Supplemental 1. List of abundant OTUs, accession number of the best match originating from the warmest region, their query coverage and maximum identity and the native region.

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| OTU | Accession number | Query cover / Identity | Region |
| Phaeocystaceae\_1 | KC488454.1 | 98% / 99% | North Atlantic |
| Phaeocystaceae\_2 | JX840877.1 | 99% / 99% | Polar |
| Phaeocystaceae\_3 | JX840877.1 | 95% / 100% | Polar |
| Phaeocystaceae\_4 | JX840877.1 | 99% / 99% | Polar |
| Phaeocystaceae\_5 | JX840877.1 | 99% / 99% | Polar |
| Phaeocystaceae\_6 | JX840877.1 | 99% / 99% | Polar |
| Phaeocystaceae\_7 | JX840877.1 | 99% / 99% | Polar |
| Phaeocystaceae\_8 | JX680367.1 | 99% / 99% | Sub Polar |
| Phaeocystaceae\_9 | JX840877.1 | 99% / 99% | Polar |
| Phaeocystaceae\_10 | JX840877.1 | 99% / 99% | Polar |
| Phaeocystaceae\_11 | JX680367.1 | 99% / 99% | Sub Polar |
| Phaeocystaceae\_12 | JX680415.1 | 99% / 97% | Sub Polar |
| Prymnesiaceae\_1 | AM491017.2 | 98% / 99% | Polar |
| Prymnesiaceae\_2 | AM491011.1 | 99% / 99% | North Pacific |
| Prymnesiaceae\_3 | KC488457.1 | 99% / 99% | North Atlantic |
| Prymnesiaceae\_4 | FN263276.1 | 99% / 99% | Baltic Sea |
| Prymnesiaceae\_5 | HQ865016.1 | 99% / 99% | North Pacific |
| Pavlovophyceae | EU682597.1 | 91% / 100% | North Atlantic |
| Incertae\_Sedis | FN690514.1 | 100% / 99% | Baltic Sea |
| Diatom\_1 | JX840887.1 | 99% / 99% | Polar |
| Diatom\_2 | JX840887.1 | 96% / 99% | Polar |
| Diatom\_3 | KF925340.1 | 100% / 99% | South Atlantic |
| Diatom\_4 | KF925340.1 | 97% / 99% | South Atlantic |
| Diatom\_5 | EF140623.1 | 99% / 99% | Polar |
| Diatom\_6 | JX840887.1 | 99% / 99% | Polar |
| Diatom\_7 | HQ912646.1 | 98% / 97% | North Pacific |
| Diatom\_8 | JF794046.1 | 99% / 99% | Polar |
| Diatom\_9 | AJ535140.1 | 100% / 99% | Polar |
| Diatom\_10 | FN690544.1 | 99% / 99% | Baltic Sea |
| Bicoecea | AY821979.1 | 93% / 94% | Freshwater |
| Chrysophyceae | AY994316.1 | 99% / 100% | Spain |
| Dictyochophyceae\_1 | U14385.1 | 99% / 99% | Baltic Sea |
| Dictyochophyceae\_2 | KF422609.1 | 99% / 99% | English Channel |
| Dictyochophyceae\_3 | JF794054.1 | 99% / 100% | Polar |
| Dictyochophyceae\_4 | HQ438119.1 | 100% / 97% | Polar |
| Dictyochophyceae\_5 | HQ869665.1 | 99% / 100% | North Pacific |
| MAST\_1A | KC488521.1 | 99% / 99% | North Atlantic |
| MAST\_1B | KC488516.1 | 99% / 99% | North Atlantic |
| MAST\_1C\_1 | KC488518.1 | 99% / 100% | North Atlantic |
| MAST\_1C\_2 | HQ869499.1 | 99% / 99% | North Pacific |
| MAST\_2\_1 | JQ782083.1 | 97% / 99% | East China Sea |
| MAST\_2\_2 | HQ865141.1 | 98% / 100% | North Pacific |
| MAST\_3\_1 | KC488532.1 | 100% / 99% | North Atlantic |
| MAST\_3\_2 | HM581748.1 | 99% / 99% | Polar |
| MAST\_7\_1 | KC488553.1 | 99% / 99% | North Atlantic |
| MAST\_7\_2 | AY116219.1 | 99% / 100% | North Atlantic |

Supplemental 1. continued

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| OTU | Accession number | Query cover / Identity | Region |
| MAST\_7\_3 | HQ868802.1 | 99% / 100% | North Pacific |
| MAST\_8\_1 | HQ869551.1 | 98% / 100% | North Pacific |
| MAST\_8\_2 | HQ869384.1 | 99% / 100% | North Pacific |
| Pelagophyceae | KC488603.1 | 99% / 99% | North Atlantic |
| Dolichomastigales\_1 | HQ869376.1 | 100% / 99% | North Pacific |
| Dolichomastigales\_2 | GU824649.1 | 98% / 99% | Caribbean Sea |
| Mamiellales\_1 | JQ956271 | 99% / 99% | Polar |
| Mamiellales\_2 | JX840897.1 | 99% / 99% | Polar |
| Mamiellales\_3 | AF363156.1 | 99% / 99% | Polar |
| Halosphaeraceae\_1 | FN690733.1 | 99% / 99% | Baltic Sea |
| Halosphaeraceae\_2 | FN690733.1 | 100% / 99% | Baltic Sea |
| Halosphaeraceae\_3 | FN690733.1 | 100% / 99% | Baltic Sea |
| Halosphaeraceae\_4 | JN934689.1 | 98% / 99% | Polar |
| Halosphaeraceae\_5 | FN690733.1 | 100% / 99% | Baltic Sea |
| Halosphaeraceae\_6 | FN690733.1 | 100% / 99% | Baltic Sea |
| Halosphaeraceae\_7 | FN690733.1 | 100% / 99% | Baltic Sea |
| Halosphaeraceae\_8 | FN690733.1 | 100% / 99% | Baltic Sea |
| Dinophyceae\_1 | KC488434 | 95% / 100% | North Atlantic |
| Dinophyceae\_2 | GU825681 | 99% / 99% | Caribbean Sea |
| Dinophyceae\_3 | KC488434 | 100% / 99% | North Atlantic |
| Dinophyceae\_4 | FJ914494.1 | 99% / 99% | Coast of North Carolina |
| Dinophyceae\_5 | FJ431836.1 | 98% / 99% | English Channel |
| unc.\_Alveolate | KC488434 | 99% / 99% | North Atlantic |
| Syndiniales\_Group\_I\_1 | JF826359.1 | 99% / 99% | Polar |
| Syndiniales\_Group\_I\_2 | JN832726 | 91% / 99% | Polar |
| Syndiniales\_Group\_II\_1 | KC488506 | 99% / 99% | North Atlantic |
| Syndiniales\_Group\_II\_2 | HQ867522.1 | 99% / 99% | North Pacific |
| Ciliophora\_1 | KC488390 | 100% / 99% | North Atlantic |
| Ciliophora\_2 | JX840885 | 100% / 99% | Polar |