## S1 Summary and overview of all experiments

| Date & Time (LT) (UTC+2) | Location | Sample name | Type of sample | Sample volume (mL seawater or L air) | Analysed with | | |
|---|---|---|---|---|---|---|---|
| | | | | | FM | IC | DNA |
| 18.05.21 18:13-<br>19.05.21 18:40 | | SSC1 | Chamber air | 7350 L | (X) | X | X |
| 19.05.21 09:00 | 57°4,362'N<br>18°42,726'E | SW1 | bulk seawater (SW)* | 50 mL for FM<br>500 mL for DNA<br>10 mL for IC | (X) | X | X |
| 19.05.21 18:55-<br>20.05.21 18:15 | | SSC2 | Chamber air | 7000 L | (X) | X | |
| 19.05.21 19:30 | 57°23,448'N<br>19°02,05'E | SW3 | SW | 500 mL for DNA<br>10 mL for IC | | X | X |
| 20.05.21 12:00 | 57°25,3'N<br>19°00,8'E | SW4 | SW | FM: 100 mL<br>DNA: 500 mL<br>IC: 5 mL | (X) | X | X |
| 20.05.21 15:00 | 57°25,3'N<br>19°00,8'E | SW5 | SML | FM: 100 mL | (X) | | |
| 20.05.21 18:30-<br>21.05.21 18:00 | | SSC3 | Chamber air | 7050 L | (X) | X | |
| 21.05.21 09:30 | 57°23,448'N<br>19°02,05'E | SW7 | SW | FM: 100 mL<br>DNA: 500 mL<br>IC: 5 mL | (X) | X | X |
| 21.05.21 11:00 | | | Filter blank | 0 L | (X) | X | X |
| 21.05.21 18:15-<br>22.05.21 18:45 | | SSC4 | Chamber air | 7350 L | (X) | X | X |
| 22.05.21 00:15 | 57°24,552'N<br>19°03,618'E | SW8 | SW | DNA: 500 mL | | | X |
| 22.05.21 08:30 | 58°29,9'N<br>20°00,0'E | SW9 | SW | FM: 100 mL<br>DNA: 500 mL<br>IC: 5 mL | (X) | X | X |
| 22.05.21 08:30 | 58°29,9'N<br>20°00,0'E | SW10 | SML | FM: 80 mL<br>DNA: 500 mL<br>IC: 5 mL | (X) | X | X |
| 22.05.21 18:50 -<br>23.05.21 18:00 | | SSC5 | Chamber air | 6950 L | (X) | X | X |
| 22.05.21 19:00 | | | MiliQ blank | 10 mL | | X | |
| 22.05.21 19:00 | | | Filter blank | 0 L | | | X |
| 23.05.21 08:45 | 57°23,4'N<br>19°02,07'E | SW11 | SW | FM: 100 mL<br>DNA: 500 mL<br>IC: 5 mL | (X) | X | X |
| 23.05.21 09:00 | | | Filter blank | 0 L | | | X |
| 23.05.21 18:30-<br>24.05.21 18:15 | | SSC6 | SSC | 7125 L | (X) | | X |
| 24.05.21 12:00 | 56°38,7'N<br>18°54,6'E | SW12 | SW | FM: 100 mL<br>DNA: 500 mL<br>IC: 5 mL | (X) | X | X |
| 24.05.21 12:00 | 56°38,7'N<br>18°54,6'E | SW13 | SML | FM: 100 mL<br>DNA: 300 mL<br>IC: 5 mL | (X) | X | (X) |
| 24.05.21 18:15-<br>25.05.21 18:00 | | SSC7 | Chamber air | 5550 L | (X) | X | X |
| 25.05.21 09:00 | 56°37,97'N<br>18°36,4'E | SW14 | SW | FM: 100 mL<br>DNA: 500 mL<br>IC: 5 mL | (X) | X | X |
| 25.05.21 09:00 | 56°37,97'N<br>18°36,4'E | SW15 | SML | FM: 75 mL<br>DNA: 500 mL<br>IC: 5 mL | (X) | | X |
| 25.05.21 18:15-<br>26.05.21 18:00 | | SSC8 | Chamber air | 7125 L | (X) | X | X |
| 25.05.21 18:15 | | | Filter blank | 0 L | (X) | | |
| 26.05.21 09:15 | 54°34,77'N<br>18°47,5'E | SW16 | SW | FM: 75 mL<br>DNA: 500 mL<br>IC: 5 mL | (X) | X | X |
| 26.05.21 09:15 | 54°34,77'N<br>18°47,5'E | SW17 | SML | FM: 75 mL<br>DNA: 250 mL<br>IC: 5 mL | (X) | X | X |
| 26.05.21 18:15-<br>27.05.21 17:50 | | SSC9 | Chamber air | 7075 L | (X) | X | X |
| 27.05.21 08:00 | 54°52,98'N<br>18°22,2'E | SW18 | SW | FM: 75 mL<br>DNA: 500 mL<br>IC: 5 mL | (X) | X | X |
| 27.05.21 12:30 | 55°17,4672'<br>17°59,784' | SW19 | SML | FM: 75 mL<br>DNA: 400 mL<br>IC: 5 mL | (X) | X | X |
| 27.05.21 18:00-<br>28.05.21 18:00 | | SSC10 | Chamber air | 7200 L | (X) | X | (X) |
| 28.05.21 08:00 | 55°07,97'N<br>17°45,03'E | SW20 | SW | FM: 100 mL<br>DNA: 500 mL<br>IC: 5 mL | (X) | X | X |
| 28.05.21 18:05-<br>29.05.21 18:00 | | SSC11 | Chamber air | 7125 L | (X) | X | (X) |
| 28.05.21 18:05 | | | Filter blank | 0 L | (X) | | |
| 29.05.21 08:30 | 54°39,06'N<br>16°50,06'E | SW22 | SW | FM: 100 mL<br>DNA: 400 mL<br>IC: 5 mL | (X) | X | X |
| 29.05.21 08:30 | 54°39,06'N<br>16°50,06'E | SW23 | SML | FM: 75 mL<br>DNA: 300 mL<br>IC: 5 mL | (X) | X | X |
| 29.05.21 09:00 | | | Filter blank | 0 L | | X | X |

*sampled from at 1.5 m depth

Table S1: Overview table of all seawater samples collected during the *Oceania* campaign. Samples in brackets are excluded from analysis.

