

YeeE-like bacterial SoxT proteins mediate sulfur import for oxidation and signal transduction

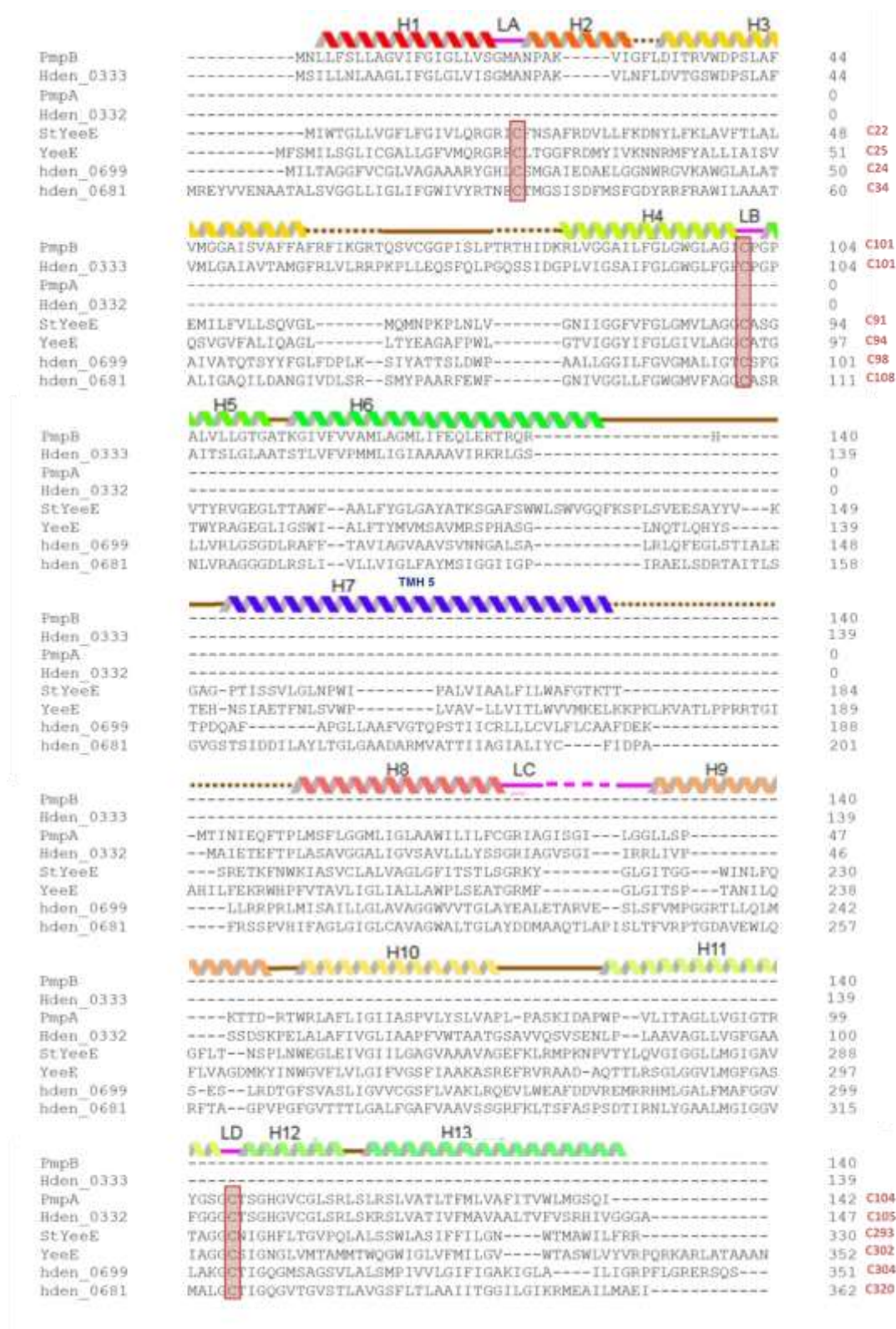
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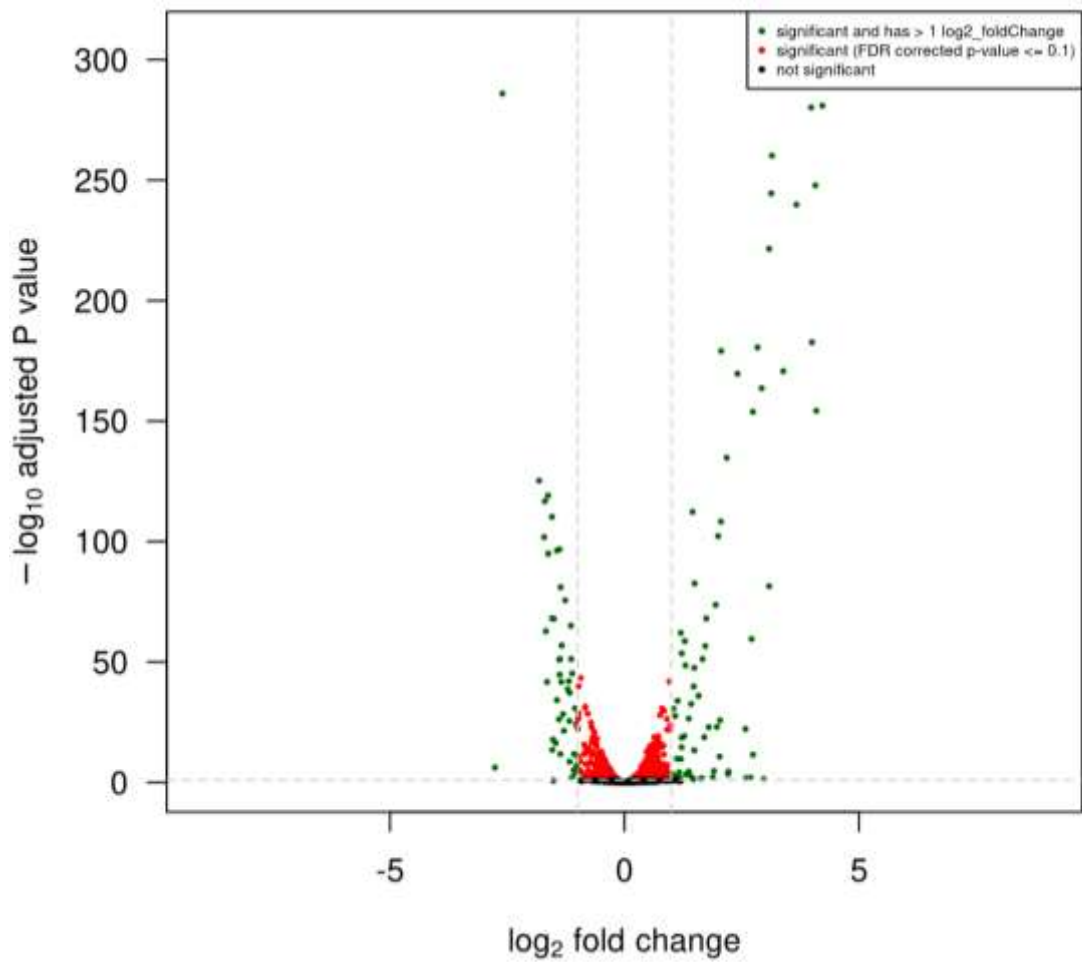
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Supplementary Figures and Tables:

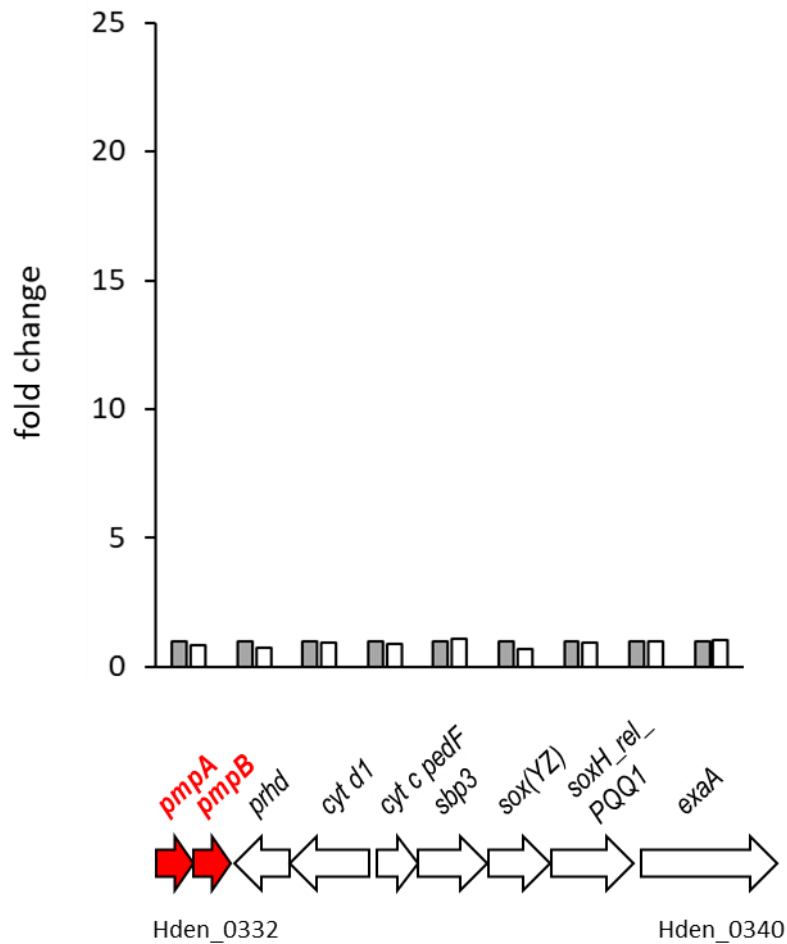
- Supplementary Fig. 1:** Alignment of YeeE/YedE family proteins.
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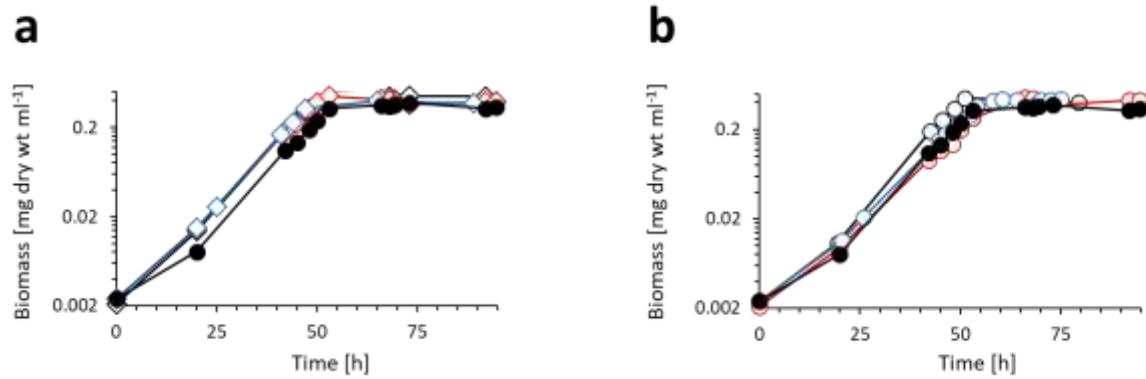
Supplementary Fig. 1. Alignment of YeeE/YedE family proteins. Amino acid sequences of PmpA and PmpB from *Serratia* sp. (Ser39006_020715 and Ser39006_02071520) and *Hyphomicrobium denitrificans* (Hden_0332 and Hden_0333), SoxT1A (Hden_0681) and SoxT1B (Hden_0699) from *H. denitrificans*, YeeE (TsuA, b2013) from *E. coli* K12 and StYeeE (Spith_0734) from *Spirochaeta thermophila* DSM 6578 were aligned with Clustal Omega (EMBL-EBI). Conserved cysteines are marked in red. The secondary structure of StYeeE with loops LA to LD and α -helices H1 to H13 was taken from Tanaka *et al.*, 2020¹. Helices 1, 3, 4, 6, 7, 8, 10, 11 and 13 are membrane-spanning.



