

Supporting Information

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SI Materials and Methods

GeneChip-Based Studies of *M. smithii*. This custom GeneChip was also used for whole genome transcriptional profiling of the type strain. Cells were grown at 37 °C, with or without agitation (100 rpm), in 125-mL serum bottles containing 15 mL of supplemented MBC medium (7) under an atmosphere of H₂ and CO₂ (4:1) that was replenished every 6 h, and harvested during the log or stationary phase (log phase: OD₆₀₀ of 1.10 and 0.36 for agitated and static cultures, respectively; stationary phase: OD₆₀₀ of 3.14 and 0.57, respectively). RNA was isolated, and cDNAs were prepared and then hybridized to GeneChips as described previously (7) ($n = 9\text{--}13$ GeneChips/condition). GeneChip-wide normalization (to an intensity of 500) was carried out with an Affymetrix MAS5. The significance of observed differences in gene expression was determined using a 2-tailed Student *t* test.

Isolation and Characterization of NulOs. After resuspension in 2N acetic acid, cell suspensions were incubated at 80 °C for 3 h to

release cell surface NulO residues. Insoluble cell debris was pelleted at maximum speed on a tabletop centrifuge, and material released into the soluble fraction was passed over a 10-K molecular weight cutoff filtration unit (Centricon). Purified LPS samples containing Leg (25) or Pse (26) acids were processed similarly by mild acid hydrolysis and filtration. Low molecular weight fractions or commercially available Neu were derivatized with DMB, and NulO–DMB adducts were resolved by HPLC using a reverse-phase C18 column (Varian) eluted isocratically at a rate of 0.9 mL/min over 50 min using 85% MQ water, 7% methanol, and 8% acetonitrile. DMB-derivatized extracts or individually isolated HPLC peaks were analyzed by LCMS using a Finnigan-MAT HPLC system with a tandem LCQ mass spectrometer (46). Detection of fluorescently labeled NulO sugars was achieved at excitation and emission wavelengths of 373 nm and 448 nm, respectively.

Table S1. Distribution of NAB homologs among sequenced bacteria and archaea

NCBI accession numbers for NAB-1 and NAB-2 homologs are color coded according to Fig. 3A predictions, **Neu; Leg; Psc; 'animal-like'**. Strains are in alphabetical order with NAB-negative genomes enclosed by double lines below each NCBI class of NAB-positive genomes.

ε-Proteobacteria	NAB-1			NAB-2		
<i>Arcobacter butzleri</i> RM4018	YP_001491128			YP_001491129		
<i>Caminibacter mediatlanticus</i> TB-2	ZP_0187175 2	ZP_01872215		ZP_0187175 7	ZP_01872218	
<i>Campylobacter coli</i> RM2228	ZP_0036736 5	ZP_0036738 1	ZP_003680 95	ZP_0036737 1	ZP_00367377	
<i>Campylobacter concisus</i> 13826	YP_001467628			YP_001467632		
<i>Campylobacter curvus</i> 525.92	YP_001408965			YP_001408968		
<i>Campylobacter fetus</i> subsp. <i>fetus</i> 82-40	YP_892682			YP_892689		
<i>Campylobacter jejuni</i> RM1221	YP_179491	YP_179505		YP_179497	YP_179501	
<i>Campylobacter jejuni</i> subsp. <i>doylei</i> 269.97	YP_0013976 04	YP_0013975 84	YP_001397 865	YP_0013975 96	YP_001397590	
<i>Campylobacter jejuni</i> subsp. <i>jejuni</i> 260.94	ZP_0106903 2	ZP_01069114		ZP_01068970	ZP_01069267	
<i>Campylobacter jejuni</i> subsp. <i>jejuni</i> 81116	YP_001482908			YP_001482827	YP_00148291 4	
<i>Campylobacter jejuni</i> subsp. <i>jejuni</i> 81-176	YP_0010009 86	ZP_0227165 0	YP_001000 821	YP_0010009 92	ZP_0227148 8	YP_00100081 8
<i>Campylobacter jejuni</i> subsp. <i>jejuni</i> 84-25	ZP_0109932 5	ZP_0109976 7	ZP_010997 42	ZP_0109931 1	ZP_0109929 9	ZP_01099657
<i>Campylobacter jejuni</i> subsp. <i>jejuni</i> CF93-6	ZP_0106824 9	ZP_0106828 0	ZP_010685 49	ZP_0106826 0	ZP_0106822 4	ZP_01068514
<i>Campylobacter jejuni</i> subsp. <i>jejuni</i> CG8486	ZP_0181069 4	ZP_01810708		ZP_0181070 0	ZP_0181070 4	ZP_01809838
<i>Campylobacter jejuni</i> subsp. <i>jejuni</i> HB93-13	ZP_01070901		ZP_010708 36	ZP_01070873		ZP_01071011
<i>Campylobacter jejuni</i> subsp. <i>jejuni</i> NCTC 11168	NP_282457	NP_282477	NP_282291	NP_282463	NP_282473	NP_282289
<i>Campylobacter lari</i> RM2100	ZP_0036943 0	ZP_00369519		ZP_0036865 0	ZP_00369513	
<i>Campylobacter upsaliensis</i> RM3195	ZP_0037176 4	ZP_0037149 5	ZP_003711 44	ZP_0037033 5	ZP_00371499	
<i>Helicobacter acinonychis</i> str. <i>Sheeba</i>	YP_665018	YP_664764		YP_664200		YP_665020
<i>Helicobacter hepaticus</i> ATCC 51449	NP_860431			NP_860439		
<i>Helicobacter pylori</i> 26695	NP_207124			NP_206977		
<i>Helicobacter pylori</i> HPAG1	YP_627070			YP_626916		
<i>Helicobacter pylori</i> J99				NP_222887		
<i>Sulfurimonas denitrificans</i> DSM 1251	YP_393113				YP_393109	
<i>Wolinella succinogenes</i> DSM 1740	NP_908204			NP_908207		
<i>Campylobacter hominis</i> ATCC BAA-381	<i>Sulfurovum</i> sp. NBC37-1					
<i>Nitratiruptor</i> sp. SB155-2	<i>Thiomicrospira denitrificans</i> ATCC 33889					
Bacteroidetes	NAB-1			NAB-2		
<i>Algoriphagus</i> sp. PR1	ZP_01717386			ZP_01717383		
<i>Bacteroides capillosus</i> ATCC 29799	ZP_02036000					
<i>Bacteroides fragilis</i> NCTC 9343	YP_211444					
<i>Bacteroides fragilis</i> YCH46	YP_101321	YP_099504	YP_099012			
<i>Bacteroides ovatus</i> ATCC 8483	ZP_02066715					
<i>Bacteroides thetaiotaomicron</i> VPI-5482	NP_810626.1			NP_810627		
<i>Bacteroides uniformis</i> ATCC 8492	ZP_0207081 2	ZP_0207154 6	ZP_020719 64	ZP_0207154 2	ZP_02070811	
<i>Bacteroides vulgatus</i> ATCC 8482	YP_0013012 63	YP_0013012 61	YP_001299 934	YP_001301264		
<i>Cellulophaga</i> sp. MED134	ZP_0105150 3	ZP_01049060		ZP_01051504		
<i>Chlorobium chlorochromatii</i> CaD3	YP_379437	YP_378636		YP_379377		

<i>chlorobium ferrooxidans</i> DSM 13031	ZP_0138574 1	ZP_0138546 1	ZP_013852 31	ZP_01385460	ZP_01385672
<i>Chlorobium limicola</i> DSM 245	ZP_0051141 2	ZP_00513057			ZP_00512609
<i>Chlorobium phaeobacteroides</i> DSM 266	YP_911960	YP_912515			YP_911647
<i>Chlorobium tepidum</i> TLS	NP_662044	NP_662709			NP_661719
<i>Croceibacter atlanticus</i> HTCC2559	ZP_0095041 0	ZP_0095126 3	ZP_00950767	ZP_00950411	
<i>Cytophaga hutchinsonii</i> ATCC 33406	YP_679353			YP_679350	
<i>Flavobacteria bacterium</i> BAL38	ZP_0173318 6	ZP_01735244		ZP_01733184	
<i>Flavobacteria bacterium</i> BBFL7	ZP_0120289 6	ZP_0120192 1	ZP_012030 49	ZP_0120289 9	ZP_01201920
<i>Flavobacteriales bacterium</i> HTCC2170	ZP_0110568 7	ZP_01106328		ZP_01105691	
<i>Flavobacterium johnsoniae</i> UW101	YP_0011926 62	YP_001196831		YP_001192660	
<i>Flavobacterium psychrophilum</i> JIP02/86	YP_0012961 51	YP_001295888		YP_001296150	
<i>Flavobacterium</i> sp. MED217	ZP_0105892 9	ZP_01061526		ZP_01058928	
<i>Gramella forsetii</i> KT0803	YP_860622	YP_862055	YP_861860	YP_860619	
<i>Pedobacter</i> sp. BAL39	ZP_01883717			ZP_01883719	
<i>Pelodictyon luteolum</i> DSM 273	YP_374880				YP_375179
<i>Pelodictyon phaeoclathratiforme</i> BU-1	ZP_0059063 7	ZP_0058816 7	ZP_005882 67	ZP_0058827 4	ZP_0171738 3
<i>Polaribacter irgensii</i> 23-P	ZP_01118271				
<i>Prosthecochloris aestuarii</i> DSM 271	ZP_0059235 5	ZP_00590933			ZP_00591854
<i>Prosthecochloris vibrioformis</i> DSM 265	YP_0011304 43	YP_001129928			YP_00113054 1
<i>Psychroflexus torquis</i> ATCC 700755	ZP_0125435 8	ZP_01253608			
<i>Robiginitalea biformata</i> HTCC2501	ZP_01120753				
<i>Salinibacter ruber</i> DSM 13855	YP_444751			YP_444748	
<i>Tenacibaculum</i> sp. MED152	ZP_0105275 4	ZP_01052336		ZP_01052757	
<i>unidentified eubacterium</i> SCB49	ZP_0188975 2	ZP_01890888			
<i>Bacteroides caccae</i> ATCC 43185	<i>Chlorobium phaeobacteroides</i> BS1		<i>Parabacteroides merdae</i> ATCC 43184		
<i>Candidatus Sulcia muelleri</i> str. Hc (<i>Homalodisca coagulata</i>)	<i>Parabacteroides distasonis</i> ATCC 8503		<i>Porphyromonas gingivalis</i> W83		
Cyanobacteria	NAB-1		NAB-2		
<i>Acaryochloris marina</i> MBIC11017	YP_001516521				
<i>Anabaena variabilis</i> ATCC 29413	YP_323517	YP_323463			
<i>Crocospaera watsonii</i> WH 8501	ZP_00517669		ZP_00514892		
<i>Cyanothece</i> sp. CCY0110-	ZP_01729244		ZP_01731448		
<i>Gloeobacter violaceus</i> PCC 7421	NP_926721				
<i>Lyngbya</i> sp. PCC 8106	ZP_0162232 9	ZP_01622482			
<i>Nodularia spumigena</i> CCY9414	ZP_0163100 2	ZP_01631569	ZP_01632274		
<i>Nostoc punctiforme</i> PCC 73102	ZP_0010827 2	ZP_00110422	ZP_00109033		
<i>Nostoc</i> sp. PCC 7120	NP_485331	NP_485019			
<i>Prochlorococcus marinus</i> str. AS9601	YP_001009733		YP_001009815		
<i>Prochlorococcus marinus</i> str. MIT 9211	YP_0015511 27	YP_001551172	YP_001551130		
<i>Prochlorococcus marinus</i> str. MIT 9215	YP_0014846 62	YP_001484645	YP_0014846 80	YP_001484665	
<i>Prochlorococcus marinus</i> str. MIT 9301	YP_0010916 37	YP_001091645	YP_001091632		
<i>Prochlorococcus marinus</i> str. MIT 9303	YP_001016135		YP_001016130		

