CI20 | CI5 | PW5 | DB5 |  | CI20 | CI5 | PW5 | DB5 |
| CI20 | 0.7903 | 0.0031\* | 0.5537 | 0.0048 | CI20 | <0.0001\* | <0.0001\* | <.0001\* | <0.0001\* |
| CI5 | 0.3462 | 0.9999 | 0.0850 | 0.9984 | CI5 | <0.0001\* | 0.6039 | <0.0001\* | 0.4718 |
| PW5 | 0.6967 | 0.9330 | 0.6750 | 0.1192 | PW5 | <0.0001\* | 0.7400 | <0.0001\* | 0.0002 |
| DB5 | 0.8869 | 0.8221 | 0.9899 | 0.9997 | DB5 | <0.0001\* | 0.8961 | 0.9858 | 0.0348 |
| Manganese |
|  | CI20 | CI5 | PW5 | DB5 |  | CI20 | CI5 | PW5 | DB5 |
| CI20 | 0.0035\* | <0.0001\* | 0.0063 | <0.0001\* | CI20 | <0.0001\* | <0.0001\* | <0.0001\* | <0.0001\* |
| CI5 | 0.0448 | 1.0000 | 0.1994 | 0.6702 | CI5 | <0.0001\* | 0.1737 | 0.1434 | 0.1983 |
| PW5 | 0.0043 | 0.7894 | 0.1150 | 0.0163 | PW5 | <0.0001\* | 0.3098 | 0.0243 | 0.0009\* |
| DB5 | 0.0030\* | 0.6181 | 0.9857 | 0.9990 | DB5 | <0.0001\* | 0.7902 | 0.0464 | 0.9084 |
| Iron |
|  | CI20 | CI5 | PW5 | DB5 |  | CI20 | CI5 | PW5 | DB5 |
| CI20 | <0.0001\* | 0.0029\* | 0.9453 | 0.0051 | CI20 | <0.0001\* | <0.0001\* | <0.0001\* | <0.0001\* |
| CI5 | 0.6817 | 0.9959 | 0.0130 | 0.9971 | CI5 | <0.0001\* | 0.0118 | <0.0001\* | 0.5642 |
| PW5 | 0.1013 | 0.5950 | <0.0001\* | 0.0215 | PW5 | <0.0001\* | 0.1110  | <0.0001\* | 0.0005\* |
| DB5 | 0.9515 | 0.4020 | 0.0428 | 1.0000 | DB5 | <0.0001\* | 0.5496 | 0.7163 | <0.0001\* |
| Cobalt |
|  | CI20 | CI5 | PW5 | DB5 |  | CI20 | CI5 | PW5 | DB5 |
| CI20 | 0.9116 | 0.0832 | 0.9981 | 0.4501 | CI20 | 0.2795 | <0.0001\* | 0.8259 | <0.0001\* |
| CI5 | 0.5927 | 0.9999 | 0.0570 | 0.7688 | CI5 | <0.0001\* | 1.0000 | <0.0001\* | 0.0466 |
| PW5 | 0.8026 | 0.1256 | 0.9971 | 0.3547 | PW5 | 0.9986 | <0.0001\* | 0.7725 | 0.0003\* |
| DB5 | 0.9996 | 0.5165 | 0.8747 | 0.9997 | DB5 | 0.0671 | 0.0018\* | 0.1084 | 0.9792 |
| Nickel |
|  | CI20 | CI5 | PW5 | DB5 |  | CI20 | CI5 | PW5 | DB5 |
| CI20 | 0.8998 | 0.5056 | 0.9844 | 0.7738 | CI20 | 0.5181 | <0.0001\* | 0.0471 | <0.0001\* |
| CI5 | 0.5252 | 0.9999 | 0.3098 | 0.9701 | CI5 | 0.0001\* | 1.0000 | 0.0003\* | 0.7131 |
| PW5 | 0.9919 | 0.6990 | 0.9912 | 0.5610 | PW5 | 0.0016\* | 0.7905 | 0.0131 | 0.0068 |
| DB5 | 0.7974 | 0.9811 | 0.9159 | 1.0000 | DB5 | 0.0017\* | 0.7046 | 0.9992 | 1.0000 |
| Copper |