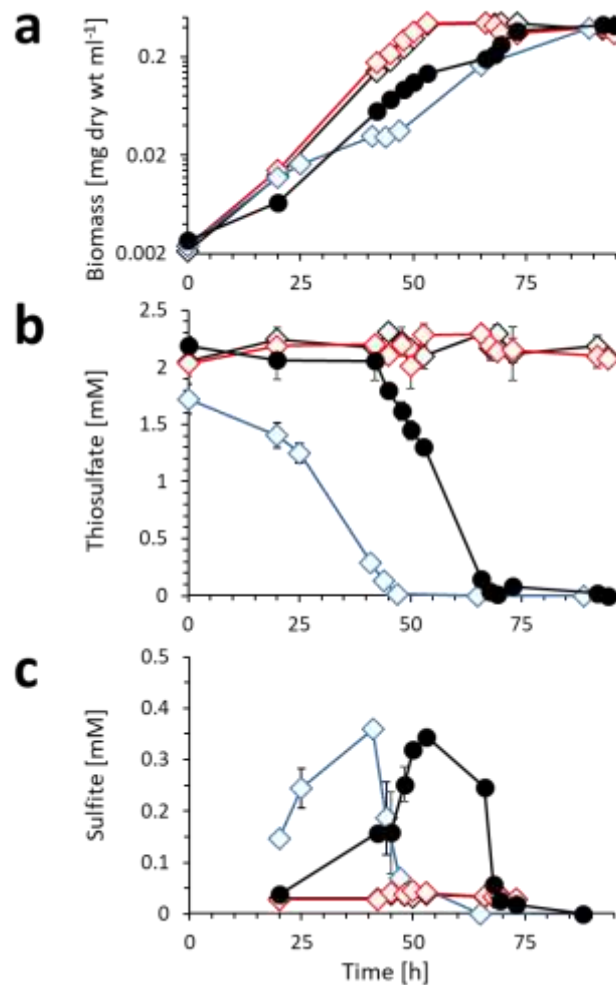
Supplementary Fig. 2. Volcano plot of differentially expressed genes for the *H. denitrificans* Δ *tsdA* reference strain in the absence versus the presence of thiosulfate. log₂-fold change threshold =1, Benjamini-Hochberg corrected p-value = 0.1.



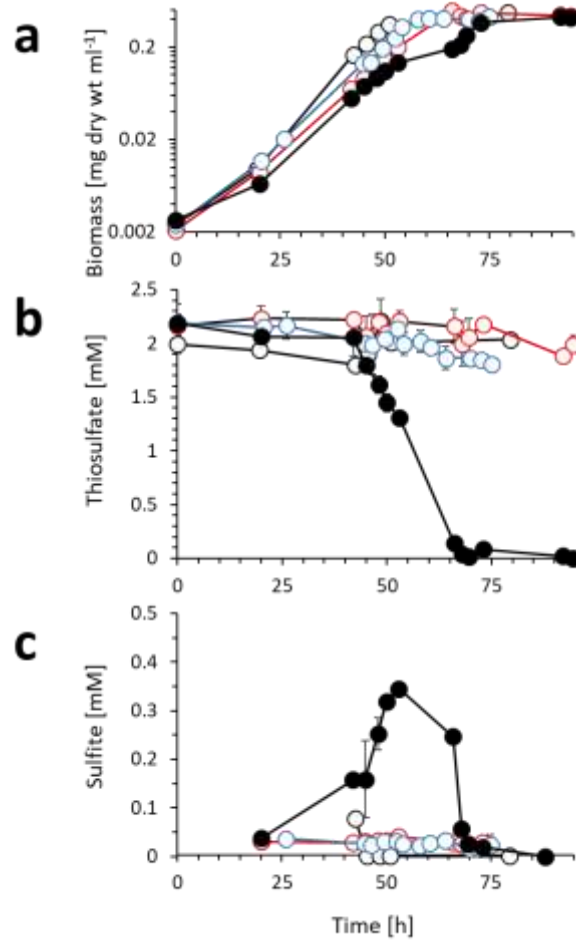
Supplementary Fig. 3. Transcript abundance changes of genes encoding PmpA and PmpB and neighboring genes from *Hyphomicrobium denitrificans* Δ *tsdA*. Columns in gray show the reference value for cells grown in the absence of thiosulfate, white columns apply to cells grown with 2 mM thiosulfate. The experiment was conducted in duplicate, each time using mRNA preparations from two different cultures. Adjusted p values were all below 0.05. *prhd*, periplasmic rhodanese-like domain-containing sulfurtransferase with a CXXXCW motif, consistent with a possible role in redox cofactor binding (IPR001763 and IPR022376); *cyt d1*, periplasmic protein with a cytochrome *d1* heme domain and a YVTN beta-propeller repeat (TIGR03866); *pedF*, cytochrome *c*₅₅₀ (TIGR04494), periplasmic electron carrier; *sbp3*, extracellular substrate-binding protein family 3 (IPR001638). *sox(YZ)*, Sox(YZ) fusion protein (TIGR04557); *soxH_rel_PQQ1*, encodes a potential Zn metallohydrolase of the same family as the SoxH protein (TIGR04558) associated with thiosulfate oxidation². *prhd*, *cyt d1*, *cyt c550*, *sox(YZ)*, and *soxH_rel_PQQ1* show relationships by phylogenetic profiling and conserved gene neighborhoods with transport systems for alcohols metabolized by PQQ-dependent enzymes (here probably the enzyme encoded by *exaA*), that have a Cys-Cys motif (TIGR03075) for electron transfer to *c*₅₅₀ family cytochromes.



Supplementary Fig. 4. Growth of *H. denitrificans* reference and mutant strains on methanol. a. Growth curves are compared for the reference strain *H. denitrificans* $\Delta tsdA$ (black filled circles) and strains lacking gene *soxT1B*: *H. denitrificans* $\Delta tsdA \Delta soxT1B$ (black open diamonds), *H. denitrificans* $\Delta tsdA \Delta soxT1B \Delta soxR$ (blue open diamonds) and *H. denitrificans* $\Delta tsdA \Delta soxT1B \Delta shdrR$ (red open diamonds). **b.** Growth curves are compared for the reference strain *H. denitrificans* $\Delta tsdA$ (black filled circles) and strains lacking gene *soxT1A*: *H. denitrificans* $\Delta tsdA \Delta soxT1A$ (black open circles), *H. denitrificans* $\Delta tsdA \Delta soxT1A \Delta soxR$ (blue open circles) and *H. denitrificans* $\Delta tsdA \Delta soxT1B \Delta shdrR$ (red open circles). Error bars indicating SD are too small to be visible for the determination of biomass.



Supplementary Fig. 5. Growth and thiosulfate consumption of *H. denitrificans* reference and mutant strains lacking *soxT1B*. **a.** Growth curves on medium containing 2 mM thiosulfate. Error bars indicating SD are too small to be visible for the determination of biomass. **b.** Thiosulfate consumption **c.** Sulfite production. Symbols identifying strains: *H. denitrificans* $\Delta tsdA$ (black filled circles), *H. denitrificans* $\Delta tsdA \Delta soxT1B$ (black open diamonds), *H. denitrificans* $\Delta tsdA \Delta soxT1B \Delta soxR$ (blue open diamonds) and *H. denitrificans* $\Delta tsdA \Delta soxT1B \Delta shdrR$ (red open diamonds). Precultures contained 2 mM thiosulfate.



Supplementary Fig. 6. Growth and thiosulfate consumption of *H. denitrificans* reference and mutant strains lacking *soxT1A*. **a.** Growth curves on medium containing 2 mM thiosulfate. Error bars indicating SD are too small to be visible for the determination of biomass. **b.** Thiosulfate consumption **c.** Sulfite production. Symbols identifying strains: *H. denitrificans* $\Delta tsdA$ (black filled circles), *H. denitrificans* $\Delta tsdA \Delta soxT1A$ (black open circles), *H. denitrificans* $\Delta tsdA \Delta soxT1A \Delta soxR$ (blue open circles) and *H. denitrificans* $\Delta tsdA \Delta soxT1B \Delta shdrR$ (red open diamonds).

Supplementary Table 1: Presence (1)/Absence (0) of SoxT-type transporters, genes for other Sox proteins, and the transcriptional regulators SoxR and sHdrR among the sulfur-oxidizing prokaryotes with sHdr system