<i>Prochlorococcus marinus</i> str. MIT 9312	YP_397845	YP_397837	YP_397842	YP_397836
<i>Prochlorococcus marinus</i> str. MIT 9313	NP_893935		NP_893939	
<i>Prochlorococcus marinus</i> str. NATL1A	YP_001014697		YP_001014695	
<i>Synechococcus elongatus</i> PCC 7942	YP_401307			
<i>Synechococcus</i> sp. BL107	ZP_01468600	ZP_01468925	ZP_01469027	ZP_01468604
<i>Synechococcus</i> sp. CC9311	YP_729407	YP_729419	YP_729411	YP_729418
<i>Synechococcus</i> sp. CC9605	YP_382511		YP_382515	
<i>Synechococcus</i> sp. CC9902-	YP_376474	YP_376118	YP_376470	YP_376102
<i>Synechococcus</i> sp. RS9916	ZP_01471749		ZP_01471755	
<i>Synechococcus</i> sp. RS9917	ZP_01078981		ZP_01078980	
<i>Synechococcus</i> sp. WH 8102-	NP_896493	NP_896539	NP_896543	NP_896489
<i>Synechocystis</i> sp. PCC 6803	NP_441379		NP_441367	
<i>Trichodesmium erythraeum</i> IMS101	YP_723938		YP_723990	
<i>Leptolyngbya valderiana</i> BDU 20041	<i>Synechococcus elongatus</i> PCC 6301		<i>Synechococcus</i> sp. WH 5701	
<i>Prochlorococcus marinus</i> str. NATL2A	<i>Synechococcus</i> sp. JA-2-3B'a(2-13)		<i>Synechococcus</i> sp. WH 7803	
<i>Prochlorococcus marinus</i> ss. <i>marinus</i> CCMP1375	<i>Synechococcus</i> sp. JA-3-3Ab		<i>Synechococcus</i> sp. WH 7805	
<i>Prochlorococcus marinus</i> ss. <i>pastoris</i> CCMP1986	<i>Synechococcus</i> sp. RCC307		<i>Thermosynechococcus elongatus</i> BP-1	
δ-Proteobacteria	NAB-1		NAB-2	
<i>Bdellovibrio bacteriovorus</i> HD100	NP_968563		NP_968560	
<i>delta proteobacterium</i> MLMS-1	ZP_01287684		ZP_01288484	
<i>Desulfovibrio desulfuricans</i> G20	YP_389746		YP_389745	YP_390169
<i>Desulfovibrio vulgaris</i> subsp. <i>vulgaris</i> DP4	YP_968030		YP_968032	YP_968074
<i>Desulfovibrio vulgaris</i> ss. <i>vulgaris</i> Hildenborough			YP_009573	YP_012219
<i>Desulfuromonas acetoxidans</i> DSM 684	ZP_01312106	YP_386919	ZP_01312107	ZP_01311516
<i>Geobacter bemidjiensis</i> Bem			ZP_01773432	
<i>Geobacter lovleyi</i> SZ	YP_001951964			
<i>Geobacter metallireducens</i> GS-15	YP_384236		YP_383423	
<i>Geobacter sulfurreducens</i> PCA	NP_953021		NP_953019	
<i>Geobacter uraniireducens</i> Rf4	YP_001232805		YP_001232802	
<i>Lawsonia intracellularis</i> PHE/MN1-00	YP_595364			YP_965814
<i>Myxococcus xanthus</i> DK 1622	YP_629360			
<i>Pelobacter carbinolicus</i> DSM 2380	YP_356697		YP_356696	YP_356559
<i>Syntrophus aciditrophicus</i> SB	YP_463211			
<i>Anaeromyxobacter dehalogenans</i> 2CP-C	<i>Desulfotalea psychrophila</i> LSV54		<i>Plesiocystis pacifica</i> SIR-1	
<i>Anaeromyxobacter</i> sp. Fw109-5	<i>Desulfovibrio vulgaris</i> subsp. <i>vulgaris</i> DP4		<i>Stigmatella aurantiaca</i> DW4/3-1	
<i>Candidatus Desulfococcus oleovorans</i> Hxd3	<i>Pelobacter propionicus</i> DSM 2379		<i>Syntrophobacter fumaroxidans</i> MPOB	
α-Proteobacteria	NAB-1		NAB-2	
<i>Bradyrhizobium japonicum</i> USDA 110	NP_772636	NP_772612	NP_772632	NP_772611
<i>Erythrobacter</i> sp. NAP1	ZP_01040808	ZP_01038973	ZP_01040809	ZP_01038969
<i>Fulvamarina pelagi</i> HTCC2506	ZP_01440484		ZP_01440497	
<i>Loktanella vestfoldensis</i> SKA53	ZP_01002614		ZP_01002612	
<i>Magnetospirillum magneticum</i> AMB-1	YP_419451	YP_419454	YP_419443	YP_419455
<i>Magnetospirillum magnetotacticum</i> MS-1	ZP_00056632.2		ZP_00056630	ZP_00054178
<i>Methylobacterium chloromethanicum</i> CM4	ZP_02059631		ZP_02059639	YP_420076
<i>Nitrobacter</i> sp. Nb-311A	ZP_01045625		ZP_01045622	ZP_01045506
<i>Nitrobacter winogradskyi</i> Nb-255	YP_319003		YP_319002	YP_317265

<i>Oceanicaulis alexandrii</i> HTCC2633	ZP_00952361		ZP_00952353	
<i>Paracoccus denitrificans</i> PD1222	YP_913900	YP_917316	YP_917322	
<i>Rhodopseudomonas palustris</i> BisA53	YP_783144		YP_783141	
<i>Rhodopseudomonas palustris</i> HaA2	YP_485157		YP_485155	
<i>Roseobacter denitrificans</i> OCh 114	YP_684331		YP_684329	
<i>Roseobacter</i> sp. AzwK-3b	ZP_0190153 2	ZP_01901542	ZP_0190153 6	ZP_01901525
<i>Roseobacter</i> sp. CCS2	ZP_01750795		ZP_0174999 0	ZP_01750793
<i>Roseobacter</i> sp. SK209-2-6	ZP_0175674 6	ZP_01756754	ZP_0175674 9	ZP_01756734
<i>Sphingopyxis alaskensis</i> RB2256	YP_616624	YP_616627	YP_616622	YP_616626
<i>Stappia aggregata</i> IAM 12614	ZP_0154547 7	ZP_01550520	ZP_01545475	
<i>Sinorhizobium meliloti</i> 1021	<i>Methylobacterium extorquens</i> PA1		<i>Rickettsia felis</i> URRWXCa2	
<i>Agrobacterium tumefaciens</i> str. C58	<i>Methylobacterium</i> sp. 4-46		<i>Rickettsia massiliae</i> MTU5	
<i>alpha proteobacterium</i> HTCC2255	<i>Neorickettsia sennetsu</i> str. Miyayama		<i>Rickettsia prowazekii</i> str. Madrid E	
<i>Anaplasma marginale</i> str. St. Maries	<i>Nitrobacter hamburgensis</i> X14		<i>Rickettsia rickettsii</i> str. 'Sheila Smith'	
<i>Anaplasma phagocytophilum</i> HZ	<i>Novosphingobium aromaticivorans</i> DSM 12444		<i>Rickettsia sibirica</i> 246	
<i>Bartonella bacilliformis</i> KC583	<i>Oceanicola batsensis</i> HTCC2597		<i>Rickettsia typhi</i> str. Wilmington	
<i>Bartonella henselae</i> str. Houston-1	<i>Oceanicola granulosus</i> HTCC2516		<i>Roseobacter</i> sp. MED193	
<i>Bartonella quintana</i> str. Toulouse	<i>Ochrobactrum anthropi</i> ATCC 49188		<i>Roseovarius nubinhbens</i> ISM	
<i>Brucella abortus</i> biovar 1 str. 9-941	<i>Orientia tsutsugamushi</i> Boryong		<i>Roseovarius</i> sp. 217	
<i>Brucella melitensis</i> 16M	<i>Parvibaculum lavamentivorans</i> DS-1		<i>Roseovarius</i> sp. HTCC2601	
<i>Brucella melitensis</i> biovar Abortus 2308	<i>Parvularcula bermudensis</i> HTCC2503		<i>Roseovarius</i> sp. TM1035	
<i>Brucella ovis</i> ATCC 25840	<i>Rhizobium etli</i> CFN 42		<i>Sagittula stellata</i> E-37	
<i>Brucella suis</i> 1330	<i>Rhizobium leguminosarum</i> bv. viciae 3841		<i>Silicibacter pomeroyi</i> DSS-3	
<i>Candidatus Pelagibacter ubique</i> HTCC1002	<i>Rhodobacter sphaeroides</i> 2.4.1		<i>Silicibacter</i> sp. TM1040	
<i>Candidatus Pelagibacter ubique</i> HTCC1062	<i>Rhodobacter sphaeroides</i> ATCC 17025		<i>Sinorhizobium medicae</i> WSM419	
<i>Caulobacter crescentus</i> CB15	<i>Rhodobacter sphaeroides</i> ATCC 17029		<i>Sphingomonas</i> sp. SKA58	
<i>Caulobacter</i> sp. K31	<i>Rhodobacteriales bacterium</i> HTCC2150		<i>Sphingomonas wittichii</i> RW1	
<i>Ehrlichia canis</i> str. Jake	<i>Rhodobacteriales bacterium</i> HTCC2654		<i>Sulfitobacter</i> sp. EE-36	
<i>Ehrlichia chaffeensis</i> str. Arkansas	<i>Rhodopseudomonas palustris</i> BisB18		<i>Sulfitobacter</i> sp. NAS-14.1	
<i>Ehrlichia chaffeensis</i> str. Sapulpa	<i>Rhodopseudomonas palustris</i> BisB5		<i>Wolbachia endosymbiont of Drosophila ananassae</i>	
<i>Ehrlichia ruminantium</i> str. Gardel	<i>Rhodopseudomonas palustris</i> CGA009		<i>Wolbachia endosymbiont of Drosophila melanogaster</i>	
<i>Ehrlichia ruminantium</i> str. Welgevonden	<i>Rhodospirillum rubrum</i> ATCC 11170		<i>Wolbachia endosymbiont of Drosophila simulans</i>	
<i>Granulibacter bethesdensis</i> CGDNIH1	<i>Rickettsia africae</i> ESF-5		<i>Wolbachia endosymbiont of Drosophila willistoni</i> TSC#14030-0811.24	
<i>Hypomonas neptunium</i> ATCC 15444	<i>Rickettsia akari</i> str. Hartford		<i>Wolbachia endosymbiont strain TRS of Brugia malayi</i>	
<i>Jannaschia</i> sp. CCS1	<i>Rickettsia bellii</i> OSU 85-389		<i>Xanthobacter autotrophicus</i> Py2	
<i>Maricaulis maris</i> MCS10	<i>Rickettsia bellii</i> RML369-C		<i>Zymomonas mobilis</i> subsp. mobilis ZM4	
<i>Mesorhizobium loti</i> MAFF303099]	<i>Rickettsia canadensis</i> str. McKiel			
<i>Mesorhizobium</i> sp. BNCl	<i>Rickettsia conorii</i> str. Malish 7			
γ-Proteobacteria	NAB-1		NAB-2	
<i>Aeromonas hydrophila</i> subsp. <i>hydrophila</i> ATCC 7966	YP_858601		YP_858603	
<i>Aeromonas salmonicida</i> subsp. <i>salmonicida</i> A449	YP_001140096		YP_001140094	
<i>Alkalilimnicola ehrlichei</i> MLHE-1	YP_743154		YP_743157	
<i>Alteromonadales bacterium</i> TW-7	ZP_01612074		ZP_01612070	
<i>Alteromonas macleodii</i> 'Deep ecotype'	ZP_01110485		ZP_01110476	
<i>Azotobacter vinelandii</i> AvOP	ZP_00416273			
<i>Colwellia psychrerythraea</i> 34H	YP_268821		YP_268824	

