Table S1. Sample information of sea cucumber and seawater

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sample | Sample ID | No. of total reads | No. of reads passed quality control | No. of reads passed quality control (removed eukaryotic reads) | No. of ASVs |
| Sea cucumber | FESC | 36,250 | 6,812 | 6,812 | 144 |
| GLSC | 103,776 | 20,589 | 20,589 | 219 |
| EASC | 93,745 | 18,742 | 18,742 | 157 |
| LASC | 28,437 | 8,446 | 8,446 | 120 |
| PTSC | 94,496 | 26,546 | 25,643 | 327 |
| JNSC | 90,369 | 26,898 | 26,481 | 254 |
| Seawater | FESW | 115,709 | 27,807 | 27,206 | 232 |
| GLSW | 27,217 | 7,167 | 7,078 | 84 |
| EASW | 92,787 | 18,144 | 18,144 | 139 |
| LASW | 119,368 | 29,894 | 25,390 | 277 |
| PTSW | 89,820 | 25,561 | 25,402 | 163 |
| JNSW | 82,779 | 31,786 | 31,720 | 69 |
| Total |  | 974,753 | 248,392 | 241,653 | 1,440 |

Table S2. Relative abundance of different bacterial taxa at order level

| Order | FE | GL | EA | LA | PT | JN | FESW | GLSW | EASW | LASW | PTSW | JNSW |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Rhodobacterales* | 4.9% | 7.0% | 9.8% | 26.0% | 37.0% | 22.8% | 1.4% | 3.6% | 7.3% | 24.1% | 11.5% | 4.0% |
| *Oceanospirillales* | 29.9% | 31.4% | 24.1% | 3.2% | 9.8% | 49.1% | 1.7% | 7.1% | 19.0% | 5.3% | 46.2% | 87.7% |
| *Flavobacteriales* | 3.6% | 2.1% | 1.5% | 25.5% | 14.2% | 3.4% | 1.2% | 0.3% | 1.9% | 8.5% | 7.5% | 2.7% |
| *Alteromonadales* | 33.3% | 32.5% | 46.2% | 14.8% | 10.6% | 6.3% | 1.3% | 20.3% | 50.1% | 21.3% | 4.3% | 0.1% |
| *Cellvibrionales* | 1.6% | 2.0% | 1.3% | 4.4% | 5.3% | 1.7% | 0.8% | 2.2% | 1.5% | 2.0% | 0.9% | 0.3% |
| *Rhizobiales* | 2.0% | 1.1% | 0.2% | 2.4% | 2.4% | 2.5% | 0.0% | 0.0% | 0.2% | 1.4% | 0.4% | 0.1% |
| *Bacteroidia* | 0.4% | 0.3% | 0.7% | 0.9% | 4.6% | 1.4% | 0.1% | 0.0% | 0.1% | 1.1% | 0.2% | 0.1% |
| *Gammaproteobacteria* | 0.3% | 0.6% | 0.8% | 1.8% | 1.8% | 2.9% | 0.6% | 0.3% | 0.2% | 2.4% | 0.8% | 1.2% |
| *Pseudomonadales* | 7.7% | 4.6% | 2.4% | 5.0% | 1.0% | 0.3% | 0.4% | 4.3% | 10.7% | 1.6% | 0.7% | 0.0% |
| *Vibrionales* | 7.2% | 13.6% | 12.1% | 4.7% | 1.0% | 0.3% | 0.5% | 5.0% | 3.7% | 4.9% | 0.2% | 0.0% |
| *Bacillales* | 0.6% | 0.0% | 0.0% | 2.8% | 1.1% | 0.4% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Bdellovibrionales* | 0.0% | 0.0% | 0.0% | 2.0% | 1.3% | 0.9% | 0.0% | 0.0% | 0.0% | 2.0% | 0.7% | 0.1% |
| *Bacteria* | 1.2% | 0.3% | 0.0% | 0.9% | 1.1% | 1.5% | 0.5% | 0.0% | 0.1% | 1.2% | 0.5% | 0.4% |
| *Chitinophagales* | 1.4% | 0.2% | 0.0% | 0.8% | 1.4% | 0.7% | 0.0% | 0.0% | 0.0% | 0.5% | 0.1% | 0.0% |
| *Caulobacterales* | 0.4% | 0.6% | 0.0% | 0.4% | 1.1% | 1.2% | 0.0% | 0.0% | 0.0% | 1.1% | 0.5% | 0.0% |
| *Gammaproteobacteria* | 0.0% | 0.0% | 0.0% | 0.4% | 0.3% | 0.1% | 0.0% | 0.0% | 0.0% | 0.2% | 0.0% | 0.0% |
| *Betaproteobacteriales* | 0.6% | 0.2% | 0.1% | 0.2% | 0.3% | 0.1% | 0.6% | 0.4% | 0.0% | 0.0% | 1.4% | 0.1% |
| *Sphingomonadales* | 0.9% | 0.9% | 0.0% | 0.1% | 0.2% | 0.2% | 0.0% | 0.0% | 0.1% | 0.0% | 0.0% | 0.0% |
| *Corynebacteriales* | 0.4% | 0.0% | 0.0% | 0.1% | 0.2% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Campylobacterales* | 0.0% | 0.0% | 0.7% | 0.1% | 0.2% | 0.0% | 0.0% | 0.0% | 2.1% | 0.0% | 0.1% | 0.1% |
| *Microtrichales* | 0.2% | 0.3% | 0.0% | 0.0% | 0.1% | 0.1% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Micavibrionales* | 0.2% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Synechococcales* | 1.1% | 0.5% | 0.0% | 0.0% | 0.0% | 0.0% | 1.9% | 1.9% | 1.6% | 0.0% | 0.0% | 0.0% |
