

Supplementary Tables

Table S1. GenBank accession numbers and RDP¹ sequence identifiers (locus) for 16S rRNA gene sequences of reference species used in the phylogenetic tree calculations of Figure 1A.

Species	Strain	GenBank Acc. No.	RDP Sequence Identifier
<i>Desulfobacterium corrodens</i>	IS4	AY274450	S000405328
<i>Desulfobulbus alkaliphilus</i>	APS1	HM750216	S002232697
<i>Desulfobulbus elongatus</i>	DSM 2908	X95180	S000126615
<i>Desulfobulbus japonicus</i>	DSM 18378	AB110550	S000469517
<i>Desulfobulbus japonicus</i>	DSM 18378	AB110549	S000469516
<i>Desulfobulbus mediterraneus</i>	86FS1	AF354663	S000392134
<i>Desulfobulbus mediterraneus</i>	NA62	AJ866934	S000570998
<i>Desulfobulbus propionicus</i>	DSM 2032	AY548789	S000485873
<i>Desulfobulbus propionicus</i>	DSM 2032	CP002364	S004065689
<i>Desulfobulbus propionicus</i>	DSM 2032	CP002364	S004065690
<i>Desulfobulbus rhabdoformis</i>	M16	U12253	S000437114
<i>Desulfobulbus rhabdoformis</i>	Mic13c08	AB546247	S002165016
<i>Desulfobulbus rhabdoformis</i>	Mic5c02	AB546248	S002165017
<i>Desulfocapsa sulfexigens</i>	DSM 10523	CP003985	S004066753
<i>Desulfocapsa sulfexigens</i>	DSM 10523	CP003985	S004066754
<i>Desulfocapsa sulfexigens</i>	DSM 10523	CP003985	S004066755
<i>Desulfocapsa sulfexigens</i>	SB164P1	Y13672	S000130725
<i>Desulfocapsa thiozymogenes</i>	DSM 7269	X95181	S000128257
<i>Desulfofustis glycolicus</i>	PerGlyS	X99707	S000381437
<i>Desulfopila aestuarii</i>	MSL86	AB110542	S000469515
<i>Desulforhopalus singaporensis</i>	S'pore T1	AF118453	S000429262
<i>Desulforhopalus vacuolatus</i>	ltk10	L42613	S000435986
<i>Desulfotalea arctica</i>	LSv514	AF099061	S000428874
<i>Desulfotalea psychrophila</i>	LSv54	AF099062	S000428875
<i>Desulfotalea psychrophila</i>	LSv54	CR522870	S002287357
<i>Desulfotalea psychrophila</i>	LSv54	CR522870	S002287793
<i>Desulfotalea psychrophila</i>	LSv54	CR522870	S002288923
<i>Desulfotalea psychrophila</i>	LSv54	CR522870	S002289484
<i>Desulfotalea psychrophila</i>	LSv54	CR522870	S002290733
<i>Desulfotalea psychrophila</i>	LSv54	CR522870	S002291210
<i>Desulfotalea psychrophila</i>	LSv54	CR522870	S004067690
<i>Desulfovibrio marinus</i>	E-2	DQ365924	S000649379
<i>Desulfurivibrio alkaliphilus</i>	AHT2	EF422413	S000824852
<i>Desulfurivibrio alkaliphilus</i>	AHT2	CP001940	S002290083
<i>Desulfurivibrio alkaliphilus</i>	AHT2	CP001940	S004063855
Delta proteobacterium	MLMS-1	AY459365	S000358719

¹ Ribosomal Database Project

Table S2. Metadata of DsrAB sequences used for reconstructing the phylogeny of cable bacteria and closely related *Desulfobulbus* species. DsrAB sequences of *D. elongatus*, *D. japonicus*, and *D. mediterraneus* were retrieved from the Integrated Microbial Genomes (IMG) database (V.M. Markowitz, I.-M.A. Chen, K. Palaniappan, K. Chu, E. Szeto, Y. Grechkin, A. Ratner, B. Jacob, J. Huang, P. Williams, M. Huntemann, I. Anderson, K. Mavromatis, N.N. Ivanova, N.C. Kyrpides, IMG; the integrated microbial genomes database and comparative analysis system, Nucleic Acids Res., 40 (2012) D115-D122.) and are shown with the corresponding IMG gene id's (marked with asterisks). Abbreviation: aa, amino acids.