<i>Escherichia coli</i> APEC O1	YP_854393		YP_854394	
<i>Escherichia coli</i> UTI89	YP_542349		YP_542350	
<i>Francisella tularensis</i> subsp. <i>holarctica</i>			YP_513685	
<i>Haemophilus ducreyi</i> 35000HP	NP_873215			
<i>Haemophilus influenzae</i> 22.1-21	ZP_01785141			
<i>Haemophilus influenzae</i> 22.4-21	ZP_01786684			
<i>Haemophilus influenzae</i> 3655	ZP_01788996			
<i>Haemophilus influenzae</i> 86-028NP	YP_249309			
<i>Haemophilus influenzae</i> PittAA	ZP_01790101			
<i>Haemophilus influenzae</i> PittEE	YP_001290615			
<i>Haemophilus influenzae</i> PittGG	YP_001291778			
<i>Haemophilus influenzae</i> PittHH	ZP_01792523			
<i>Haemophilus influenzae</i> PittII	ZP_01794452			
<i>Haemophilus influenzae</i> R2846	ZP_00154934.2			
<i>Haemophilus influenzae</i> R2866	ZP_00157363.2			
<i>Haemophilus influenzae</i> R3021	ZP_0179767 5	ZP_01797708		
<i>Haemophilus influenzae</i> Rd KW20	NP_439432			
<i>Haemophilus somnus</i> 129PT	YP_718918			
<i>Haemophilus somnus</i> 2336	YP_001784447			
<i>Hahella chejuensis</i> KCTC 2396	YP_435951	YP_436364	YP_435954	YP_436365
<i>Idiomarina loihiensis</i> L2TR	YP_154910	YP_154944	YP_154941	YP_154911
<i>Legionella pneumophila</i> str. <i>Corby</i>	YP_001251802		YP_001251801	YP_001251785
<i>Legionella pneumophila</i> str. <i>Lens</i>	YP_126150		YP_126151	YP_126168
<i>Legionella pneumophila</i> str. <i>Paris</i>	YP_123147		YP_123148	YP_123162
<i>Legionella pneumophila</i> subsp. <i>pneumophila</i> str. <i>Philadelphia 1</i>	YP_094787		YP_094788	YP_094804
<i>marine gamma proteobacterium</i> HTCC2207			ZP_01225164	
<i>Marinobacter algicola</i> DG893			ZP_01894552	
<i>Marinobacter</i> sp. <i>ELB17</i>	ZP_01738899		ZP_01738902	
<i>Marinomonas</i> sp. <i>MED121</i>	ZP_01075554		ZP_01075556	
<i>Marinomonas</i> sp. <i>MWYL1</i>	YP_001342399		YP_001342401	
<i>Moritella</i> sp. <i>PE36</i>	ZP_0189801 4	ZP_01896204&187	ZP_01896208	ZP_01896186
<i>Nitrococcus mobilis</i> Nb-231	ZP_0112753 9	ZP_01126021	ZP_01126018	ZP_01126018
<i>Oceanobacter</i> sp. <i>RED65</i>	ZP_01306785		ZP_01306787	
<i>Oceanospirillum</i> sp. <i>MED92</i>	ZP_01167341		ZP_01167812	ZP_01167342
<i>Pasteurella multocida</i> subsp. <i>multocida</i> str. <i>Pm70</i>	NP_245124			
<i>Photobacterium profundum</i> 3TCK	ZP_0121868 8	ZP_01218721	ZP_01218684	ZP_01218717
<i>Photobacterium profundum</i> SS9	YP_130889		YP_130887	
<i>Pseudoalteromonas atlantica</i> T6c	YP_662638		YP_662636	
<i>Pseudoalteromonas tunicata</i> D2	ZP_01132761		ZP_01132767	
<i>Pseudomonas entomophila</i> L48	YP_607270			
<i>Pseudomonas fluorescens</i> Pf-5	YP_258749		YP_258751	
<i>Pseudomonas fluorescens</i> Pfo-1	YP_347253		YP_347255	
<i>Pseudomonas putida</i> F1	YP_001269217		YP_001266824	
<i>Pseudomonas putida</i> GB-1	YP_001667719			
<i>Pseudomonas putida</i> KT2440	NP_743946			
<i>Pseudomonas putida</i> W619	YP_001750560		YP_001750558	
<i>Pseudomonas stutzeri</i> A1501	YP_001174303		YP_001174300	

<i>Psychrobacter arcticus</i> 273-4	YP_263949		YP_263953	YP_263955
<i>Psychromonas</i> sp. CNPT3	ZP_01215215		ZP_01215217	
<i>Reinekea</i> sp. MED297	ZP_01114619		ZP_01114616	
<i>Shewanella amazonensis</i> SB2B	YP_928211		YP_928206	
<i>Shewanella baltica</i> OS155			YP_001051309	
<i>Shewanella baltica</i> OS185	YP_001367175		YP_001367171	
<i>Shewanella baltica</i> OS195	YP_001555547		YP_001555543	
<i>Shewanella baltica</i> OS223			ZP_01840575	
<i>Shewanella denitrificans</i> OS217	YP_562297		YP_562298	YP_564113
<i>Shewanella frigidimarina</i> NCIMB 400	YP_751516			
<i>Shewanella loihica</i> PV-4	YP_001093456		YP_001093457	
<i>Shewanella oneidensis</i> MR-1			NP_718815	
<i>Shewanella pealeana</i> ATCC 700345	YP_001499916		YP_001499913	
<i>Shewanella putrefaciens</i> CN-32	YP_001184147		YP_001184145	
<i>Shewanella sediminis</i> HAW-EB3	YP_001474836		YP_001474832	
<i>Shewanella</i> sp. ANA-3	YP_868949		YP_868944	
<i>Shewanella</i> sp. MR-7	YP_737443		YP_737447	
<i>Shewanella</i> sp. W3-18-1	YP_962777		YP_962779	
<i>Shewanella woodyi</i> ATCC 51908	YP_001759959		YP_001759963	
<i>Thiomicrospira crunogena</i> XCL-2	YP_391722		YP_391724	
<i>Vibrio fischeri</i> ES114	YP_203530		YP_203526	
<i>Vibrio harveyi</i> ATCC BAA-1116	YP_001443906		YP_001443899	
<i>Vibrio harveyi</i> HY01	ZP_01987522		ZP_01987528	
<i>Vibrio parahaemolyticus</i> AQ3810	ZP_01993064	ZP_01992254	ZP_01992251	
<i>Vibrio parahaemolyticus</i> RIMD 2210633	NP_796582		NP_796579	
<i>Vibrio shilonii</i> AK1	ZP_01867489		ZP_01867488	
<i>Vibrio</i> sp. Ex25	ZP_01475338	ZP_01475320	ZP_01475341	
<i>Vibrio splendidus</i> 12B01	ZP_00989910		ZP_00989905	
<i>Vibrio vulnificus</i> CMCP6	NP_759780		NP_759785	
<i>Vibrio vulnificus</i> YJ016	NP_933109		NP_933105	
<i>Vibrionales bacterium</i> SWAT-3	ZP_01813606		ZP_01813603	
<i>Acinetobacter baumannii</i> ATCC 17978	<i>Francisella tularensis</i> ss. <i>novicida</i> GA99-3549		<i>Shewanella putrefaciens</i> 200	
<i>Acinetobacter</i> sp. ADP1	<i>Francisella tularensis</i> ss. <i>novicida</i> U112		<i>Shewanella</i> sp. MR-4	
<i>Actinobacillus pleuropneumoniae</i> serovar 1 str. 4074	<i>Francisella tularensis</i> ss. <i>tularensis</i> FSC033		<i>Shigella boydii</i> CDC 3083-94	
<i>Actinobacillus succinogenes</i> 130Z	<i>Francisella tularensis</i> subsp. <i>tularensis</i> FSC198		<i>Shigella boydii</i> Sb227	
<i>Aeromonas salmonicida</i> subsp. <i>salmonicida</i> A449	<i>Francisella tularensis</i> ss. <i>tularensis</i> SCHU S4		<i>Shigella dysenteriae</i> 1012	
<i>Alcanivorax borkumensis</i> SK2	<i>Francisella tularensis</i> ss. <i>tularensis</i> WY96-3418		<i>Shigella dysenteriae</i> Sd197	
<i>Baumannia cicadellinicola</i> str. Hc (<i>Homalodisca coagulata</i>)	<i>gamma proteobacterium</i> KT 71		<i>Shigella flexneri</i> 2a str. 2457T	
<i>Beggiatoa</i> sp. PS	<i>Halorhodospira halophila</i> SL1		<i>Shigella flexneri</i> 2a str. 301	
<i>Buchnera aphidicola</i> str. APS (<i>Acyrtosiphon pisum</i>)	<i>Idiomarina baltica</i> OS145		<i>Shigella flexneri</i> 5 str. 8401	
<i>Buchnera aphidicola</i> str. Bp (<i>Baizongia pistaciae</i>)	<i>Klebsiella pneumoniae</i> subsp. <i>pneumoniae</i> MGH 78578		<i>Shigella sonnei</i> Ss046	
<i>Buchnera aphidicola</i> str. Cc (<i>Cinara cedri</i>)	<i>Mannheimia haemolytica</i> PHL213		<i>Sodalis glossinidius</i> str. 'morstitans'	
<i>Buchnera aphidicola</i> str. Sg (<i>Schizaphis graminum</i>)	<i>Mannheimia succiniciproducens</i> MBEL55E		<i>Vibrio alginolyticus</i> 12G01	
<i>Candidatus Blochmannia floridanus</i>	<i>marine gamma proteobacterium</i> HTCC2080		<i>Vibrio angustum</i> S14	
<i>Candidatus Blochmannia pennsylvanicus</i> str. BPEN	<i>marine gamma proteobacterium</i> HTCC2143		<i>Vibrio cholerae</i> 1587	
<i>Candidatus Carsonella ruddii</i> PV	<i>Marinobacter aquaeolei</i> VT8		<i>Vibrio cholerae</i> 2740-80	