| *Cytophagales* | 1.0% | 0.3% | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Rhodospirillales* | 0.2% | 0.1% | 0.1% | 0.0% | 0.0% | 0.0% | 1.5% | 2.7% | 0.0% | 0.1% | 0.0% | 0.0% |
| *Arenicellales* | 0.1% | 0.2% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Actinobacteria* | 0.3% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Oligoflexales* | 0.1% | 0.1% | 0.0% | 0.1% | 0.0% | 0.1% | 0.1% | 0.0% | 0.0% | 0.8% | 0.0% | 0.0% |
| *Myxococcales* | 0.1% | 0.1% | 0.0% | 0.0% | 0.3% | 0.5% | 0.0% | 0.0% | 0.0% | 0.1% | 0.1% | 0.0% |
| *Deltaproteobacteria* NB1-j | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Actinomarinales* | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.7% | 0.2% | 0.3% | 0.2% | 0.0% | 0.0% |
| *Francisellales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.2% |
| SAR11 clade | 0.0% | 0.3% | 0.0% | 0.0% | 0.0% | 0.0% | 78.2% | 48.0% | 1.0% | 14.0% | 20.5% | 2.5% |
| *Proteobacteria* | 0.0% | 0.1% | 0.0% | 0.0% | 0.9% | 1.1% | 0.5% | 0.0% | 0.0% | 2.6% | 1.0% | 0.4% |
| *Nitrosococcales* | 0.0% | 0.1% | 0.0% | 2.1% | 0.5% | 1.2% | 0.0% | 0.0% | 0.0% | 1.0% | 0.0% | 0.0% |
| *Coxiellales* | 0.0% | 0.0% | 0.0% | 0.2% | 0.1% | 0.1% | 0.0% | 0.0% | 0.0% | 0.2% | 0.1% | 0.0% |
| *Parvibaculales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.0% | 0.5% | 0.4% | 0.0% | 0.1% | 0.8% | 0.0% |
| *Puniceispirillales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 1.8% | 1.5% | 0.1% | 0.9% | 0.5% | 0.0% |
| KI89A clade | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.1% | 0.0% | 0.5% | 0.4% | 0.0% |
| *Alphaproteobacteria* | 0.0% | 0.0% | 0.0% | 0.0% | 1.3% | 0.3% | 0.2% | 0.1% | 0.0% | 0.2% | 0.3% | 0.0% |
| *Legionellales* | 0.0% | 0.0% | 0.0% | 0.1% | 0.2% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.0% |
| *Clostridiales* | 0.0% | 0.0% | 0.0% | 0.1% | 0.5% | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.1% | 0.0% |
| *Bacteroidales* | 0.0% | 0.0% | 0.0% | 0.6% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.6% | 0.0% | 0.0% |
| *Kordiimonadales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.2% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Thalassobaculales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.3% | 0.3% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Micrococcales* | 0.0% | 0.0% | 0.0% | 0.3% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.0% | 0.0% |
| *Mollicutes* | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Thiomicrospirales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.3% | 0.0% | 0.0% | 0.3% | 0.0% | 0.0% |
| *SAR86 clade* | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 2.2% | 0.3% | 0.0% | 0.3% | 0.0% | 0.0% |
| *Rickettsiales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.3% | 0.1% | 0.0% | 0.0% | 0.2% | 0.0% | 0.0% |
| OM182 clade | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.2% | 0.0% | 0.0% |
| *Marinimicrobia* | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.2% | 0.3% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Oxyphotobacteria* | 0.0% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.4% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Aeromonadales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Ectothiorhodospirales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.3% | 0.3% | 0.0% | 0.0% | 0.0% | 0.0% |
