**Table S1.** Relative proportions (average ± SD %) of the most abundant fatty acids (FAs), sum of bacterial and terrestrial FAs, and relative proportions of saturated (SFAs), monounsaturated (MUFAs) and polyunsaturated FAs (PUFAs) in top, middle and bottom sections of first (FYI) and multiyear ice (MYI) samples collected in the Lincoln Sea during May 2018.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Fatty acids (%)** | **FYI** | | | **MYI** | | | **t-test bottom ice** | | |
| **Top (*n* = 2)** | **Middle (*n* = 2)** | **Bottom (*n* = 10)** | **Top (*n* = 2)** | **Middle (*n* = 2)** | **Bottom (*n* = 5)** | ***df*** | ***t*** | ***p*** |
| 14:0 | 2.5 ± 0.6 | 3.3 ± 2.1 | 6.3 ± 1.5 | 1.3 ± 0.6 | 2.3 ± 0.3 | 4.0 ± 0.5 | 12.5 | 4.5 | ≤ 0.001 |
| 15:0 isoa | ndb | 1.1 ± 1.6 | 0.2 ± 0.4 | 1.0 ± 0.9 | 1.6 ± 0.5 | 0.9 ± 0.9 | nsc | | |
| 16:0 | 14.4 ± 9.4 | 8.3 ± 2.6 | 10.7 ± 1.6 | 6.6 ± 0.1 | 7.3 ± 0.6 | 9.9 ± 0.9 | ns | | |
| 16:1n-11 | 1.6 ± 0.2 | 2.9 ± 0.1 | 1.2 ± 1.2 | 2.3 ± 3.0 | 1.6 ± 0.3 | 1.3 ± 1.7 | ns | | |
| 16:1n-7d | 0.6 ± 0.2 | 3.1 ± 3.1 | 13.1 ± 3.0 | 1.7 ± 0.3 | 0.9 ± 0.2 | 12.7 ± 4.3 | ns | | |
| 16:2n-4 | nd | nd | 1.1 ± 0.3 | nd | nd | 0.8 ± 0.3 | ns | | |
| 16:3n-4 | 0.6 ± 0.8 | 0.8 ± 0.5 | 0.8 ± 0.5 | nd | 0.5 ± 0.1 | 1.6 ± 0.6 | 11.5 | 2.5 | ≤ 0.05 |
| 16:4n-1d | 0.1 ± 0.1 | nd | 1.9 ± 0.6 | 0.1 ± 0.1 | 0.1 ± 0.1 | 1.4 ± 0.4 | ns | | |
| 16:4n-3 | 2.3 ± 1.3 | 1.9 ± 0.5 | 0.3 ± 0.4 | 0.7 ± 0.6 | 1.3 ± 0.3 | 0.2 ± 0.4 | ns | | |
| 17:0a | 0.3 ± 0.4 | 0.6 ± 0.1 | 0.2 ± 0.2 | 0.4 ± 0.1 | 0.6 ± 0 | 0.1 ± 0.2 | ns | | |
| 17:0 isoa | 1.2 ± 1.0 | 0.8 ± 1.1 | 0.3 ± 0.5 | 0.3 ± 0.1 | 0.7 ± 0.5 | 0.2 ± 0.4 | ns | | |
| 18:0 | 22.9 ± 11.8 | 7.5 ± 1.2 | 2.7 ± 1.5 | 5.9 ± 2.3 | 7.7 ± 1.7 | 4.5 ± 2.5 | ns | | |
| 18:1n-9 | 2.3 ± 0.4 | 2.7 ± 1.0 | 4.2 ± 1.3 | 2.1 ± 0.2 | 1.8 ± 0.3 | 2.3 ± 0.4 | 12.9 | 4.1 | ≤ 0.001 |
| 18:1n-7 | 1.4 ± 1.3 | 0.9 ± 0.4 | 1.7 ± 0.3 | 1.0 ± 0.5 | 0.5 ± 0.1 | 2.9 ± 0.7 | 5.2 | 4.2 | ≤ 0.01 |
| 18:1n-5 | 2.9 ± 1.3 | 2.3 ± 0.1 | 0.5 ± 0.4 | 1.1 ± 0.5 | 1.8 ± 0.8 | 1.0 ± 1.0 | ns | | |
| 18:2n-7 | 2.1 ± 0.1 | nd | 0.2 ± 0.4 | 1.7 ± 2.4 | nd | 0.2 ± 0.5 | ns | | |
| 18:2n-6e | 0.6 ± 0.1 | 0.3 ± 0.5 | 1.6 ± 0.7 | 0.5 ± 0.1 | 0.5 ± 0.2 | 0.7 ± 0.4 | ns | | |