Taxonomy assignments are derived from the genome taxonomy database GTDB R214

Genome identifier	Domain	Phylum	Class	Order	Family	Genus	Species	SoxX	SoxY	SoxZ	SoxA	SoxB	SoxC	SoxD	SoxT1	SoxT2	SoxR	sHdrR	sHdr_TypeI	sHdr_TypeII
GCA_016211105	Bacteria	Acidobacteriota	Acidimicrobia	RPQK01	JACQX01	JACQX01	JACQX01-sp016211105	0	0	0	0	0	0	0	0	0	0	1	0	1
GCA_002898115	Bacteria	Actinobacteriota	Acidimicrobia	UBA5794	BM5388IN02	BM5388IN02	BM5388IN02-sp002898115	0	0	0	0	0	0	0	0	0	0	1	0	1
GCA_003140595	Bacteria	Actinobacteriota	Acidimicrobia	Bog-793	Fen-455	Fen-455	Fen-455-sp003140595	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA_003158835	Bacteria	Actinobacteriota	Acidimicrobia	Palae-688	Fen-671	Fen-671	Fen-671-sp003158835	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA_003159795	Bacteria	Actinobacteriota	Acidimicrobia	Bog-793	Bog-793	Bog-793	Bog-793-sp003159795	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA_003166025	Bacteria	Actinobacteriota	Acidimicrobia	Palae-688	Fen-671	Fen-671	Fen-671-sp003166025	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA_003170375	Bacteria	Actinobacteriota	Acidimicrobia	Acidimicrobiales	Bog-793	Fen-455	Fen-455-sp003170375	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA_003230435	Bacteria	Actinobacteriota	Acidimicrobia	UBA5794	ZC4R635	SZUA-217	SZUA-217-sp003230435	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA_006515755	Bacteria	Actinobacteriota	Acidimicrobia	Acidimicrobiales	Ilumatobacteriaceae	VFMCD1	VFMCD1-sp006515755	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA_013044385	Bacteria	Actinobacteriota	Acidimicrobia	Acidimicrobiales	Ilumatobacteriaceae	JABEUN01	JABEUN01-sp013044385	0	0	0	0	0	0	0	0	0	0	1	0	1
GCA_013151445	Bacteria	Actinobacteriota	Acidimicrobia	UBA5794	BM5388IN02	BM5388IN02	BM5388IN02-sp013151445	0	0	0	0	0	0	0	0	0	0	1	0	1
GCA_015488325	Bacteria	Actinobacteriota	Acidimicrobia	UBA5794	S012-128	S012-128	S012-128-sp015488325	0	0	0	0	0	0	0	0	0	0	0	0	1
GCF_000023265	Bacteria	Actinobacteriota	Acidimicrobia	Acidimicrobiales	Acidimicrobiaceae	Acidimicrobium	Acidimicrobium-ferrooxidans	0	0	0	0	0	0	0	0	0	0	0	0	1
GCF_000742905	Bacteria	Actinobacteriota	Acidimicrobia	Acidimicrobiales	Acidimicrobiaceae	Ferrimicrobium	Ferrimicrobium-acidiphilum	0	0	0	0	0	0	0	0	0	0	1	0	1
GCF_900128965	Bacteria	Actinobacteriota	Acidimicrobia	Acidimicrobiales	Acidimicrobiaceae	Ferritrix	Ferritrix-thermotolerans	0	0	0	0	0	0	0	0	0	0	1	0	1
GCA_002384835	Bacteria	Actinobacteriota	Actinomycetia	Propionibacteriales	Noctardiaceae	UBA4001	UBA4001-sp002384835	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA_003541285	Bacteria	Actinobacteriota	Actinomycetia	Streptosporangiales	Streptosporangiaceae	UBA9676	UBA9676-sp003541285	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA_004193205	Bacteria	Actinobacteriota	Actinomycetia	Mycobacteriales	Mycobacteriaceae	Gordonia	Gordonia-sediminis	0	0	0	0	0	0	0	0	0	0	1	0	1
GCA_016201065	Bacteria	Actinobacteriota	Actinomycetia	Mycobacteriales	CADCTP01	JACQD01	JACQD01-sp016201065	0	0	0	0	0	0	0	0	0	0	1	0	1
GCF_000244855	Bacteria	Actinobacteriota	Actinomycetia	Pseudonocardiales	Pseudonocardaceae	Saccharomonospora	Saccharomonospora-marina	0	0	0	0	0	0	0	0	0	0	1	0	1
GCF_000298195	Bacteria	Actinobacteriota	Actinomycetia	Mycobacteriales	Mycobacteriaceae	Gordonia	Gordonia-rhizosphaera	0	0	0	0	0	0	0	0	0	0	0	0	1
GCF_003347205	Bacteria	Actinobacteriota	Actinomycetia	Mycobacteriales	Mycobacteriaceae	Mycobacterium	Mycobacterium-moriokense	0	0	0	0	0	0	0	0	0	0	1	0	1
GCF_006152065	Bacteria	Actinobacteriota	Actinomycetia	Mycobacteriales	Pseudonocardiales	Amycolatopsis	Amycolatopsis-alkalitolerans	0	0	0	0	0	0	0	0	0	0	1	0	1
GCF_011761185	Bacteria	Actinobacteriota	Actinomycetia	Mycobacteriales	Pseudonocardiales	Saccharomonospora	Saccharomonospora-emissum	0	0	0	0	0	0	0	0	0	0	1	0	1
GCF_012328925	Bacteria	Actinobacteriota	Actinomycetia	Mycobacteriales	Pseudonocardiales	Amycolatopsis	Amycolatopsis-acididurans	0	0	0	0	0	0	0	0	0	0	1	0	1
GCA_002341805	Bacteria	Aquificota	Aquificae	Aquificales	Hydrogenobaculaceae	Hydrogenobaculum	Hydrogenobaculum-sp002341805	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_002878215	Bacteria	Aquificota	Aquificae	Aquificales	Hydrogenobaculaceae	Hydrogenobaculum	Hydrogenobaculum-sp002878215	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA_003696135	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	UBA11096	UBA11096-sp003696135	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_003978875	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Aquifex	Aquifex-sp003978875	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_009903855	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Thermocrinis	Thermocrinis-sp009903855	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_011054805	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	UBA11096	UBA11096-sp011054805	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_011373045	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Hydrogenivirga	Hydrogenivirga-seolius A	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_011375435	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Thermocrinis	Thermocrinis-nuber A	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_013153455	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Aquifex	Aquifex-sp013153455	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_013153495	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Hydrogenivirga	Hydrogenivirga-sp013153495	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_015487365	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	S012-77	S012-77-sp015487365	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA_015487405	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Aquifex	Aquifex-sp015487405	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA_015487615	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	WFWF01	WFWF01-sp015487615	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_015487835	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Hydrogenivirga	Hydrogenivirga-sp015487835	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_015490105	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Hydrogenivirga	Hydrogenivirga-sp015490105	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_015490115	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Hydrogenivirga	Hydrogenivirga-sp015490115	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_015490135	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	WFWF01	WFWF01-sp015490135	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_015490215	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Hydrogenivirga	Hydrogenivirga-sp015490215	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_015492115	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Hydrogenivirga	Hydrogenivirga-sp015492115	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_015661465	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Aquifex	Aquifex-seolius B	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_018771605	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	UBA11096	UBA11096-sp003534055	0	1	1	1	1	0	0	0	0	0	0	1	0
GCF_000008625	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Aquifex	Aquifex-seolius	0	1	1	1	1	0	0	0	0	0	0	1	0
GCF_000020785	Bacteria	Aquificota	Aquificae	Aquificales	Hydrogenobaculaceae	Hydrogenobaculum	Hydrogenobaculum-sp000020785	0	0	0	0	0	0	0	0	0	0	0	1	0
GCF_000025605	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Thermocrinis	Thermocrinis-elbus	0	1	1	1	1	0	0	0	0	0	0	1	0
GCF_000213785	Bacteria	Aquificota	Aquificae	Aquificales	Hydrogenobaculaceae	Hydrogenobaculum	Hydrogenobaculum-sp000213785	0	0	0	0	0	0	0	0	0	0	0	1	0
GCF_000512735	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Thermocrinis	Thermocrinis-nuber	0	1	1	1	1	0	0	0	0	0	0	1	0
GCF_000702425	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Thermocrinis	Thermocrinis-sp000702425	0	1	1	1	1	0	0	0	0	0	0	1	0
GCF_003664005	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Hydrogenivirga	Hydrogenivirga-calditiformis	0	1	1	1	1	0	0	0	0	0	0	1	0
GCF_011006175	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	UBA11096	UBA11096-sp011006175	0	1	1	1	1	0	0	0	0	0	0	1	0
GCF_900143435	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Thermocrinis A	Thermocrinis A-minervae	0	1	1	1	1	0	0	0	0	0	0	1	0
GCF_900215655	Bacteria	Aquificota	Aquificae	Aquificales	Aquificaceae	Hydrogenobacter	Hydrogenobacter-hydrogenophilus	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_006226345	Bacteria	Bacteroidota	Bacteroidia	Chitinophagales	Saprosipiraceae	M3007	M3007-sp006226345	0	0	0	0	0	0	0	0	0	0	1	0	1
GCA_006501835	Bacteria	Bacteroidota	Bacteroidia	Chitinophagales	Saprosipiraceae	BCD1	BCD1-sp006501835	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA_015488485	Bacteria	Bacteroidota	Bacteroidia	Cytophagales	Cyclobacteriaceae	S012-113	S012-113-sp015488485	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_015490175	Bacteria	Bacteroidota	Bacteroidia	Chitinophagales	Saprosipiraceae	WFWF01	WFWF01-sp015490175	0	0	0	0	0	0	0	0	0	0	1	0	1
GCA_015490715	Bacteria	Bacteroidota	Bacteroidia	Chitinophagales	Saprosipiraceae	S141-48	S141-48-sp015490715	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_016703765	Bacteria	Bacteroidota	Bacteroidia	Chitinophagales	Saprosipiraceae	JADJTT01	JADJTT01-sp016703765	0	0	0	0	0	0	0	0	0	0	1	0	1
GCA_016711045	Bacteria	Bacteroidota	Bacteroidia	Chitinophagales	Saprosipiraceae	JADJTT01	JADJTT01-sp016711045	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA_016719895	Bacteria	Bacteroidota	Bacteroidia	Chitinophagales	Saprosipiraceae	M3007	M3007-sp016719895	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA_00266395	Bacteria	Bacteroidota	Bacteroidia	Cytophagales	Cyclobacteriaceae	ELB16-189	ELB16-189-sp00266395	0	0	0	0	0	0	0	0	0	0	1	0	1
GCF_000020225	Bacteria	Bacteroidota	Chlorobiales	Chloroheteropetoniales	Chloroheteropetoniaceae	Chloroheteropetonia	Chloroheteropetonia-thalassium	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA_003453835	Bacteria	Bacteroidota	UBA10030	UBA10030	UBA10030	UBA10030	UBA10030-sp003453835	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA_003696445	Bacteria	Calditrichota	Calditrichia	RBG-13-44-9	J042	J042	J042-sp003696445	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_003696775	Bacteria	Calditrichota	Calditrichia	Calditrichales	J004	J004	J004-sp003696775	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA_013112635	Bacteria	Calditrichota	Calditrichia	Calditrichales	JABSGF01	JABSGF01	JABSGF01-sp013112635	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA_013150955	Bacteria	Calditrichota	Calditrichia	RBG-13-44-9	J042	JAAJD01	JAAJD01-sp013150955	0	0	0	0									