| SAR202 clade | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.3% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Marinimicrobia* SAR406 clade | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.2% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Sphingobacteriales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Balneolales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Rhodothermales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Nostocales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.2% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Dadabacteriales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Entotheonellales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Marinimicrobia* SAR406 clade | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.2% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Nitrospirales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Candidatus* Peregrinibacteria | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Candidatus* Peribacteria | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Phycisphaerales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.3% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Sneathiellales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Alphaproteobacteria* | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| SAR324 clade | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Steroidobacterales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.2% | 0.2% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Thiotrichales* | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.3% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Gammaproteobacteria* | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| *Xanthomonadales* | 0.0% | 0.5% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |

Table S3. Comparison of isolates with Meta16S

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ASV ID | Relative abundance | No. of strains | Affiliation based on GreenGenes (QIIME2) | Taxonomic assignment of isolates based on 16S rRNA gene using BLAST |
| FESC | GLSC | EASC | LASC | PTSC | JNSC | FESW | GLSW | EASW | LASW | PTSW | JNSW | Total |
| ASV0010 | 0.0082 | 0.0102 | 0.0192 | 0 | 0 | 0 | 0 | 0.0355 | 0.08 | 0.0024 | 0 | 0 | 0.0099 | 10 | *Alteromonas* | *Alteromonas mediterranea* |
| ASV0011 | 0 | 0.0109 | 0.018 | 0 | 0 | 0 | 0 | 0.0302 | 0.0718 | 0.0039 | 0.0019 | 0 | 0.0096 | 10 | *Alteromonas* | *Alteromonas mediterranea* |
| ASV0013 | 0.0038 | 0.0132 | 0.0459 | 0.011 | 0.0017 | 0.0035 | 0 | 0.0109 | 0.0223 | 0.0128 | 0 | 0 | 0.0091 | 10 | *Alteromonas* | *Alteromonas mediterranea* |
| ASV0015 | 0 | 0.0022 | 0.01 | 0.0281 | 0.014 | 0.0122 | 0 | 0.0079 | 0.0169 | 0.0195 | 0 | 0 | 0.0083 | 19 | *Marinobacter* | *Marinobacter algicola* |
| ASV0016 | 0 | 0.012 | 0.0371 | 0.0117 | 0.003 | 0.0019 | 0 | 0.0062 | 0.0223 | 0.0121 | 0.0031 | 0 | 0.0083 | 10 | *Alteromonas* | *Alteromonas mediterranea* |
| ASV0017 | 0 | 0.0035 | 0.0098 | 0.0225 | 0.0115 | 0.0106 | 0 | 0 | 0.0137 | 0.0175 | 0.0062 | 0 | 0.0079 | 19 | *Marinobacter* | *Marinobacter algicola* |
