Catalase and ascorbate peroxidase in Euglenozoan protists

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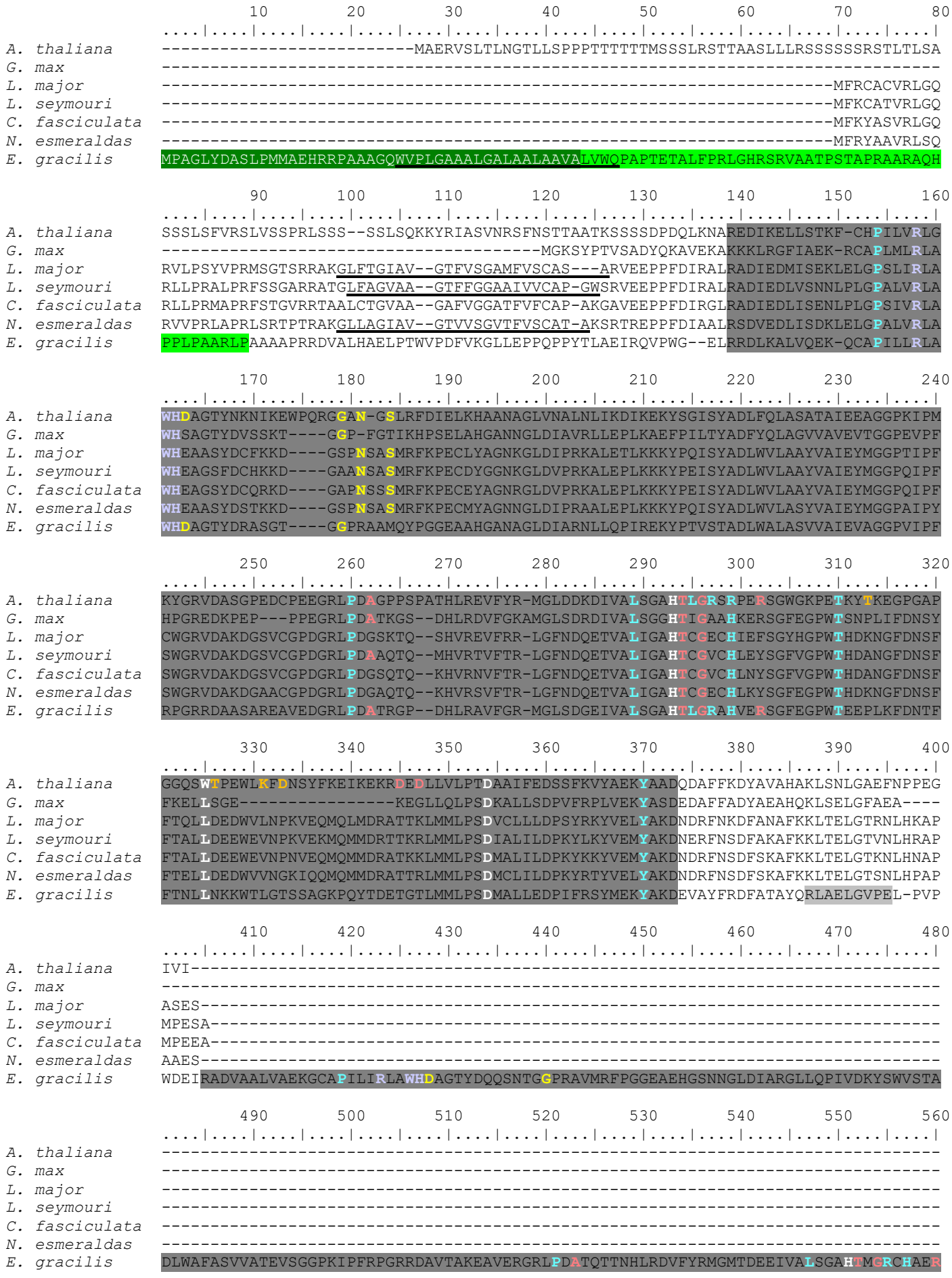
SUPPLEMENTARY FIGURE S1

SUPPLEMENTARY TABLES S1 – S2

SUPPLEMENTARY FILES S1 – S2


10 20 30 40 50 60 70 80
A. thaliana ----------MAERVSLTLNGTLLSPPPTTTTTTMSSSLRSTTAASLLLRSSSSSSRSTLTLSA
G. max ----------
L. major ----------MFRCACVRLGQ
L. seymouri ----------MFKCATVRLGQ
C. fasciculata ----------MFKYASVRLGQ
N. esmeraldas ----------MFRYAAVRLSQ
E. gracilis MPAGLYDASLPMMAEHRRPAAAGQWVPLGAAALGALAALAAVALVWQPAPTETALFPRLGHRSRVAATPSTAPRAARAQH
90 100 110 120 130 140 150 160
A. thaliana SSSLSFVRSLVSSPRLSSS--SSLSQKKYRIASVNRSFNSTTAATKSSSSDPDQLKNAREDIKELLSTKF-CHPILVRLG
G. max ----------MGKSYPTVSADYQKAVEKAKKKLRGFIAEK-RCAPLMLRLA
L. major RVLPSYVPRMSGTSRRAKGLFTGIAV--GTFVSGAMFVSCAS---ARVEEPPFDIRALRADIEDMISEKLELGPSLIRLA
L. seymouri RLLPRALPRFSSGARRATGLFAGVAA--GTFFGGAAIVVCAP-GWSRVEEPPFDIRALRADIEDLVSNNLPLGPALVRLA
C. fasciculata RLLPRMAPRFSTGVRRTAALCTGVAA--GAFVGGATFVFCAP-AKGAVEEPPFDIRGLRADIEDLISENLPLGPSIVRLA
N. esmeraldas RVVPRLAPRLSRTPTRAKGLLAGIAV--GTVVSGVTFVSCAT-AKSRTREPPFDIAALRSDVEDLISDKLELGPALVRLA
E. gracilis PPLPAARLPAAAAPRRDVALHAELPTWVPDFVKGLLEPPQPPYTLAEIRQVPWG--ELRRDLKALVQEK-QCAPILLRLA
170 180 190 200 210 220 230 240
A. thaliana WHDAGTYNKNIKEWPQRGGAN-GSLRFDIELKHAANAGLVNALNLIKDIKEKYSGISYADLFQLASATAIEEAGGPKIPM
G. max WHSAGTYDVSSKT----GGP-FGTIKHPSELAHGANNGLDIAVRLLEPLKAEFPILTYADFYQLAGVVAVEVTGGPEVPF
L. major WHEAASYDCFKKD----GSPNSASMRFKPECLYAGNKGLDIPRKALETLKKKYPQISYADLWVLAAYVAIEYMGGPTIPF
L. seymouri WHEAGSFDCHKKD----GAANSASMRFKPECDYGGNKGLDVPRKALEPLKKKYPEISYADLWVLAAYVAIEYMGGPQIPF
C. fasciculata WHEAGSYDCQRKD----GAPNSSSMRFKPECEYAGNRGLDVPRKALEPLKKKYPEISYADLWVLAAYVAIEYMGGPQIPF