<i>Candidatus Ruthia magnifica</i> str. Cm (<i>Calypotgena magnifica</i>)	<i>Methylococcus capsulatus</i> str. Bath	<i>Vibrio cholerae</i> 623-39
<i>Candidatus Vesicomysocius okutanii</i> HA	<i>Neptuniibacter caesariensis</i>	<i>Vibrio cholerae</i> AM-19226
<i>Chromohalobacter salexigens</i> DSM 3043	<i>Nitrosococcus oceani</i> ATCC 19707	<i>Vibrio cholerae</i> B33
<i>Citrobacter koseri</i> ATCC BAA-895	<i>Photobacterium</i> sp. SKA34	<i>Vibrio cholerae</i> MAK 757
<i>Coxiella burnetii</i> Dugway 5J108-111	<i>Photorhabdus luminescens</i> subsp. laumondii TTO1	<i>Vibrio cholerae</i> MO10
<i>Coxiella burnetii</i> Dugway 7E9-12	<i>Pseudoalteromonas haloplanktis</i> TAC125	<i>Vibrio cholerae</i> MZO-2
<i>Coxiella burnetii</i> 'MSU Goat Q177'	<i>Pseudomonas aeruginosa</i> 2192	<i>Vibrio cholerae</i> MZO-3
<i>Coxiella burnetii</i> RSA 331	<i>Pseudomonas aeruginosa</i> C3719	<i>Vibrio cholerae</i> NCTC 8457
<i>Coxiella burnetii</i> RSA 334	<i>Pseudomonas aeruginosa</i> PA7	<i>Vibrio cholerae</i> O1 biovar eltor str. N16961
<i>Coxiella burnetii</i> RSA 493	<i>Pseudomonas aeruginosa</i> PACS2	<i>Vibrio cholerae</i> O395
<i>ctinobacillus pleuropneumoniae</i> L20	<i>Pseudomonas aeruginosa</i> PAO1	<i>Vibrio cholerae</i> RC385
<i>Dichelobacter nodosus</i> VCS1703A	<i>Pseudomonas aeruginosa</i> UCBPP-PA14	<i>Vibrio cholerae</i> V51
<i>Endoriftia persephone</i> 'Hot96_1+Hot96_2'	<i>Pseudomonas mendocina</i> ymp	<i>Vibrio cholerae</i> V52
<i>Enterobacter sakazakii</i> ATCC BAA-894	<i>Pseudomonas syringae</i> pv. phaseolicola 1448A	<i>Vibrio</i> sp. MED222
<i>Enterobacter</i> sp. 638	<i>Pseudomonas syringae</i> pv. syringae B728a	<i>Wigglesworthia glossinidia</i> endosymbiont of <i>Glossina brevipalpis</i>
<i>Erwinia carotovora</i> subsp. atroseptica SCRI1043	<i>Pseudomonas syringae</i> pv. tomato str. DC3000	<i>Yersinia bercovieri</i> ATCC 43970
<i>Escherichia coli</i> 101-1	<i>Psychrobacter cryohalolentis</i> K5	<i>Yersinia enterocolitica</i> subsp. enterocolitica 8081
<i>Escherichia coli</i> 536	<i>Psychrobacter</i> sp. PRwf-1	<i>Yersinia frederiksenii</i> ATCC 33641
<i>Escherichia coli</i> 53638	<i>Psychromonas ingrahamii</i> 37	<i>Yersinia intermedia</i> ATCC 29909
<i>Escherichia coli</i> B	<i>Rickettsiella grylli</i>	<i>Yersinia mollaretii</i> ATCC 43969
<i>Escherichia coli</i> B171	<i>Saccharophagus degradans</i> 2-40	<i>Yersinia pestis</i> Angola
<i>Escherichia coli</i> B7A	<i>Salmonella enterica</i> subsp. enterica serovar 4,[5],12:i:- str. CVM23701	<i>Yersinia pestis</i> Antiqua
<i>Escherichia coli</i> CFT073	<i>S. enterica</i> subsp. enterica serovar Agona str. SL483	<i>Yersinia pestis</i> biovar Antiqua str. B42003004
<i>Escherichia coli</i> E110019	<i>S. enterica</i> subsp. enterica serovar Choleraesuis str. SC-B67	<i>Yersinia pestis</i> biovar Antiqua str. E1979001
<i>Escherichia coli</i> E22	<i>S. enterica</i> subsp. enterica serovar Dublin str. CT_02021853	<i>Yersinia pestis</i> biovar Antiqua str. UG05-0454
<i>Escherichia coli</i> E24377A	<i>S. enterica</i> subsp. enterica serovar Heidelberg str. SL476	<i>Yersinia pestis</i> biovar Mediaevalis str. K1973002
<i>Escherichia coli</i> F11	<i>S. enterica</i> subsp. enterica serovar Javiana str. GA_MM04042433	<i>Yersinia pestis</i> biovar Microtus str. 91001
<i>Escherichia coli</i> HS	<i>S. enterica</i> subsp. enterica serovar Kentucky str. CDC 191	<i>Yersinia pestis</i> biovar Microtus str. 91001
<i>Escherichia coli</i> O157:H7 EDL933	<i>S. enterica</i> subsp. enterica serovar Kentucky str. CVM29188	<i>Yersinia pestis</i> biovar Orientalis str. F1991016
<i>Escherichia coli</i> O157:H7 str. Sakai	<i>S. enterica</i> subsp. enterica serovar Newport str. SL254	<i>Yersinia pestis</i> biovar Orientalis str. IP275
<i>Escherichia coli</i> SECEC SMS-3-5	<i>S. enterica</i> subsp. enterica serovar Newport str. SL317	<i>Yersinia pestis</i> biovar Orientalis str. MG05-1020
<i>Escherichia coli</i> str. K-12 substr. MG1655	<i>S. enterica</i> subsp. enterica serovar Paratyphi A str. ATCC 9150	<i>Yersinia pestis</i> CA88-4125
<i>Escherichia coli</i> W3110	<i>S. enterica</i> subsp. enterica serovar Saintpaul str. SARA23	<i>Yersinia pestis</i> CO92
<i>Francisella tularensis</i> subsp. holarctica 257	<i>S. enterica</i> subsp. enterica serovar Saintpaul str. SARA29	<i>Yersinia pestis</i> FV-1
<i>Francisella tularensis</i> subsp. holarctica FSC022	<i>S. enterica</i> subsp. enterica serovar Schwarzengrund str. CVM19633	<i>Yersinia pestis</i> KIM
<i>Francisella tularensis</i> subsp. holarctica FSC200	<i>S. enterica</i> subsp. enterica serovar Schwarzengrund str. SL480	<i>Yersinia pestis</i> Nepal516
<i>Francisella tularensis</i> subsp. holarctica FTA	<i>S. enterica</i> subsp. enterica serovar Typhi str. CT18	<i>Yersinia pestis</i> Pestoides F
<i>Francisella tularensis</i> subsp. holarctica FTNF002-00	<i>S. enterica</i> subsp. enterica serovar Typhi Ty2	<i>Yersinia pseudotuberculosis</i> IP 31758
<i>Francisella tularensis</i> subsp. holarctica OSU18	<i>Salmonella typhimurium</i> LT2	<i>Yersinia pseudotuberculosis</i> IP 3295
<i>Francisella tularensis</i> subsp. novicida GA99- 3548	<i>Serratia proteamaculans</i> 568	
β-Proteobacteria	NAB-1	NAB-2

<i>Burkholderia cenocepacia</i> MC0-3	YP_001765854			
<i>Burkholderia phymatum</i> STM815	YP_001859225		YP_001859224	
<i>Burkholderia pseudomallei</i> S13	ZP_01329806			
<i>Chromobacterium violaceum</i> ATCC 12472	NP_903698		NP_903701	
<i>Dechloromonas aromatica</i> RCB	YP_284470		YP_284473	
<i>Hermiimonas arsenicoxydans</i>			YP_001099432	
<i>Methylophilales bacterium</i> HTCC2181	ZP_01552361	NP_841608	NP_841609	
<i>Neisseria meningitidis</i> FAM18	YP_974195		YP_974194	
<i>Neisseria meningitidis</i> MC58	NP_273133		NP_273132	
<i>Nitrosomonas europaea</i> ATCC 19718	NP_841608		NP_841609	
<i>Nitrosomonas eutropha</i> C91	YP_747757		YP_747758	
<i>Nitrospira multiformis</i> ATCC 25196	YP_411110		YP_411108	
<i>Ralstonia pickettii</i> 12D			ZP_02007588	
<i>Verminephrobacter eiseniae</i> EF01-2	YP_999560		YP_999561	
<i>Acidovorax avenae</i> subsp. <i>citrulli</i> AAC00-1	<i>Burkholderia oklahomensis</i> EO147		<i>Burkholderia thailandensis</i> E264	
<i>Acidovorax</i> sp. JS42	<i>Burkholderia phytofirmans</i> PsJN		<i>Burkholderia thailandensis</i> TXDOH	
<i>Azoarcus</i> sp. BH72	<i>Burkholderia pseudomallei</i> 1106a		<i>Burkholderia ubonensis</i> Bu	
<i>Azoarcus</i> sp. EbN1	<i>Burkholderia pseudomallei</i> 1106b		<i>Burkholderia vietnamiensis</i> G4	
<i>Bordetella bronchiseptica</i> RB50	<i>Burkholderia pseudomallei</i> 112		<i>Burkholderia xenovorans</i> LB400	
<i>Bordetella parapertussis</i> 12822	<i>Burkholderia pseudomallei</i> 14		<i>Comamonas testosteroni</i> KF-1	
<i>Bordetella pertussis</i> Tohama I	<i>Burkholderia pseudomallei</i> 1655		<i>Delftia acidovorans</i> SPH-1	
<i>Burkholderia ambifaria</i> AMMD	<i>Burkholderia pseudomallei</i> 1710a		<i>ethylbium petroleiphilum</i> PMI	
<i>Burkholderia ambifaria</i> MC40-6	<i>Burkholderia pseudomallei</i> 1710b		<i>Janthinobacterium</i> sp. Marseille	
<i>Burkholderia cenocepacia</i> AU 1054	<i>Burkholderia pseudomallei</i> 305		<i>Limnobacter</i> sp. MED105	
<i>Burkholderia cenocepacia</i> HI2424	<i>Burkholderia pseudomallei</i> 381		<i>Methylobacillus flagellatus</i> KT	
<i>Burkholderia dolosa</i> AUO158	<i>Burkholderia pseudomallei</i> 406e		<i>Neisseria gonorrhoeae</i> FA 1090	
<i>Burkholderia mallei</i> 2002721280	<i>Burkholderia pseudomallei</i> 668		<i>Neisseria meningitidis</i> Z2491	
<i>Burkholderia mallei</i> ATCC 10399	<i>Burkholderia pseudomallei</i> 7894		<i>Polaromonas naphthalenivorans</i> CJ2	
<i>Burkholderia mallei</i> ATCC 23344	<i>Burkholderia pseudomallei</i> 9		<i>Polaromonas</i> sp. JS666	
<i>Burkholderia mallei</i> FMH	<i>Burkholderia pseudomallei</i> 91		<i>Polynucleobacter</i> sp. QLW-PIDMWA-1	
<i>Burkholderia mallei</i> GB8 horse 4	<i>Burkholderia pseudomallei</i> B7210		<i>Ralstonia eutropha</i> H16	
<i>Burkholderia mallei</i> JHU	<i>Burkholderia pseudomallei</i> BCC215		<i>Ralstonia eutropha</i> JMP134	
<i>Burkholderia mallei</i> NCTC 10229	<i>Burkholderia pseudomallei</i> DM98		<i>Ralstonia metallidurans</i> CH34	
<i>Burkholderia mallei</i> NCTC 10247	<i>Burkholderia pseudomallei</i> K96243		<i>Ralstonia pickettii</i> 12J	
<i>Burkholderia mallei</i> PRL-20	<i>Burkholderia pseudomallei</i> NCTC 13177		<i>Ralstonia solanacearum</i> GMI1000	
<i>Burkholderia mallei</i> SAVP1	<i>Burkholderia pseudomallei</i> Pasteur 52237		<i>Ralstonia solanacearum</i> UW551	
<i>Burkholderia multivorans</i> ATCC 17616	<i>Burkholderia</i> sp. 383		<i>Rhodoferax ferrireducens</i> T118	
<i>Burkholderia oklahomensis</i> C6786	<i>Burkholderia thailandensis</i> Bt4		<i>Thiobacillus denitrificans</i> ATCC 25259	
Firmicutes	NAB-1		NAB-2	
<i>Alkaliphilus oremlandii</i> OhILAs	YP_001514040		YP_001514037	
<i>Bacillus amyloliquefaciens</i> FZB42			YP_001423072	
<i>Bacillus cereus</i> G9241	ZP_00236340	ZP_00239762	ZP_00236342	
<i>Bacillus pumilus</i> SAFR-032	YP_001487128		ZP_01724639	YP_001488643
<i>Bacillus</i> sp. B14905	ZP_01724636		ZP_01724639	
<i>Bacillus subtilis</i> subsp. <i>subtilis</i> str. 168			NP_391666	
<i>Bacillus thuringiensis</i> serovar <i>israelensis</i> ATCC 35646			ZP_00741540	
<i>Clostridium acetobutylicum</i> ATCC 824			NP_348805	
<i>Clostridium beijerinckii</i> NCIMB 8052	YP_001311347		YP_001311344	
<i>Clostridium botulinum</i> A str. ATCC 19397	YP_0013849	YP_001384963	YP_001384922	