Cable filament/species	Used for			DsrA			DsrB		
	DsrAB tree topology calculation	Accession number (Locus tag)	Length [aa]	Comment	Accession number (Locus tag)	Length [aa]	Comment		
" <i>Candidatus</i> Electrothrix communis A1"	No	-	-	missing	KU844004	379	full length		
" <i>Candidatus</i> Electrothrix marina A2"	Yes	KU844005	426	full length	KU844006	362	missing middle fragment		
" <i>Candidatus</i> Electrothrix marina A3"	No	KU844007	329	N- and C- termini incomplete	KU844008	264	N- and C- termini incomplete		
" <i>Candidatus</i> Electrothrix marina A5"	Yes	KU844009	409	N- and C- termini incomplete	KU844010	379	full length		
" <i>Candidatus</i> Electrothrix aarhusiensis MCF"	Yes	KU844014	426	full length	KU844015	379	full length		
" <i>Candidatus</i> Electronema nielsenii F1"	No	-	-	missing	-	-	missing		
" <i>Candidatus</i> Electronema palustris F3"	No	-	-	missing	KU844011	196	C- terminus incomplete		
" <i>Candidatus</i> Electronema palustris F4"	Yes	KU844012	426	full length	KU844013	379	full length		
" <i>Candidatus</i> Electronema nielsenii F5"	No	-	-	missing	-	-	missing		
" <i>Candidatus</i> Electrothrix communis N2"	No	KU844016	329	N- terminus incomplete	KU844017	379	full length		
" <i>Candidatus</i> Electrothrix communis N3"	No	-	-	missing	KU844018	379	full length		
" <i>Candidatus</i> Electrothrix japonica TB"	Yes	KU844019	426	full length	KU844020	379	full length		
" <i>Candidatus</i> Electrothrix communis US1"	Yes	KU844021	426	full length	KU844022	379	full length		
" <i>Candidatus</i> Electrothrix communis US2"	No	KU844023	246	C- terminus incomplete	KU844024	354	N- terminus incomplete		
" <i>Candidatus</i> Electrothrix communis US4"	Yes	KU844025	426	full length	KU844026	379	full length		
" <i>Candidatus</i> Electrothrix communis US5"	Yes	KU844027	409	N- terminus incomplete	KU844028	379	full length		
<i>Desulfobulbus propionicus</i>	Yes	CP002364, Despr_2940	426	full length	CP002364, Despr_2941	379	full length		
<i>Desulfobulbus rhabdoformis</i>	Yes	AJ250473	379	N- terminus incomplete	AJ250473	379	full length		
<i>Desulfobulbus elongatus</i>	Yes	2558014283*	428	full length	2558014284*	379	full length		
<i>Desulfobulbus japonicus</i>	Yes	2525724744*	428	full length	2525724745*	379	full length		
<i>Desulfobulbus mediterraneus</i>	Yes	2523914993*	428	full length	2523914992*	379	full length		

Table S3. GenBank-, VAMPS- and SRA accession numbers and read names of 16S rRNA gene sequences classified as cable bacteria as shown in Figure 3.

Classified to	Accession number or read name	
" <i>Candidatus</i> Electrothrix marina"	JX091065	
	JX091056	
	JX091026	
	KP265606	
	SRR1237828.8534	
	SRR1237828.19412	
	SRR1239351.13008	
	SRR1239351.19032	
	SRR1239352.6071	
	SRP001224.FjaYyyyy	
	SRP001224.FjeYyyyy.1	
	" <i>Candidatus</i> Electrothrix aarhusiensis"	KJ562791
		KJ562774
HG004404		
KCK_LSM_Bv6.FYDYyyyy		
SRP018043.Sr0SRR66		
SRP018043.Sr0SRR67		
SRP018043.Sr0SRR68		
SRP018043.Sr0SRR69		
SRP018043.Sr0SRR10		
SRP018043.Sr0SRR12		
SRP018043.Sr0SRR13		
SRP018043.Sr0SRR16		
SRP018043.Sr0SRR17		
SRP001224.FjjYyyyy		
SRP001224.FjfYyyyy		
SRP001224.FjkYyyyy		
SRP001224.FjvYyyyy		
SRP001224.FcxYyyyy		
SRP001224.FjuYyyyy		
SRP001224.FjpYyyyy		
SRP048832.FqpYyyyy		
SRP001219.FhkYyyyy		
" <i>Candidatus</i> Electrothrix japonica"	KJ562804	
	KJ562801	
	KJ562800	
	KJ562733	
	KP265514	
	JX091073	
	JX091064	
	JX091057	
	HG004406	
	HG004418	
	GQ249497	
	JF268345	
	JF268368	
	JF268348	
	SRR1055216.453	