N. esmeraldas WHEAASYDSTKKD----GSPNSASMRFKPECMYAGNNGLDIPRAALEPLKKKYPQISYADLWVLASYVAIEYMGGPAIPY
E. gracilis WHDAGTYDRASGT----GGPRAAMQYPGGEAAHGANAGLDIARNLLQPIREKYPTVSTADLWALASVVAIEVAGGPVIPF
250 260 270 280 290 300 310 320
A. thaliana KYGRVDASGPEDCPEEGRLPDAGPPSPATHLREVFYR-MGLDDKDIVALSGAHTLGRSRPERSGWGKPETKYTKEGPGAP
G. max HPGREDKPEP---PPEGRLPDATKGS--DHLRDVFGKAMGLSDRDIVALSGGHTIGAAHKERSGFEGPWTSNPLIFDNSY
L. major CWGRVDAKDGSVCGPDGRLPDGSKTQ--SHVREVFRR-LGFNDQETVALIGAHTCGECHIEFSGYHGPWTHDKNGFDNSF
L. seymouri SWGRVDAKDGSVCGPDGRLPDAAQTQ--MHVRTVFTR-LGFNDQETVALIGAHTCGVCHLEYSGFVGPWTHDANGFDNSF
C. fasciculata SWGRVDAKDGSVCGPDGRLPDGSQTQ--KHVRNVFTR-LGFNDQETVALIGAHTCGVCHLNYSGFVGPWTHDANGFDNSF
N. esmeraldas SWGRVDAKDGAACGPDGRLPDGAQTQ--KHVRSVFTR-LGFNDQETVALIGAHTCGECHLKYSGFEGPWTHDKNGFDNSF
E. gracilis RPGRRDAASAREAVEDGRLPDATRGP--DHLRAVFGR-MGLSDGEIVALSGAHTLGRAHVERSGFEGPWTEEPLKFDNTF
330 340 350 360 370 380 390 400
A. thaliana GGQSWTPEWLKFDNSYFKEIKEKRDEDLLVLPTDAAIFEDSSFKVYAEKYAADQDAFFKDYAVAHAKLSNLGAEFNPPEG
G. max FKELLSGE----------KEGLLQLPSDKALLSDPVFRPLVEKYASDEDAFFADYAEAHQKLSELGFAEA----
L. major FTQLLDEDWVLNPKVEQMQLMDRATTKLMMLPSDVCLLLDPSYRKYVELYAKDNDRFNKDFANAFKKLTELGTRNLHKAP
L. seymouri FTALLDEEWEVNPKVEKMQMMDRTTKRLMMLPSDIALILDPKYLKYVEMYAKDNERFNSDFAKAFKKLTELGTVNLHRAP
C. fasciculata FTALLDEEWEVNPNVEQMQMMDRATKKLMMLPSDMALILDPKYKKYVEMYAKDNDRFNSDFSKAFKKLTELGTKNLHNAP
N. esmeraldas FTELLDEDWVVNGKIQQMQMMDRATTRLMMLPSDMCLILDPKYRTYVELYAKDNDRFNSDFSKAFKKLTELGTSNLHPAP
E. gracilis FTNLLNKKWTLGTSSAGKPQYTDETGTLMMLPSDMALLEDPIFRSYMEKYAKDEVAYFRDFATAYQRLAELGVPEL-PVP
410 420 430 440 450 460 470 480
A. thaliana IVI----------
G. max ----------
L. major ASES----------
L. seymouri MPESA----------
C. fasciculata MPEEA----------
