**Table S3** Sequences used in this study as BLAST queries for retrieving homologs in the Organic Lake metagenomes.

|  |  |  |  |
| --- | --- | --- | --- |
| Gene (% ID) | Organism | Accession | Reference |
| *dddD* (60) | *Marinomonas* sp.MWYL1 | ABR72937.1 | Todd *et al*., 2007 |
| *Pseudomonas* sp. J465 | ACY01992.1 | Curson *et al*., 2010 |
| *Psychrobacter* sp. J466 | ACY02894.1 | Curson *et al*., 2010 |
| *Halomonas* sp. HTNK1 | ACV84065.1 | Todd *et al*., 2010 |
| *dddL* (45) | *Sulfitobacter* sp. EE36 | ADK55772.1 | Curson *et al*., 2008 |
| *Rhodobacter sphaeroides* 2.4.1 | ABA77574.1 | Curson *et al*., 2008 |
| *dddP* (55) | *Roseovarius nubinhibens* ISM | EAP77700.1 | Todd *et al*., 2009 |
| *dddQ* | *Ruegeria pomeroyi* DSS-3 | AAV94883.1 | Todd *et al*., 2011 |
| *Roseovarius nubinhibens* ISM | EAP76001.1  EAP76002.1 | Todd *et al*., 2011 |
| marine metagenome | GOS\_7860946  GOS\_2632696  GOS\_2469775 | Todd *et al*., 2011 |
| *dddW* | *Ruegeria pomeroyi* DSS-3 | AAV93771.1 | Todd *et al*., 2012 |
| *dddY* | *Alcaligenes faecalis* | ADT64689.1 | Curson *et al*., 2011 |
| *dmdA* (50) | *Ruegeria pomeroyi* DSS-3  *Pelagibacter ubique* HTCC1062 | AAV95190.1  YP\_265671.1 | Howard *et al*., 2006 |
| rhodopsin | *Dokdonia donghaensis* MED134 | EAQ40507.1 | Gómez-Consarnau *et al*., 2007 |
| *Vibrio* sp. AND4 | ZP\_02194911.1 | Gómez-Consarnau *et al*., 2010 |
| *Salinibacter ruber* DSM 13855 | YP\_445623.1 | Balashov *et al*., 2005 |
| *pufL* (45) | *Roseovarius tolerans* | ABK88229.1 | Labrenz *et al*., 1999 |
| *Congregibacter litoralis* KT71 | ZP\_01104363.1 | Fuchs *et al*., 2006 |
| *pufM* (45) | *Roseovarius tolerans* | ABK88230.1 | Labrenz *et al*., 1999 |
| *Congregibacter litoralis* KT71 | ZP\_01104362.1 | Fuchs *et al*., 2006 |
| *soxB* (45) | *Sulfurimonas denitrificans* DSM 1251 | YP\_392780.1 | Sievert *et al*., 2008 |
| *Thiomicrospira crunogena* XCL-2 | ABB42141.1 | Scott *et al*., 2006 |
| *soxA* (45) | *Sulfurimonas denitrificans* DSM 1251 | YP\_392779.1 | Sievert *et al*., 2008 |
| *Thiomicrospira crunogena* XCL-2 | YP\_390871.1 | Scott *et al*., 2006 |
| *soxC* (45) | *Sulfurimonas denitrificans* DSM 1251 | YP\_394569.1 | Sievert *et al*., 2008 |
| *Thiomicrospira crunogena* XCL-2 | YP\_390426.1 | Scott *et al*., 2006 |
| *soxD* (45) | *Sulfurimonas denitrificans* DSM 1251 | YP\_394568.1 | Sievert *et al*., 2008 |
| *Thiomicrospira crunogena* XCL-2 | YP\_390427.1 | Scott *et al*., 2006 |
| *sqr* (60) | *Sulfurimonas denitrificans* DSM 1251 | ABB43898.1 | Sievert *et al*., 2008 |
| *recA* | *Escherichia coli* K12 | P0A7G6.2 | Howard *et al*., 2008 |

(%ID) is the minimum amino acid sequence identity for matches to be considered a homolog.