	23		YP_0013849 62	
<i>Clostridium botulinum A str. ATCC 3502</i>	YP_0012551 80	YP_001255220	YP_0012552 19	YP_001255179
<i>Clostridium botulinum A str. Hall</i>	YP_0013883 92	YP_001388433	YP_0013883 91	YP_001388432
<i>Clostridium botulinum F str. Langeland</i>	YP_0013920 01	YP_001391979	YP_0013920 03	YP_001391978
<i>Clostridium difficile QCD-32g58</i>	ZP_01801682			
<i>Clostridium kluyveri DSM 555</i>	YP_0013958 49	YP_001395014	YP_0013958 55	YP_001395492
<i>Clostridium novyi NT</i>	YP_877856		YP_877857	YP_877964
<i>Clostridium tetani E88</i>	NP_782308	NP_781273	NP_782309	
<i>Clostridium thermocellum ATCC 27405</i>	YP_0010390 31	YP_001038625	YP_0010390 33	YP_001038624
<i>Desulfotobacterium hafniense DCB-2</i>			ZP_01372474	
<i>Desulfotobacterium hafniense Y51</i>	YP_519540		YP_520419	
<i>Enterococcus faecium DO</i>	ZP_00604822		ZP_00604816	
<i>Geobacillus kaustophilus HTA426</i>	YP_148973		YP_148976	
<i>Haloferoxilus orenii H 168</i>			ZP_0118851 1	ZP_01188516
<i>Lactobacillus johnsonii NCC 533</i>		NP_965637		
<i>Lactococcus lactis ssp. cremoris SK1</i>		YP_808727		
<i>Lactococcus lactis subsp. lactis II140</i>		NP_266866		
<i>Moorella thermoacetica ATCC 39073</i>	YP_429619		YP_429617	
<i>Ruminococcus gnavus ATCC 29149</i>	ZP_02041060		ZP_02041061	
<i>Streptococcus agalactiae 18RS21</i>	ZP_0078188 0	ZP_0078016 3	ZP_007819 66	ZP_00781900
<i>Streptococcus agalactiae 2603V/R</i>	NP_688167	NP_688113		NP_688170
<i>Streptococcus agalactiae 515</i>	ZP_0078899 8	ZP_00789247		ZP_00789031
<i>Streptococcus agalactiae A909</i>	YP_329861	YP_329810		YP_329864
<i>Streptococcus agalactiae CJB111</i>	ZP_0078853 8	ZP_00786919		ZP_00788547
<i>Streptococcus agalactiae COH1</i>	ZP_0078570 7	ZP_00785426		ZP_00785697
<i>Streptococcus agalactiae H36B</i>	ZP_0078297 8	ZP_00782941		ZP_00782986
<i>Streptococcus agalactiae NEM316</i>	NP_735677	NP_735617		NP_735680
<i>Streptococcus mutans UA159</i>		NP_721495		
<i>Streptococcus suis 05ZYH33</i>	YP_001197947			YP_001197944
<i>Streptococcus suis 89/1591</i>	ZP_0087590 3	ZP_00875443		ZP_00875906
<i>Streptococcus suis 98HAH33</i>	YP_001200143			YP_001200140
<i>Streptococcus thermophilus CNRZ1</i>		YP_141453		
<i>Streptococcus thermophilus LMD-9</i>		YP_820445		
<i>Streptococcus thermophilus LMG 18</i>		YP_139528		
<i>Syntrophomonas wolfei subsp. wolfei str. Goettingen</i>			YP_752933	
<i>Thermoanaerobacter pseudethanolicus ATCC 33223</i>			YP_001664975	
<i>Thermoanaerobacter sp. X514</i>			YP_001663050	
<i>Thermoanaerobacter tengcongensis MB4</i>			NP_622664	
<i>Thermosinus carboxydivorans Nor1</i>	ZP_01667693			
<i>Alkaliphilus metalliredigens QYMF</i>	<i>Eubacterium dolichum DSM 3991</i>			<i>Pelotomaculum thermopropionicum SI</i>
<i>Anaerostipes caccae DSM 14662</i>	<i>Eubacterium siraeum DSM 15702</i>			<i>Peptostreptococcus micros ATCC 33270</i>
<i>Bacillus anthracis str. A1055</i>	<i>Eubacterium ventriosum ATCC 27560</i>			<i>Ruminococcus obeum ATCC 29174</i>
<i>Bacillus anthracis str. A2012</i>	<i>Exiguobacterium sibiricum 255-15</i>			<i>Ruminococcus torques ATCC 27756</i>
<i>Bacillus anthracis str. Ames</i>	<i>Faecalibacterium prausnitzii M21/2</i>			<i>Staphylococcus aureus RF122</i>
<i>Bacillus anthracis str. 'Ames Ancestor'</i>	<i>Geobacillus thermodenitrificans NG80-2</i>			<i>Staphylococcus aureus subsp. aureus COL</i>

<i>Bacillus anthracis</i> str. Australia 94	<i>Lactobacillus acidophilus</i> NCFM	<i>Staphylococcus aureus</i> subsp. <i>aureus</i> JH1
<i>Bacillus anthracis</i> str. CNEVA-9066	<i>Lactobacillus brevis</i> ATCC 367	<i>Staphylococcus aureus</i> subsp. <i>aureus</i> JH9
<i>Bacillus anthracis</i> str. Kruger B	<i>Lactobacillus casei</i> ATCC 334	<i>Staphylococcus aureus</i> subsp. <i>aureus</i> MRSA252
<i>Bacillus anthracis</i> str. Sterne	<i>Lactobacillus delbrueckii</i> subsp. <i>bulgaricus</i> ATCC 11842	<i>Staphylococcus aureus</i> subsp. <i>aureus</i> MSSA476
<i>Bacillus anthracis</i> str. Vollum	<i>Lactobacillus delbrueckii</i> subsp. <i>bulgaricus</i> ATCC BAA-365	<i>Staphylococcus aureus</i> subsp. <i>aureus</i> Mu3
<i>Bacillus anthracis</i> str. Western North America USA6153	<i>Lactobacillus gasseri</i> ATCC 33323	<i>Staphylococcus aureus</i> subsp. <i>aureus</i> Mu50
<i>Bacillus anthracis</i> Tsiankovskii-1	<i>Lactobacillus plantarum</i> WCFS1	<i>Staphylococcus aureus</i> subsp. <i>aureus</i> MW2
<i>Bacillus cereus</i> 03BB108	<i>Lactobacillus reuteri</i> 100-23	<i>Staphylococcus aureus</i> subsp. <i>aureus</i> N315
<i>Bacillus cereus</i> AH1134	<i>Lactobacillus reuteri</i> F275	<i>Staphylococcus aureus</i> subsp. <i>aureus</i> NCTC 8325
<i>Bacillus cereus</i> AH187	<i>Lactobacillus sakei</i> subsp. <i>sakei</i> 23K	<i>Staphylococcus aureus</i> subsp. <i>aureus</i> str. Newman
<i>Bacillus cereus</i> AH820	<i>Lactobacillus salivarius</i> subsp. <i>salivarius</i> UCC118	<i>Staphylococcus aureus</i> subsp. <i>aureus</i> USA300
<i>Bacillus cereus</i> ATCC 10987	<i>Lactococcus lactis</i> subsp. <i>cremoris</i> MG1363	<i>Staphylococcus epidermidis</i> ATCC 12228
<i>Bacillus cereus</i> ATCC 14579	<i>Leuconostoc mesenteroides</i> subsp. <i>mesenteroides</i> ATCC 8293	<i>Staphylococcus epidermidis</i> RP62A
<i>Bacillus cereus</i> B4264	<i>Listeria innocua</i> Clip11262	<i>Staphylococcus haemolyticus</i> JCSC1435
<i>Bacillus cereus</i> E33L	<i>Listeria monocytogenes</i> 10403S	<i>Staphylococcus saprophyticus</i> subsp. <i>saprophyticus</i> ATCC 15305
<i>Bacillus cereus</i> H3081.97	<i>Listeria monocytogenes</i> EGD-e	<i>Streptococcus gordonii</i> str. Challis substr. CH1
<i>Bacillus cereus</i> NVH0597-99	<i>Listeria monocytogenes</i> F6900	<i>Streptococcus pneumoniae</i> D39
<i>Bacillus cereus</i> subsp. <i>cytotoxis</i> NVH 391-98	<i>Listeria monocytogenes</i> FSL F2-515	<i>Streptococcus pneumoniae</i> R6
<i>Bacillus cereus</i> W	<i>Listeria monocytogenes</i> FSL J1-175	<i>Streptococcus pneumoniae</i> SP11-BS70
<i>Bacillus clausii</i> KSM-K16	<i>Listeria monocytogenes</i> FSL J1-194	<i>Streptococcus pneumoniae</i> SP14-BS69
<i>Bacillus coagulans</i> 36D1	<i>Listeria monocytogenes</i> FSL J1-208	<i>Streptococcus pneumoniae</i> SP18-BS74
<i>Bacillus halodurans</i> C-125	<i>Listeria monocytogenes</i> FSL J2-003	<i>Streptococcus pneumoniae</i> SP19-BS75
<i>Bacillus licheniformis</i> ATCC 14580	<i>Listeria monocytogenes</i> FSL J2-064	<i>Streptococcus pneumoniae</i> SP23-BS72
<i>Bacillus</i> sp. NRRL B-14911	<i>Listeria monocytogenes</i> FSL J2-071	<i>Streptococcus pneumoniae</i> SP3-BS71
<i>Bacillus</i> sp. SG-1	<i>Listeria monocytogenes</i> FSL N1-017	<i>Streptococcus pneumoniae</i> SP6-BS73
<i>Bacillus thuringiensis</i> serovar <i>konkukian</i> str. 97-27	<i>Listeria monocytogenes</i> FSL N3-165	<i>Streptococcus pneumoniae</i> SP9-BS68
<i>Bacillus thuringiensis</i> str. Al Hakam	<i>Listeria monocytogenes</i> FSL R2-503	<i>Streptococcus pneumoniae</i> TIGR4
<i>Bacillus weihenstephanensis</i> KBAB4	<i>Listeria monocytogenes</i> HPB2262	<i>Streptococcus pyogenes</i> M1 GAS
<i>Caldicellulosiruptor saccharolyticus</i> DSM 8903	<i>Listeria monocytogenes</i> J0161	<i>Streptococcus pyogenes</i> M49 591
<i>Carboxythermus hydrogenoformans</i> Z-2901	<i>Listeria monocytogenes</i> J2818	<i>Streptococcus pyogenes</i> MGAS10270
<i>Clostridium boltea</i> ATCC BAA-613	<i>Listeria monocytogenes</i> LO28	<i>Streptococcus pyogenes</i> MGAS10394
<i>Clostridium botulinum</i> A str. Hall	<i>Listeria monocytogenes</i> str. 1/2a F6854	<i>Streptococcus pyogenes</i> MGAS10750
<i>Clostridium botulinum</i> Bf	<i>Listeria monocytogenes</i> str. 4b F2365	<i>Streptococcus pyogenes</i> MGAS2096
<i>Clostridium botulinum</i> C str. Eklund	<i>Listeria monocytogenes</i> str. 4b H7858	<i>Streptococcus pyogenes</i> MGAS315
<i>Clostridium botulinum</i> G	<i>Listeria welshimeri</i> serovar 6b str. SLCC5334	<i>Streptococcus pyogenes</i> MGAS5005
<i>Clostridium botulinum</i> NCTC 2916	<i>Mesoplasma florum</i> L1	<i>Streptococcus pyogenes</i> MGAS6180
<i>Clostridium botulinum</i> str. Iwanei E	<i>Mycoplasma agalactiae</i> PG2	<i>Streptococcus pyogenes</i> MGAS8232
<i>Clostridium butyricum</i> 5521	<i>Mycoplasma capricolum</i> subsp. <i>capricolum</i> ATCC 27343	<i>Streptococcus pyogenes</i> MGAS9429
<i>Clostridium cellulolyticum</i> H10	<i>Mycoplasma gallisepticum</i> R	<i>Streptococcus pyogenes</i> SSI-1
<i>Clostridium difficile</i> 630	<i>Mycoplasma genitalium</i> G37	<i>Streptococcus pyogenes</i> str. Manfredo
<i>Clostridium difficile</i> QCD-66c26	<i>Mycoplasma hyopneumoniae</i> 232	<i>Streptococcus sanguinis</i> SK36
<i>Clostridium leptum</i> DSM 753	<i>Mycoplasma hyopneumoniae</i> 7448	<i>Streptococcus thermophilus</i> CNRZ1066
<i>Clostridium perfringens</i> ATCC 13124	<i>Mycoplasma hyopneumoniae</i> J	<i>Symbiobacterium thermophilum</i> IAM 14863
<i>Clostridium perfringens</i> B str. ATCC 3626	<i>Mycoplasma mobile</i> 163K	<i>Ureaplasma parvum</i> serovar 1
<i>Clostridium perfringens</i> C str. JGS1495	<i>Mycoplasma mycoides</i> subsp. <i>mycoides</i> LC str. GM12	<i>Ureaplasma parvum</i> serovar 14
<i>Clostridium perfringens</i> CPE str. F4969	<i>Mycoplasma mycoides</i> subsp. <i>mycoides</i> SC str. PG1	<i>Ureaplasma parvum</i> serovar 3