| 18:3n-1 | 3.1 ± 4.1 | 1.8 ± 2.6 | 1.0 ± 1.0 | 1.5 ± 2.1 | 0.8 ± 1.2 | 1.7 ± 1.2 | ns | | |
| 18:3n-3e | 0.1 ± 0.2 | 0.1 ± 0.2 | 1.3 ± 0.7 | nd | 0.1 ± 0.2 | 0.9 ± 0.4 | ns | | |
| 18:4n-1 | 0.1 ± 0.1 | 0.8 ± 0.7 | 3.3 ± 0.9 | nd | 0.1 ± 0.2 | 1.9 ± 1.0 | 7.0 | 2.8 | ≤ 0.05 |
| 20:0 | 0.3 ± 0.4 | 0.4 ± 0 | 2.1 ± 1.3 | 0.2 ± 0.3 | 1.9 ± 1.5 | 1.6 ± 0.8 | ns | | |
| 20:1n-9f | 3.3 ± 3.9 | 4.4 ± 1.1 | 2.9 ± 1.3 | 5.8 ± 0.4 | 4.8 ± 1.1 | 5.2 ± 1.2 | 13.0 | 3.0 | ≤ 0.01 |
| 20:1n-7f | 0.6 ± 0.8 | 1.3 ± 0.4 | 1.4 ± 0.6 | 1.7 ± 0.1 | 1.4 ± 0.2 | 2.7 ± 0.6 | 12.8 | 3.5 | ≤ 0.01 |
| 20:3n-3 | 3.1 ± 4.4 | 2.2 ± 2.0 | 0.4 ± 0.7 | 0.7 ± 0.4 | 1.9 ± 0.6 | 0.1 ± 0.3 | ns | | |
| 20:4n-3 | 0.3 ± 0.5 | 0.2 ± 0.3 | 0.2 ± 0.2 | nd | nd | 0.1 ± 0.2 | ns | | |
| 20:5n-3d | 0.7 ± 0.2 | 3.7 ± 3.4 | 12.9 ± 4.4 | 0.8 ± 0.7 | 0.5 ± 0.1 | 11.1± 3.8 | ns | | |
| 22:1n-11f | 2.6 ± 3.6 | nd | 2.0 ± 1.0 | nd | nd | 3.3 ± 0.9 | 12.9 | 2.4 | ≤ 0.05 |
| 22:1n-9f | 25.0 ± 30.7 | 41.4 ± 15.3 | 15.5 ± 6.7 | 54.7 ± 8.3 | 51.6 ± 2.0 | 17.1 ± 5.5 | ns | | |
| 22:2n-6 | 0.8 ± 1.1 | 1.4 ± 0.2 | 0.1 ± 0.2 | 1.6 ± 0.1 | 1.5 ± 0.2 | 0.2 ± 0.2 | ns | | |
| 22:6n-3g | nd | 1.3 ± 0.9 | 5.3 ± 1.7 | nd | 0.5 ± 0.7 | 4.1 ± 1.1 | ns | | |
| 16:1/16:0 | 0.1 ± 0.1 | 0.3 ± 0.3 | 1.2 ± 0.2 | 0.3 ± 0.1 | 0.1 ± 0.1 | 1.3 ± 0.5 | ns | | |
| ΣC16/ΣC18 | 0.5 ± 0.1 | 0.9 ± 0.2 | 1.7 ± 0.4 | 0.6 ± 0.1 | 0.8 ± 0.1 | 1.7 ± 0.6 | ns | | |
| 20:5/22:6 | nd | 2.5 ± 0.9 | 3.1 ± 2.3 | nd | 0.4 | 2.6 ± 0.2 | ns | | |
| Σ bacterial | 2.5 ± 0.5 | 3.4 ± 0.6 | 1.3 ± 0.9 | 2.1 ± 0.6 | 3.9 ± 0.2 | 2.1 ± 1.0 | ns | | |
| Σ terrestrial | 0.7 ± 0.1 | 0.4 ± 0.6 | 2.9 ± 0.6 | 0.5 ± 0.1 | 0.6 ± 0.3 | 1.6 ± 0.1 | 10.3 | 6.4 | ≤ 0.001 |
| Σ PUFA | 15.0 ± 8.3 | 16.8 ± 10.0 | 33.2 ± 5.7 | 12.2 ± 5.1 | 11.2 ± 0.2 | 27.5 ± 4.8 | ns | | |
| Σ MUFA | 41.9 ± 30.8 | 59.9 ± 13.4 | 43.6 ± 5.0 | 71.8 ± 4.0 | 65.0 ± 4.6 | 50.4 ± 4.4 | 9.2 | 2.6 | ≤ 0.05 |
| Σ SFA | 43.1 ± 22.4 | 23.3 ± 3.4 | 23.2 ± 2.7 | 16.0 ± 1.1 | 23.8 ± 4.3 | 22.1 ± 3.1 | ns | | |

a Bacterial FA

b Not detected

c Not significantly different between FYI and MYI

d Diatom-associated FA

e Terrestrial FA

f Calanoid copepod-associated FA

g Dinoflagellate-associated FA