| Date & Time (LT) (UTC+2) | Location | Sample name | Type of sample | Sample volume (mL SW or L air) | Analysed with | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | FM | IC | DNA | MBS |
| 10.08.21 14:00 | 57°25,914'N 18°58,764'E | SW1 | SW* | FM: 80 mL DNA: 500 mL IC: 5 mL | X | X | X | |
| 10.08.21 14:00-11.08.21 14:00 | | SSC1 | Chamber air | 7200 L | X | X | X | (X) |
| 10.08.21 18:00 | 57°26,004'N 18°57,756'E | SML1 | SML | FM: 100 mL DNA: 500 mL IC: 5 mL | X | X | X | |
| 11.08.21 06:15 | 57°25,914'N 18°58,764'E | SW3 | SW | DNA: 500 mL IC: 5 mL | | X | X | |
| 11.08.21 09:30 | 57°26,004'N 18°57,756'E | SML2 | SML | FM: 50 mL DNA: 500 mL IC: 5 mL | X | X | X | |
| 11.08.21 14:00 | 57°25,914'N 18°58,764'E | SW5 | SW | FM: 100 mL DNA: 500 mL IC: 5 mL | X | X | X | |
| 11.08.21 14:30 | | | Filter blank | 0 L | X | X | X | |
| 11.08.21 14:15-12.08.21 14:00 | | SSC2 | Chamber air | 7175 mL | X | X | X | (X) |
| 12.08.21 11:00 | 57°26,004'N 18°57,756'E | SML3 | SML | FM: 75 mL DNA: 500 mL IC: 5 mL | X | X | X | |
| 12.08.21 14:00 | 57°25,914'N 18°58,764'E | SW9 | SW | FM: 100 mL DNA: 500 mL IC: 5 mL | X | X | X | |
| 12.08.21 16:30-13.08.21 13:45 | | SSC3 | Chamber air | 6375 L | X | X | X | X |
| 13.08.21 12:30 | 57°26,004'N 18°57,756'E | SML4 | SML | FM: 75 mL DNA: 500 mL IC: 5 mL | X | X | X | |
| 13.08.21 13:30 | 57°25,914'N 18°58,764'E | SW13 | SW | FM: 75 mL DNA: 500 mL IC: 5 mL | X | X | X | |
| 13.08.21 14:45-14.08.21 14:00 | | SSC4 | Chamber air | 6975 L | X | X | X | X |
| 14.08.21 13:30 | 57°25,914'N 18°58,764'E | SW16 | SW | FM: 100 mL DNA: 500 mL IC: 5 mL | X | X | X | |
| 14.08.21 14:00-15.08.21 14:45 | | SSC5 | Chamber air | 7200 L | X | X | X | X |
| 15.08.21 14:00 | 57°25,914'N 18°58,764'E | SW20 | SW | FM: 75 mL DNA: 500 mL IC: 5 mL | X | X | X | |
| 15.08.21 14:00-17.08.21 12:00 | | SSC6 | Chamber air | 13800 L | X | X | X | X |
| 17.08.21 12:00 | 57°27,618'N 18°56,1'E | SW23 | SW | FM: 75 mL DNA: 500 mL IC: 5 mL | X | X | X | |
| 17.08.21 13:00 | | | Filter blank | 0 L | X | X | X | |
| 17.08.21 15:30 | 57°26,004'N 18°57,756'E | SML5 | SML | FM: 75 mL DNA: 500 mL IC: 5 mL | X | X | X | |
| 17.08.21 14:00-18.08.21 08:30 | | SSC7 | Chamber air | 5550 L | X | X | X | X |
| 18.08.21 08:30 | 57°25,824'N 18°58,002'E | SW24 | SW | FM: 60 mL DNA: 500 mL IC: 5 mL | X | X | X | |
| 18.08.21 08:50-19.08.21 08:00 | | SSC8 | Chamber air | 6950 L | X | X | X | X |
| 19.08.21 08:00 | 57°25,824'N 18°58,002'E | SW25 | SW | FM: 50 mL DNA: 500 mL IC: 5 mL | X | X | X | |
| 19.08.21 08:20-20.08.21 08:00 | | SSC9 | Chamber air | 7100 L | X | X | X | X |
| 20.08.21 07:45 | 57°26,004'N 18°57,756'E | SML6 | SML | FM: 50 mL DNA: 500 mL IC: 5 mL | X | X | X | |
| 20.08.21 08:00 | 57°25,824'N 18°58,002'E | SW26 | SW | FM: 50 mL DNA: 500 mL IC: 5 mL | X | X | X | |
| 20.08.21 08:15-21.08.21 08:15 | | SSC10 | Chamber air | 7200 L | X | X | X | X |
| 21.08.21 08:00 | 57°25,824'N 18°58,002'E | SW27 | SW | FM: 50 mL DNA: 500 mL IC: 5 mL | X | X | X | |
| 21.08.21 09:00 | | | Filter blank | 0 L | X | X | X | |
| 21.08.21 08:30-22.08.21 08:00 | | SSC11 | Chamber air | 7050 L | X | X | X | X |
| 21.08.21 17:45 | 57°26,004'N 18°57,756'E | SML7 | SML | FM: 50 mL DNA: 500 mL IC: 5 mL | X | X | X | |
| 22.08.21 08:00 | 57°25,824'N 18°58,002'E | SW28 | SW | FM: 50 mL DNA: 500 mL IC: 5 mL | X | X | X | |

*sampled from ship's inlet at 1.5 m depth

Table S2: Overview table of all samples collected during the *Electra* campaign. Samples in brackets are excluded from analysis.

## S2 Description of triple PCR amplification

The PCR mixture included a template volume of 2.5-10 µL, 12.5 µL 2X KAPA HiFi HotStart polymerase (Kapa Biosystems, Inc.,mUS), 0.5 µL forward primer (10 pmol µL), 0.5 µL reverse primer (10 pmol µL), and 0.5 µL BSA ($4\,g\,L^{-1}$). The first PCR involved an initial denaturation at 95°C for 3 min, followed by 24 cycles of denaturation at 95°C for 30 s, annealing at 55°C for 30 s, elongation at 72°C for 30 s, and a final elongation at 72°C for 5 min. A second PCR with 10–12 cycles was conducted using the same PCR conditions, but this time incorporating the Illumina overhang adapters without BSA. In a third PCR, primers were annealed to the adapter sequence from step two for indexing purposes.

The resulting PCR product was cleaned with 20 µL AMPure XP beads (Beckman Coulter, US) and gel electrophoresis confirmed successful amplification. Prior to sequencing, DNA concentrations were determined using the Quant-iT$^{TM}$ dsDNA high sensitivity Assay Kits (Thermo Fisher Scientific, US) and normalized to a concentration of $4\,ng\,\mu L^{-1}$.

## S3 Processing of DNA sequencing data using the nf-core ampliseq workflow

The nf-core/ampliseq workflow version 2.3.2 (Straub et al., 2020) was used for the analysis of the sequencing data. This involved pre-processing steps such as read quality control (FastQC version 0.11.9, Andrews et al., 2010), and primer trimming with cutadapt (version 3.4 Martin, 2011). Amplicon sequence variants (ASV) were inferred and classified using DADA2 (version 1.22.0, Callahan et al., 2016) with the Silva reference taxonomy database (version 138, Quast et al., 2012). A secondary taxonomic classification was performed using the Quantitative Insights Into Microbial Ecology 2 platform (QIIME2, version 2021.8.0, Bolyen et al., 2019), providing absolute and relative abundances of the different taxa found in each sample.

## S4 Overview of contaminant ASVs

| Phylum | Class | Order | Family | Genus | Species |
|---|---|---|---|---|---|
| Proteobacteria | Alphaproteobacteria | Sphingomonadales | Sphingomonadaceae | Sphingomonas | NA |
| Proteobacteria | Alphaproteobacteria | SAR11 clade | Clade I | Clade Ia | NA |
| Bacteroidota | Bacteroidia | Sphingobacteriales | NS11-12 marine group | NA | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Proteobacteria | Alphaproteobacteria | Sphingomonadales | Sphingomonadaceae | Sphingomonas | NA |
| Proteobacteria | Alphaproteobacteria | SAR11 clade | Clade I | Clade Ia | NA |
| Firmicutes | Bacilli | Paenibacillales | Paenibacillaceae | Paenibacillus | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Proteobacteria | Alphaproteobacteria | Rhodobacterales | Rhodobacteraceae | Yoonia-Loktanella | NA |
| Firmicutes | Bacilli | Paenibacillales | Paenibacillaceae | Paenibacillus | NA |
| Actinobacteriota | Actinobacteria | Frankiales | Sporichthyaceae | hgcI clade | NA |
| Verrucomicrobiota | Verrucomicrobiae | Chthoniobacterales | Chthoniobacteraceae | LD29 | NA |
| Cyanobacteria | Cyanobacteriia | Synechococcales | Cyanobiaceae | Cyanobium PCC-6307 | NA |
| Proteobacteria | Alphaproteobacteria | SAR11 clade | Clade I | Clade Ia | NA |
| Actinobacteriota | Actinobacteria | Frankiales | Sporichthyaceae | hgcI clade | NA |
| Proteobacteria | Alphaproteobacteria | SAR11 clade | Clade I | Clade Ia | NA |
| Bacteroidota | Bacteroidia | Cytophagales | Spirosomaceae | Taeseokella | NA |
| Proteobacteria | Alphaproteobacteria | SAR11 clade | Clade III | NA | NA |
| Proteobacteria | Gammaproteobacteria | Burkholderiales | Methylophilaceae | OM43 clade | NA |
| Proteobacteria | Gammaproteobacteria | Burkholderiales | Comamonadaceae | RS62 marine group | NA |
| Actinobacteriota | Actinobacteria | Frankiales | Sporichthyaceae | Candidatus Planktophila | NA |
| Proteobacteria | Gammaproteobacteria | Burkholderiales | Comamonadaceae | RS62 marine group | NA |
| Proteobacteria | Gammaproteobacteria | Burkholderiales | Comamonadaceae | Aquabacterium | NA |
| Firmicutes | Bacilli | Bacillales | Bacillaceae | Bacillus | NA |
| Firmicutes | Bacilli | Paenibacillales | Paenibacillaceae | Paenibacillus | NA |
| Actinobacteriota | Acidimicrobiia | Microtrichales | Ilumatobacteraceae | CL500-29 marine group | NA |
| Firmicutes | Bacilli | Paenibacillales | Paenibacillaceae | Paenibacillus | NA |
| Proteobacteria | Gammaproteobacteria | Burkholderiales | Methylophilaceae | OM43 clade | NA |
| Actinobacteriota | Actinobacteria | Frankiales | Sporichthyaceae | hgcI clade | NA |
| Proteobacteria | Gammaproteobacteria | Burkholderiales | Alcaligenaceae | GKS98 freshwater group | NA |
| Actinobacteriota | Actinobacteria | Frankiales | Sporichthyaceae | hgcI clade | NA |
| Proteobacteria | Alphaproteobacteria | SAR11 clade | Clade I | Clade Ia | NA |
| Proteobacteria | Gammaproteobacteria | Pseudomonadales | Moraxellaceae | Acinetobacter | lwoffii |
| Actinobacteriota | Actinobacteria | Micrococcales | Microbacteriaceae | Candidatus Aquiluna | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Firmicutes | Bacilli | Paenibacillales | Paenibacillaceae | Paenibacillus | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Bacteroidota | Bacteroidia | Chitinophagales | Saprospiraceae | Lewinella | NA |
| Cyanobacteria | Cyanobacteriia | Synechococcales | Cyanobiaceae | Cyanobium PCC-6307 | NA |