| ASV0019 | 0 | 0 | 0.0082 | 0.0084 | 0.039 | 0.013 | 0 | 0 | 0 | 0.0031 | 0.004 | 0 | 0.0072 | 13 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0021 | 0.016 | 0.0101 | 0.0355 | 0 | 0.0034 | 0 | 0 | 0.0062 | 0.0194 | 0.0101 | 0 | 0 | 0.0071 | 10 | *Alteromonas* | *Alteromonas mediterranea* |
| ASV0022 | 0 | 0 | 0.008 | 0.013 | 0.0334 | 0.0127 | 0 | 0 | 0 | 0.0042 | 0.0031 | 0.0017 | 0.007 | 13 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0023 | 0 | 0 | 0.0233 | 0.0175 | 0.0047 | 0.0024 | 0 | 0 | 0.0438 | 0 | 0 | 0 | 0.0065 | 1 | *Nitrincolaceae* | *Neptunomonas phycophila* |
| ASV0025 | 0 | 0.0097 | 0.0297 | 0.0127 | 0 | 0 | 0 | 0.0062 | 0.0197 | 0.0083 | 0 | 0 | 0.0063 | 10 | *Alteromonas* | *Alteromonas mediterranea* |
| ASV0026 | 0 | 0 | 0.0036 | 0.0133 | 0.029 | 0.0105 | 0 | 0 | 0.0057 | 0.0039 | 0.0047 | 0 | 0.0063 | 13 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0027 | 0 | 0.0059 | 0.0051 | 0.0168 | 0 | 0 | 0 | 0.0154 | 0.0469 | 0.0066 | 0.0013 | 0 | 0.0063 | 4 | *Pseudomonas* | *Pseudomonas pachastrellae* |
| ASV0029 | 0 | 0.0062 | 0.0038 | 0.0156 | 0.0036 | 0.0017 | 0 | 0.0082 | 0.0423 | 0.0074 | 0 | 0 | 0.0061 | 4 | *Pseudomonas* | *Pseudomonas pachastrellae* |
| ASV0030 | 0 | 0.0009 | 0.0065 | 0.0078 | 0.0303 | 0.0116 | 0 | 0 | 0.0017 | 0.0022 | 0.0028 | 0 | 0.006 | 13 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0032 | 0 | 0.0151 | 0.0128 | 0.0101 | 0.0034 | 0.0038 | 0 | 0.0124 | 0.0134 | 0.0063 | 0 | 0 | 0.0054 | 1 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0033 | 0.0054 | 0.0476 | 0.0034 | 0 | 0 | 0 | 0 | 0.0079 | 0.005 | 0 | 0 | 0 | 0.0052 | 6 | *Pseudoalteromonas* | *Pseudoalteromonas maricaloris* |
| ASV0035 | 0 | 0 | 0.0028 | 0.0109 | 0.0154 | 0.008 | 0 | 0 | 0.0064 | 0.0041 | 0.0083 | 0 | 0.0049 | 3 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0036 | 0 | 0.0083 | 0.0235 | 0 | 0 | 0 | 0 | 0.0081 | 0.0161 | 0.0068 | 0 | 0.001 | 0.0048 | 10 | *Alteromonas* | *Alteromonas mediterranea* |
| ASV0039 | 0.0073 | 0.0402 | 0.0039 | 0 | 0 | 0 | 0 | 0.0085 | 0.0023 | 0 | 0 | 0 | 0.0043 | 6 | *Pseudoalteromonas* | *Pseudoalteromonas maricaloris* |
| ASV0040 | 0 | 0.0016 | 0.018 | 0 | 0.0019 | 0 | 0 | 0 | 0.0333 | 0 | 0.0008 | 0 | 0.0043 | 1 | *Nitrincolaceae* | *Neptunomonas phycophila* |
| ASV0043 | 0.0233 | 0.0088 | 0.014 | 0 | 0 | 0 | 0 | 0.0146 | 0.0119 | 0.0037 | 0 | 0 | 0.0042 | 4 | *Vibrio* | *Vibrio* |
| ASV0046 | 0 | 0 | 0.0038 | 0.0108 | 0.0051 | 0.0066 | 0 | 0 | 0.0095 | 0.0086 | 0 | 0.0024 | 0.0039 | 1 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0052 | 0 | 0.0116 | 0.0081 | 0.0101 | 0.0041 | 0 | 0 | 0 | 0.0105 | 0.0045 | 0 | 0 | 0.0037 | 1 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0053 | 0 | 0 | 0.0046 | 0.0099 | 0.0154 | 0.0072 | 0 | 0 | 0 | 0.0026 | 0 | 0.0011 | 0.0035 | 3 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0057 | 0 | 0 | 0 | 0.0205 | 0.011 | 0.0093 | 0 | 0 | 0 | 0 | 0.0024 | 0 | 0.0031 | 7 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0062 | 0 | 0.0036 | 0.0057 | 0 | 0 | 0 | 0 | 0.0093 | 0.0203 | 0.003 | 0 | 0 | 0.0029 | 3 | *Alteromonas* | *Alteromonas mediterranea* |
| ASV0065 | 0.0094 | 0.0027 | 0.0039 | 0 | 0 | 0 | 0 | 0.0126 | 0.0198 | 0 | 0 | 0 | 0.0027 | 3 | *Alteromonas* | *Alteromonas mediterranea* |