GCA_002400963	Bacteria	Chloroflexota	Anaerolineae	UBA4142	UBA4142	UBA4142	UBA4142-sp002400365	0	0	0	0	0	0	0	0	0	0	0
GCA_002418205	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	UBA12294	UBA12294-sp002418205	0	0	0	0	0	0	0	0	0	0	0
GCA_002418215	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	UBA5796	UBA5796-sp002418215	0	0	0	0	0	0	0	0	0	0	0
GCA_002473085	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	UBA7227	UBA7227-sp002473085	0	0	0	0	0	0	0	0	0	0	0
GCA_003577395	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	UBA12294	UBA12294-sp003577395	0	0	0	0	0	0	0	0	0	0	0
GCA_003599285	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	OLB14	OLB14-sp003599285	0	0	0	0	0	0	0	0	0	0	0
GCA_011331405	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	UBA12294	UBA12294-sp011331405	0	0	0	0	0	0	0	0	0	0	0
GCA_013151415	Bacteria	Chloroflexota	Anaerolineae	J102	J102	JAA0101	JAA0101-sp013151415	0	0	0	0	0	0	0	0	0	0	0
GCA_013359445	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	JABWBV01	JABWBV01	JABWBV01-sp013359445	0	0	0	0	0	0	0	0	0	0	0
GCA_013360075	Bacteria	Chloroflexota	Anaerolineae	J102	J102	JABWBG01	JABWBG01-sp013360075	0	0	0	0	0	0	0	0	0	0	0
GCA_013360875	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	UBA12294	UBA12294-sp013360875	0	0	0	0	0	0	0	0	0	0	0
GCA_013388685	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	UBA12294	UBA12294-sp013388685	0	0	0	0	0	0	0	0	0	0	0
GCA_014860745	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	OLB14	OLB14-sp014860745	0	0	0	0	0	0	0	0	0	0	0
GCA_015073725	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	OLB14	OLB14-sp008363285	0	0	0	0	0	0	0	0	0	0	0
GCA_015484715	Bacteria	Chloroflexota	Anaerolineae	S140-20	S140-20	S140-20	S140-20-sp015484715	0	0	0	0	0	0	0	0	0	0	0
GCA_015480995	Bacteria	Chloroflexota	Anaerolineae	JAA0DB01	JAA0DB01	S141-23	S141-23-sp015480995	0	0	0	0	0	0	0	0	0	0	0
GCA_015491235	Bacteria	Chloroflexota	Anaerolineae	Ardenicatenales	Ardenicatenaceae	WFWG01	WFWG01-sp015491235	0	0	0	0	0	0	0	0	0	0	0
GCA_016191955	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	OLB14	OLB14-sp016191955	0	0	0	0	0	0	0	0	0	0	0
GCA_016197225	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	VGOW01	JACPWCO1	JACPWCO1-sp016197225	0	0	0	0	0	0	0	0	1	0	0
GCA_016200785	Bacteria	Chloroflexota	Anaerolineae	JACRMK01	JACRMK01	JACQEC01	JACQEC01-sp016200785	0	0	0	0	0	0	0	0	0	0	0
GCA_016209205	Bacteria	Chloroflexota	Anaerolineae	UBA4142	SHND01	SHND01	SHND01-sp016209205	0	0	0	0	0	0	0	0	0	0	0
GCA_016213135	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	VGOW01	JACRBQ01	JACRBQ01-sp016213135	0	0	0	0	0	0	0	0	1	0	0
GCA_016215145	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	VGOW01	JACRLA01	JACRLA01-sp016215145	0	0	0	0	0	0	0	0	1	0	0
GCA_016219275	Bacteria	Chloroflexota	Anaerolineae	UBA4142	UBA4142	JACRBM01	JACRBM01-sp016219275	0	0	0	0	0	0	0	0	0	0	0
GCA_016223135	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	UBA12294	UBA12294-sp016223135	0	0	0	0	0	0	0	0	0	0	0
GCA_016234495	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	UBA7227	UBA7227-sp016234495	0	0	0	0	0	0	0	0	0	0	0
GCA_016234495	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	OLB14	OLB14-sp016234495	0	0	0	0	0	0	0	0	0	0	0
GCA_016234535	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	OLB14	OLB14-sp016234535	0	0	0	0	0	0	0	0	0	0	0
GCA_016235425	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	OLB14	OLB14-sp016235425	0	0	0	0	0	0	0	0	0	0	0
GCA_016235440	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	OLB14	OLB14-sp016235440	0	0	0	0	0	0	0	0	0	0	0
GCA_016716230	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	UBA12294	UBA12294-sp016716230	0	0	0	0	0	0	0	0	0	0	0
GCA_016718275	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	OLB14	OLB14-sp016718275	0	0	0	0	0	0	0	0	0	1	0
GCA_016721315	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	OLB14	OLB14-sp016721315	0	0	0	0	0	0	0	0	0	0	0
GCA_016789025	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	UBA12294	UBA12294-sp016789025	0	0	0	0	0	0	0	0	0	0	0
GCA_016866215	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	OLB14	OLB14-sp016866215	0	0	0	0	0	0	0	0	0	0	0
GCA_016875735	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	VGOW01	VGOW01	VGOW01-sp016875735	0	0	0	0	0	0	0	1	0	0	0
GCA_016875735	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	OLB14	OLB14-sp016875735	0	0	0	0	0	0	0	0	0	0	0
GCA_017743695	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	6300-37	6300-37-sp017743695	0	0	0	0	0	0	0	0	0	0	0
GCA_900696595	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	OLB14	OLB14-sp900696595	0	0	0	0	0	0	0	0	0	0	0
GCA_903838415	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	UBA5195	UBA5195-sp903838415	0	0	0	0	0	0	0	0	0	0	0
GCA_903908605	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	UBA5195	UBA5195-sp903908605	0	0	0	0	0	0	0	0	0	0	0
GCA_903910795	Bacteria	Chloroflexota	Anaerolineae	Anaerolineales	EnvOPSL2	UBA5195	UBA5195-sp903910795	0	0	0	0	0	0	0	0	0	0	0
GCA_002896225	Bacteria	Chloroflexota	Chloroflexi	Thermomicrobiales	Thermomicrobiaceae	Thermomicrobium	Thermomicrobium-sp002896225	0	0	0	0	0	0	0	0	0	0	0
GCA_002896975	Bacteria	Chloroflexota	Chloroflexi	Thermomicrobiales	Thermomicrobiaceae	Thermomicrobium	Thermomicrobium-sp002896975	0	0	0	0	0	0	0	0	0	0	0
GCA_004138175	Bacteria	Chloroflexota	Chloroflexi	Chloroflexales	Chloroflexaceae	Oscillochloris	Oscillochloris-sp004138175	0	0	0	0	0	0	0	0	1	0	0
GCA_012032475	Bacteria	Chloroflexota	Chloroflexi	Chloroflexales	Chloroflexaceae	JAAU5Y01	JAAU5Y01-sp012032475	0	0	0	0	0	0	0	0	0	0	0
GCA_014874425	Bacteria	Chloroflexota	Chloroflexi	Thermomicrobiales	Thermomicrobiaceae	HRBIN26	HRBIN26-sp014874425	0	0	0	0	0	0	0	0	0	0	0
GCF_000021685	Bacteria	Chloroflexota	Chloroflexi	Thermomicrobiales	Thermomicrobiaceae	Thermomicrobium-roseum	Thermomicrobium-roseum	0	0	0	0	0	0	0	0	0	0	0
GCA_001794840	Bacteria	Chloroflexota	Limnocyndria	Limnocyndriales	CSPL-4	GWIC2-73-18	GWIC2-73-18-sp001794840	0	0	0	0	0	0	0	0	1	0	0
GCA_001795340	Bacteria	Chloroflexota	Limnocyndria	Limnocyndriales	CSPL-4	UBA5189	UBA5189-sp001795340	0	0	0	0	0	0	0	0	0	0	0
GCA_011057330	Bacteria	CSPL-3	CSPL-3	CSPL-3	SpSt-165	SpSt-165	SpSt-165-sp011057330	0	0	0	0	0	0	0	0	1	0	0
GCA_016189835	Bacteria	Desulfobacterota B	Binatia	JACPRU01	JACPRU01	JACPRU01	JACPRU01-sp016189835	0	0	0	0	0	0	0	0	1	0	0
GCA_003164475	Bacteria	Dormibacterota	Dormibacteri	UBA8260	Bog-877	Bog-877	Bog-877-sp003164475	0	0	0	0	0	0	0	0	0	0	0
GCA_003446775	Bacteria	Dormibacterota	Dormibacteri	UBA8260	Dormibacteraceae	UBA10449	UBA10449-sp003446775	0	0	0	0	0	0	0	0	1	0	0
GCA_005889515	Bacteria	Dormibacterota	Dormibacteri	UBA8260	CF-96	CF-96	CF-96-sp005889515	0	0	0	0	0	0	0	0	0	0	0
GCF_000092905	Bacteria	Firmicutes	Bacilli	Kyrpidiales	Kyrpidiaceae	Kyrpidia	Kyrpidia-turdiae	0	0	0	0	0	0	0	0	0	0	0
GCF_002804065	Bacteria	Firmicutes	Bacilli	Kyrpidiales	Kyrpidiaceae	Kyrpidia	Kyrpidia-spormanni	0	0	0	0	0	0	0	0	0	0	0
GCA_000237975	Bacteria	Firmicutes E	Suifobacill	Suifobacillales	Suifobacillaceae	Suifobacillus A	Suifobacillus A-acidophilus	0	0	0	0	0	0	0	0	0	0	0
GCA_002551515	Bacteria	Firmicutes E	Suifobacill	Suifobacillales	Suifobacillaceae	Suifobacillus	Suifobacillus-thermotolerans	0	0	0	0	0	0	0	0	0	1	0
GCA_003023695	Bacteria	Firmicutes E	Suifobacill	Suifobacillales	Suifobacillaceae	Suifobacillus C	Suifobacillus C-beneficiens A	0	0	0	0	0	0	0	0	0	0	0
GCA_003023725	Bacteria	Firmicutes E	Suifobacill	Suifobacillales	Suifobacillaceae	Suifobacillus	Suifobacillus-beneficiens A	0	0	0	0	0	0	0	0	0	0	1
GCA_003023740	Bacteria	Firmicutes E	Suifobacill	Suifobacillales	Suifobacillaceae	Suifobacillus B	Suifobacillus B-acidophilus A	0	0	0	0	0	0	0	0	0	0	0
GCA_902809625	Bacteria	Firmicutes E	Suifobacill	Suifobacillales	R501	R501	R501-sp902809625	0	0	0	0	0	0	0	0	0	0	1
GCF_001280565	Bacteria	Firmicutes E	Suifobacill	Suifobacillales	Suifobacillaceae	Suifobacillus	Suifobacillus-thermosuifodooxi	0	0	0	0	0	0	0	0	0	0	1
GCF_012933365	Bacteria	Firmicutes E	Suifobacill	Suifobacillales	Suifobacillaceae	Suifobacillus B	Suifobacillus B-sp012933365	0	0	0	0	0	0	0	0	0	0	0
GCF_900176145	Bacteria	Firmicutes E	Suifobacill	Suifobacillales	Suifobacillaceae	Suifobacillus	Suifobacillus-thermosuifodooxi	0	0	0	0	0	0	0	0	0	0	1
GCA_015492735	Bacteria	Gemmatimonadota	Gemmatimonadetes	Longimicrobiales	UBA6960	S146-37	S146-37-sp015492735	0	0	0	0	0	0	0	0	0	1	0
GCA_011375725	Bacteria	KS81	UBA2214	DRLW01	DRLW01	DRLW01	DRLW01-sp011375725	0	0	0	0	0	0	0	0	0	0	0
GCA_015482525	Bacteria	KS81	UBA2214	DRLW01	DRLW01	DRLW01	DRLW01-sp015482525	0	0	0	0	0	0	0	0	0	0	0
GCA_015491485	Bacteria	KS81	UBA2214	DRLW01	DRLW01	WFWT01	WFWT01-sp015491485	0	0	0	0	0	0	0	0	0	1	0
GCA_002256485	Bacteria	Marinisomatota	Marinisomatia	Marinisomatales	TC555	UBA2126	UBA2126-sp002256485	0	0	0	0	0	0	0	0	1	0	0
GCA_002713885	Bacteria	Marinisomatota	Marinisomatia	Marinisomatales	UBA1611	TMED80	TMED80-sp002713885	0	0	0	0	0	0	0	0	0	0	0
GCA_002730315	Bacteria	Marinisomatota	Marinisomatia	Marinisomatales	TC555	UBA2126	UBA2126-sp002730315	0	0	0	0	0	0	0	0	0	0	0
GCA_004124295	Bacteria	Marinisomatota	Marinisomatia	SGCC-AA003-L08	TS1811	TS1811	TS1811-sp004124295	0	0	0	0	0	0	0	0	0	0	0
GCA_018651745	Bacteria	Marinisomatota	Marinisomatia	Marinisomatales	TC555	JAAZYX01	JAAZYX01-sp018651745	0	0	0	0	0	0	0	0	0	0	0
GCA_018671775	Bacteria	Marinisomatota	Marinisomatia	Marinisomatales	UBA1611	JABHG01	JABHG01-sp018671775	0	0	0	0	0	0	0	0	0	0	0
GCA_018674655	Bacteria	Marinisomatota	Marinisomatia	Marinisomatales	TC555	TC555	TC555-sp018674655	0	0	0	0	0	0	0	0	1	1	0
GCA_018692355	Bacteria	Marinisomatota	Marinisomatia															