N. esmeraldas AAES----------
E. gracilis WDEIRADVAALVAEKGCAPILIRLAWHDAGTYDQQSNTGGPRAVMRFPGGEAEHGSNNGLDIARGLLQPIVDKYSWVSTA
490 500 510 520 530 540 550 560
A. thaliana ----------
G. max ----------
L. major ----------
L. seymouri ----------
C. fasciculata ----------
N. esmeraldas ----------
E. gracilis DLWAFASVVATEVSGGPKIPFRPGRRDAVTAKEAVERGRLPDATQTTNHLRDVFYRMGMTDEEIVALSGAHTMGRCHAER

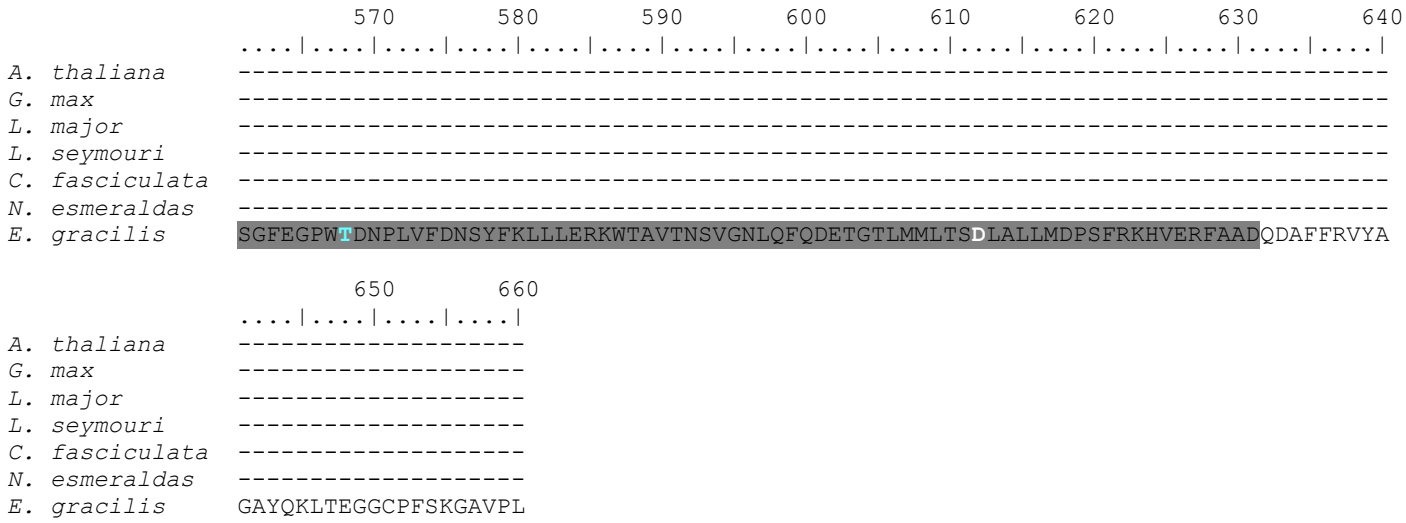


Figure S1: Full alignment of APX sequences from selected species. APX domains, signal and transit peptide, and linker are boxed by a colored background corresponding to domain colors in Fig. 4. Important amino acid residues are highlighted in different colors corresponding to colors in Fig. 4. Transmembrane domains are underlined.

Table S1. Predicted subcellular localization of euglenozoan sequences used in this study.

protein	organism	sequence	peroxisomal prediction	NommPred	TargetP	MultiLoc2 fungal	MultiLoc2 animal	PrediSI	No. TMDs	INFERRED
mitCCP	*Diplonema papillatum*	TR110952__c20_g26_i1__m.25215	-	_	mTP (36-37)	M: 0.62	S: 0.94	S (24)	0	M
eHPX	*Diplonema papillatum*	TR8739__c0_g1_i1__m.830	PTS1: SKL	M	mTP	S: 0.46	M: 0.41	-	0	M/G
eHPX	*Diplonema papillatum*	TR45711__c0_g1_i1__m.5672	-	M	SP (16-17)	S: 0.98	C: 0.46	S (16)	0	truncated N&C
eHPX	*Diplonema papillatum*	TR130880__c10_g1_i1__m.31721	-	_	SP (19-20)	S: 0.98	S: 0.9	S (17)	1	S
mitCCP	*Diplonema japonicum*	TRINITY_DN10300_c4_g1_i2	-	_	mTP (32-33)	M: 0.74	M: 0.87	-	0	M
mitCCP	*Diplonema japonicum*	TRINITY_DN10460_c6_g1_i1	PTS2: MSVSQNRLKVLNSHV	_	noTP	S: 0.68	C: 0.67	-	1	C
eHPX	*Diplonema japonicum*	TRINITY_DN10282_c5_g3_i2	-	M	mTP (23-24)	M: 0.72	M: 0.75	-	1	M