| ASV0067 | 0 | 0 | 0 | 0.0246 | 0.0066 | 0.0042 | 0 | 0 | 0 | 0.003 | 0.0027 | 0 | 0.0026 | 6 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0069 | 0 | 0 | 0 | 0 | 0.0093 | 0.008 | 0 | 0 | 0 | 0.0058 | 0 | 0.001 | 0.0026 | 7 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0071 | 0 | 0 | 0 | 0 | 0.0035 | 0.0038 | 0 | 0 | 0.0048 | 0.0024 | 0.0067 | 0.0028 | 0.0025 | 1 | *Neptuniibacter* | *Neptuniibacter caesariensis* |
| ASV0072 | 0 | 0.0098 | 0.0121 | 0 | 0.0021 | 0 | 0 | 0 | 0 | 0.0045 | 0 | 0 | 0.0025 | 4 | *Vibrio* | *Vibrio* |
| ASV0074 | 0 | 0.0091 | 0.0163 | 0.0104 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0024 | 4 | *Vibrio* | *Vibrio* |
| ASV0087 | 0 | 0.0038 | 0.0028 | 0 | 0.0043 | 0.0019 | 0 | 0 | 0.004 | 0.0036 | 0.0019 | 0 | 0.0021 | 15 | *Marinobacter* | *Marinobacter algicola* |
| ASV0088 | 0 | 0 | 0.0017 | 0.0109 | 0.0043 | 0.0031 | 0 | 0 | 0 | 0.0036 | 0.0034 | 0 | 0.002 | 1 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0093 | 0 | 0 | 0.0042 | 0.0064 | 0.0047 | 0.0024 | 0 | 0 | 0.0031 | 0.0037 | 0 | 0 | 0.0019 | 15 | *Marinobacter* | *Marinobacter algicola* |
| ASV0099 | 0.0076 | 0.0053 | 0.0034 | 0 | 0 | 0.0009 | 0 | 0.011 | 0.0016 | 0 | 0 | 0 | 0.0017 | 4 | *Pseudomonas* | *Pseudomonas pachastrellae* |
| ASV0103 | 0 | 0 | 0 | 0.0157 | 0.0066 | 0.0038 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0017 | 1 | *Exiguobacterium* | *Exiguobacterium* |
| ASV0109 | 0 | 0 | 0.0017 | 0.0095 | 0.0028 | 0.0022 | 0 | 0 | 0.0024 | 0.0038 | 0 | 0 | 0.0016 | 15 | *Marinobacter* | *Marinobacter algicola* |
| ASV0114 | 0 | 0.0057 | 0.0026 | 0 | 0 | 0 | 0 | 0.0211 | 0 | 0 | 0 | 0 | 0.0015 | 1 | *Vibrio* | *Vibrio* |
| ASV0116 | 0.01 | 0.0033 | 0.0043 | 0.0044 | 0 | 0 | 0 | 0 | 0.0061 | 0 | 0 | 0 | 0.0015 | 4 | *Pseudomonas* | *Pseudomonas pachastrellae* |
| ASV0121 | 0 | 0.0072 | 0.0057 | 0 | 0 | 0 | 0 | 0 | 0.0047 | 0 | 0 | 0 | 0.0014 | 6 | *Vibrio* | *Vibrio* |
| ASV0122 | 0 | 0.0048 | 0.0051 | 0 | 0.003 | 0 | 0 | 0 | 0 | 0.0026 | 0 | 0 | 0.0014 | 1 | *Marinobacter* | *Marinobacter algicola* |
| ASV0127 | 0 | 0 | 0 | 0.0089 | 0.0034 | 0.0041 | 0 | 0 | 0 | 0.0023 | 0 | 0 | 0.0014 | 1 | *Marinobacter* | *Marinobacter algicola* |
| ASV0132 | 0.006 | 0.0035 | 0.005 | 0 | 0 | 0 | 0 | 0.0073 | 0 | 0 | 0 | 0 | 0.0013 | 12 | *Alteromonadales* | *Pseudoalteromonas arabiensis* |
| ASV0134 | 0 | 0 | 0 | 0.0059 | 0.0062 | 0.0038 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0013 | 5 | *Muricauda* | *Muricauda* |
| ASV0135 | 0 | 0 | 0 | 0 | 0.0034 | 0.0032 | 0 | 0 | 0.0037 | 0.0028 | 0 | 0 | 0.0013 | 1 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0139 | 0.0113 | 0.0045 | 0.007 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0012 | 1 | *Pseudoalteromonas* | *Pseudoalteromonas shioyasakiensis* |
| ASV0154 | 0 | 0.003 | 0.002 | 0 | 0.0034 | 0.0028 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0011 | 5 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0159 | 0 | 0 | 0 | 0.0089 | 0.001 | 0.0012 | 0 | 0 | 0 | 0.0029 | 0.0016 | 0 | 0.001 | 1 | *Marinobacter* | *Marinobacter algicola* |
| ASV0160 | 0 | 0 | 0.0035 | 0 | 0.005 | 0 | 0 | 0 | 0 | 0.0019 | 0 | 0 | 0.001 | 1 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0167 | 0 | 0 | 0 | 0 | 0.0028 | 0.0026 | 0 | 0 | 0 | 0.0032 | 0 | 0 | 0.0009 | 1 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0171 | 0 | 0 | 0.0041 | 0 | 0.0041 | 0 | 0 | 0 | 0 | 0.0015 | 0 | 0 | 0.0009 | 1 | *Nitrincolaceae Amphritea* | *Amphritea ceti* |