GCA 001788395	Bacteria	Methylomirabilota	Methylomirabilota	Rokubacteriales	CSP1-6	UBA12499	UBA12499-sp001788395	0	1	1	1	1	0	0	0	0	0	1	0	1
GCA 001788415	Bacteria	Methylomirabilota	Methylomirabilota	Rokubacteriales	CSP1-6	UBA12499	UBA12499-sp001788415	0	1	1	1	1	0	0	0	0	0	0	0	1
GCA 016177535	Bacteria	Methylomirabilota	Methylomirabilota	Rokubacteriales	CSP1-6	UBA12499	UBA12499-sp016177535	0	0	0	0	0	0	0	0	0	0	1	0	1
GCA 016179875	Bacteria	Methylomirabilota	Methylomirabilota	Rokubacteriales	CSP1-6	GWAA-73-35	GWAA-73-35-sp016179875	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA 016179925	Bacteria	Methylomirabilota	Methylomirabilota	Rokubacteriales	CSP1-6	JACP001	JACP001-sp016179925	0	1	1	1	1	0	0	0	0	0	1	0	1
GCA 016188005	Bacteria	Methylomirabilota	Methylomirabilota	Rokubacteriales	CSP1-6	UBA12499	UBA12499-sp016188005	1	1	1	1	1	0	0	0	0	0	0	1	1
GCA 016209635	Bacteria	Methylomirabilota	Methylomirabilota	Rokubacteriales	CSP1-6	JACQW01	JACQW01-sp016209635	1	1	1	1	1	0	0	0	0	0	1	0	1
GCA 002683135	Bacteria	Planctomycetota	GCA-002687715	GCA-002687715	GCA-002687715	GCA-2683135	GCA-2683135-sp002683135	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA 002687715	Bacteria	Planctomycetota	GCA-002687715	GCA-002687715	GCA-002687715	GCA-2687715	GCA-2687715-sp002687715	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA 013213915	Bacteria	Planctomycetota	GCA-002687715	GCA-002687715	GCA-002687715	GCA-2683135	GCA-2683135-sp013213915	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA 002683825	Bacteria	Planctomycetota	UBA1135	UBA1135	GCA-002686595	GCA-2683825	GCA-2683825-sp002683825	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA 002685965	Bacteria	Planctomycetota	UBA1135	UBA2386	GCA-002748355	GCA-2685965	GCA-2685965-sp002685965	0	0	0	0	0	0	0	0	0	0	0	0	1
GCA 000961635	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Hymenimicrobiaceae	Hymenimicrobium	Hymenimicrobium-sp000961635	1	1	1	1	1	1	1	1	1	1	1	1	0
GCA 001516065	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Bin65	Bin65	Bin65-sp002238725	1	1	1	1	1	1	1	1	1	1	1	0	1
GCA 002238725	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Casp-alpha2	UBA3470	UBA3470-sp002238725	1	1	1	1	1	0	0	0	1	0	0	0	1
GCA 002378125	Bacteria	Proteobacteria	Alphaproteobacteria	Rhodospirillales	Rhodobacteraceae	Phaeovulum	Phaeovulum-sp002378125	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA 002421605	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Rhizobiaceae	Oricola	Oricola-sp002421605	1	1	1	1	1	1	1	1	1	1	1	1	0
GCA 002698425	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Casp-alpha2	UBA3470	UBA3470-sp002698425	1	1	1	1	1	1	1	1	1	1	1	1	0
GCA 002708525	Bacteria	Proteobacteria	Alphaproteobacteria	Rhodospirillales	Casp-alpha2	UBA3470	UBA3470-sp002708525	1	1	1	1	1	1	1	1	1	1	1	1	0
GCA 002733385	Bacteria	Proteobacteria	Alphaproteobacteria	Caulobacteriales	Maricaulaceae	Robignitumaculum A	Robignitumaculum A-sp002733385	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA 002733485	Bacteria	Proteobacteria	Alphaproteobacteria	Caulobacteriales	Maricaulaceae	Robignitumaculum B	Robignitumaculum B-sp002733485	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA 002733495	Bacteria	Proteobacteria	Alphaproteobacteria	Caulobacteriales	Maricaulaceae	Robignitumaculum B	Robignitumaculum B-sp002733495	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA 002733735	Bacteria	Proteobacteria	Alphaproteobacteria	Caulobacteriales	Maricaulaceae	Robignitumaculum B	Robignitumaculum B-sp002733735	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA 002733805	Bacteria	Proteobacteria	Alphaproteobacteria	Caulobacteriales	Maricaulaceae	Robignitumaculum B	Robignitumaculum B-sp002733805	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA 008933705	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Hymenimicrobiaceae	AWTP1-13	AWTP1-13-sp008933705	0	0	0	0	0	0	1	1	1	1	1	1	0
GCA 009773395	Bacteria	Proteobacteria	Alphaproteobacteria	Caulobacteriales	TH1-2	UBA1942	UBA1942-sp009773395	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA 009840595	Bacteria	Proteobacteria	Alphaproteobacteria	Bin65	Bin65	Bin65	Bin65-sp009840595	1	1	1	1	1	1	1	1	1	1	1	1	0
GCA 009920775	Bacteria	Proteobacteria	Alphaproteobacteria	Rhodobacteriales	Rhodobacteraceae	Marivivens	Marivivens-sp009920775	1	1	1	1	1	1	1	1	1	1	1	1	0
GCA 011087605	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Rhizobiaceae	R2A130	R2A130-sp011087605	1	1	1	1	1	0	0	1	0	1	1	1	0
GCA 011332665	Bacteria	Proteobacteria	Alphaproteobacteria	Acetobacteriales	Acetobacteraceae	Acidobrevibacterium	Acidobrevibacterium-sp011332665	0	0	0	0	0	0	0	0	0	1	1	1	0
GCA 011523635	Bacteria	Proteobacteria	Alphaproteobacteria	Bin65	Bin65	Bin65	Bin65-sp011523635	1	1	1	1	1	0	0	1	0	0	0	1	0
GCA 012842935	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Rhizobiaceae	DUSC01	DUSC01-sp012842935	0	0	0	0	0	0	0	0	0	1	1	1	0
GCA 013001295	Bacteria	Proteobacteria	Alphaproteobacteria	Caulobacteriales	Maricaulaceae	Robignitumaculum A	Robignitumaculum A-sp013001295	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA 013003675	Bacteria	Proteobacteria	Alphaproteobacteria	DSM-16000	Inquilinaceae	JABDIP01	JABDIP01-sp013003675	1	1	1	1	1	0	0	0	1	0	1	1	0
GCA 013141225	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Hymenimicrobiaceae	JABFR01	JABFR01-sp013141225	1	1	1	1	1	0	0	1	1	0	0	1	0
GCA 013693875	Bacteria	Proteobacteria	Alphaproteobacteria	Rhodobacteriales	Rhodobacteraceae	SSD5	SSD5-sp013693875	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA 014359905	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Rhizobiaceae	Hoeflea	Hoeflea-sp014359905	1	1	1	1	1	1	1	1	1	1	1	1	0
GCA 014763545	Bacteria	Proteobacteria	Alphaproteobacteria	Sphingomonadales	Sphingomonadaceae	JACKV001	JACKV001-sp014763545	0	0	0	0	0	0	0	0	0	1	1	1	0
GCA 014851515	Bacteria	Proteobacteria	Alphaproteobacteria	Caulobacteriales	Maricaulaceae	Robignitumaculum B	Robignitumaculum B-sp014851515	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA 014853335	Bacteria	Proteobacteria	Alphaproteobacteria	Caulobacteriales	Maricaulaceae	Robignitumaculum B	Robignitumaculum B-sp014853335	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA 014873905	Bacteria	Proteobacteria	Alphaproteobacteria	Caulobacteriales	Parvularculaceae	S012-90	S012-90-sp014873905	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA 016124615	Bacteria	Proteobacteria	Alphaproteobacteria	Rhodobacteriales	Rhodobacteraceae	Soilrhodobacter	Soilrhodobacter-sp016124615	1	1	1	1	1	0	0	0	1	0	1	1	0
GCA 016125575	Bacteria	Proteobacteria	Alphaproteobacteria	Rhodobacteriales	Rhodobacteraceae	JACU001	JACU001-sp016125575	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA 016195145	Bacteria	Proteobacteria	Alphaproteobacteria	CACIAM-22H2	CACIAM-22H2	JACQAF01	JACQAF01-sp016195145	1	1	1	1	1	0	0	0	0	0	0	1	0
GCA 016213505	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Devosia	Devosia A	Devosia A-sp016213505	0	0	0	0	0	0	0	0	0	1	1	1	0
GCA 016522385	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Aestuariivivaceae	JABDIP01	JABDIP01-sp016522385	1	1	1	1	1	0	0	1	0	0	1	1	0
GCA 016763915	Bacteria	Proteobacteria	Alphaproteobacteria	Caulobacteriales	Maricaulaceae	Robignitumaculum B	Robignitumaculum B-sp016763915	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA 016765135	Bacteria	Proteobacteria	Alphaproteobacteria	Caulobacteriales	Maricaulaceae	Robignitumaculum A	Robignitumaculum A-sp016765135	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA 016765225	Bacteria	Proteobacteria	Alphaproteobacteria	Caulobacteriales	Maricaulaceae	Robignitumaculum A	Robignitumaculum A-sp016765225	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA 016776605	Bacteria	Proteobacteria	Alphaproteobacteria	GCA-2731375	GCA-2731375	GCA-2731375	GCA-2731375-sp016776605	1	1	1	1	1	0	0	1	0	0	1	1	0
GCA 016861165	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Rhizobiaceae	BOKV01	BOKV01-sp016861165	0	0	0	0	0	0	0	1	0	0	0	1	0
GCA 018242215	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Hymenimicrobiaceae	Hymenimicrobium	Hymenimicrobium-sp018242215	0	1	1	1	1	0	0	1	0	1	1	1	0
GCA 018660225	Bacteria	Proteobacteria	Alphaproteobacteria	Sphingomonadales	Emicobacteraceae	UBA4441	UBA4441-sp018660225	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA 018660265	Bacteria	Proteobacteria	Alphaproteobacteria	GCA-2731375	GCA-2731375	GCA-2731375	GCA-2731375-sp018660265	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA 018665815	Bacteria	Proteobacteria	Alphaproteobacteria	Rhodospirillales	Casp-alpha2	UBA3470	UBA3470-sp018665815	1	1	1	1	1	0	0	0	0	0	0	1	0
GCA 018666805	Bacteria	Proteobacteria	Alphaproteobacteria	UBA828	UBA828	PTK801	PTK801-sp018666805	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA 018667835	Bacteria	Proteobacteria	Alphaproteobacteria	GCA-2731375	GCA-2731375	GCA-2731375	GCA-2731375-sp018667835	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA 018701215	Bacteria	Proteobacteria	Alphaproteobacteria	GCA-2731375	GCA-2731375	GCA-2731375	GCA-2731375-sp018701215	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA 018819265	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Hymenimicrobiaceae	Flomicrobium	Flomicrobium-sp018819265	1	1	1	1	1	1	1	1	1	1	1	1	0
GCA 018971835	Bacteria	Proteobacteria	Alphaproteobacteria	Micropepsales	Micropepsaceae	Rhizomicrobium	Rhizomicrobium-sp018971835	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA 019073865	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Beijerinikaceae	REEB77	REEB77-sp019073865	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA 019073905	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Beijerinikaceae	REEB77	REEB77-sp019073905	1	1	1	1	1	0	0	0	0	0	1	1	0
GCA 900197615	Bacteria	Proteobacteria	Alphaproteobacteria	Bin65	Bin65	Bin65	Bin65-sp00197615	1	1	1	1	1	0	0	0	0	0	0	1	0
GCA 90338215	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Rhizobiaceae	DUSC01	DUSC01-sp00338215	0	0	0	0	0	0	0	0	0	0	1	1	0
GCF 000143145	Bacteria	Proteobacteria	Alphaproteobacteria	Rhizobiales	Hymenimicrobiaceae	Hymenimicrobium	Hymenimicrobium-sp000143145	0	1	1	1	1	0	0	1	0	1	1	1	0
GCF 001281485	Bacteria	Proteobacteria	Alphaproteobacteria	Sphingomonadales	Sphingomonadaceae	Erythrobacter	Erythrobacter-sp001281485	0	0	0	0	0	0	0	0	0	0	1	1	0
GCF 002079905	Bacteria	Proteobacteria	Alphaproteobacteria	Rhodobacteriales	Rhodobacteraceae	Rhodovulum	Rhodovulum-sp002079905	1	1	1	1	1	1	1	1	1	1	1	1	0
GCF 002269345	Bacteria	Proteobacteria	Alphaproteobacteria	Sphingomonadales	Sphingomonadaceae	Tsuneonella	Tsuneonella-sp002269345	0	0	0	0	0	0	0	0	0	0	1	1	0
GCF 002871005	Bacteria	Proteobacteria	Alphaproteobacteria	Rhodobacteriales	Rhodobacteraceae	Acidimangrovinomonas	Acidimangrovinomonas-sp002871005	1	1	1	1	1	0	0	0	1	1	0	1	0
GCF 002937115	Bacteria	Proteobacteria	Alphaproteobacteria	Acetobacteriales	Acetobacteraceae	Rhodospila	Rhodospila-sp002937115	0	0	0	0</									