eHPX	*Diplonema japonicum*	TRINITY_DN8646_c0_g2_i1	-	_	SP (16-17)	S: 0.99	S: 0.89	S (16)	0	S
eHPX	*Diplonema japonicum*	TRINITY_DN10642_c2_g3_i1	-	_	SP (21-22)	S: 0.89	S: 0.84	S (21)	0	S; truncated C
eHPX	*Diplonema japonicum*	TRINITY_DN8053_c0_g1_i1	PTS1: SRI	_	noTP	S: 0.52	N: 0.43	-	1	truncated N
eHPX	*Rhynchopus humris*	TRINITY_DN40212_c0_g1_i1	-	_	mTP (34-35)	M: 0.65	M: 0.81	-	1	M
eHPX	*Rhynchopus humris*	TRINITY_DN23907_c1_g1_i1	-	_	SP (44-45)	S: 0.45	S: 0.4	S (44)	1	S; truncated C
eHPX	*Rhynchopus humris*	TRINITY_DN57024_c0_g1_i1	-	_	noTP	S: 0.89	S: 0.66	S (50)	1	S; truncated C
eHPX	*Rhynchopus humris*	TRINITY_DN63548_c0_g1_i1	-	_	noTP	S: 0.9	S: 0.83	-	0	truncated N&C
mitCCP	*Lacrimia lanifica*	TRINITY_DN7350_c0_g1_i1	-	_	mTP (26-27)	M: 0.71	M: 0.95	-	0	M
eHPX	*Lacrimia lanifica*	TRINITY_DN4895_c0_g1_i1	-	_	noTP	M: 0.56	M: 0.83	-	1	M
eHPX	*Lacrimia lanifica*	TRINITY_DN11643_c1_g8_i2	-	_	SP (19-20)	S: 0.99	S: 0.99	S (21)	1	S
eHPX	*Lacrimia lanifica*	TRINITY_DN11235_c0_g1_i6	-	_	SP (23-24)	S: 1.0	S: 0.99	S (23)	0	S; truncated C
eHPX	*Lacrimia lanifica*	TRINITY_DN11361_c1_g9_i2	-	_	SP (22-23)	S: 0.97	S: 0.72	S (22)	0	S; truncated C
eHPX	*Lacrimia lanifica*	TRINITY_DN8638_c0_g1_i1	-	_	noTP	S: 0.65	C: 0.57	-	1	truncated N
k-hAPX-CCP	*Lacrimia lanifica*	TRINITY_DN11414_c4_g13_i1	PTS2: MERLHVLKTHL	_	noTP	C: 0.64	C: 0.45	-	0	G
mitCCP	*Sulcionema specki*	TRINITY_DN80007_c0_g1_i1	-	_	mTP (36-37)	M: 0.59	M: 0.9	-	0	M
eHPX	*Sulcionema specki*	TRINITY_DN10012_c0_g1_i1	-	M	noTP	M: 0.39	M: 0.61	-	1	M
eHPX	*Sulcionema specki*	TRINITY_DN49103_c1_g2_i3	-	_	mTP (32-33)	M: 0.64	M: 0.89	-	0	M; truncated C
eHPX	*Sulcionema specki*	TRINITY_DN77967_c0_g1_i1	-	M	mTP (24-25)	M: 0.64	M: 0.95	-	0	M
eHPX	*Sulcionema specki*	TRINITY_DN50008_c0_g1_i1	-	_	SP (16-17)	S: 0.99	S: 0.81	S (16)	0	S