| ASV0172 | 0 | 0.0023 | 0 | 0.006 | 0 | 0.0043 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0009 | 1 | *Rhodobacteraceae* | *Ruegeria* |
| ASV0176 | 0 | 0 | 0 | 0 | 0.0049 | 0.0016 | 0 | 0 | 0 | 0 | 0.0013 | 0 | 0.0008 | 1 | *Marinobacter* | *Marinobacter hydrocarbonoclasticus* |
| ASV0178 | 0 | 0 | 0 | 0 | 0.0012 | 0 | 0 | 0 | 0.0093 | 0 | 0 | 0 | 0.0008 | 1 | *Pseudomonas* | *Pseudomonas pachastrellae* |
| ASV0189 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0041 | 0 | 0 | 0.0007 | 3 | *uncultured Puniceispirillum* | *Amphritea phycophila* |
| ASV0194 | 0 | 0 | 0 | 0 | 0.0021 | 0 | 0 | 0 | 0.0026 | 0.003 | 0 | 0 | 0.0007 | 1 | *Marinobacter* | *Marinobacter algicola* |
| ASV0195 | 0 | 0 | 0 | 0 | 0.0049 | 0 | 0 | 0 | 0 | 0.0015 | 0 | 0.0004 | 0.0007 | 5 | *Muricauda* | *Muricauda* |
| ASV0207 | 0 | 0 | 0 | 0 | 0.0034 | 0 | 0 | 0 | 0 | 0.003 | 0 | 0 | 0.0007 | 3 | *Marinobacter* | *Marinobacter salsuginis* |
| ASV0218 | 0 | 0.0076 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0006 | 1 | *Vibrio* | *Vibrio* |
| ASV0238 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0045 | 0.0012 | 0 | 0.0006 | 1 | *Oleiphilus* | *Psychromonas kaikoae* |
| ASV0252 | 0.0197 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0006 | 3 | *Pseudoalteromonas* | *Pseudoalteromonas maricaloris* |
| ASV0265 | 0.0183 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0005 | 19 | *Marinobacter* | *Marinobacter algicola* |
| ASV0286 | 0.0166 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0005 | 4 | *Pseudomonas* | *Pseudomonas pachastrellae* |
| ASV0287 | 0.0166 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0005 | 4 | *Pseudomonas* | *Pseudomonas pachastrellae* |
| ASV0296 | 0 | 0.0053 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0005 | 3 | *Pseudoalteromonas* | *Pseudoalteromonas maricaloris* |
| ASV0320 | 0 | 0 | 0 | 0 | 0.0041 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0004 | 5 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0321 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0041 | 0 | 0 | 0.0004 | 1 | *Marinobacter* | *Marinobacter algicola* |
| ASV0323 | 0 | 0 | 0 | 0 | 0.004 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0004 | 1 | *Colwelliaceae* | *Psychromonas kaikoae* |
| ASV0328 | 0.0148 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0004 | 10 | *Alteromonas* | *Alteromonas mediterranea* |
| ASV0334 | 0.0145 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0004 | 9 | *Pseudoalteromonas* | *Pseudoalteromonas maricaloris* |
| ASV0337 | 0.0144 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0004 | 10 | *Alteromonas* | *Alteromonas mediterranea* |
| ASV0351 | 0.0139 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0004 | 12 | *Alteromonadales* | *Pseudoalteromonas arabiensis* |
| ASV0354 | 0 | 0 | 0 | 0 | 0.0037 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0004 | 1 | *Arenibacter* | *Arenibacter* |
| ASV0360 | 0 | 0 | 0.0049 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0004 | 10 | *Alteromonas* | *Alteromonas mediterranea* |
| ASV0376 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0035 | 0 | 0 | 0.0004 | 1 | *Marinobacter* | *Marinobacter algicola* |
| ASV0384 | 0 | 0 | 0 | 0 | 0.0034 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0004 | 2 | *Labrenzia* | *Labrenzia* |
| ASV0402 | 0 | 0 | 0 | 0.002 | 0.0026 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0003 | 1 | *Oleiphilus* | *Psychromonas kaikoae* |