Table S3: Overview of ASVs that were identified as contamination and removed from further analysis.

| Phylum | Class | Order | Family | Genus | Species |
|---|---|---|---|---|---|
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Actinobacteriota | Actinobacteria | Frankiales | Sporichthyaceae | hgcI clade | NA |
| Actinobacteriota | Actinobacteria | Micrococcales | Microbacteriaceae | Candidatus Limnoluna | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Bacteroidota | Bacteroidia | Flavobacteriales | Flavobacteriaceae | Subsaxibacter | NA |
| Firmicutes | Bacilli | Paenibacillales | Paenibacillaceae | Paenibacillus | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Proteobacteria | Alphaproteobacteria | Caulobacterales | Caulobacteraceae | Brevundimonas | NA |
| Proteobacteria | Gammaproteobacteria | Burkholderiales | Comamonadaceae | Aquabacterium | NA |
| Bacteroidota | Bacteroidia | Flavobacteriales | NS9 marine group | NA | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Proteobacteria | Alphaproteobacteria | Rickettsiales | Mitochondria | NA | NA |
| Cyanobacteria | Cyanobacteriia | Synechococcales | Cyanobiaceae | Cyanobium PCC-6307 | NA |
| Proteobacteria | Alphaproteobacteria | Sphingomonadales | Sphingomonadaceae | Sphingobium | yanoikuyae |
| Actinobacteriota | Actinobacteria | Micrococcales | Micrococcaceae | Micrococcus | NA |
| Bacteroidota | Bacteroidia | Flavobacteriales | Flavobacteriaceae | NA | NA |
| Proteobacteria | Alphaproteobacteria | Sphingomonadales | Sphingomonadaceae | Erythrobacter | NA |
| Firmicutes | Bacilli | Bacillales | Bacillaceae | Bacillus | NA |
| Proteobacteria | Alphaproteobacteria | Caulobacterales | Hyphomonadaceae | Hyphomonas | NA |
| Bacteroidota | Bacteroidia | Flavobacteriales | Flavobacteriaceae | NS5 marine group | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Firmicutes | Bacilli | Bacillales | Bacillaceae | Bacillus | NA |
| Cyanobacteria | Cyanobacteriia | Pseudanabaenales | Pseudanabaenaceae | Pseudanabaena PCC-7429 | NA |
| Firmicutes | Bacilli | Lactobacillales | Streptococcaceae | Streptococcus | NA |
| Firmicutes | Bacilli | Staphylococcales | Staphylococcaceae | Staphylococcus | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Proteobacteria | Gammaproteobacteria | Pseudomonadales | Pseudohongiellaceae | Pseudohongiella | NA |
| Proteobacteria | Gammaproteobacteria | Enterobacterales | Enterobacteriaceae | Escherichia-Shigella | NA |
| Proteobacteria | Alphaproteobacteria | Sphingomonadales | Sphingomonadaceae | Sphingobium | NA |
| Proteobacteria | Alphaproteobacteria | Rhodospirillales | Magnetospiraceae | NA | NA |
| Proteobacteria | Alphaproteobacteria | Rhodobacterales | Rhodobacteraceae | Pseudorhodobacter | NA |
| Proteobacteria | Gammaproteobacteria | Burkholderiales | Nitrosomonadaceae | IS-44 | NA |
| Proteobacteria | Alphaproteobacteria | Rickettsiales | Fokiniaceae | MD3-55 | NA |
| Bacteroidota | Bacteroidia | Flavobacteriales | Cryomorphaceae | NA | NA |
| Proteobacteria | Gammaproteobacteria | Pseudomonadales | Moraxellaceae | Enhydrobacter | aerosaccus |

Table S3 continued

| Phylum | Class | Order | Family | Genus | Species |
|---|---|---|---|---|---|
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Proteobacteria | Gammaproteobacteria | Pseudomonadales | Moraxellaceae | Psychrobacter | NA |
| Proteobacteria | Gammaproteobacteria | Pseudomonadales | Moraxellaceae | Psychrobacter | namhaensis |
| Proteobacteria | Gammaproteobacteria | Pseudomonadales | Moraxellaceae | Psychrobacter | NA |
| Actinobacteriota | Actinobacteria | Propionibacteriales | Propionibacteriaceae | Cutibacterium | NA |
| Proteobacteria | Alphaproteobacteria | Rickettsiales | Rickettsiaceae | NA | NA |
| Proteobacteria | Alphaproteobacteria | SAR11 clade | Clade III | NA | NA |
| Proteobacteria | Alphaproteobacteria | Rickettsiales | Rickettsiaceae | Candidatus Megaira | NA |
| Proteobacteria | Gammaproteobacteria | Enterobacterales | Shewanellaceae | Shewanella | NA |
| Actinobacteriota | Thermoleophilia | Gaiellales | NA | NA | NA |
| Proteobacteria | Alphaproteobacteria | Sphingomonadales | Sphingomonadaceae | Erythrobacter | NA |
| Proteobacteria | Alphaproteobacteria | Rhodobacterales | Rhodobacteraceae | Tabrizicola | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Bacteroidota | Bacteroidia | Cytophagales | Cyclobacteriaceae | Marinoscillum | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Proteobacteria | Alphaproteobacteria | Rhodobacterales | Rhodobacteraceae | Gemmobacter | aquaticus |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Proteobacteria | Alphaproteobacteria | Sphingomonadales | Sphingomonadaceae | NA | NA |
| Proteobacteria | Alphaproteobacteria | Sphingomonadales | Sphingomonadaceae | Novosphingobium | NA |
| Proteobacteria | Gammaproteobacteria | Xanthomonadales | Xanthomonadaceae | Stenotrophomonas | maltophilia |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Proteobacteria | Alphaproteobacteria | Rhodobacterales | Rhodobacteraceae | Limimaricola | NA |
| Bacteroidota | Bacteroidia | Flavobacteriales | Flavobacteriaceae | Winogradskyella | NA |
| Actinobacteriota | Thermoleophilia | Gaiellales | NA | NA | NA |
| Actinobacteriota | Actinobacteria | PeM15 | NA | NA | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Proteobacteria | Alphaproteobacteria | Rhodospirillales | Magnetospiraceae | NA | NA |
| Proteobacteria | Gammaproteobacteria | Pseudomonadales | Pseudomonadaceae | Pseudomonas | NA |
| Proteobacteria | Gammaproteobacteria | Pseudomonadales | Pseudohongiellaceae | Pseudohongiella | NA |
| Proteobacteria | Gammaproteobacteria | Xanthomonadales | Xanthomonadaceae | Stenotrophomonas | NA |
| Bacteroidota | Bacteroidia | Cytophagales | Cyclobacteriaceae | Algoriphagus | aquaemixtae |
| Proteobacteria | Alphaproteobacteria | Rickettsiales | Fokiniaceae | NA | NA |
| Proteobacteria | Gammaproteobacteria | Xanthomonadales | Xanthomonadaceae | Stenotrophomonas | NA |
| Actinobacteriota | Actinobacteria | PeM15 | NA | NA | NA |
| Proteobacteria | Alphaproteobacteria | Sphingomonadales | Sphingomonadaceae | Sphingobium | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |

Table S3 continued

| Phylum | Class | Order | Family | Genus | Species |
|---|---|---|---|---|---|
| Proteobacteria | Alphaproteobacteria | Rickettsiales | Mitochondria | NA | NA |
| Proteobacteria | Alphaproteobacteria | Paracaedibacterales | Paracaedibacteraceae | Candidatus Captivus | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Actinobacteriota | Actinobacteria | Corynebacteriales | Corynebacteriaceae | Corynebacterium | NA |
| Proteobacteria | Alphaproteobacteria | Sphingomonadales | Sphingomonadaceae | Erythrobacter | NA |
| Bacteroidota | Bacteroidia | Flavobacteriales | Cryomorphaceae | NA | NA |
| Proteobacteria | Alphaproteobacteria | Rickettsiales | Mitochondria | NA | NA |
| Proteobacteria | Gammaproteobacteria | Burkholderiales | Comamonadaceae | Limnohabitans | NA |
| Proteobacteria | Gammaproteobacteria | Pseudomonadales | Pseudomonadaceae | Pseudomonas | NA |
| Proteobacteria | Alphaproteobacteria | SAR11 clade | Clade III | NA | NA |
| Proteobacteria | Alphaproteobacteria | Rhodobacterales | Rhodobacteraceae | Lentibacter | algarum |
| Proteobacteria | Alphaproteobacteria | Sphingomonadales | Sphingomonadaceae | Porphyrobacter | sanguineus |
| Actinobacteriota | Actinobacteria | Corynebacteriales | Mycobacteriaceae | Mycobacterium | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Proteobacteria | Alphaproteobacteria | Rhodobacterales | Rhodobacteraceae | Roseobacter | NA |
| Firmicutes | Bacilli | Bacillales | Bacillaceae | Bacillus | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Proteobacteria | Alphaproteobacteria | Rhodobacterales | Rhodobacteraceae | Yoonia-Loktanella | NA |
| Bacteroidota | Bacteroidia | Chitinophagales | Saprospiraceae | NA | NA |
| Planctomycetota | Planctomycetes | Pirellulales | Pirellulaceae | NA | NA |
| Actinobacteriota | Actinobacteria | Frankiales | Sporichthyaceae | hgcI clade | NA |
| Proteobacteria | Gammaproteobacteria | Burkholderiales | Comamonadaceae | Polaromonas | NA |
| Proteobacteria | Gammaproteobacteria | Burkholderiales | Alcaligenaceae | NA | NA |
| Actinobacteriota | Actinobacteria | PeM15 | NA | NA | NA |
| Proteobacteria | Alphaproteobacteria | Rickettsiales | Anaplasmataceae | Wolbachia | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Proteobacteria | Alphaproteobacteria | Rickettsiales | Mitochondria | NA | NA |
| Actinobacteriota | Thermoleophilia | Solirubrobacterales | 67-14 | NA | NA |
| Proteobacteria | Gammaproteobacteria | Pseudomonadales | Moraxellaceae | Alkanindiges | NA |
| Proteobacteria | Alphaproteobacteria | Rickettsiales | Mitochondria | NA | NA |
| Proteobacteria | Alphaproteobacteria | NA | NA | NA | NA |
| Proteobacteria | Gammaproteobacteria | Pseudomonadales | Pseudomonadaceae | Pseudomonas | NA |
| Bacteroidota | Bacteroidia | Flavobacteriales | NS9 marine group | NA | NA |
| Proteobacteria | Alphaproteobacteria | Rickettsiales | Mitochondria | NA | NA |
| Proteobacteria | Alphaproteobacteria | Rickettsiales | Mitochondria | NA | NA |
| Proteobacteria | Alphaproteobacteria | Sphingomonadales | Sphingomonadaceae | Croceicoccus | NA |
| Proteobacteria | Alphaproteobacteria | Rickettsiales | Mitochondria | NA | NA |
| Proteobacteria | Alphaproteobacteria | Rhodobacterales | Rhodobacteraceae | NA | NA |
| Proteobacteria | Gammaproteobacteria | Pseudomonadales | Moraxellaceae | Acinetobacter | NA |
| Firmicutes | Clostridia | Peptostreptococcales-Tissierellales | Family XI | Anaerococcus | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |

Table S3 continued

| Phylum | Class | Order | Family | Genus | Species |
|---|---|---|---|---|---|
| Firmicutes | Bacilli | Lactobacillales | Streptococcaceae | Streptococcus | NA |
| Actinobacteriota | Actinobacteria | Frankiales | Sporichthyaceae | hgcI clade | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Bacteroidota | Bacteroidia | Flavobacteriales | Flavobacteriaceae | Gaetbulibacter | NA |
| Proteobacteria | Alphaproteobacteria | Rickettsiales | Mitochondria | NA | NA |
| Proteobacteria | Alphaproteobacteria | Rickettsiales | NA | NA | NA |
| Proteobacteria | Alphaproteobacteria | SAR11 clade | Clade IV | NA | NA |
| Verrucomicrobiota | Verrucomicrobiae | Verrucomicrobiales | Rubritaleaceae | Haloferula | NA |
| Cyanobacteria | Cyanobacteriia | Chloroplast | NA | NA | NA |
| Actinobacteriota | Actinobacteria | Propionibacteriales | Nocardioidaceae | Nocardioides | NA |
| Bacteroidota | Bacteroidia | Chitinophagales | Saprospiraceae | NA | NA |
| Proteobacteria | Gammaproteobacteria | Gammaproteobacteria Incertae Sedis | Unknown Family | Marinicella | NA |
| Proteobacteria | Alphaproteobacteria | Kiloniellales | Kiloniellaceae | NA | NA |
| Actinobacteriota | Actinobacteria | Propionibacteriales | Propionibacteriaceae | NA | NA |
| Proteobacteria | Alphaproteobacteria | Sphingomonadales | Sphingomonadaceae | Altererythrobacter | NA |
| Bacteroidota | Bacteroidia | Flavobacteriales | Flavobacteriaceae | Flavobacterium | NA |
| Bacteroidota | Bacteroidia | Sphingobacteriales | Sphingobacteriaceae | Pedobacter | NA |

Table S3 continued

## S5 Supplementary figures

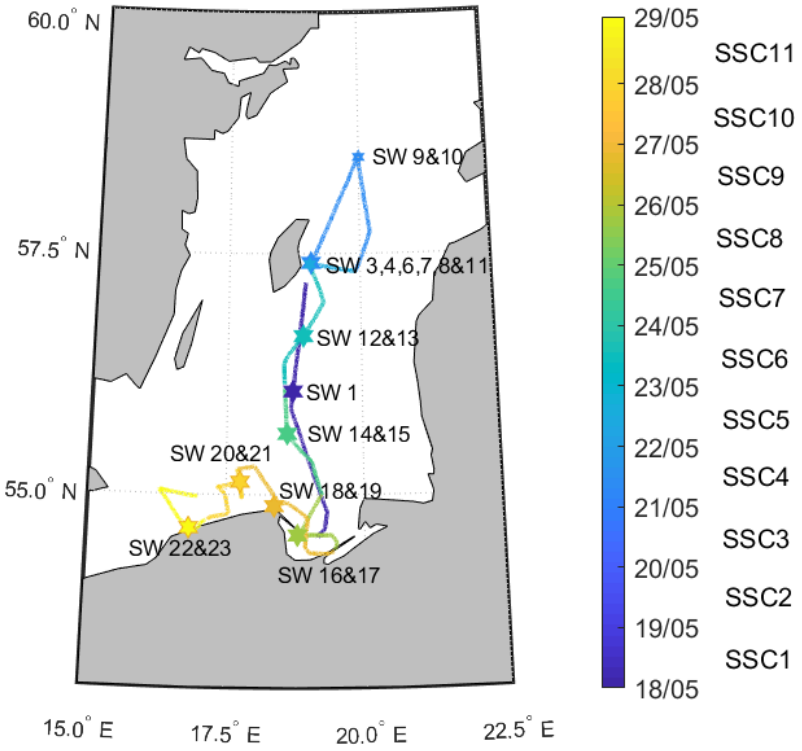


Figure S1: Cruise track during the *Oceania* campaign. The color-code indicates where each sea spray chamber (SSC) experiment was conducted, the stars mark location were the seawater samples were collected.