GCA_001770633	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	SG8-39	2-12-FULL-68-20	2-12-FULL-68-20-sp001770633	0	1	1	1	1	0	0	1	0	0	1	1	0
GCA_001771985	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	SG8-41	DSOT01	DSOT01-sp001771985	1	1	1	1	1	0	0	1	0	0	0	1	0
GCA_001772005	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	SG8-41	DSOT01	DSOT01-sp001772005	0	1	1	1	1	0	0	1	0	0	0	1	0
GCA_002253363	Bacteria	Proteobacteria	Gamma-proteobacteria	21-64-14	21-64-14	21-64-14	21-64-14-sp002253363	1	1	1	1	1	0	0	1	0	0	0	1	0
GCA_002341813	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	UBA2487	Sulfuriferulaceae	UBA2487-sp002341813	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_002746155	Bacteria	Proteobacteria	Gamma-proteobacteria	Enterobacteriales	GCA-002770795	GCA-2746155	GCA-2746155-sp002746155	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA_003540933	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	Ga0077336	UBA11873	UBA11873-sp003540933	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_003550945	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio B	Thioalkalivibrio B-sp00355094	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_003553165	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio B	Thioalkalivibrio B-sp003553165	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_003553285	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio B	Thioalkalivibrio B-sp003553285	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_003820645	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	SG8-41	Ga0077327	Ga0077327-sp003820645	1	1	1	1	0	0	0	1	0	0	0	1	0
GCA_004282875	Bacteria	Proteobacteria	Gamma-proteobacteria	Woeseliales	Woeselaceae	UBA1847	UBA1847-sp004282875	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA_004297625	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	SG8-39	SGCG-AG-212-123	SGCG-AG-212-123-sp004297625	0	1	1	1	1	0	0	1	0	0	1	1	0
GCA_005240145	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	SG8-39	RBG-16-66-20	RBG-16-66-20-sp005240145	0	1	1	1	1	0	0	1	0	1	1	1	0
GCA_005777205	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	SG8-39	RBG-16-66-20	RBG-16-66-20-sp005777205	0	1	1	1	1	0	0	1	0	0	1	1	0
GCA_007116035	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio B	Thioalkalivibrio B-sp007116035	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_007133115	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio B	Thioalkalivibrio B-sp007133115	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_007136145	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio B	Thioalkalivibrio B-sp007136145	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_007693435	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio B	Thioalkalivibrio B-sp007693435	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_007692335	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio B	Thioalkalivibrio B-sp007692335	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_009835185	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	SG8-41	UBA5216	UBA5216-sp009835185	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA_009937305	Bacteria	Proteobacteria	Gamma-proteobacteria	Woeseliales	Woeselaceae	JAACF01	JAACF01-sp009937305	1	1	1	1	0	0	0	1	0	0	0	1	0
GCA_009937605	Bacteria	Proteobacteria	Gamma-proteobacteria	Woeseliales	Woeselaceae	UBA1847	UBA1847-sp009937605	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA_009937615	Bacteria	Proteobacteria	Gamma-proteobacteria	Woeseliales	Woeselaceae	JAACF01	JAACF01-sp009937615	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA_011046905	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	SG8-41	DSOT01	DSOT01-sp011046905	1	1	1	1	0	0	0	1	0	0	1	1	0
GCA_011330925	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	SG8-41	SG8-41	SG8-41-sp011330925	1	1	1	1	1	0	0	1	0	0	0	1	0
GCA_011389635	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio B	Thioalkalivibrio B-sp011389635	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_011390385	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio B	Thioalkalivibrio B-nitratireduc	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_011390585	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio B	Thioalkalivibrio B-paradoxus	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_011524975	Bacteria	Proteobacteria	Gamma-proteobacteria	Xanthomonadales	SZUA-36	WTJ01	WTJ01-sp011524975	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_011525945	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	WYB01	WYB01	WYB01-sp011525945	1	1	1	1	0	0	0	0	0	0	0	1	0
GCA_011772885	Bacteria	Proteobacteria	Gamma-proteobacteria	Woeseliales	Woeselaceae	JAACF01	JAACF01-sp011772885	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA_011773845	Bacteria	Proteobacteria	Gamma-proteobacteria	Xanthomonadales	SZUA-36	WVWV01	WVWV01-sp011773845	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_013001885	Bacteria	Proteobacteria	Gamma-proteobacteria	Xanthomonadales	SZUA-36	JABDPF01	JABDPF01-sp013001885	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA_013042375	Bacteria	Proteobacteria	Gamma-proteobacteria	Woeseliales	Woeselaceae	UBA1847	UBA1847-sp013042375	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_013042915	Bacteria	Proteobacteria	Gamma-proteobacteria	Xanthomonadales	SZUA-36	JABDPF01	JABDPF01-sp013042915	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA_013043165	Bacteria	Proteobacteria	Gamma-proteobacteria	Woeseliales	Woeselaceae	UBA1847	UBA1847-sp013043165	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA_013138675	Bacteria	Proteobacteria	Gamma-proteobacteria	Woeseliales	Woeselaceae	JAACF01	JAACF01-sp013138675	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_013140785	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	Sulfuriferulaceae	Sulfuriferula A	Sulfuriferula A-sp013140785	1	1	1	1	1	0	0	0	0	0	0	1	0
GCA_013348725	Bacteria	Proteobacteria	Gamma-proteobacteria	GCA-013348725	GCA-013348725	GCA-013348725	GCA-013348725-sp013348725	1	1	1	1	0	0	0	1	0	0	0	1	0
GCA_014762505	Bacteria	Proteobacteria	Gamma-proteobacteria	SpR-1174	SpR-1174	SpR-1174	SpR-1174-sp014762505	1	1	1	1	1	0	0	1	0	0	0	1	0
GCA_015487785	Bacteria	Proteobacteria	Gamma-proteobacteria	S140-43	S140-43	S140-43	S140-43-sp015487785	1	1	1	1	1	0	0	1	0	0	0	1	0
GCA_015481615	Bacteria	Proteobacteria	Gamma-proteobacteria	S140-43	S140-43	S140-43	S140-43-sp015481615	1	1	1	1	1	0	0	1	0	0	0	1	0
GCA_016183615	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	UBA6910	JACFEG01	JACFEG01-sp016183615	1	1	1	1	1	0	0	0	0	0	0	1	0
GCA_016192835	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	SG8-41	PALSA-1004	PALSA-1004-sp016192835	1	1	1	1	1	0	0	0	0	0	0	1	0
GCA_016202585	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	SG8-41	DSOT01	DSOT01-sp016202585	0	1	1	1	1	0	0	1	0	0	1	1	0
GCA_016202605	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	SG8-41	DSOT01	DSOT01-sp016202605	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_016202615	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	SG8-41	PALSA-1004	PALSA-1004-sp016202615	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_016704635	Bacteria	Proteobacteria	Gamma-proteobacteria	Steroidobacteriales	RPOJ01	RPOJ01	RPOJ01-sp016704635	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA_016705325	Bacteria	Proteobacteria	Gamma-proteobacteria	Steroidobacteriales	RPOJ01	RPOJ01	RPOJ01-sp016705325	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA_016713725	Bacteria	Proteobacteria	Gamma-proteobacteria	Steroidobacteriales	RPOJ01	RPOJ01	RPOJ01-sp016713725	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA_016868105	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	SG8-39	RBG-16-66-20	RBG-16-66-20-sp016868105	0	0	0	0	0	0	0	1	0	0	1	1	0
GCA_018059685	Bacteria	Proteobacteria	Gamma-proteobacteria	Steroidobacteriales	RPOJ01	RPOJ01	RPOJ01-sp018059685	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_018224485	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio B	Thioalkalivibrio B-sp018224485	0	1	1	1	1	0	0	0	0	0	0	1	0
GCA_018241785	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	VBCG01	VBCG01	VBCG01-sp018241785	0	0	0	0	0	0	0	0	0	0	1	1	0
GCA_018971195	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	VBCG01	VBCG01	VBCG01-sp018971195	0	1	1	1	1	0	0	1	0	1	1	1	0
GCA_019136105	Bacteria	Proteobacteria	Gamma-proteobacteria	Steroidobacteriales	RPOJ01	RPOJ01	RPOJ01-sp019136105	0	0	0	0	0	0	0	0	0	0	0	1	0
GCA_902826125	Bacteria	Proteobacteria	Gamma-proteobacteria	Burkholderiales	SG8-39	CADEDU01	CADEDU01-sp002826125	0	1	1	1	1	0	0	1	0	1	1	1	0
GCA_903480235	Bacteria	Proteobacteria	Gamma-proteobacteria	Woeseliales	Woeselaceae	SZUA-117	SZUA-117-sp003480235	0	0	0	0	0	0	0	0	0	0	1	1	0
GCF_000021485	Bacteria	Proteobacteria	Gamma-proteobacteria	Acidithiobacillales	Acidithiobacillaceae	Acidithiobacillus	Acidithiobacillus-ferrooxidans	0	0	0	0	0	0	0	0	0	0	0	1	0
GCF_000021985	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio A	Thioalkalivibrio A-sulfidiphilus	1	1	1	1	1	0	0	1	0	0	0	1	0
GCF_000022545	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio	Thioalkalivibrio-sp000022545	0	1	1	1	1	0	0	1	0	0	0	1	0
GCF_000172575	Bacteria	Proteobacteria	Gamma-proteobacteria	Acidithiobacillales	Acidithiobacillaceae	Acidithiobacillus A	Acidithiobacillus A-caldus	1	1	1	1	1	0	0	0	0	0	0	1	0
GCF_000222005	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Ecotiorhodospiraceae	Ecotiorhodospira	Ecotiorhodospira-sp000222005	0	1	1	1	1	0	0	1	0	0	0	1	0
GCF_000227725	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Ecotiorhodospiraceae	Thiorhodospira	Thiorhodospira-sibirica	0	0	0	0	0	0	0	0	0	0	0	1	0
GCF_000321415	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio B	Thioalkalivibrio B-nitratireduc	0	1	1	1	1	0	0	0	0	0	0	1	0
GCF_000376845	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio	Thioalkalivibrio-sp000376845	0	1	1	1	1	0	0	1	0	0	0	1	0
GCF_000376865	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio	Thioalkalivibrio-sp000376865	1	1	1	1	1	0	0	1	0	0	0	1	0
GCF_000377205	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio	Thioalkalivibrio-sp000377205	0	1	1	1	1	0	0	1	0	0	0	1	0
GCF_000377345	Bacteria	Proteobacteria	Gamma-proteobacteria	Ecotiorhodospirales																

GCF_00038521.1	Bacteria	Proteobacteria	Gamma proteobacteria	Ecotthiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio	Thioalkalivibrio-thiocyanoxidans	0	1	1	1	1	0	0	1	0	0	0	1	0
GCF_00042016.5	Bacteria	Proteobacteria	Gamma proteobacteria	Ecotthiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio	Thioalkalivibrio-sp00042016.5	0	0	0	0	0	0	0	1	0	0	0	1	0
GCF_00042382.1	Bacteria	Proteobacteria	Gamma proteobacteria	Acidithiobacillales	Thermithiobacillaceae	Thermithiobacillus	Thermithiobacillus-terridurans	1	1	1	1	1	0	0	0	0	0	0	1	0
GCF_00063393.3	Bacteria	Proteobacteria	Gamma proteobacteria	Ecotthiorhodospirales	Ecotthiorhodospiraceae	Ecotthiorhodospira	Ecotthiorhodospira-haloalkaliphila	0	1	1	1	1	0	0	0	0	0	0	1	0
GCF_00075409.5	Bacteria	Proteobacteria	Gamma proteobacteria	Ecotthiorhodospirales	Acidithiobacillaceae	Acidithiobacter	Acidithiobacter-prosperus	1	1	1	1	1	0	0	0	0	0	0	1	0
GCF_00139975.3	Bacteria	Proteobacteria	Gamma proteobacteria	Thiohalorhodospirales	Thiohalorhodospiraceae	Thiohalorhodospira	Thiohalorhodospira-denitrificans	1	1	1	1	1	0	0	0	0	0	0	1	0
GCF_00163284.3	Bacteria	Proteobacteria	Gamma proteobacteria	Ecotthiorhodospirales	Ecotthiorhodospiraceae	Ecotthiorhodospira	Ecotthiorhodospira-sp00163284.3	0	1	1	1	1	0	0	0	0	0	0	1	0
GCF_00175316.5	Bacteria	Proteobacteria	Gamma proteobacteria	Ecotthiorhodospirales	Acidithiobacillaceae	Acidithiobacter	Acidithiobacter-neolus	1	1	1	1	1	0	0	0	0	0	0	1	0
GCF_00175324.3	Bacteria	Proteobacteria	Gamma proteobacteria	Ecotthiorhodospirales	Acidithiobacillaceae	Acidithiobacter	Acidithiobacter-vilgamentis	1	1	1	1	1	0	0	0	0	0	0	1	0
GCF_00197572.5	Bacteria	Proteobacteria	Gamma proteobacteria	Ecotthiorhodospirales	Acidithiobacillaceae	Acidithiobacter A	Acidithiobacter A-ferrooxydans	0	0	0	0	0	0	0	0	0	0	0	1	0
GCF_00199525.3	Bacteria	Proteobacteria	Gamma proteobacteria	Ecotthiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio	Thioalkalivibrio-halophilus	0	1	1	1	1	0	0	0	0	0	0	1	0
GCF_00199932.3	Bacteria	Proteobacteria	Gamma proteobacteria	Ecotthiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio	Thioalkalivibrio-versutus	0	1	1	1	1	0	0	0	0	0	0	1	0
GCF_00200096.3	Bacteria	Proteobacteria	Gamma proteobacteria	Ecotthiorhodospirales	Thioalkalivibrionaceae	Thioalkalivibrio A	Thioalkalivibrio A-denitrificans	0	0	0	0	0	0	0	0	0	0	0	1	0
GCF_00207713.3	Bacteria	Proteobacteria	Gamma proteobacteria	Xanthomonadales	Rhodanobacteraceae	Metallobacterium	Metallobacterium-schefferi	0	0	0	0	0	0	0	0	0	0	0	1	0
GCF_00216203.3	Bacteria	Proteobacteria	Gamma proteobacteria	Burkholderiales	Sulfuriferulaceae	Sulfuriferula A	Sulfuriferula A-sp00216203.3	1	1	1	1	1	0	0	0	0	0	0	1	0
GCF_00284750.5	Bacteria	Proteobacteria	Gamma proteobacteria	Acidithiobacillales	Acidithiobacillaceae	Acidithiobacillus	Acidithiobacillus-sp00284750.5	1	1	1	1	1	0	0	0	0	0	0	1	0
GCF_00318426.3	Bacteria	Proteobacteria	Gamma proteobacteria	Acidithiobacillales	Acidithiobacillaceae	Acidithiobacillus	Acidithiobacillus-sp00318426.3	1	1	1	1	1	0	0	0	0	0	0	1	0
GCF_00333331.3	Bacteria	Proteobacteria	Gamma proteobacteria	Acidithiobacillales	Acidithiobacillaceae	Acidithiobacillus	Acidithiobacillus-thiooxydans	1	1	1	1	1	0	0	0	0	0	0	1	0
GCF_00372122.3	Bacteria	Proteobacteria	Gamma proteobacteria	Acidithiobacillales	Acidithiobacillaceae	Acidithiobacillus B	Acidithiobacillus B-sulfuriphilus	1	1	1	1	1	0	0	0	0	0	0	1	0
GCF_00385112.3	Bacteria	Proteobacteria	Gamma proteobacteria	Burkholderiales	Sulfuriferulaceae	Sulfuriferula	Sulfuriferula-multivivans	1	1	1	1	1	0	0	0	0	0	0	1	0
GCF_00386497.3	Bacteria	Proteobacteria	Gamma proteobacteria	Burkholderiales	Sulfuriferulaceae	Sulfuriferula A	Sulfuriferula A-thiophila	1	1	1	1	1	0	0	0	0	0	0	1	0
GCF_00396665.3	Bacteria	Proteobacteria	Gamma proteobacteria	Acidithiobacillales	Acidithiobacillaceae	Acidithiobacillus	Acidithiobacillus-ferriurans	0	0	0	0	0	0	0	0	0	0	0	1	0
GCF_00434668.3	Bacteria	Proteobacteria	Gamma proteobacteria	Burkholderiales	Sulfuriferulaceae A	Sulfuriferula	Sulfuriferula-autotrophica	1	0	1	1	1	0	0	0	0	0	0	1	0

[illegible]

Supplementary Table 2. mRNAseq analysis of *H. denitrificans* *ΔtsdA*, part 1. Genes with lower mRNA abundances in thiosulfate containing medium in comparison to thiosulfate free medium.