eHPX	*Sulcionema specki*	TRINITY_DN70017_c0_g1_i1	-	_	SP (17-18)	S: 0.97	S: 0.95	S (17)	0	S; truncated C
eHPX	*Sulcionema specki*	TRINITY_DN23548_c0_g1_i2	-	_	noTP	M: 0.58	C: 0.47	-	0	truncated N
pt/cytAPX-LGT	*Sulcionema specki*	TRINITY_DN24282_c1_g1_i1	PTS2: MEARRLDVLRSHI	_	noTP	C: 0.72	C: 0.44	-	0	G
mitCCP	*Artemidia motanka*	TRINITY_DN15980_c4_g3_i1	-	_	mTP (37-38)	M: 0.91	M: 0.92	S (22)	0	M
eHPX	*Artemidia motanka*	TRINITY_DN6375_c0_g1_i2	-	M	mTP (27-28)	M: 0.87	M: 0.92	-	0	M; truncated C
eHPX	*Artemidia motanka*	TRINITY_DN14823_c0_g2_i1	-	M	mTP (26-27)	M: 0.83	M: 0.82	-	1	M
eHPX	*Artemidia motanka*	TRINITY_DN24471_c0_g1_i1	-	M	mTP (24-25)	M: 0.73	M: 0.89	-	1	M
pt/cytAPX-LGT	*Artemidia motanka*	TRINITY_DN15980_c4_g5_i1	PTS2: MHRLAVVSSHL	_	noTP	C: 0.66	C: 0.49	-	0	G
pt-hAPX-CCP-LGT	*Artemidia motanka*	TRINITY_DN17334_c8_g3_i1	-	_	noTP	C: 0.63	C: 0.65	-	0	C
mitCCP	*Namystynia karyoxenos*	TRINITY_DN77678_c0_g1_i1	-	_	mTP (27-28)	M: 0.77	M: 0.98	-	0	M
eHPX	*Namystynia karyoxenos*	TRINITY_DN89651_c0_g1_i1	PTS2: MPPAVIAAQLLLPGRLRLLLRARRV	M	noTP	M: 0.58	M: 0.54	-	1	M/G
eHPX	*Namystynia karyoxenos*	TRINITY_DN15097_c0_g1_i1	-	_	noTP	M: 0.76	M: 0.92	S (44)	1	M
eHPX	*Namystynia karyoxenos*	TRINITY_DN52435_c0_g1_i1	-	M	mTP (33-34)	M: 0.71	M: 0.86	-	1	M
eHPX	*Namystynia karyoxenos*	TRINITY_DN26871_c0_g1_i1	-	_	SP (28-29)	S: 0.99	M: 0.86	S (28)	0	S
pt/cytAPX-LGT	*Namystynia karyoxenos*	TRINITY_DN89136_c0_g1_i1	PTS2: MAARRIDVLSSHV	_	noTP	M: 0.37	C: 0.47	-	0	G

pt-hAPX-CCP-LGT	*Namystynia karyoxenos*	TRINITY_DN22390_c0_g1_i1	-	_	noTP	C: 0.7	N: 0.64	-	0	C
pt-hAPX-CCP	*Euglena gracilis*	GEFR01005776.1/BAC05484	-	_	noTP	S: 0.37	M: 0.81	S (43)	1	P