| ASV0405 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0033 | 0 | 0 | 0.0003 | 1 | *Oleiphilus* | *Psychromonas kaikoae* |
| ASV0406 | 0.012 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0003 | 4 | *Idiomarina* | *Idiomarina* |
| ASV0413 | 0 | 0 | 0.0043 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0003 | 11 | *Alteromonas* | *Alteromonas mediterranea* |
| ASV0425 | 0 | 0 | 0 | 0 | 0 | 0.0029 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0003 | 4 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0436 | 0 | 0 | 0 | 0 | 0.003 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0003 | 1 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0441 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.003 | 0 | 0 | 0.0003 | 1 | *Vibrio* | *Vibrio* |
| ASV0458 | 0 | 0.0035 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0003 | 1 | *Alteromonas* | *Alteromonas mediterranea* |
| ASV0475 | 0 | 0 | 0 | 0 | 0.0027 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0003 | 1 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0503 | 0.0095 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0003 | 1 | *Vibrio* | *Vibrio* |
| ASV0514 | 0 | 0 | 0 | 0 | 0 | 0.0024 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0003 | 1 | *Rhodobacteraceae* | *Rhodobacteraceae* |
| ASV0544 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0023 | 0 | 0 | 0.0002 | 1 | *uncultured Rickettsiaceae* | *Alteromonas mediterranea* |
| ASV0575 | 0.0078 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0002 | 15 | *Marinobacter* | *Marinobacter algicola* |
| ASV0578 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0029 | 0 | 0 | 0 | 0.0002 | 1 | *Vibrio* | *Vibrio* |
| ASV0663 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0002 | 1 | *uncultured Terasakiellaceae* | *Paraglaciecola agarilytica* |
| ASV0673 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0002 | 3 | *uncultured Puniceispirillum* | *Amphritea phycophila* |
| ASV0691 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0002 | 3 | *uncultured Puniceispirillum* | *Amphritea phycophila* |
| ASV0695 | 0 | 0 | 0 | 0 | 0.0015 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0002 | 1 | *Cellvibrionaceae* | *Spongiispira norvegica* |
| ASV0707 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0052 | 0 | 0 | 0 | 0 | 0.0002 | 3 | *uncultured Puniceispirillum* | *Amphritea phycophila* |
| ASV0736 | 0.0051 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0001 | 1 | *Marinobacter* | *Marinobacter algicola* |
| ASV0739 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0014 | 0 | 0 | 0.0001 | 3 | *uncultured Puniceispirillum* | *Amphritea phycophila* |
| ASV0740 | 0 | 0.0017 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0001 | 3 | *Litorimonas* | *Pseudoalteromonas shioyasakiensis* |
| ASV0755 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0013 | 0 | 0.0001 | 1 | *Puniceispirillales* | *Neptunomonas phycophila* |
| ASV0760 | 0 | 0.001 | 0.0006 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0001 | 4 | *Idiomarina* | *Idiomarina* |
| ASV0786 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0012 | 0 | 0 | 0.0001 | 1 | *Rhodobacteraceae* | *Rhodococcus cerastii* |
| ASV0788 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0017 | 0 | 0 | 0 | 0.0001 | 1 | *Marinobacter* | *Marinobacter hydrocarbonoclasticus* |