Locus tag		Fold	log ₂ _fold		
NCBI	Annotation	change	change	p_value	adj_p_value
Hden_0086	group II truncated hemoglobin	0.34	-1.54	1.36E-15	3.34E-14
Hden_0095	HPF/RaiA family ribosome-associated protein	0.31	-1.68	2.70E-65	1.79E-63
Hden_0096	zinc-dependent alcohol dehydrogenase family protein	0.31	-1.71	1.75E-104	1.56E-102
Hden_0097	flavin reductase family protein	0.32	-1.65	3.84E-44	1.85E-42
Hden_0099	PAS domain-containing protein	0.47	-1.07	7.24E-14	1.60E-12
Hden_0138	hypothetical protein	0.46	-1.12	2.13E-03	9.53E-03
Hden_0432	hypothetical protein	0.35	-1.51	7.50E-02	1.72E-01
Hden_0554	beta-ketoacyl-ACP synthase	0.39	-1.37	8.25E-14	1.81E-12
Hden_0555	beta-ketoacyl-ACP synthase	0.38	-1.39	1.84E-28	6.70E-27
Hden_0556	zinc-binding dehydrogenase	0.37	-1.44	1.58E-36	7.02E-35
Hden_0557	beta-ketoacyl-ACP synthase	0.44	-1.17	9.49E-28	3.38E-26
Hden_0558	beta-ketoacyl-ACP synthase	0.38	-1.39	2.03E-53	1.12E-51
Hden_0559	beta-hydroxyacyl-ACP dehydratase	0.34	-1.54	1.21E-70	8.68E-69
Hden_0560	acyl carrier protein	0.31	-1.70	1.88E-119	1.92E-117
Hden_0561	SDR family oxidoreductase	0.28	-1.82	4.85E-128	5.29E-126
Hden_0562	HAD-IIIc family phosphatase	0.39	-1.36	1.22E-83	9.35E-82
Hden_0567	U32 family peptidase	0.49	-1.02	5.71E-09	8.10E-08
Hden_0568	U32 family peptidase	0.47	-1.08	9.51E-07	9.79E-06
Hden_0570	cyclic nucleotide-binding domain-containing protein	0.39	-1.35	3.58E-44	1.76E-42
Hden_0572	hypothetical protein	0.35	-1.53	5.98E-20	1.73E-18
Hden_0573	4Fe-4S binding protein	0.49	-1.03	2.07E-26	7.21E-25
Hden_0574	cupredoxin domain-containing protein	0.38	-1.38	3.70E-47	1.92E-45
Hden_0575	iron transporter	0.37	-1.44	6.51E-99	5.50E-97
Hden_0576	oxygen-independent coproporphyrinogen III oxidase	0.32	-1.62	1.38E-97	1.13E-95
Hden_0581	cytochrome c	0.36	-1.47	1.69E-18	4.68E-17
Hden_0589	hypothetical protein	0.44	-1.17	1.49E-10	2.47E-09
Hden_0590	NnrS family protein	0.50	-1.01	1.98E-05	1.55E-04
Hden_0591	copper-containing nitrite reductase	0.39	-1.37	1.02E-53	5.92E-52
Hden_0592	host attachment family protein	0.40	-1.31	1.26E-30	4.91E-29
Hden_0595	helix-turn-helix domain-containing protein	0.38	-1.38	2.00E-99	1.73E-97
Hden_0925	MFS transporter	0.40	-1.34	2.23E-59	1.37E-57
Hden_0976	gamma-glutamyl-gamma-aminobutyrate hydrolase family protein	0.44	-1.17	1.44E-39	6.59E-38
Hden_1046	GTP-binding protein	0.16	-2.60	4.68E-289	1.13E-286
Hden_1047	sulfate adenyllyltransferase subunit CysD	0.35	-1.51	1.81E-70	1.25E-68
Hden_1055	hypothetical protein	0.44	-1.19	2.16E-44	1.09E-42
	NADPH-dependent assimilatory sulfite reductase hemoprotein				
Hden_1491	subunit	0.32	-1.63	7.95E-122	8.40E-120
Hden_1773	radical SAM protein	0.50	-1.01	5.37E-13	1.10E-11
Hden_1841	universal stress protein	0.48	-1.06	4.24E-33	1.77E-31
Hden_2047	cytochrome-c oxidase 2C cbb3-type subunit III	0.46	-1.14	1.05E-53	6.03E-52
Hden_2048	cbb3-type cytochrome c oxidase subunit 3	0.43	-1.21	4.63E-41	2.14E-39
Hden_2049	cytochrome-c oxidase 2C cbb3-type subunit II	0.45	-1.14	1.21E-67	8.15E-66
Hden_2050	cytochrome-c oxidase%2C cbb3-type subunit I	0.42	-1.26	3.47E-78	2.61E-76
Hden_2136	DHA2 family efflux MFS transporter permease subunit	0.41	-1.29	1.26E-23	3.97E-22
Hden_2177	Crp/Fnr family transcriptional regulator	0.46	-1.12	1.21E-47	6.37E-46
Hden_2272	membrane protein	0.49	-1.04	9.08E-06	7.75E-05
Hden_2394	lysozyme inhibitor Lprl family protein	0.15	-2.76	5.63E-08	7.02E-07
Hden_2827	ferric reductase-like transmembrane domain-containing protein	0.34	-1.55	5.87E-113	5.66E-111

Supplementary Table 3. mRNAseq analysis of *H. denitrificans* Δ tsdA, part 2. Genes with higher mRNA abundances in thiosulfate containing medium in comparison to thiosulfate free medium

Locus tag		Fold	log ₂ _fold		
NCBI	Annotation	change	change	p_value	adj_p_value
Hden_0441	glycosyltransferase	6.04	2.59	4.91E-03	1.91E-02
Hden_0444	glycosyltransferase family 4 protein	2.09	1.07	6.44E-03	2.40E-02
Hden_0457	hypothetical protein	4.65	2.22	3.21E-06	2.99E-05
Hden_0460	DUF983 domain-containing protein	2.42	1.27	1.97E-21	6.04E-20
Hden_0523	zf-HC2 domain-containing protein	2.61	1.38	7.21E-05	4.99E-04
Hden_0525	catalase family peroxidase	2.24	1.17	8.70E-06	7.46E-05
Hden_0678	hypothetical protein	6.69	2.74	1.58E-13	3.38E-12
Hden_0679	DsbA family protein	8.49	3.09	4.28E-84	3.36E-82
Hden_0680	sulfur transferase domain-containing protein	12.69	3.67	8.60E-243	1.45E-240
Hden_0681	YeeE/YedE family protein	18.94	4.24	0.00E+00	0.00E+00
Hden_0683	radical SAM protein LipS1	16.81	4.07	7.46E-251	1.40E-248
Hden_0684	NAD(P)/FAD-dependent oxidoreductase LipT	17.04	4.09	4.28E-157	5.17E-155
Hden_0685	radical SAM protein LipS2	15.85	3.99	0.00E+00	0.00E+00
Hden_0686	lipoate--protein ligase family protein sLpl(AB)	16.65	4.06	7.66E-319	1.99E-316
Hden_0687	GMP synthase - glutamine amidotransferase domain-like protein LipX	15.98	4.00	1.23E-185	1.89E-183
Hden_0689	sHdrC1	16.09	4.01	0.00E+00	0.00E+00
Hden_0690	sHdrB	17.82	4.16	0.00E+00	0.00E+00
Hden_0691	sHdrA	19.29	4.27	0.00E+00	0.00E+00
Hden_0692	sHdrH	18.64	4.22	5.23E-284	1.18E-281
Hden_0693	sHdrC2	15.79	3.98	2.81E-283	5.93E-281
Hden_0694	sHdrB2	13.34	3.74	0.00E+00	0.00E+00
Hden_0695	sHdrI	10.45	3.39	1.48E-173	2.00E-171
Hden_0696	LbpA2	8.49	3.09	1.81E-224	2.91E-222
Hden_0697	cytochrome P450	7.14	2.84	1.62E-183	2.38E-181
Hden_0698	sulfurtransferase TusA family protein	7.60	2.93	1.86E-166	2.32E-164
Hden_0701	SoxS	6.54	2.71	4.74E-62	3.02E-60
Hden_0702	sulfur oxidation c-type cytochrome SoxX	6.68	2.74	1.21E-156	1.41E-154
Hden_0703	sulfur oxidation c-type cytochrome SoxA	8.85	3.15	3.34E-263	6.63E-261
Hden_0704	thiosulfate oxidation carrier protein SoxY	8.97	3.16	0.00E+00	0.00E+00
Hden_0705	thiosulfate oxidation carrier complex protein SoxZ	8.76	3.13	1.60E-247	2.84E-245
Hden_0706	thiosulfohydrolase SoxB	7.29	2.86	0.00E+00	0.00E+00
Hden_0719	TIGR01244 family sulfur transferase	2.79	1.48	3.31E-42	1.55E-40
Hden_0720	sulfite exporter TauE/SafE family protein	2.59	1.37	9.37E-29	3.52E-27
Hden_0721	MBL fold metallo-hydrolase	2.99	1.58	2.59E-38	1.16E-36
Hden_0722	response regulator transcription factor	4.08	2.03	1.03E-12	2.04E-11
Hden_0723	hypothetical protein	5.31	2.41	1.61E-172	2.09E-170
Hden_0724	substrate-binding domain-containing protein	2.80	1.49	2.09E-15	5.03E-14
Hden_0728	hypothetical protein	2.06	1.04	6.78E-33	2.76E-31
Hden_0729	hypothetical protein	2.68	1.42	6.37E-35	2.76E-33
Hden_0730	NAD(P)H-dependent oxidoreductase	3.99	2.00	6.42E-105	5.86E-103
Hden_0731	peroxiredoxin	2.82	1.49	3.20E-85	2.58E-83
Hden_0732	fatty acid desaturase	4.18	2.06	5.43E-182	7.65E-180
Hden_0733	group 1 truncated hemoglobin	4.53	2.18	1.53E-137	1.72E-135
Hden_0734	2Fe-2S iron-sulfur cluster binding domain-containing protein	4.17	2.06	5.70E-111	5.35E-109
Hden_0735	transcriptional repressor	3.17	1.67	1.19E-53	6.72E-52
Hden_0737	alpha/beta fold hydrolase	3.30	1.72	3.97E-59	2.40E-57
Hden_0738	hypothetical protein	5.98	2.58	2.10E-24	6.83E-23
Hden_0739	flavin reductase family protein	3.25	1.70	5.67E-21	1.69E-19
Hden_0742	SCO family protein	3.85	1.95	2.72E-76	2.00E-74
Hden_0743	selenium-binding protein	7.36	2.88	0.00E+00	0.00E+00
Hden_0748	cell envelope integrity protein TolA	2.03	1.02	3.91E-05	2.85E-04
Hden_0783	PQQ-binding-like beta-propeller repeat protein	2.46	1.30	4.87E-51	2.65E-49
Hden_0784	thiamine pyrophosphate-dependent dehydrogenase E1 component subunit alpha	2.81	1.49	5.40E-50	2.90E-48
Hden_0785	alpha-ketoacid dehydrogenase subunit beta	2.44	1.29	3.49E-61	2.19E-59
Hden_0786	acetoin dehydrogenase dihydrolipoyllysine-residue				
Hden_0786	acetyltransferase subunit	2.33	1.22	4.78E-56	2.84E-54
Hden_0788	thiazole synthase	2.59	1.37	3.40E-06	3.13E-05
Hden_0791	dihydrolipoyl dehydrogenase	2.33	1.22	9.79E-21	2.88E-19
Hden_0792	hypothetical protein	2.30	1.20	1.29E-64	8.40E-63
Hden_0796	methanol/ethanol family PQQ-dependent dehydrogenase	2.12	1.08	6.90E-30	2.62E-28
Hden_0834	YeiH family protein	525.97	9.04	0.00E+00	0.00E+00
Hden_0835	LysR family transcriptional regulator	65.57	6.03	0.00E+00	0.00E+00
Hden_0914	hypothetical protein	6.46	2.69	2.83E-03	1.20E-02

Hden_1114	hypothetical protein	3.08	1.62	1.14E-02	3.84E-02
Hden_1133	Do family serine endopeptidase	2.74	1.45	4.60E-115	4.58E-113
Hden_1509	metal-sensitive transcriptional regulator	2.16	1.11	6.08E-02	1.47E-01
Hden_1967	hypothetical protein	2.72	1.45	3.95E-03	1.59E-02
Hden_2058	isocitrate lyase	2.24	1.17	2.35E-02	6.90E-02
Hden_2164	AraC family transcriptional regulator	2.01	1.01	3.10E-02	8.60E-02
Hden_2373	DUF4118 domain-containing protein	2.26	1.18	3.47E-03	1.42E-02
Hden_2458	hypothetical protein	7.83	2.97	1.25E-02	4.16E-02
Hden_2475	PsiF family protein	3.92	1.97	2.80E-25	9.57E-24
Hden_2542	class I SAM-dependent methyltransferase	4.62	2.21	4.34E-05	3.14E-04
Hden_2565	Spy/CpxP family protein refolding chaperone	2.19	1.13	3.46E-36	1.52E-34
Hden_2684	hypothetical protein	2.33	1.22	1.06E-16	2.70E-15
Hden_2786	hypothetical protein	4.11	2.04	4.69E-28	1.69E-26
Hden_2822	efflux RND transporter periplasmic adaptor subunit	3.69	1.88	2.01E-03	9.02E-03
Hden_2931	potassium-transporting ATPase subunit KdpA	3.76	1.91	2.11E-06	2.03E-05
Hden_2933	potassium-transporting ATPase subunit KdpC	2.10	1.07	3.98E-02	1.05E-01
Hden_2938	formylglycine-generating enzyme family protein	2.14	1.09	9.57E-04	4.77E-03
Hden_2956	hypothetical protein	2.79	1.48	1.57E-02	5.02E-02
Hden_2958	glycoside hydrolase family 108 protein	2.06	1.04	2.02E-02	6.14E-02
Hden_2965	hypothetical protein	2.26	1.18	7.04E-02	1.64E-01
Hden_3023	hypothetical protein	3.14	1.65	4.24E-03	1.69E-02
Hden_3040	hypothetical protein	2.30	1.20	1.04E-11	1.99E-10
Hden_3139	hypothetical protein	3.35	1.74	1.30E-70	9.15E-69
Hden_3465	hypothetical protein	2.18	1.12	8.00E-12	1.54E-10
Hden_R0052		2.48	1.31	6.69E-05	4.66E-04
none_0000	DUF1488 family protein	3.48	1.80	3.67E-25	1.24E-23