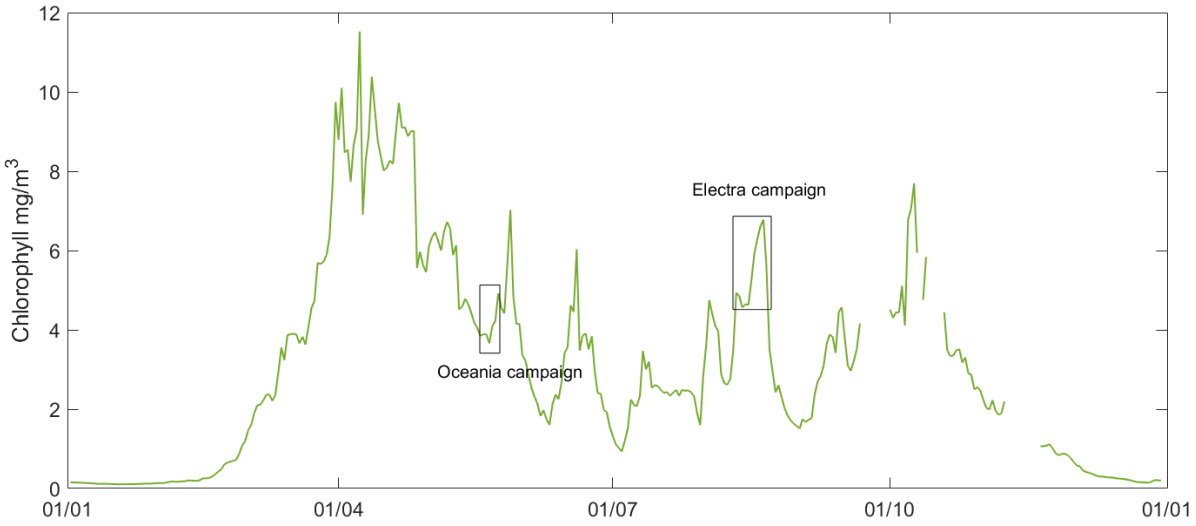


Figure S2: Yearly time series of daily average chlorophyll-$a$ concentrations in the surface seawater close to Östergarnsholm island obtained from re-analysis data.

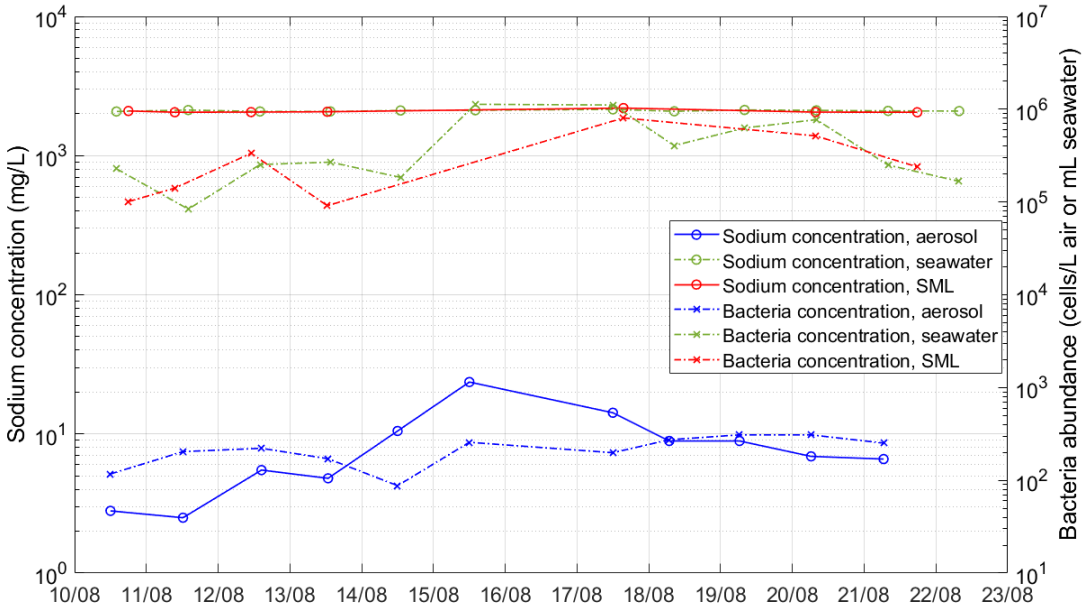


Figure S3: Time series of bacteria abundance and sodium concentrations in the aerosol and seawater samples during the *Electra* campaign.

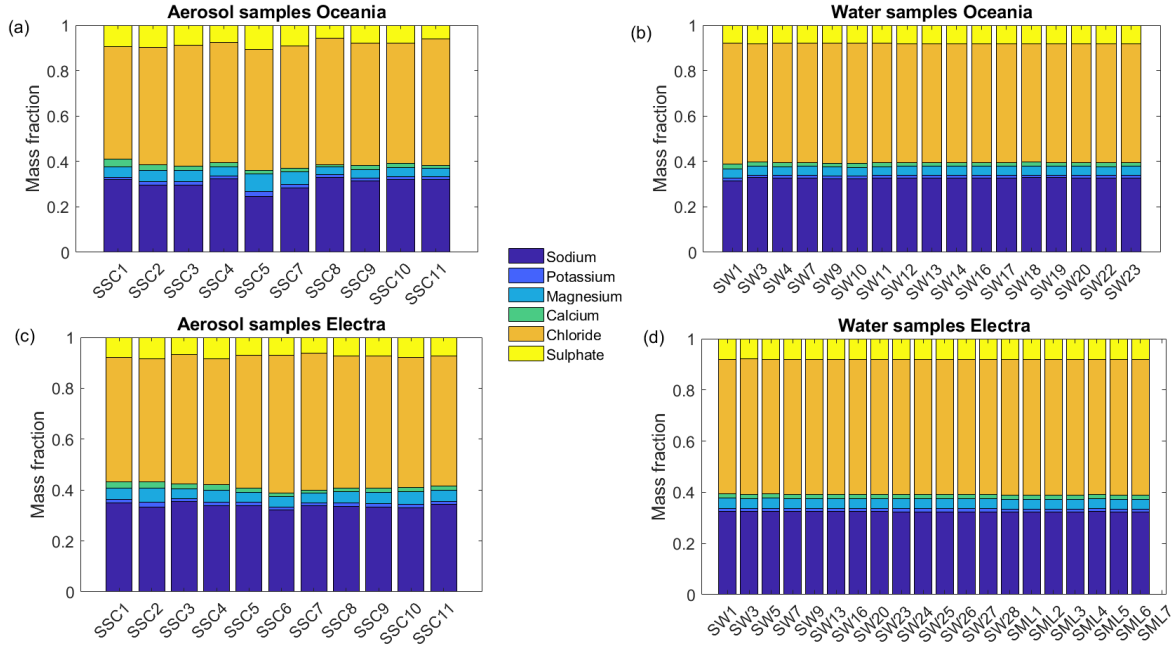


Figure S4: Mass fractions of ionic compounds from IC measurements in (a) aerosol and (b) water samples from the *Oceania* campaign and (c) aerosol and (d) water samples from the *Electra* campaign.