<i>Clostridium perfringens</i> E str. JGS1987	<i>Mycoplasma penetrans</i> HF-2	<i>Ureaplasma parvum</i> serovar 3 str. ATCC 700970
<i>Clostridium perfringens</i> NCTC 8239	<i>Mycoplasma pneumoniae</i> M129	<i>Ureaplasma parvum</i> serovar 6
<i>Clostridium perfringens</i> SM101	<i>Mycoplasma pulmonis</i> UAB CTIP	<i>Ureaplasma urealyticum</i> serovar 10
<i>Clostridium perfringens</i> str. 13	<i>Mycoplasma synoviae</i> 53	<i>Ureaplasma urealyticum</i> serovar 11
<i>Clostridium phytofermentans</i> ISDg	<i>Oceanobacillus ihyenssis</i> HTE831	<i>Ureaplasma urealyticum</i> serovar 12
<i>Clostridium</i> sp. L2-50	<i>Oenococcus oeni</i> ATCC BAA-1163	<i>Ureaplasma urealyticum</i> serovar 13
<i>Desulfotomaculum reducens</i> MI-1	<i>Oenococcus oeni</i> PSU-1	<i>Ureaplasma urealyticum</i> serovar 4
<i>Dorea longicatena</i> DSM 13814	Onion yellows phytoplasma OY-M	<i>Ureaplasma urealyticum</i> serovar 5
<i>Enterococcus faecalis</i> V583	<i>Paenibacillus larvae</i> subsp. <i>larvae</i> BRL-230010	<i>Ureaplasma urealyticum</i> serovar 7
<i>Epulopiscium</i> sp. 'N.t. morphotype B'	<i>Pasteuria nishizawae</i> str. North American	<i>Ureaplasma urealyticum</i> serovar 8
	<i>Pediococcus pentosaceus</i> ATCC 25745	<i>Ureaplasma urealyticum</i> serovar 9
Archaea	NAB-1	NAB-2
<i>Haloquadratum walsbyi</i> DSM 16790	YP_659191	YP_659192
<i>Methanobrevibacter smithii</i> ATCC 35061	YP_001273517	YP_001274112
<i>Methanocaldococcus jannaschii</i> DSM 2661	NP_247475	NP_248059
<i>Methanococcoides burtonii</i> DSM 6242	YP_566239	YP_566240
<i>Methanococcus aeolicus</i> Nankai-3	YP_001324615	YP_001324618
<i>Methanococcus maripaludis</i> C5	YP_001097036	YP_001097035
<i>Methanosarcina acetivorans</i> C2A	NP_618639	NP_618640
<i>Methanosarcina barkeri</i> str. <i>Fusaro</i>	YP_306910	
<i>Methanospirillum hungatei</i> JF-1	YP_504500	YP_504504
<i>Methanococcus vannielii</i> SB	<i>Methanococcus maripaludis</i> C7	<i>Pyrobaculum calidifontis</i> JCM 11548
<i>Methanoculleus marisnigri</i> JR1	<i>Methanococcus maripaludis</i> S2	<i>Pyrobaculum islandicum</i> DSM 4184
<i>Aeropyrum pernix</i> K1	<i>Methanocorpusculum labreanum</i> Z	<i>Pyrococcus abyssi</i> GE5
<i>Archaeoglobus fulgidus</i> DSM 4304	<i>Methanopyrus kandleri</i> AV19	<i>Pyrococcus furiosus</i> DSM 3638
<i>Caldivirga maquilingensis</i> IC-167	<i>Methanoaeta thermophila</i> PT	<i>Pyrococcus horikoshii</i> OT3
<i>Candidatus Methanoregula boonei</i> 6A8	<i>Methanosarcina mazei</i> GoI	<i>Staphylothermus marinus</i> F1
<i>Ferroplasma acidarmanus</i> fer1	<i>Methanosphaera stadmanae</i> DSM 3091	<i>Sulfolobus acidocaldarius</i> DSM 639
<i>Haloarcula marismortui</i> ATCC 43049	<i>Methanothermobacter thermautotrophicus</i> str. <i>Delta H</i>	<i>Sulfolobus solfataricus</i> P2
<i>Halobacterium</i> sp. NRC-1	<i>Nanoarchaeum equitans</i> Kin4-M	<i>Sulfolobus tokodaii</i> str. 7
<i>Halorubrum lacusprofundi</i> ATCC 49239	<i>Natronomonas pharaonis</i> DSM 2160	<i>Thermococcus kodakarensis</i> KOD1
<i>Hyperthermus butylicus</i> DSM 5456	<i>Picrophilus torridus</i> DSM 9790	<i>Thermofilum pendens</i> Hrk 5
<i>Ignicoccus hospitalis</i> KIN4/I	<i>Pyrobaculum aerophilum</i> str. IM2	<i>Thermoplasma acidophilum</i> DSM 1728
<i>Metallosphaera sedula</i> DSM 5348	<i>Pyrobaculum arsenaticum</i> DSM 13514	<i>Thermoplasma volcanium</i> GSS1
Actinobacteria	NAB-1	NAB-2
<i>Brevibacterium linens</i> BL2	ZP_00379860	ZP_00379861
<i>Mycobacterium gilvum</i> PYR-GCK		YP_001136025
<i>Streptomyces avermitilis</i> MA-4680	NP_824551	NP_824550
<i>Streptomyces coelicolor</i> A3(2)]	NP_629034	NP_629033
<i>Thermobifida fusca</i> YX	YP_288072	YP_288073
<i>Acidothermus cellulolyticus</i> 11B	<i>Frankia</i> sp. CcI3	<i>Mycobacterium tuberculosis</i> CDC1551
<i>Actinomyces odontolyticus</i> ATCC 17982	<i>Frankia</i> sp. EAN1pec	<i>Mycobacterium tuberculosis</i> F11
<i>Arthrobacter aurescens</i> TC1	<i>Janibacter</i> sp. HTCC2649	<i>Mycobacterium tuberculosis</i> H37Ra
<i>Arthrobacter</i> sp. FB24	<i>Kineococcus radiotolerans</i> SRS30216	<i>Mycobacterium tuberculosis</i> H37Rv
<i>Bifidobacterium adolescentis</i> ATCC 15703	<i>Leifsonia xyli</i> subsp. <i>xyli</i> str. CTCB07	<i>Mycobacterium tuberculosis</i> str. Haarlem
<i>Bifidobacterium adolescentis</i> L2-32	<i>marine actinobacterium</i> PHSC20C1	<i>Mycobacterium ulcerans</i> Agy99
<i>Bifidobacterium longum</i> DJO10A	<i>Mycobacterium avium</i> 104	<i>Mycobacterium vanbaalenii</i> PYR-1
<i>Bifidobacterium longum</i> NCC2705	<i>Mycobacterium avium</i> subsp. <i>paratuberculosis</i> K-10	<i>Nocardia farcinica</i> IFM 10152

<i>Clavibacter michiganensis</i> subsp. <i>michiganensis</i> NCPPB 382	<i>Mycobacterium bovis</i> AF2122/97	<i>Nocardioides</i> sp. JS614
<i>Collinsella aerofaciens</i> ATCC 25986	<i>Mycobacterium bovis</i> BCG str. Pasteur 1173P2	<i>Propionibacterium acnes</i> KPA171202
<i>Corynebacterium diphtheriae</i> NCTC 13129	<i>Mycobacterium leprae</i> TN	<i>Rhodococcus</i> sp. RHA1
<i>Corynebacterium efficiens</i> YS-314	<i>Mycobacterium smegmatis</i> str. MC2 155	<i>Rubrobacter xylanophilus</i> DSM 9941
<i>Corynebacterium glutamicum</i> ATCC 13032	<i>Mycobacterium</i> sp. JLS	<i>Saccharopolyspora erythraea</i> NRRL 2338
<i>Corynebacterium glutamicum</i> R	<i>Mycobacterium</i> sp. KMS	<i>Salinispora arenicola</i> CNS-205
<i>Corynebacterium jeikeium</i> K411	<i>Mycobacterium</i> sp. MCS	<i>Salinispora tropica</i> CNB-440
<i>Frankia alni</i> ACN14a	<i>Mycobacterium tuberculosis</i> C	<i>Tropheryma whipplei</i> str. Twist
		<i>Tropheryma whipplei</i> TW08/27
Spirochetales	NAB-1	NAB-2
<i>Leptospira borgpetersenii</i> serovar <i>Hardjobovis</i> JB197	YP_800486	YP_800485 YP_800448
<i>Leptospira borgpetersenii</i> serovar <i>Hardjobovis</i> L550	YP_797605	YP_797604 YP_797566
<i>Leptospira interrogans</i> serovar <i>Copenhageni</i> str. <i>Fiocruz LI-130</i>	YP_002112 YP_002102	YP_002108 no ptase YP_002104
<i>Leptospira interrogans</i> serovar <i>Lai</i> str. 56601	NP_711786 NP_711796	NP_711790 NP_711794
<i>Treponema denticola</i> ATCC 35405		NP_971570
<i>Treponema pallidum</i> subsp. <i>pallidum</i> str. <i>Nichols</i>	NP_218729	NP_219001
<i>Borrelia afzelii</i> ACA-1	<i>Borrelia burgdorferi</i> B31	<i>Borrelia garinii</i> PBI
<i>Borrelia afzelii</i> PKo	<i>Borrelia burgdorferi</i> Bol26	<i>Borrelia valaisiana</i> VS116
<i>Borrelia burgdorferi</i> 156a	<i>Borrelia burgdorferi</i> ZS7	

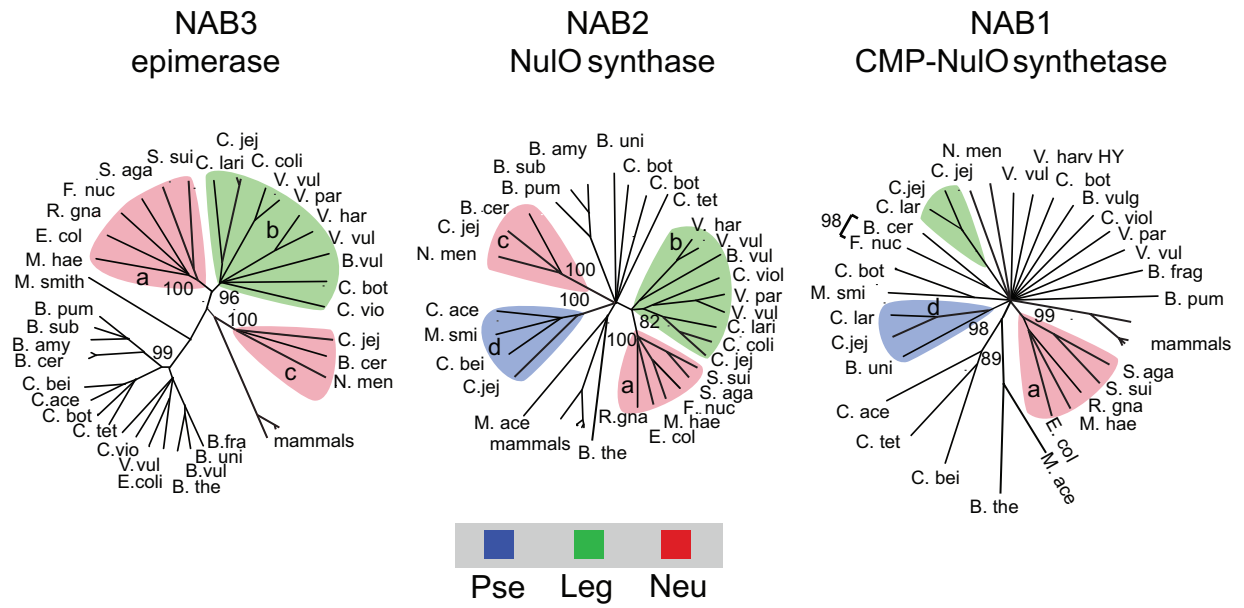


Fig. S1. Phylogenies of NAB pathways reveal distinct bacterial innovations of Sia mimicry. Phylogenetic trees were constructed based on NAB-1, NAB-2, and NAB-3 amino acid sequences collected from pathogenic bacteria represented in clades “a” and “c,” as well as a defined subset of organisms representative of other phylogenetic clades shown in Fig. 3. Colored branches indicate published biochemical data for specific NulO residues, as shown in the color key. Shading reflects monophyletic clades with high bootstrap support.