g-ptAPX	*Euglena gracilis*	GDJR01039455.1	-	_	noTP	S: 0.45	M: 0.63	S (49)	2	truncated N
eHPX	*Euglena gracilis*	GDJR01082147.1	-	_	noTP	S: 0.92	C: 0.6	-	0	truncated N&C
eHPX	*Euglena gracilis*	GDJR01082152.1	-	_	noTP	S: 0.9	C: 0.74	-	0	truncated N&C
eHPX	*Euglena gracilis*	GEFR01009177.1 (C-terminal of GDJR01082147.1)	-	_	noTP	S: 0.83	C: 0.67	-	0	truncated N&C
eHPX	*Euglena gracilis*	GEFR01013723.1	-	_	noTP	S: 0.97	C: 0.71	-	0	truncated N&C
eHPX	*Euglena gracilis*	GEFR01042768.1	-	_	noTP	S: 0.94	S: 0.7	-	0	truncated N&C
eHPX	*Euglena longa*	GGOE01045416.1 (Contig45548)	-	_	SP (19-20)	S: 0.99	S: 0.95	S (19)	0	S; truncated C
pt-hAPX-CCP	*Eutreptiella gymnastica* NIES-381	CAMNT_0000682101	-	_	noTP	S: 0.54	C: 0.74	-	0	truncated N
pt-hAPX-CCP	*Eutreptiella gymnastica* NIES-381	CAMNT_0000688179	PTS1: NKA	_	noTP	S: 0.75	M: 0.37	S (44)	1	P
pt-hAPX-CCP	*Eutreptiella gymnastica* NIES-381	CAMNT_0000690323	-	_	noTP	S: 0.47	C: 0.52	S (42)	1	P
pt-hAPX-CCP	*Eutreptiella gymnastica* NIES-381	CAMNT_0000693181	-	_	noTP	C: 0.51	C: 0.45	S (40)	1	P
pt-hAPX-CCP	*Eutreptiella gymnastica* NIES-381	CAMNT_0000708097	-	_	noTP	S: 0.47	C: 0.52	S (42)	1	P
g-ptAPX	*Eutreptiella gymnastica* NIES-381	Transcript_62771	-	_	noTP	C: 0.44	C: 0.39	S (50)	0	truncated N
g-ptAPX	*Eutreptiella gymnastica* NIES-381	Transcript_108943	-	_	SP (28-29)	M: 0.57	S: 0.95	S (31)	3	P; truncated C
g-ptAPX	*Eutreptiella gymnastica* NIES-381	MMETSP0039_2-20120614_21586	-	_	noTP	M: 0.59	M: 062	S (35)	3	P
pt-hAPX-CCP	*Eutreptiella gymnastica*-like CCMP1594	CAMNT_0046500393	-	_	noTP	S: 0.59	M: 0.68	S (48)	1	P
pt-hAPX-CCP	*Eutreptiella gymnastica*-like CCMP1594	CAMNT_0046515501	-	_	noTP	S: 0.52	M: 0.63	S (41)	1	P
