Table S2. Microbial taxa detected in the Organic Lake water column profile.

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| --- | --- | --- | --- | --- |
| Phylum (%domain) | Class (%phylum) | Genera (%class) | Physiological features and notes | References |
| Bacteroidetes (18.0) | Flavobacteria (89.0) | *Psychroflexus* (74.1)  unclassified Flavobacteriales (19.2)  *Brumimicrobium* (5.6)  *Owenweeksia* (0.7)  *Stenothermobacter* (0.2)  *Persicivirga* (0.1) | Psy: Obligately aerobic heterotrophs capable of degrading high molecular weight carbon sources, likely capable of proteorhodopsin mediated photoheterotrophy. |  |
| Sphingobacteria (4.5) | *Lewinella* (51.7)  E6aC02 (42.0)  Ns11-12\_marine\_gp (3.3)  WCHB1-69 (3.0) | Lew: Obligately aerobic heterotrophs capable of degrading high molecular weight carbon sources, putative xanthorhodopsin mediated photoheterotrophy  E6aC02 is an uncultured clade associated with marine and hypersaline environments, particularly mats and anaerobic sediments. Organic Lake 16s distribution suggests anaerobic metabolism  Ns11-12\_marine\_gp: 200+ sequences, marine origin  WCHB1-69: Large group 600+ seqs | E6aC02: Sørensen *et al*., 2005 |
| Cytophagia (4.3) | Ml602j-37 (77.0)  unclassified Cytophagales (9.1)  *Cyclobacterium* (8.5)  *Marivirga* (5.4) | Ml602j-37 (Order incertae sedis III): >100 environmental clones including marine |  |
| VC2.1\_bac22 (0.8) | VC2.1\_bac22 (100) | 417 environmental clones |  |
| SB-1 (0.7) | SB-1 (100) | 219 environmental clones |  |
| Proteobacteria (54.2) | Gammaproteobacteria (68.8) | *Marinobacter* (64.0)  unclassified Gammaproteobacteria (9.9)  unclassified Alteromonadales (9.5)  *Saccharospirillim* (7.0)  *Halomonas* (4.4)  *Psychromonas* (2.3)  *Glaciecola* (0.8)  unclassified *Oceanospirillales* (0.7)  *Pseudomonas* (0.3)  *Thiomicrospira* (0.3)  *Thermomonas* (0.2)  unclassified Enterobacteriales (0.1)  Bps-ck174 (0.1)  *Modicisalibacter* (0.1)  *Leucothrix* (0.1)  *Thiorhodovibrio* (0.1)  *Pseudospirillum* (0.1) | Facultative anaerobic heterotroph capable of nitrate or DMSO respiration preferring labile substrates and hydrocarbons, chemolithoautotrophic growth supported by oxidation of iron and manganese, some species capable of symbiotic relationship with dinoflagellates such as *Gymnodinium*, putative DMSP lysis capability, putative rhodopsin mediated photoheterotrophy |  |
| Alphaproteobacteria (28.5) | *Roseovarius* (76.1)  unclassified Rhodobacterales (13.4)  *Loktanella* (5.7)  *Albimonas* (1.5)  TK34 (0.5)  *Phaeobacter* (0.5)  unclassified Alphaproteobacteria (0.3)  *Sphingomonas* (0.2)  *Octadecabacter* (0.2)  Db1-14 (0.2)  *Oceanicaulis* (0.2)  *Sulfitobacter* (0.2)  unclassified Rhodospirillales (0.2)  *Roseibaca* (0.2) | Heterotrophic aerobes, capable of aerobic anoxygenic phototrophy, CO oxidation supporting lithoheterotrophy, DMSP lysis, some species symbionts of microalgae, putative rhodopsin mediated photoheterotrophy | (Labrenz 1999) |
| Epsilonproteobacteria (1.5) | *Sulfurimonas* (75.5)  *Sulfurospirillum* (8.1)  *Arcobacter* (7.0)  Br36 (6.4) | Sulfur-oxidizing chemolithoautotrophic or mixotrophic, may also oxidize hydrogen, reduced sulfur compounds or organic acids.  *Arcobacter* is diazatrophic NB. RTCA C-fix. |  |