| ASV0848 | 0 | 0 | 0 | 0 | 0 | 0.0007 | 0 | 0 | 0 | 0 | 0.0003 | 0 | 0.0001 | 1 | *Nitrincolaceae Amphritea* | *Amphritea ceti* |
| ASV0862 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.001 | 0 | 0.0001 | 3 | *uncultured Puniceispirillum* | *Amphritea phycophila* |
| ASV0863 | 0 | 0 | 0 | 0 | 0.0006 | 0 | 0 | 0 | 0 | 0 | 0.0004 | 0 | 0.0001 | 1 | *Rhodobacteraceae* | *Rhodococcus cerastii* |
| ASV0867 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.001 | 0 | 0 | 0.0001 | 3 | *Marinobacter* | *Marinobacter algicola* |
| ASV0873 | 0 | 0 | 0.0013 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0001 | 1 | *Pseudomonas* | *Pseudomonas pachastrellae* |
| ASV0888 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0001 | 3 | *uncultured Puniceispirillum* | *Amphritea phycophila* |
| ASV0929 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0012 | 0 | 0 | 0 | 0.0001 | 1 | *Nitrincolaceae Amphritea* | *Amphritea ceti* |
| ASV0977 | 0.0028 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0001 | 1 | *Ruegeria* | *Ruegeria* |
| ASV0992 | 0 | 0 | 0 | 0.0022 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0001 | 1 | *Arenibacter* | *Arenibacter* |
| ASV1004 | 0.0026 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0001 | 3 | *Litorimonas* | *Pseudoalteromonas shioyasakiensis* |
| ASV1025 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0001 | 1 | *Puniceispirillales* | *Neptunomonas phycophila* |
| ASV1063 | 0 | 0 | 0 | 0.0019 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0001 | 2 | *Labrenzia* | *Labrenzia* |
| ASV1067 | 0 | 0 | 0.0008 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0001 | 2 | *Labrenzia* | *Labrenzia* |
| ASV1072 | 0 | 0 | 0 | 0 | 0 | 0.0006 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0001 | 1 | *Rhodobacteraceae* | *Rhodococcus cerastii* |
| ASV1090 | 0 | 0 | 0 | 0.0018 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0001 | 1 | *Rhodobacteraceae* | *Rhodococcus cerastii* |
| ASV1102 | 0.0021 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0001 | 2 | *Labrenzia* | *Labrenzia* |
| ASV1119 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0008 | 0 | 0 | 0 | 0.0001 | 3 | *uncultured Puniceispirillum* | *Amphritea phycophila* |
| ASV1174 | 0 | 0 | 0 | 0 | 0.0005 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | *Kordiimonas* | *Kangiella geojedonens* |
| ASV1247 | 0.0013 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | *Gammaproteobacteria* | *Neptunicella marina* |
| ASV1407 | 0 | 0.0002 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | *unassigned bacteria* | *Kangiella geojedonens* |
| SUM | 0.2803 | 0.3059 | 0.4616 | 0.3702 | 0.349 | 0.1755 | 0 | 0.2447 | 0.6039 | 0.2371 | 0.0604 | 0.0104 |   |   |   |   |

Table S4. Total and viable bacterial counts

|  |  |  |
| --- | --- | --- |
| Sample | Total bacterial counts(cells/g) | Viable bacterial counts (CFU/g) |
| FESC | 4.9 x 10⁸ | 1.6 x 104 |
| GLSC | 6.4 x 10⁷ | 3.0 x 103 |
| EASC | 9.9 x 10⁶ | 1.6 x 104 |
| LASC | 8.3 x 10⁶ | 8.1 x 104 |
| PTSC | 1.1 x 10⁸ | 3.1 x 104 |
| JNSC | 4.5 x 10⁷ | 9.0 x 103 |
| FESW (KSW) | 2.6 x 10⁴ | 2.4 x 102 |
| GLSW | 3.9 x 10⁴ | NT |
| EASW | 6.9 x 10⁴ | NT |
| LASW | 4.6 x 10⁴ | NT |
| PTSW | 2.2 x 10⁵ | NT |
| JNSW | 1.7 x 10⁵ | NT |

 NT: Not tested.