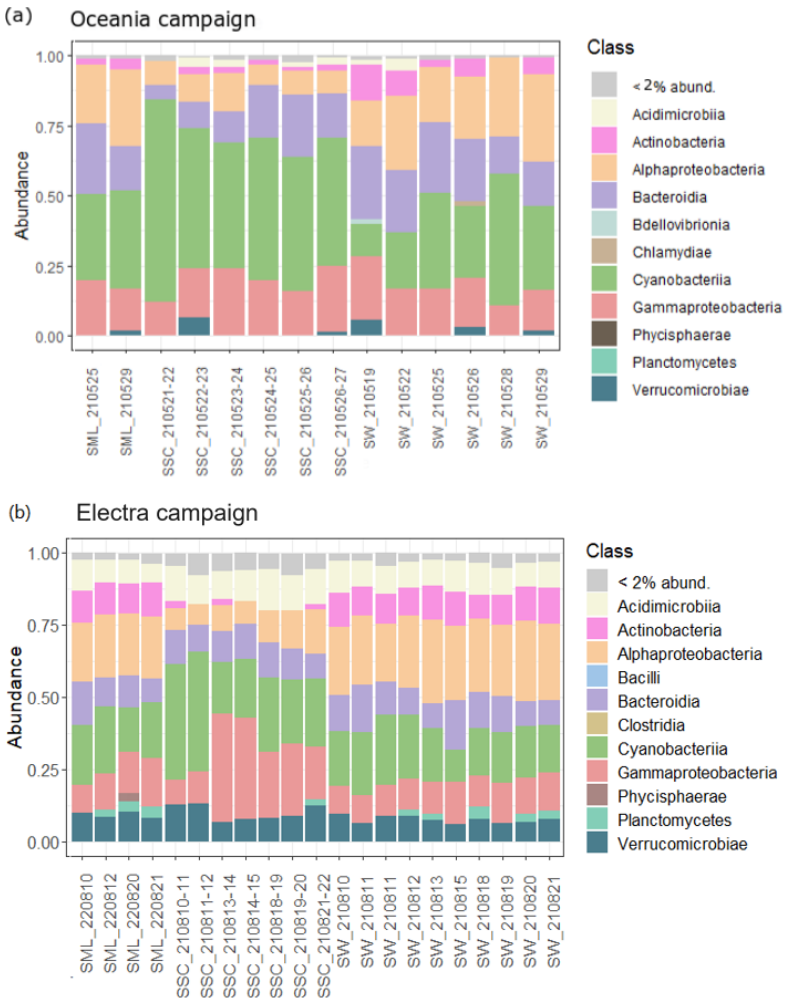


Figure S5: Bacterial enrichment factor in the SML compared to underlying SW versus wind speed during the *Electra* campaign..

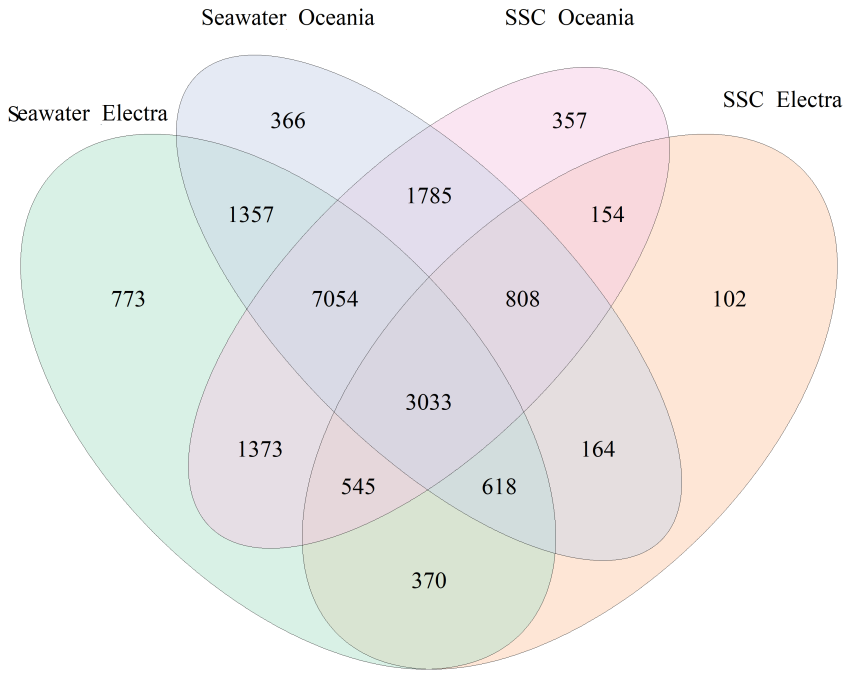


Figure S6: Venn diagram indicating shared taxa (ASVs) between seawater samples and chamber aerosol samples (SSC) between the two campaigns.

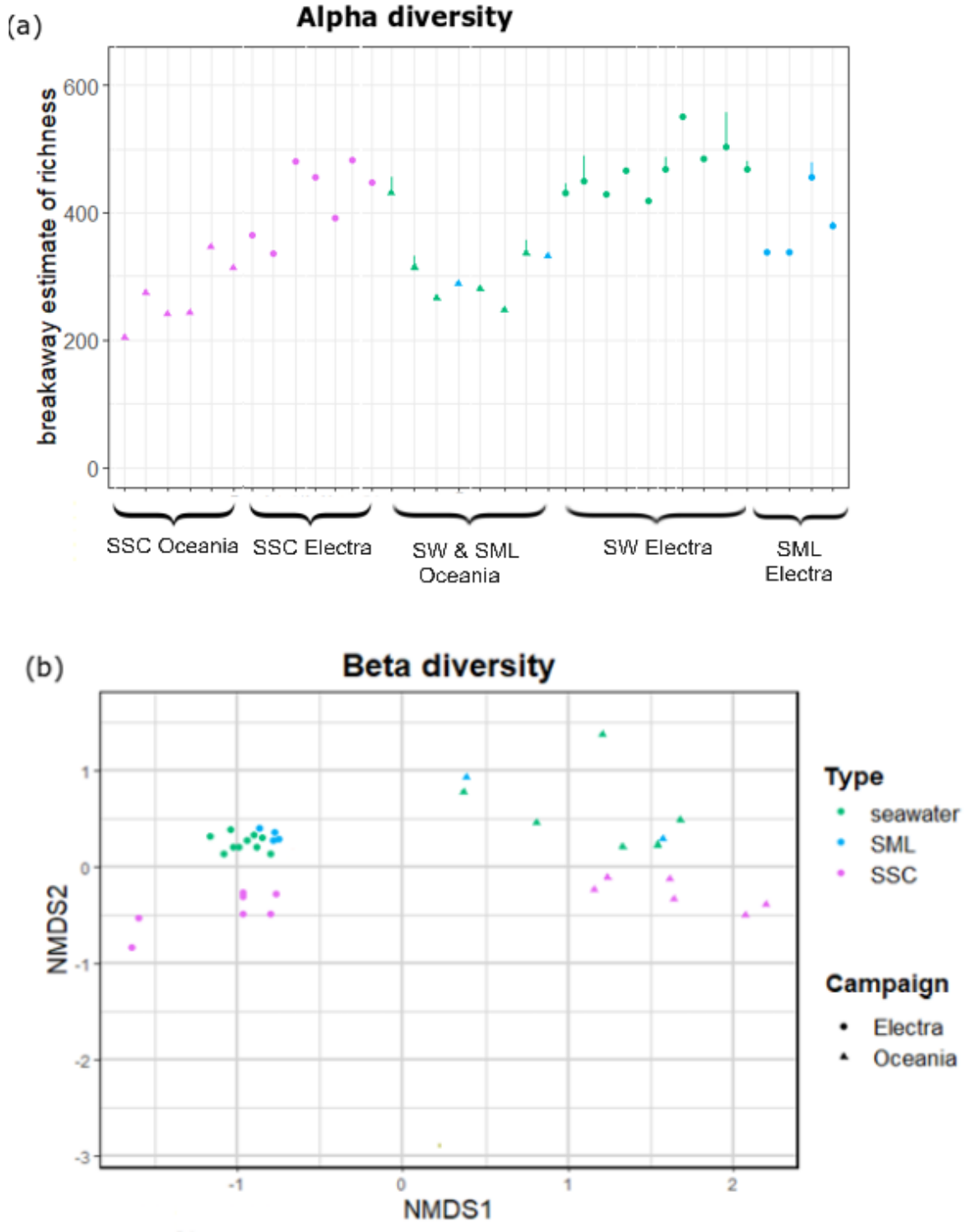


Figure S7: (a) Observed alpha and (b) beta diversity of sea spray chamber aerosol (SSC), bulk seawater (SW) and surface microlayer (SML) for both campaigns with corresponding sampling dates. The beta diversity was estimated based on non-metric multidimensional scaling of Bray-Curtis dissimilarity.