|  | CI20 | CI5 | PW5 | DB5 |  | CI20 | CI5 | PW5 | DB5 |
| CI20 | 1.0000 | 0.0004\* | 0.3568 | 0.0002\* | CI20 | 0.0654 | <0.0001\* | 0.3094 | <0.0001\* |
| CI5 | 0.0302 | 0.8770 | 0.0355 | 0.9952 | CI5 | 0.2065 | 0.9017 | 0.0001\* | 0.5844 |
| PW5 | 0.0045 | 0.8774 | 0.4003 | 0.0198 | PW5 | 0.0906 | 0.9757 | 0.0075 | 0.0048 |
| DB5 | 0.0360 | 0.9997 | 0.9278 | 0.8602 | DB5 | 0.0003\* | 0.0707 | 0.1672 | 0.1691 |
| Zinc |
|  | CI20 | CI5 | PW5 | DB5 |  | CI20 | CI5 | PW5 | DB5 |
| CI20 | 0.9792 | 0.0023\* | 0.2367 | 0.0019\* | CI20 | 0.9741 | 0.0012\* | 0.1416 | 0.0998 |
| CI5 | 0.4506 | 0.3930 | 0.2249 | 0.9998 | CI5 | 0.7262 | 0.8193 | 0.2396 | 0.3176 |
| PW5 | 0.0364 | 0.5434 | 0.9788 | 0.1955 | PW5 | 0.0264 | 0.2549 | 0.2978 | 0.9981 |
| DB5 | 0.3253 | 0.9888 | 0.7792 | 0.6823 | DB5 | 0.0251 | 0.2590 | 0.9999 | 0.3869 |
| Arsenic |
|  | CI20 | CI5 | PW5 | DB5 |  | CI20 | CI5 | PW5 | DB5 |
| CI20 | 0.5293 | 0.6751 | 0.4454 | 0.7395 | CI20 | 0.8824 | <0.0001\* | 0.8867 | 0.0011\* |
| CI5 | 0.7630 | 1.0000 | 0.9815 | 0.9995 | CI5 | 0.0048 | 0.8142 | <0.0001\* | 0.6135 |
| PW5 | 0.9430 | 0.4266 | 0.9805 | 0.9618 | PW5 | 0.0810 | 0.6760 | 0.0019\* | 0.0001\* |
| DB5 | 0.3017 | 0.0502 | 0.6012 | 0.1835 | DB5 | 0.0790 | 0.6246 | 0.9999 | 0.9287 |
| Cadmium |
|  | CI20 | CI5 | PW5 | DB5 |  | CI20 | CI5 | PW5 | DB5 |
| CI20 | 0.8224 | 0.1136 | 1.0000 | 0.1029 | CI20 | 0.0885 | 0.0177 | 0.6443 | 0.0061 |
| CI5 | 0.6669 | 0.9991 | 0.1159 | 1.0000 | CI5 | 0.0129 | 0.5733 | 0.0007\* | <0.0001\* |
| PW5 | 0.4233 | 0.9776 | 0.2044 | 0.1050 | PW5 | 0.0076 | 0.9972 | 0.4626 | 0.1047 |
| DB5 | 0.9879 | 0.8757 | 0.6736 | 0.9511 | DB5 | 0.9882 | 0.0057 | 0.0033\* | 1.0000 |

**Supplementary Table 4.** P values for ANOVAs and Tukey Post-Hoc Tests comparing tissue metal concentration across sites within sampling time and between sites across sampling time for oysters and mussels. Green outlined boxes are comparing different sites during January sampling, blue outlined boxes are comparing different sites during July sampling, and the diagonal in the middle is comparing each site between January and July. Asterisks indicate p-values are significant (p < 0.004, because Bonferroni correction was used).