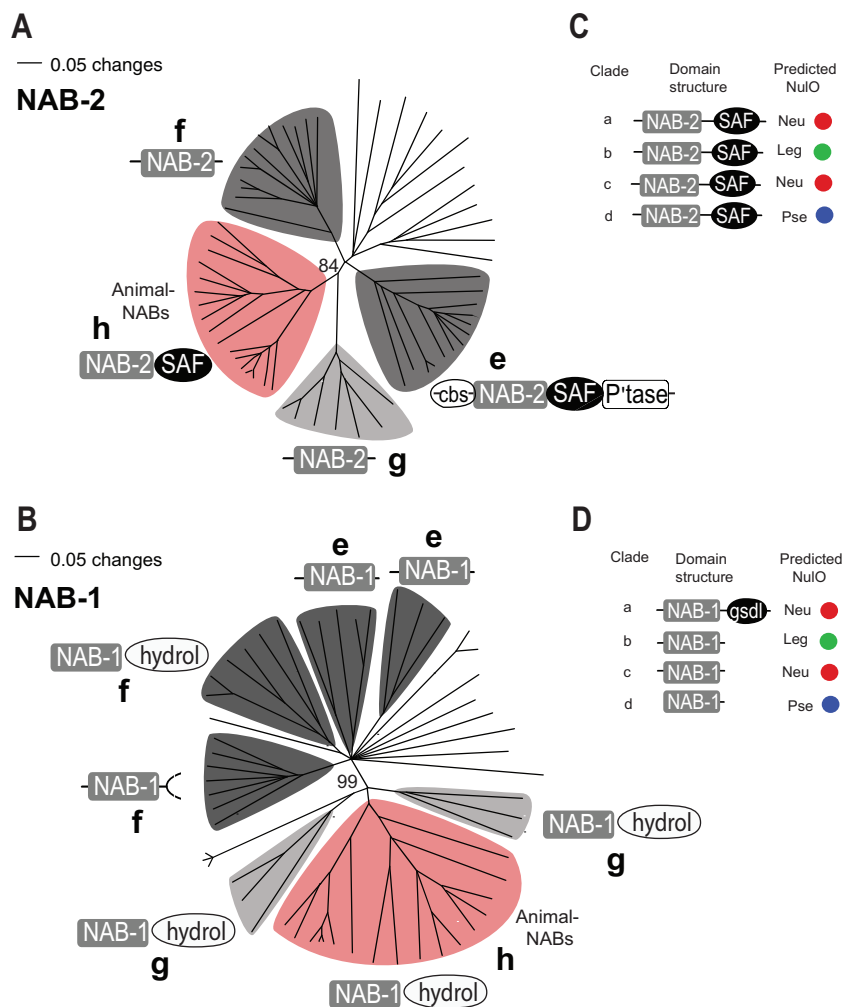


Fig. S2. Phylogenetic analysis of animal and animal-like NAB-1 and NAB-2 amino acid sequences are consistent with domain structure. (A and B), NAB-1 (A) and NAB-2 (B) amino acid sequences from organisms represented in Fig. 3, phylogenetic clades "e"–"h," were collected by BLASTp and subjected to a phylogenetic analysis that included only the NAB-1 or NAB-2 domains common to all sequences in the alignment. Protein domain organizations for clades based on the Pfam database (47), and our amino acid alignments were overlaid onto the tree. Red shading highlights the animal taxa (clade "h") that express Sias on their cell surfaces. All other clades (shown in gray) reflect novel phylogenetic classes of animal-like NAB enzymes for which no biochemical data currently exist. Clade "g" is shown in a lighter gray than other animal-like NABs to emphasize its closer phylogenetic relationship with NABs from animals as indicated by bootstrap values (shown). As in other analyses, NAB-1 appears less well conserved but shares similar phylogenetic features with functionally clustered NAB-2 sequences from the same organisms. Note that the ancestral architecture of NAB-2 likely included the C-terminal SAF domain, and that most of the animal-like NAB-1 sequences (similar to animal NAB-1 and in contrast to the sequences in clades "a"–"d") contain a C-terminal domain with predicted hydrolase activity. (C) and (D), Protein domain organization for clades "a"–"d" shown for comparison. Pfam numbers for domains are as follows: NAB-1, PF02348; NAB-2, PF03102; SAF, PF08666; CBS, PF00571; P'tase, PF01261; GSDL, PF00657; Hydrol, PF00702.

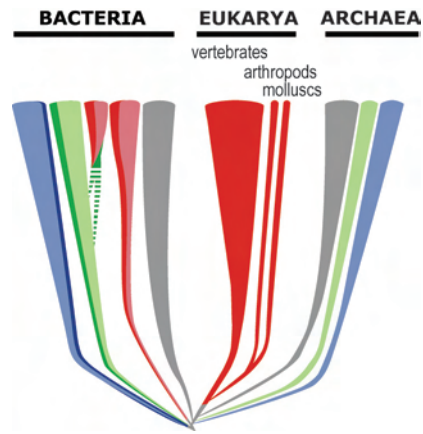


Fig. S3. A model of NuO evolution based on phylogenomic evidence. Based on phylogenetic and genomic evidence, we suggest that an early cellular diversification of NuO sugar structures resulted in the wide variety and distribution of NuO sugars that we find today (darker colors reflect published data; lighter colors indicate phylogenetic predictions). At least 3 distinct semiconvergent evolutionary paths for de novo biosynthesis of Sias are supported by the phylogenetic and biochemical data (i.e., in animals and 2 different groups of microbes often found in close association with Sia-expressing animals).

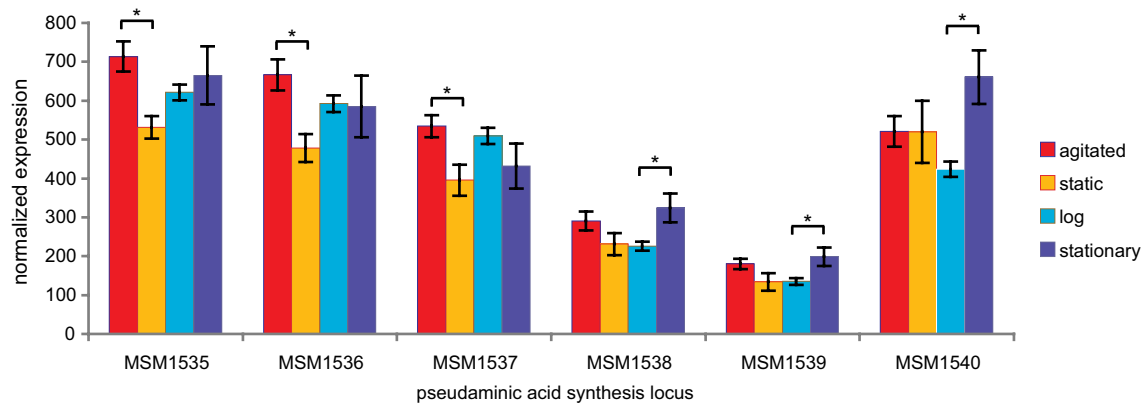


Fig. S4. Expression of predicted *M. smithii* Pse synthesis genes during growth from log phase to stationary phase in standard medium, with or without agitation. Mean values for GeneChip probeset intensities \pm SEM are plotted ($n = 9-13$ GeneChips/condition). Asterisks indicate statistically significant differences ($P < .05$ by the Student t test). Original annotations of these genes were dTDP-D-glucose 4,6 dehydratase (MSM1535), acylneuraminate cytidyltransferase (MSM1537), CMP-sialic acid synthetase (MSM1538), and a sialic acid synthase (MSM1539) (7). MSM1536 and MSM1540 encode a pleiotropic regulatory protein DegT and glycerol-3-phosphate dehydrogenase, respectively.

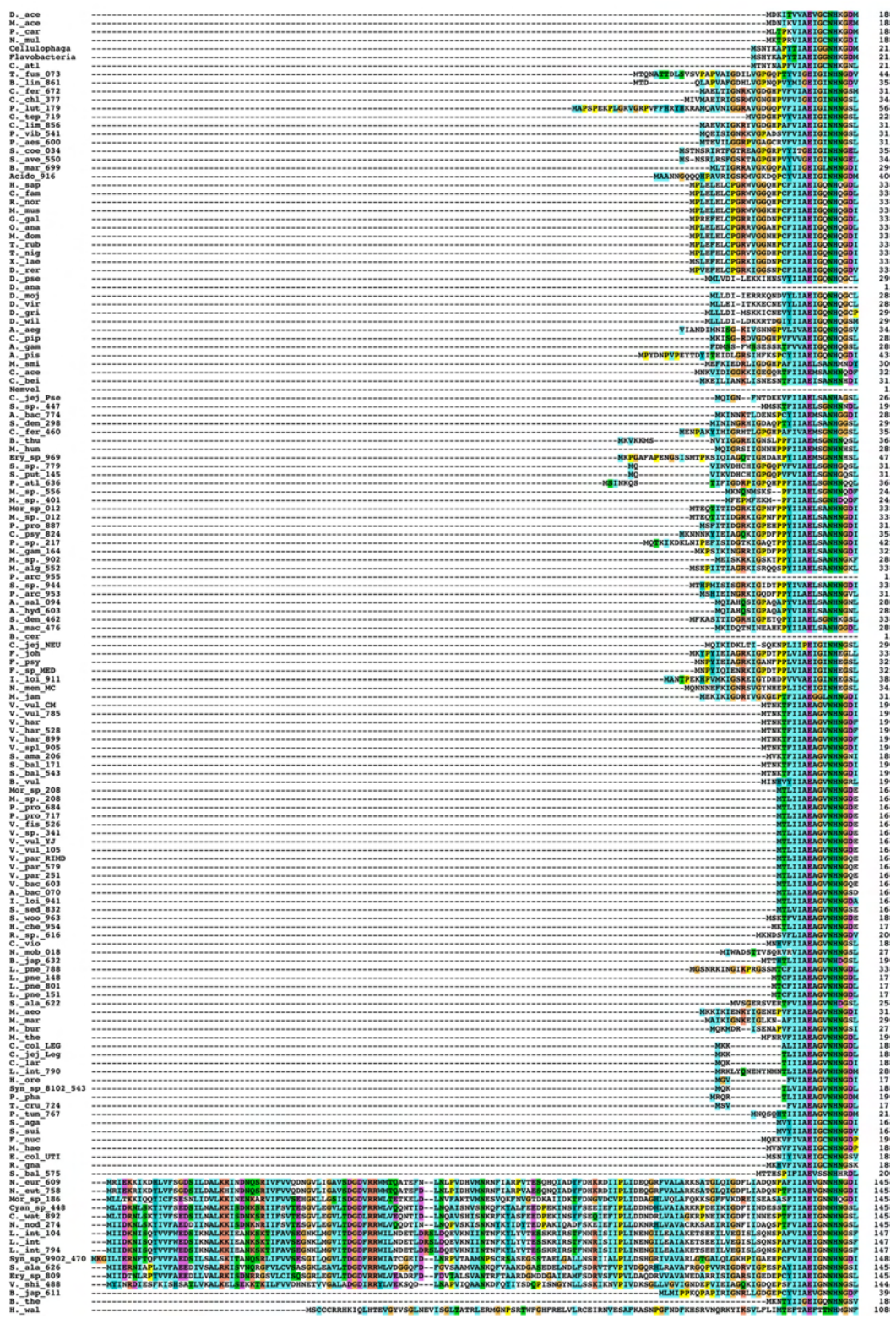


Fig. S5. Multiple sequence alignment of NAB-2 amino acid sequences used for construction of the phylogenetic tree in Fig. 3. Clustal Qt alignment of NAB-2 sequences. With the exception of the more limited sequences from sea anemone (*Nematostella*) and *P. arctica*, all gaps in the alignment were excluded from the phylogenetic analysis.

Table with multiple columns containing amino acid sequences for various proteins. The sequences are aligned and include various symbols like asterisks, dashes, and dots. The right side of the table shows line numbers from 267 to 351.

Fig. 55. Continued.