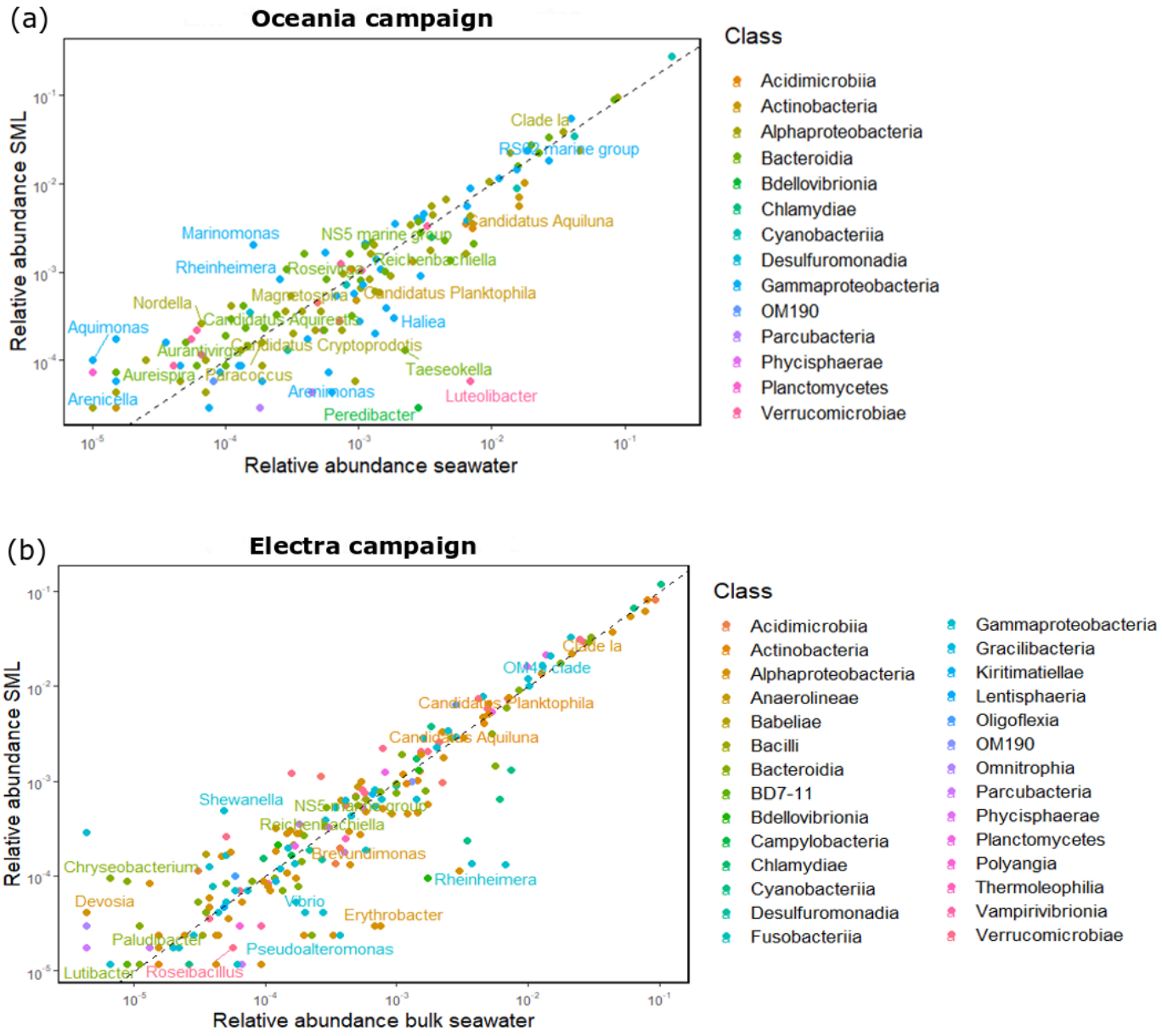


Figure S8: Enrichment of ASVs in the SML compared to the bulk seawater during (a) the *Oceania* campaign and (b) the *Electra* campaign. Colors represent different bacteria classes. The dashed line indicates the 1:1 line. A number of selected genera names is shown in each panel.

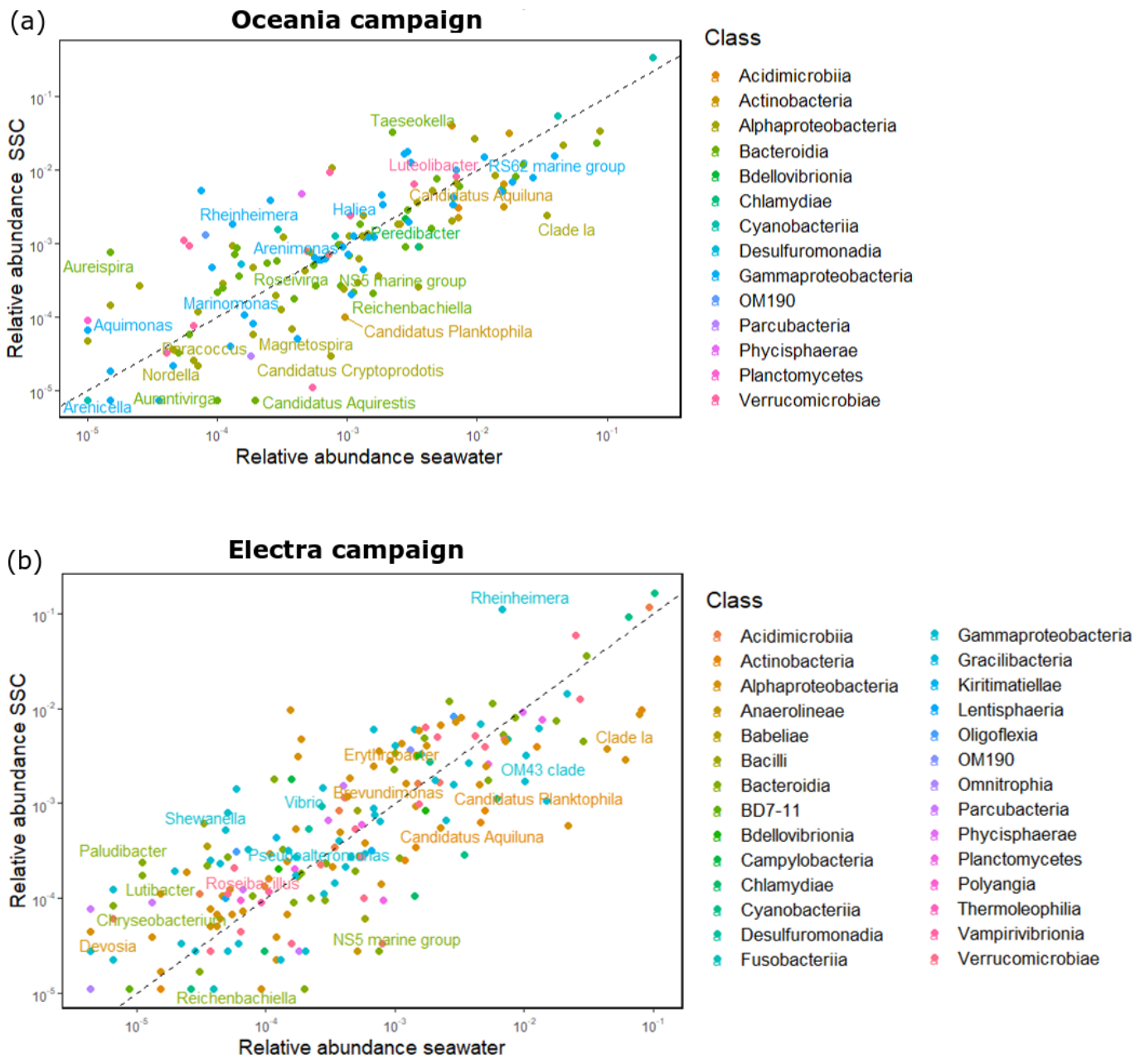


Figure S9: Enrichment of ASVs in the aerosol in the head space of the sea spray chamber compared to the bulk seawater during (a) the *Oceania* campaign and (b) the *Electra* campaign. Colors represent different bacteria classes. The dashed line indicates the 1:1 line. A number of selected genera names is shown in each panel.