| Deltaproteobacteria (1.1) | *Desulfotignum* (38.4)  *Desulfopila* (19.7)  unclassified Bdellovibrionales (12.6)  *Peredibacter* (8.5)  *Bacteriovorax* (8.5)  *Desulfosalsimonas* (4.4)  *Desulfobacterium* (3.9)  *Desulfuromonas* (3.9) |  |  |
| Cyanobacteria (12.8) | Chloroplast | *Dunaliella* chloroplast  diatom chloroplast  unclassified chloroplast  unclassified *Cyanobacteria* |  |  |
| Actinobacteria (1.4) | Actinobacteria | unclassified Micrococcales  “*Candidatus* Aquiluna”  *Demequina* |  |  |
| Firmicutes (0.8) | Clostridia | *Halanaerobium*  unclassified *Clostridiales*  unclassified *Halanaerobiales*  *Fusibacter*  *Fastidiosipila* |  |  |
| Bacilli | unclassified Bacillales  *Paraliobacillus* |  |  |
| Lentisphaerae (0.1) | Lentisphaeria | Wchb1-41  unclassified Victivallales  R76-b128 |  |  |
| Spirochaetes (0.2) | Spirochaetes | *Spirochaeta*  unclassified spirochaetales |  |  |
| Verrucomicrobia (0.8) | Verrucomicrobiae | unclassified Verrucomicrobiales  Rubritalea |  |  |
| Opitutae | unclassified Puniceicoccales  marine Puniceicoccales |  |  |
| Chlamydiae (0.03) | Chlamydiae | unclassified chlamydiales |  |  |
| candidate divisions | RF3 (5.3) | FJ231138 Laguna Lejía (57.7)  FM210971 Lake Shangmatala (22.5)  AF142888 Ekho Lake (14.8)  DQ909718 Hydrothermal vent (2.7)  HM973420 oil reservoir (1.1)  AB546068 oil well head (0.5)  GU196243 anaerobic digester (0.5) | Originally cloned from bovine rumen fluid sample |  |
|  | OD1 (3.0) | DQ521564 Lake Vida (36)  JN454910 hypersaline mat (5.7)  EU050865 Artic Sediment (4.6)  JF743552 Marine sediments (3.4)  GU197432 Endosymbionts (3.4)  JN408878 soil rhizosphere (2.3)  JN440560 hypersaline mat (2.3)  AY862782 Lake Tebenquiche (2.3)  AF419697 hydrothermal sediment (2.3)  HM481393 contaminated water (2.3)  JN441150 hypersaline mat (2.3)  JN447858 hypersaline mat (2.3) | Obsidian pool derived |  |
| TM7 (0.2) |  |  |  |
| SR1 (0.07) |  |  |  |
| Bd1-5 (0.07) |  |  |  |
| Bhi80-139 (0.06) |  |  |  |
| Euryarchaeota (100) | Halobacteria (100) | Deep\_sea\_hydrothermal\_vent\_gp\_6(dhveg-6)(100) | Obligate aerobic heterotrophs. |  |
| Viridiplantae | *Chlorophyta* | *Dunaliella*  unclassified *Chlorophyceae*  unclassified *Chlorophyta* | Photosynthetic |  |
| Stramenopiles | Bacillariophyta | *Cylindrotheca*  *Chaetoceros* | Photosynthetic |  |
|  | Dictyochophyceae | unclassified *Dictyochophyceae*  unclassified *Pedinellales* | Photosynthetic, possibly mixotrophic by phagotrophy |  |
|  | unclassfied Stramenopiles | unclassified Stramenopiles |  |  |
| Metazoa | Arthropoda | Hexpoda |  |  |
| Fungi | Neocallimastigomycota | *Neocallimastix*  unclassified *Neocallimatigomycetes* | Heterotrophic |  |
|  | Dikarya | unclassified *Ascomycota*  *Aspergillus*  *Aureobasidium*  *Cordyceps*  *Penicillum*  *Verticillum*  *Cryptococcus*  unclassified *Basidiomycota* | Heterotrophic |  |
| Alveolata | Dinophyceae | unclassified *Dinophyceae*  *Karlodinium*  unclassified *Gymnodiniales* | Photosynthetic, possibly mixotrophic by phagotrophy |  |
|  | Ciliophora | *Euplotes*  *Tunicothrix* | Heterotrophic phagotrophs |  |
| Choanoflagellida | Codonosigidae | *Proterospongia*  unclassified *Choanoflagellida* | Heterotrophic phagotrophs |  |