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| --- | --- | --- |
|  | **Oyster dry weight (grams)** | **Mussel dry weight (grams)** |
|  |  January 2019 |
|  | **CI20** | **CI5** | **PW5** | **DB5** | **CI20** | **CI5** | **PW5** | **DB5** |
| 1 | 0.0063 | 0.0073 | 0.0365 | 0.0272 | 0.0737 | 0.7198 | 0.1437 | 0.283 |
| 2 | 0.0192 | 0.0413 | 0.0258 | 0.0629 | 0.053 | 0.5723 | 0.3372 | 0.2843 |
| 3 | 0.0119 | 0.0557 | 0.00632 | 0.0463 | 0.0541 | 0.8652 | 0.2171 | 0.3337 |
| 4 | 0.0111 | 0.073 | 0.0091 | 0.0917 | 0.0772 | 0.0572 | 0.2753 | 0.2231 |
| 5 | 0.0107 | 0.1701 | 0.016 | 0.0851 | 0.0746 | 0.3374 | 0.3148 | 0.4002 |
| 6 | 0.0156 | 0.0301 | 0.0303 | 0.0253 | 0.0314 | 0.421 | 0.1985 | 0.3395 |
| 7 | 0.0167 | 0.0239 | 0.0087 | 0.0649 | 0.1153 | 0.6397 | 0.1813 | 0.4987 |
| 8 | 0.0302 | 0.0961 | 0.0193 | 0.0372 | 0.0484 | 0.5414 | 0.1869 | 0.4424 |
| 9 | 0.002 | 0.0105 | 0.0095 | 0.0843 | 0.0541 | 0.9278 | 0.1946 | 0.4298 |
| 10 | 0.0117 | 0.0695 | 0.0214 | 0.0474 | 0.124 | 0.4349 | 0.2349 | 0.2149 |
| **mean** | **0.0135** | **0.0578** | **0.01829** | **0.0572** | **0.0706** | **0.5517** | **0.2284** | **0.3450** |
|  |  July 2019 |
|  | **CI20** | **CI5** | **PW5** | **DB5** | **CI20** | **CI5** | **PW5** | **DB5** |
| 1 | 0.0056 | 0.0759 | 0.0333 | 0.1129 | 0.1236 |  | 0.3699 | 0.6344 |
| 2 | 0.027 | 0.0096 | 0.0634 |  | 0.1276 | 1.075 | 0.5292 | 0.7138 |
| 3 | 0.0121 | 0.0506 | 0.0487 | 0.01 | 0.0565 | 0.3236 | 0.4722 | 0.5996 |
| 4 | 0.0119 | 0.0396 | 0.0635 | 0.0153 | 0.0657 | 0.7606 | 0.5486 | 0.9064 |
| 5 | 0.0111 | 0.011 | 0.0279 | 0.0175 | 0.0657 | 0.4038 | 0.7084 | 0.3627 |
| 6 | 0.0071 | 0.0674 | 0.0311 |  | 0.1049 | 0.2493 |  | 0.6137 |
| 7 | 0.004 | 0.0271 | 0.0169 | 0.0139 | 0.1428 | 0.1933 | 0.5122 | 0.282 |
| 8 | 0.0077 | 0.035 | 0.0441 | 0.0121 | 0.2878 | 0.6157 | 0.3743 | 0.4576 |
| 9 | 0.0109 | 0.0456 | 0.0215 | 0.0214 | 0.3927 | 0.5946 | 0.4676 | 0.3774 |
| 10 | 0.0097 | 0.0165 | 0.0203 | 0.0229 | 0.0841 | 1.0403 | 0.4889 | 0.3383 |
| **mean** | **0.0107** | **0.0378** | **0.0371** | **0.0283** | **0.1451** | **0.5840** | **0.4968** | **0.5286** |

**Supplementary Table 5.** Dry weight of oysters and mussels from each site used in analyses, and average dry weight for each species for each of the two collections from each site (in bold). The four missing data points were removed due to sample spills in the acid digestion process.