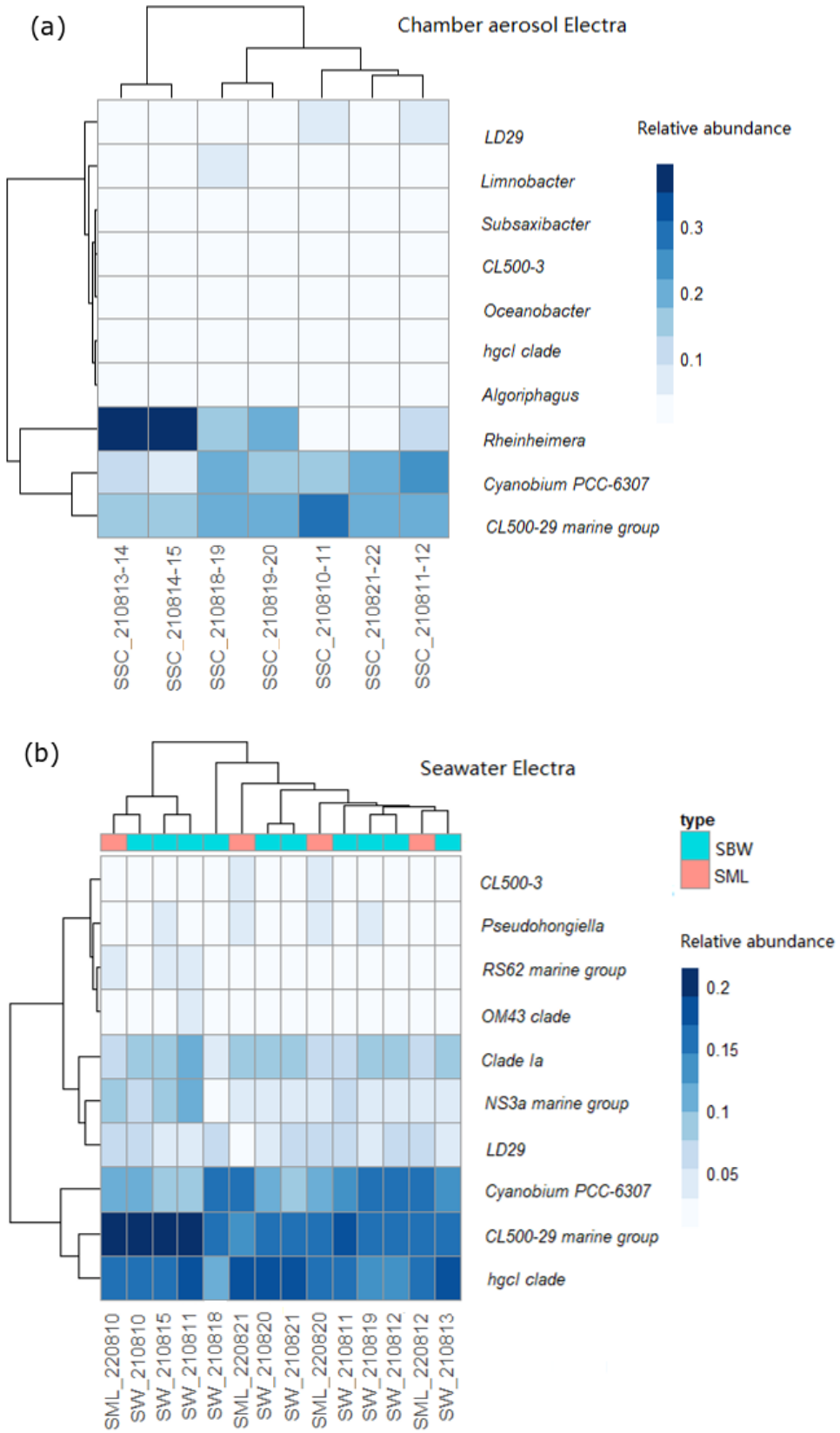


Figure S10: Relative abundance of the 10 most abundant taxa (on genus level) in (a) chamber aerosol samples (SSC), (b) bulk seawater (SW) and surface microlayer (SML) samples collected during the *Electra* campaign.

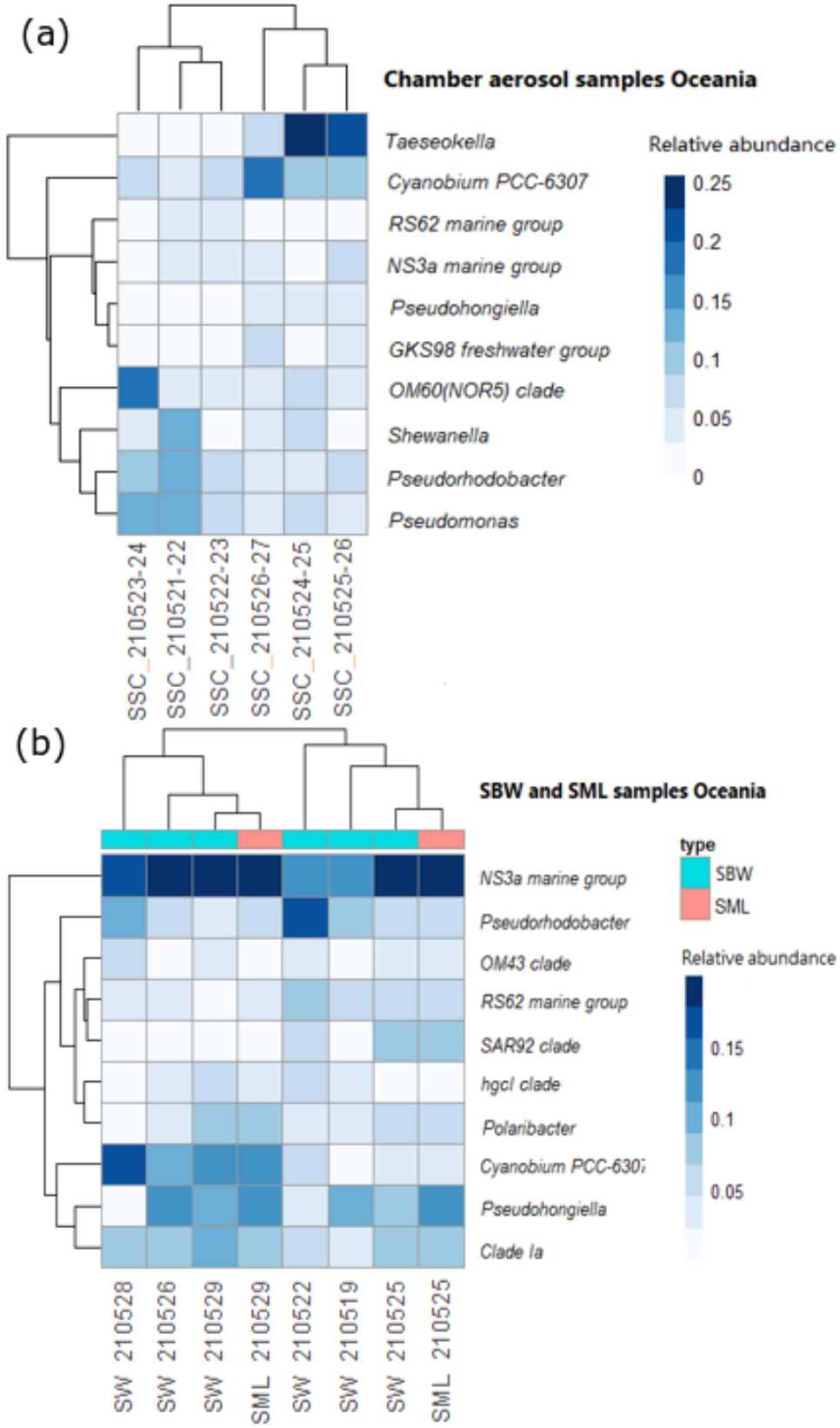


Figure S11: Relative abundance of the 10 most abundant taxa (on genus level) in (a) chamber aerosol samples (SSC) and (b) bulk and surface microlayer seawater samples collected during the *Oceania* campaign.

# References

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