

Table S1- Sixteen most cosmopolitan tags and sixteen most abundant tags for extinct sulfides in this study. GAST classification and the closest BlastN hits in the NCBI database are given, followed by the samples on which the OTU was recovered and potential ecological role for the tags where all members of that bacterial group perform a defined role.

VAMPS Taxonomy	# Tags in OTU	Closest BlastN Hits (% Identity)	3M23	3M33	7M24	9M32	9M4O	9M4I	9M4S	Potential Ecological Function
Most Cosmopolitan										
Bacteroidetes: Flavobacteria: Flavobacteriales	14994	FS396, extinct sulfide chimney clones (100)	X	X	X	X	X	X	X	
Proteobacteria: γ -proteobacteria	10009	Mariana Trough sulfide deposit clones (100)	X	X	X	X	X	X	X	
Proteobacteria: β -proteobacteria: Burkholderiales: Burkholderiaceae: Ralstonia	127	multiple <i>Ralstonia</i> spp. (100)	X	X	X	X	X	X	X	
Proteobacteria: α -proteobacteria: Rhodobacterales: Rhodobacteraceae	5659	sediment clones (96)		X	X	X	X	X	X	
Proteobacteria: γ -proteobacteria: Xanthomonadales: Xanthomonadaceae	4133	Mariana Trough sulfide deposit clones (98)	X	X	X	X	X		X	
Proteobacteria	2682	many clones (100)	X	X	X	X	X	X		
Proteobacteria: α -proteobacteria	2000	Lau Basin and Mariana Trough hydrothermal precipitates	X	X	X	X	X	X		
Proteobacteria	1789	many clones (100)	X	X	X	X	X		X	
Proteobacteria: γ -proteobacteria: Methylococcales: Methylococcaceae	1325	many Methylococcales (100)	X	X	X	X	X	X		C1 metabolizer
Proteobacteria: α -proteobacteria: Rhizobiales: Phyllobacteriaceae	1216	clones from Lau Basin and Vailulu'u Seamount (100)	X	X	X	X	X		X	
Bacteroidetes: Flavobacteria: Flavobacteriales	1135	none	X	X		X	X	X	X	
Proteobacteria: α -proteobacteria: Rhodobacterales: Rhodobacteraceae: Ahrensia	335	hydrothermal vent clones (100)	X	X	X	X	X	X		
Proteobacteria: γ -proteobacteria	247	many γ -proteobacteria clones (98)	X	X		X	X	X	X	
Proteobacteria: γ -proteobacteria	179	many γ -proteobacteria clones (100)		X	X	X	X	X	X	
Proteobacteria: β -proteobacteria: Burkholderiales:	67	<i>Acidovorax</i> and <i>Comomonas</i> spp. (100)	X		X	X	X	X	X	

Comamonadaceae

Proteobacteria: γ -proteobacteria	41	multiple sediment and symbiont γ -proteobacteria clones (100)	X	X	X	X	X	X	
Most Abundant									
Bacteroidetes: Flavobacteria: Flavobacteriales	14994	FS396, extinct sulfide chimney clones (100)	X	X	X	X	X	X	X
Proteobacteria: γ -proteobacteria: Chromatiales: Ectothiorhodospiraceae	14862	Mariana Trough inactive sulfide deposit clone (98)					X	X	X chemolithoautotrophic S-oxidizer
Proteobacteria: γ -proteobacteria	10009	Mariana Trough sulfide deposit clones (100)	X	X	X	X	X	X	X
Proteobacteria: γ -proteobacteria	8484	many γ -proteobacteria clones (100)	X	X	X	X			
Proteobacteria: δ -proteobacteria: Desulfobacterales: Desulfobulbaceae: Desulfobulbus	7067	Mariana Trough inactive sulfide deposit clone (100)		X			X	X	sulfate reducer
Proteobacteria: β -proteobacteria	6617	many β -proteobacteria clones (96)			X	X	X	X	
Proteobacteria: α -proteobacteria: Rhodobacterales: Rhodobacteraceae	5659	sediment clones (96)		X	X	X	X	X	X
Proteobacteria: α -proteobacteria: Rhodobacterales: Rhodobacteraceae	5197	hydrothermal vent and seafloor basalt clones (100)	X	X	X	X			
Proteobacteria: γ -proteobacteria: Xanthomonadales: Xanthomonadaceae	4133	Mariana Trough sulfide deposit clones (98)	X	X	X	X	X		X
Proteobacteria: δ -proteobacteria: Desulfobacterales: Desulfobulbaceae: Desulfocapsa	3863	many δ -proteobacteria clones (100)	X	X	X		X		sulfate reducer
Bacteroidetes	3457	inactive and low temperature hydrothermal sulfide clones (100)		X		X	X	X	X
Proteobacteria: α -proteobacteria: Rhodobacterales: Rhodobacteraceae	3563	Mariana Trough and Tonga Arc sulfide deposit clones (100)	X	X	X		X		
Proteobacteria: γ -proteobacteria: Chromatiales: Ectothiorhodospiraceae	2818	Mariana Trough seafloor massive sulfide deposit clone (100)		X			X	X	X chemolithoautotrophic S-oxidizer

Proteobacteria: α -proteobacteria: Rhodobacterales: Rhodobacteraceae	2811	hydrothermal vent clones (only 4 matches total, all 100% identity)	X	X	X		X	X	
	2682								
Proteobacteria Proteobacteria: δ -proteobacteria: Desulfobacterales: Desulfobulbaceae: Desulfocapsa	2307	many clones (100) hydrothermal vent clones (100)	X	X	X	X	X	X	sulfate reducer