Supplementary Table 4. Strains, primers and plasmids

Strains primers or plasmids	Relevant genotype, description or sequence	Reference or source
Strains		
<i>Escherichia coli</i> 10-beta	$\Delta(\text{ara-leu})$ 7697 <i>araD</i> 139 <i>fhuA</i> ΔlacX74 <i>galK</i> 16 <i>galE</i> 15 <i>e14-</i> ϕ 80 <i>dlacZ</i> Δ M15 <i>recA</i> 1 <i>relA</i> 1 <i>endA</i> 1 <i>nupG</i> <i>rpsL</i> (Str ^R) <i>rph</i> <i>spoT</i> 1 $\Delta(\text{mrr-hsdRMS-mcrBC})$	New England Biolabs
<i>E. coli</i> BL21 DE3	<i>B dcm ompT hsdS</i> (<i>r_B m_B</i>) <i>gal</i>	Novagen
<i>Hyphomicrobium denitrificans</i> ΔtsdA	Sm ^r , in-frame deletion of <i>tsdA</i> in <i>H. denitrificans</i> Sm200	3
<i>H. denitrificans</i> $\Delta\text{tsdA} \Delta\text{shdrR}$	Sm ^R , in-frame deletion of <i>shdrR</i> (Hden_0682) in <i>H. denitrificans</i> ΔtsdA	4
<i>H. denitrificans</i> $\Delta\text{tsdA} \Delta\text{soxR}$	Sm ^R , deletion of <i>soxR</i> (Hden_0700) in <i>H. denitrificans</i> ΔtsdA	5
<i>H. denitrificans</i> $\Delta\text{tsdA} \Delta\text{soxT1B}$	Sm ^R , in-frame deletion of <i>soxT1B</i> (Hden_0699) in <i>H. denitrificans</i> ΔtsdA	This work
<i>Hyphomicrobium denitrificans</i> ΔtsdA <i>soxT1Bcomp</i>	Sm ^R , cis complementation of <i>H. denitrificans</i> $\Delta\text{tsdA} \Delta\text{soxT1B}$ with <i>soxT1B</i>	This work
<i>H. denitrificans</i> ΔtsdA <i>soxT1B-Cys</i> ²⁴ <i>Ser</i>	Exchange of SoxT1B-Cys ²⁴ to Ser in <i>H. denitrificans</i> ΔtsdA	This work
<i>H. denitrificans</i> ΔtsdA <i>soxT1B-Cys</i> ⁹⁸ <i>Ser</i>	Exchange of SoxT1B-Cys ⁹⁸ to Ser in <i>H. denitrificans</i> ΔtsdA	This work
<i>H. denitrificans</i> ΔtsdA <i>soxT1B-Cys</i> ³⁰⁴ <i>Ser</i>	Exchange of SoxT1B-Cys ³⁰⁴ to Ser in <i>H. denitrificans</i> ΔtsdA	This work
<i>H. denitrificans</i> $\Delta\text{tsdA} \Delta\text{soxT1B} \Delta\text{soxR}$	Sm ^R , simultaneous deletion of <i>soxR</i> (Hden_0700) and <i>soxT1B</i> (Hden_0699) in <i>H. denitrificans</i> ΔtsdA	This work
<i>H. denitrificans</i> $\Delta\text{tsdA} \Delta\text{soxT1B} \Delta\text{shdrR}$	Sm ^R , simultaneous deletion of <i>shdrR</i> (Hden_0682) and <i>soxT1B</i> (Hden_0699) in <i>H. denitrificans</i> ΔtsdA	This work
<i>H. denitrificans</i> $\Delta\text{tsdA} \Delta\text{soxT1A}$	Sm ^R , in-frame deletion of <i>soxT1A</i> (Hden_0681) in <i>H. denitrificans</i> ΔtsdA	This work
<i>H. denitrificans</i> $\Delta\text{tsdA} \Delta\text{soxT1A} \Delta\text{soxR}$	Sm ^R , deletion of <i>soxR</i> in <i>H. denitrificans</i> $\Delta\text{tsdA} \Delta\text{soxT1A}$	This work
<i>H. denitrificans</i> $\Delta\text{tsdA} \Delta\text{soxT1A} \Delta\text{shdrR}$	Sm ^R , deletion of <i>shdrR</i> in <i>H. denitrificans</i> $\Delta\text{tsdA} \Delta\text{soxT1A}$	This work
Primers		
SoxT1B_Del_Up_Fw	AATAT CTAG ACGAGCGATCGCCATCGCGAG (XbaI)	This work
SoxT1B_Del_Up_Rev	CGCCCGCATGCCAATCAGCTGATCATCGGAATTCGCTCTCT	This work
SoxT1B_Del_Down_Fw	AGAGAGCGATTCCGATGATCAGCTGATTGGCATGCGGGCG	This work
SoxT1B_Del_Down_Rev	ATCT CTGCAG TTCGAACCTGGACGCCGCG (PstI)	This work
SoxT1A_del_Up_Fw	GTGGT CTAG ATGTTCAAGCTCCTCGACAAG (XbaI)	This work
SoxT1A_del_Up_Rev	GCCGCCTGTCGTCTTAAATCCGCATTTCGCCCCCGTCT	This work
SoxT1A_del_Down_Fw	AGACGGGGCGGGAAATGCGGATTTAAGAACGACAGGCGGC	This work
SoxT1A_del_Down_Rev	GTGGG TCGAC CTTTCTGGTCCATCAATGC (Sall)	This work
SoxT1B_C24S_Up_Rev	GGCGCCGCCGCCGCTACGGACATCTCTCCTCCATGGGAG	This work
SoxT1B_C24S_Down_Fw	CTCCCATGGAGGAGAGATGTCCGTAGCGGGCGGCGGCGC C	This work
SoxT1B_C98S_Up_rev	GGCACATCCAGCTTCGGGTTGCTCGTGCGCCTC	This work
SoxT1B_C98S_Down_Fw	GAGGCGCACGAGCAACCCGAAGCTGGATGTGCC	This work
SoxT1B_C304S_Up_rev	AAGGGCTCCACCATCGGCCAAGGCATGAGCGCCGGC	This work
SoxT1B_C304S_Down_Fw	GCCGGCGCTCATGCCTTGCCGATGGTGGAGCCCTT	This work
P1 fwd up hden_0700	TATA CTGCAG GATCAAGGACGTGGTGGCG (PstI)	5
P5 fwd down hden_soxR/soxT1B	CCAGGGATAGGAATGTCAGCTGATTGGCATGCGGGC	This work
P6 rev down hden_soxR/soxT1B	TTGCT CTAG ATCCGGCGCGACGATCGATG (XbaI)	This work
P7 rev up hden_soxR/soxT1B	GCCCGCATGCCAATCAGCTGACATTCCTATCCCTCGG	This work
rpoB-denitf	AGGACGTGTTCACTCGATT	6
rpoB-denitr	CGGCTTCGTCAAGGTTCTTC	6
SoxT1A_0681_qPCR-Fr	CCCAGTGATACGATTGCA	5
SoxT1A_0681_qPCR-Rev	CTAAATGCCGCCGGTGATG	5
sHdrA_qPCR-Fr	CCGATCACCATTCCGTTTCA	5
sHdrA_qPCR-Rev	CAATTGTTTCCGGGCCGATC	5
SoxXA_qPCR-Fr	CGGCGCTCATTACCTATCTC	5
SoxXA_qPCR-Rev	TCGGGGTGCTTTTTCAGTC	5
SoxT1B (0699)_qPCR-Fr	GCCGCCGTCTCAGTAAATAA	5
SoxT1B (0699)_qPCR-Rev	AGCAGAAGACGGCAGATGAT	5

Plasmids

pHP45Ω-Tc	Ap ^r , Tc ^r	7
pk18 <i>mobsacB</i>	Km ^r , Mob ⁺ , <i>sacB</i> , <i>oriV</i> , <i>oriT</i> , <i>lacZα</i>	8
pk18 <i>mobsacB</i> -Tc	Km ^r , Tc ^r pHP45Ω-Tc tetracycline cassette inserted into <i>pk18mobsacB</i> using <i>Sma</i> I	4
pk18 <i>mobsacB</i> Δ <i>tsdA</i> Tc	Km ^r , Tc ^r , 2.01 kb fragment implementing deletion of a 996 bp <i>tsdA</i> fragment in <i>pk18mobsacB</i> with additional tetracycline resistance	3
pk18 <i>mobsacB</i> -Δ <i>soxT1A</i>	Km ^r , 2.07 kb SOE PCR fragment implementing <i>in-frame</i> deletion of nucleotides encoding amino acids 3 to 361 of SoxT1A cloned into <i>Xba</i> I and <i>Sal</i> I of <i>pk18mobsacB</i>	This work
pk18 <i>mobsacB</i> -Δ <i>soxT1A</i> -Tc	Km ^r , Tc ^r , <i>pk18mobsacB</i> -Δ <i>soxT1A</i> with tetracycline resistance gene from pHP45Ω cloned into <i>Sma</i> I site	This work
pk18 <i>mobsacB</i> -Δ <i>soxT1B</i>	Km ^r , 2.07 kb SOE PCR fragment implementing <i>in-frame</i> deletion of nucleotides encoding amino acids 3 to 350 of SoxT1B cloned into <i>Xba</i> I and <i>Pst</i> I of <i>pk18mobsacB</i>	This work
pk18 <i>mobsacB</i> -Δ <i>soxT1B</i> -Tc	Km ^r , Tc ^r , pHP45Ω-Tc tetracycline cassette inserted into <i>pk18mobsacB</i> -Δ <i>soxT1B</i> using <i>Sma</i> I	This work
pk18 <i>mobsacB</i> - <i>soxT1B</i> <i>comp</i> -Tc	Km ^r , Tc ^r , SOE PCR fragment implementing chromosomal integration of <i>soxT1B</i> cloned into <i>pk18mobsacB</i> -Tc using <i>Xba</i> I and <i>Pst</i> I restriction sites	This work
pk18 <i>mobsacB</i> - <i>soxT1B</i> -C24S-Tc	Km ^r , Tc ^r , SOE PCR fragment implementing chromosomal integration of <i>soxT1B</i> encoding a Cys ²⁴ Ser exchange cloned into <i>pk18mobsacB</i> -Tc using <i>Xba</i> I and <i>Pst</i> I restriction sites	This work
pk18 <i>mobsacB</i> - <i>soxT1B</i> -C98S-Tc	Km ^r , Tc ^r , SOE PCR fragment implementing chromosomal integration of <i>soxT1B</i> encoding a Cys ⁹⁸ Ser exchange cloned into <i>pk18mobsacB</i> -Tc using <i>Xba</i> I and <i>Pst</i> I restriction sites	This work
pk18 <i>mobsacB</i> - <i>soxT1B</i> -C304S-Tc	Km ^r , Tc ^r , SOE PCR fragment implementing chromosomal integration of <i>soxT1B</i> encoding a Cys ³⁰⁴ Ser exchange cloned into <i>pk18mobsacB</i> -Tc using <i>Xba</i> I and <i>Pst</i> I restriction sites	This work
pk18 <i>mobsacB</i> _Tc_Δ <i>soxR</i> (Hden0700)	Km ^r , Tc ^r , 1.04 kb SOE PCR fragment implementing deletion of nucleotides 4 to 362 of <i>soxR</i> to cloned into <i>pk18mobsacB</i> -Tc using <i>Xba</i> I and <i>Pst</i> I restriction sites	5
pk18 <i>mobsacB</i> Δ <i>shdR</i> -Tc	Km ^r , Tc ^r , 2.2 kb <i>Bam</i> HI/ <i>Xba</i> I fragment of PCR-amplified genome region around <i>shdR</i> with deletion of <i>shdR</i> cloned into <i>Bam</i> HI/ <i>Xba</i> I of <i>pk18mobsacB</i>	4
pk18 <i>mobsacB</i> _Tc_Δ <i>soxR</i> / <i>soxT1B</i>	Km ^r , Tc ^r , 1.04 kb SOE PCR fragment implementing deletion of nucleotides 4 to of SoxR to nucleotide 1050 of <i>soxT1B</i> cloned into <i>pk18mobsacB</i> -Tc using <i>Xba</i> I and <i>Pst</i> I restriction sites	This work

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