D_ace	-----	TKSALNVL	-----	293
M_ace	-----	TKSALNVL	-----	293
F_car	-----	TKSALNVL	-----	293
N_mil	-----	TKSALNVL	-----	293
Cellulophaga	-----	TKSALNVL	-----	293
Flavobacteri	-----	TKSALNVL	-----	293
C_atl	-----	TKSALNVL	-----	293
B_fur_073	-----	TKSALNVL	-----	293
B_lut_861	-----	TKSALNVL	-----	293
C_fer_672	-----	TKSALNVL	-----	293
C_chl_777	-----	TKSALNVL	-----	293
P_lut_179	-----	TKSALNVL	-----	293
C_tep_719	-----	TKSALNVL	-----	293
C_lut_856	-----	TKSALNVL	-----	293
P_vib_541	-----	TKSALNVL	-----	293
P_ace_500	-----	TKSALNVL	-----	293
S_con_034	-----	TKSALNVL	-----	293
S_ave_550	-----	TKSALNVL	-----	293
S_mar_599	-----	TKSALNVL	-----	293
Acidic_516	-----	TKSALNVL	-----	293
H_sap	-----	TKSALNVL	-----	293
C_fam	-----	TKSALNVL	-----	293
H_nor	-----	TKSALNVL	-----	293
M_maa	-----	TKSALNVL	-----	293
O_ana	-----	TKSALNVL	-----	293
M_duo	-----	TKSALNVL	-----	293
T_rub	-----	TKSALNVL	-----	293
N_nig	-----	TKSALNVL	-----	293
L_lae	-----	TKSALNVL	-----	293
D_rce	-----	TKSALNVL	-----	293
D_pae	-----	TKSALNVL	-----	293
D_mae	-----	TKSALNVL	-----	293
D_mir	-----	TKSALNVL	-----	293
D_vir	-----	TKSALNVL	-----	293
D_wil	-----	TKSALNVL	-----	293
A_egg	-----	TKSALNVL	-----	293
A_pip	-----	TKSALNVL	-----	293
A_gam	-----	TKSALNVL	-----	293
A_pis	-----	TKSALNVL	-----	293
C_ace	-----	TKSALNVL	-----	293
N	-----	TKSALNVL	-----	293
Novel	-----	TKSALNVL	-----	293
C_jaj_784	-----	TKSALNVL	-----	293
S_sp_147	-----	TKSALNVL	-----	293
A_bac_744	-----	TKSALNVL	-----	293
S_dun_298	-----	TKSALNVL	-----	293
C_fer_460	-----	TKSALNVL	-----	293
B_thu	-----	TKSALNVL	-----	293
H_hun	-----	TKSALNVL	-----	293
Ry_s_969	-----	TKSALNVL	-----	293
S_sp_779	-----	TKSALNVL	-----	293
M_pu_145	-----	TKSALNVL	-----	293
M_atl_636	-----	TKSALNVL	-----	293
M_sp_101	-----	TKSALNVL	-----	293
Mor_sp_012	-----	TKSALNVL	-----	293
M_sp_012	-----	TKSALNVL	-----	293
P_pro_187	-----	TKSALNVL	-----	293
C_psy_214	-----	TKSALNVL	-----	293
P_sp_827	-----	TKSALNVL	-----	293
M_gam_164	-----	TKSALNVL	-----	293
M_sp_902	-----	TKSALNVL	-----	293
M_al_552	-----	TKSALNVL	-----	293
P_ace_955	-----	TKSALNVL	-----	293
S_sp_944	-----	TKSALNVL	-----	293
M_sp_953	-----	TKSALNVL	-----	293
A_sal_094	-----	TKSALNVL	-----	293
A_hyd_603	-----	TKSALNVL	-----	293
M_dan_462	-----	TKSALNVL	-----	293
A_mac_476	-----	TKSALNVL	-----	293
B_cer	-----	TKSALNVL	-----	293
DNKX	-----	TKSALNVL	-----	293
F_joh	-----	TKSALNVL	-----	293
P_fer	-----	TKSALNVL	-----	293
F_sp_MED	-----	TKSALNVL	-----	293
I_loi_911	-----	TKSALNVL	-----	293
SOD	-----	TKSALNVL	-----	293
M_jan	-----	TKSALNVL	-----	293
V_vul_CH	-----	TKSALNVL	-----	293
V_vul_785	-----	TKSALNVL	-----	293
V_har	-----	TKSALNVL	-----	293
V_har_528	-----	TKSALNVL	-----	293
V_har_898	-----	TKSALNVL	-----	293
V_spl_905	-----	TKSALNVL	-----	293
S_ama_296	-----	TKSALNVL	-----	293
S_bal_171	-----	TKSALNVL	-----	293
S_bal_543	-----	TKSALNVL	-----	293
Mor_sp_208	-----	TKSALNVL	-----	293
M_sp_208	-----	TKSALNVL	-----	293
P_pro_484	-----	TKSALNVL	-----	293
V_vul_13	-----	TKSALNVL	-----	293
V_vul_105	-----	TKSALNVL	-----	293
V_pst_810	-----	TKSALNVL	-----	293
V_pst_579	-----	TKSALNVL	-----	293
V_pst_251	-----	TKSALNVL	-----	293
V_bac_603	-----	TKSALNVL	-----	293
A_bac_070	-----	TKSALNVL	-----	293
I_loi_941	-----	TKSALNVL	-----	293
S_egg_832	-----	TKSALNVL	-----	293
S_woo_963	-----	TKSALNVL	-----	293
M_cha_954	-----	TKSALNVL	-----	293
R_sp_616	-----	TKSALNVL	-----	293
C_vio	-----	TKSALNVL	-----	293
M_mob_018	-----	TKSALNVL	-----	293
B_jap_632	-----	TKSALNVL	-----	293
M_pne_788	-----	TKSALNVL	-----	293
L_pne_148	-----	TKSALNVL	-----	293
L_pne_801	-----	TKSALNVL	-----	293
L_pne_151	-----	TKSALNVL	-----	293
S_ala_622	-----	TKSALNVL	-----	293
M_ano	-----	TKSALNVL	-----	293
M_mar	-----	TKSALNVL	-----	293
M_bar	-----	TKSALNVL	-----	293
M_tbe	-----	TKSALNVL	-----	293
C_col_L80	-----	TKSALNVL	-----	293
C_jaj_Leq	-----	TKSALNVL	-----	293
C_jar	-----	TKSALNVL	-----	293
L_int_790	-----	TKSALNVL	-----	293
H_ore	-----	TKSALNVL	-----	293
SyE_sp_8102_543	-----	TKSALNVL	-----	293
P_pha	-----	TKSALNVL	-----	293
T_cru_724	-----	TKSALNVL	-----	293
P_tun_767	-----	TKSALNVL	-----	293
S_aga	-----	TKSALNVL	-----	293
S_sul	-----	TKSALNVL	-----	293
F_ruc	-----	TKSALNVL	-----	293
M_hae	-----	TKSALNVL	-----	293
R_col_071	-----	TKSALNVL	-----	293
R_gna	-----	TKSALNVL	-----	293
S_bal_575	-----	TKSALNVL	-----	293
N_eut_598	-----	TKSALNVL	-----	293
Mor_sp_186	-----	TKSALNVL	-----	293
Cyan_sp_448	-----	TKSALNVL	-----	293
C_wat_892	-----	TKSALNVL	-----	293
Nod_274	-----	TKSALNVL	-----	293
L_int_104	-----	TKSALNVL	-----	293
L_int	-----	TKSALNVL	-----	293
L_int_194	-----	TKSALNVL	-----	293
SyE_sp_9902_470	-----	TKSALNVL	-----	293
S_ala_626	-----	TKSALNVL	-----	293
SyE_sp_809	-----	TKSALNVL	-----	293
S_ahl_488	-----	TKSALNVL	-----	293
B_jap_511	-----	TKSALNVL	-----	293
M_ana	-----	TKSALNVL	-----	293
M_wal	-----	TKSALNVL	-----	293

Fig. 55. Continued.

D_ace	.....	293
M_ace	.....	287
F_car	.....	289
N_mul	.....	293
Cellulophaga	.....	292
Flavobacteria	.....	292
C_atl	.....	292
T_fus_073	.....	294
B_lin_861	.....	296
C_fer_672	.....	290
C_chl_377	.....	294
P_lut_179	.....	315
C_tsp_719	.....	281
C_lim_856	.....	290
P_vib_541	.....	290
P_wa_600	.....	290
S_coe_034	.....	313
S_awa_550	.....	312
B_mar_699	.....	298
Acido_916	.....	301
H_ssp	.....	360
C_fam	.....	360
R_nor	.....	360
M_mus	.....	360
O_gal	.....	360
O_ana	.....	360
M_dom	.....	360
T_rub	.....	359
T_nig	.....	359
X_lao	.....	360
D_ror	.....	353
D_pse	.....	371
D_ana	.....	339
D_woj	.....	378
D_vir	.....	378
D_gri	.....	377
D_wil	.....	372
A_sog	.....	387
C_pip	.....	382
A_gem	.....	378
A_pls	.....	287
M_ana	.....	350
C_ace	.....	351
C_ba	.....	356
Hemvel	.....	300
C_jej_Pae	.....	344
S_sp_447	.....	338
A_bac_774	.....	352
S_den_298	.....	351
C_fer_460	.....	355
B_thu	.....	355
M_nan	.....	348
Ry_sp_969	.....	367
S_sp_779	.....	350
S_pst_145	.....	350
P_atl_636	.....	356
M_sp_256	.....	348
M_sp_401	.....	344
Mor_sp_012	.....	351
M_sp_012	.....	351
P_pro_887	.....	349
C_psy_824	.....	353
P_sp_217	.....	360
M_gam_164	.....	350
M_sp_902	.....	346
M_atg_552	.....	351
P_arc_955	.....	355
S_sp_944	.....	350
P_arc_953	.....	350
A_sai_094	.....	349
A_byd_603	.....	349
S_den_462	.....	360
A_msc_476	.....	348
B_cer	.....	311
C_jej_NEU	.....	344
F_job	.....	348
F_psy	.....	347
F_sp_MED	.....	347
I_col_911	.....	353
N_men_3C	.....	350
M_jan	.....	338
V_vul_CM	.....	334
V_vul_785	.....	334
V_har	.....	334
V_har_528	.....	334
V_har_899	.....	334
V_spl_905	.....	334
S_ama_206	.....	333
S_bal_171	.....	335
S_bal_543	.....	335
H_vul	.....	358
Mor_sp_208	.....	358
M_sp_208	.....	358
P_pro_684	.....	358
P_pro_717	.....	358
V_fis_526	.....	358
V_sp_341	.....	358
V_vul_17	.....	358
V_vul_105	.....	358
V_par_R1MD	.....	358
V_par_579	.....	358
V_par_351	.....	358
V_bac_603	.....	358
A_bac_070	.....	357
I_col_941	.....	358
S_sed_832	.....	358
S_woc_963	.....	360
H_che_954	.....	364
R_sp_416	.....	355
C_vio	.....	362
N_mob_018	.....	368
B_jup_632	.....	357
L_pse_788	.....	357
L_pse_148	.....	341
L_pse_801	.....	341
L_pse_151	.....	341
S_ala_622	.....	351
M_woo	.....	350
M_mar	.....	349
M_har	.....	348
M_the	.....	338
C_col_280	.....	335
C_jej_149	.....	335
C_lar	.....	335
L_int_790	.....	345
H_ore	.....	332
Syn_sp_8102_343	.....	334
P_pha	.....	336
T_cru_724	.....	335
P_tun_767	.....	342
S_osa	.....	342
S_sul	.....	339
F_msc	.....	348
M_hao	.....	346
E_col_071	.....	347
R_gna	.....	347
S_bal_575	.....	296
N_cur_609	.....	651
N_eut_758	.....	651
Mor_sp_186	.....	651
Cyan_sp_448	.....	488
C_wat_892	.....	651
N_mor_274	.....	651
L_int_104	.....	655
L_int	.....	655
L_int_194	.....	655
Syn_sp_9902_470	.....	655
S_ala_626	.....	652
Ry_sp_809	.....	652
V_sai_488	.....	652
B_jup_511	.....	514
B_the	.....	347
N_wal	.....	392

Fig. S5. Continued.

Other Supporting Information

Table S1