Table S3. continued

"*Candidatus Electrothrix japonica*", continued

SRR1055216.9384
SRR1055237.683
SRR1145124.379
SRR1145124.1380
SRR1145124.1597
SRR1145124.1994
SRR1145124.2329
SRR1145124.2432
SRR1145124.2548
SRR1145124.2901
SRR1145124.2966
SRR1145124.3860
SRR1145124.4182
SRR1145124.4418
SRR1145124.4529
SRR1145631.3034
SRP018043.Sr0SRR18
SRP001224.FjiYyyyy
SRP001224.FjcYyyyy
SRP001224.FcqYyyyy
SRP001224.FdjYyyyy
SRP001224.FjxYyyyy
SRP001224.FijYyyyy
SRP001224.FiyYyyyy
SRP001224.FwfYyyyy
SRP001224.FddYyyyy.1
SRP001224.FyeYyyyy
SRP048832.FffYyyyy
SRP048832.FfkYyyyy
SRP048832.FmhYyyyy

"*Candidatus Electrothrix communis*"

KJ562789
KJ562741
KJ021898
KJ021897
KJ021896
KJ021895
KJ021894
JX091070
JX091067
JX091062
JX091054
JX091052
JX091041
JX091028
JX091025
HG004415
HG004414
HG004413
HG004412
HG004411
HG004410
HG004409
HG004408

Table S3. continued

"*Candidatus Electrothrix communis*", continued

HG004407
HG004405
HG004425
HG004420
HG004419
HG004417
HG004416
SRR1055238.1736
SRR1055238.1755
SRR1055238.1979
SRR1055238.2280
SRR1055238.2338
SRR1303666.24062
SRR1303671.20531
SRR2002304.32048
SRR2002305.54802
SRR2002309.44990
SRP018043.Sr0SRR65
SRP018043.Sr0SRR63
SRP001224.FcyYyyyy

"*Candidatus Electronema palustris*"

KJ562812
FQ658891
FQ658831
GU208270
SRR1303674.28921
SRR1303689.2257

Unclassified¹

KF771007
JX091072
JX091071
JX091053
SRP001219.FhpYyyyy
JX091066
JX091061
JX091048
JX091047
JX091046
SRR1237828.11267
SRR1237828.13162
SRR1239351.12358
SRP001224.FjwYyyyy
KF771006
KJ021903
JF268391
GU302481
GU302491
AJ535251
KF741578
KC682614
FJ264759
AJ535236
AF420335
GQ356972
AM176869

Table S3. continued

Unclassified¹, continued

AM745164
FJ264778
FN554128
AM745147
KF616777
KF616785
FN554120
FJ813528
AB013265
AM745212
FR852964
AM745158
GQ357024
AF354166
AM745146
JN256011
KF616796
KF616762
GU369890
FM179901
FJ905682
KF440309
GU369922
JN662193
AY542555
AB806709
AB188784
FN396704
FN396626
JN662051
FN396640
FN396662
AB100011

¹ not assigned to one of the candidate species but within the cable-bacteria group

Table S4. Nucleotide identities (upper right triangle) and corresponding nucleotide alignment lengths (lower left triangle) of *dsrAB* genes of cable bacteria and closely related *Desulfobulbus* species. Cable bacteria of the same species are color coded: “*Candidatus Electrothrix communis*”, violet; “*Candidatus Electrothrix marina*”, blue; “*Candidatus Electronema palustris*”, green. Abbreviation: bp, base pairs.

	Nucleotide identity																		
	" <i>Candidatus Electrothrix communis</i> A1"	" <i>Candidatus Electrothrix communis</i> N2"	" <i>Candidatus Electrothrix communis</i> N3"	" <i>Candidatus Electrothrix communis</i> USS"	" <i>Candidatus Electrothrix communis</i> US1"	" <i>Candidatus Electrothrix communis</i> US2"	" <i>Candidatus Electrothrix communis</i> US4"	" <i>Candidatus Electrothrix communis</i> MCF"	" <i>Candidatus Electrothrix japonica</i> TB"	" <i>Candidatus Electrothrix marina</i> A2"	" <i>Candidatus Electrothrix marina</i> A3"	" <i>Candidatus Electrothrix palustris</i> F3"	" <i>Candidatus Electronema palustris</i> F4"	" <i>Desulfobulbus elongatus</i> japonicus"	" <i>Desulfobulbus Desulfobulbus mediterraneus</i> "				
" <i>Candidatus Electrothrix communis</i> A1"	*	1,000	1,000	1,000	1,000	1,000	1,000	0.914	0.875	0.895	0.896	0.893	0.758	0.774	0.755	0.763	0.756	0.775	
" <i>Candidatus Electrothrix communis</i> N2"	1,137	*	1,000	1,000	1,000	1,000	1,000	0.922	0.881	0.898	0.900	0.901	0.758	0.791	0.770	0.770	0.771	0.786	
" <i>Candidatus Electrothrix communis</i> N3"	1,137	1,137	*	1,000	1,000	1,000	1,000	0.914	0.875	0.895	0.896	0.893	0.758	0.774	0.755	0.763	0.756	0.775	
" <i>Candidatus Electrothrix communis</i> USS"	1,137	2,124	1,137	*	1,000	1,000	1,000	0.924	0.884	0.901	0.904	0.901	0.758	0.794	0.772	0.772	0.775	0.790	
" <i>Candidatus Electrothrix communis</i> US1"	1,137	2,124	1,137	2,364	*	1,000	1,000	0.924	0.886	0.902	0.904	0.901	0.758	0.796	0.774	0.774	0.777	0.792	
" <i>Candidatus Electrothrix communis</i> US2"	1,062	1,509	1,062	1,749	1,800	*	1,000	0.920	0.884	0.904	0.906	0.902	0.755	0.798	0.774	0.778	0.776	0.798	
" <i>Candidatus Electrothrix communis</i> US4"	1,137	2,124	1,137	2,364	2,415	1,800	*	0.924	0.886	0.902	0.904	0.901	0.758	0.796	0.774	0.774	0.777	0.792	
" <i>Candidatus Electrothrix aarhusiensis</i> MCF"	1,137	2,124	1,137	2,364	2,415	1,800	2,415	*	0.894	0.918	0.919	0.913	0.802	0.779	0.774	0.774	0.778	0.787	
" <i>Candidatus Electrothrix japonica</i> TB"	1,137	2,124	1,137	2,364	2,415	1,800	2,415	*	0.885	0.886	0.886	0.886	0.769	0.791	0.768	0.765	0.775	0.789	
" <i>Candidatus Electrothrix marina</i> A2"	1,086	2,073	1,086	2,313	2,364	1,749	2,364	2,364	2,364	*	0.997	0.996	0.811	0.816	0.786	0.778	0.771	0.789	
" <i>Candidatus Electrothrix marina</i> A5"	1,137	2,124	1,137	2,364	2,364	1,749	2,364	2,364	2,364	2,313	*	0.999	0.808	0.815	0.787	0.778	0.772	0.789	
" <i>Candidatus Electrothrix marina</i> A3"	792	1,779	792	1,779	1,779	1,236	1,779	1,779	1,779	1,734	*	0.802	0.813	0.794	0.788	0.781	0.795	0.795	
" <i>Candidatus Electronema palustris</i> F3"	588	588	588	588	588	210	588	588	588	588	342	*	1,000	0.732	0.758	0.702	0.736	0.736	
" <i>Candidatus Electronema palustris</i> F4"	1,137	2,124	1,137	2,364	2,415	1,800	2,415	2,415	2,415	2,364	1,779	588	*	0.783	0.788	0.736	0.767	0.767	
<i>Desulfobulbus propionicus</i>	1,137	1	1,137	2,364	2,415	1,800	2,415	2,415	2,415	2,364	1,779	588	2,415	*	0.870	0.793	0.827	0.827	
<i>Desulfobulbus elongatus</i>	1,137	2,124	1,137	2,364	2,415	1,800	2,415	2,415	2,415	2,364	1,779	588	2,415	*	0.870	0.793	0.817	0.817	
<i>Desulfobulbus japonicus</i>	1,137	2,124	1,137	2,364	2,415	1,800	2,415	2,415	2,415	2,364	1,779	588	2,415	*	0.822	0.822	0.822	0.822	
<i>Desulfobulbus mediterraneus</i>	1,137	2,124	1,137	2,364	2,415	1,800	2,415	2,415	2,415	2,364	1,779	588	2,415	2,421	2,421	2,421	2,421	*	*

Supplementary Figures

Figure S1. Phase contrast image of the single cable bacterium displayed in Figure 2E (insert) as proof of the different cell diameters within the same filament. At the two ends, the width changes distinctly, from 4 μm to 8 μm . The filament was extracted from Aarhus Bay marine sediment, with a total length exceeding 1.5 cm. Scale bar, 10 μm .