g-ptAPX	*Eutreptiella gymnastica*-like CCMP1594	MMETSP0809_Transcript_4877	-	_	noTP	M: 0.47	S: 0.59	S (40)	2	P
g-ptAPX	*Eutreptiella gymnastica*-like CCMP1594	MMETSP0811_Transcript_101747	-	_	noTP	S: 0.57	S: 0.55	S (33)	2	P
hAPX-CCP	*Blechomonas ayalai*	Baya_117_0180	-	M	mTP (26-27)	M: 0.53	M: 0.86	-	1	M
hAPX-CCP	*Crithidia fasciculata*	CFAC1_290028200.1	-	M	mTP (49-50)	C: 0.44	M: 0.95	S (43)	0	M
hAPX-CCP	*Crithidia thermophila*	c6407_g1_i1	-	M	mTP (28-29)	C: 0.48	M: 0.92	-	1	M
hAPX-CCP	*Endotrypanum monterogeii*	EMOLV88_340006000.1	-	M	mTP (49-50)	M: 0.36	M: 0.81	S (52)	0	M
hAPX-CCP	*Leishmania enriettii*	LENLEM3045_340005600.1	-	M	mTP (52-53)	M: 0.39	M: 0.88	S (52)	1	M
hAPX-CCP	*Leishmania major Friedlin*	LmjF.34.0070	-	M	mTP (46-47)	C: 0.41	M: 0.87	S (52)	1	M
hAPX-CCP	*Leishmania mexicana*	LmxM.33.0070.1	-	_	SP (32-33)	M: 0.45	M: 0.73	S (32)	1	M
hAPX-CCP	*Leishmania* sp. MAR LEM2494	LMARLEM2494_340005600.1	-	M	SP (35-36)	M: 0.44	C: 0.4	S (35)	1	M
hAPX-CCP	*Leptomonas pyrrhocoris*	LpyrH10_05_0250	-	M	mTP (21-22)	M: 0.5	M: 0.9	S (43)	1	M
hAPX-CCP	*Leptomonas seymouri*	Lsey_0078_0210	-	M	mTP (27-28)	C: 0.41	M: 0.96	S (45)	1	M
hAPX-CCP	*Novymonas esmeraldas*	NODE_82	PTS2: MFRYAAVRLSQRVVPRLAPRLSRTPTRA	_	mTP (52-53)	M: 0.51	M: 0.88	S (52)	1	M
hAPX-CCP	*Paratrypanosoma confusum*	PCON_0074310.mRNA	-	_	noTP	C: 0.6	C: 0.54	-	0	truncated N
hAPX-CCP	*Strigomonas culicis*	EPY37063.1	-	M	mTP (28-29)	M: 0.48	M: 0.88	-	0	M
hAPX-CCP	*Trypanosoma cruzi* Dm28c 2018	C4B63_47g23-t42_1	-	M	noTP	C: 0.56	M: 0.61	S (50)	0	M
hAPX-CCP	*Trypanosoma cruzi marinkellei*	Tc_MARK_3376	PTS2: MFFRLGSFFSKY	M	mTP (12-13)	C: 0.56	M: 0.67	-	1	M
hAPX-CCP	*Trypanosoma grayi*	DQ04_02591010-t26_1	-	M	mTP (51-52)	M: 0.49	M: 0.8	S (47)	0	M
hAPX-CCP	*Trypanosoma theileri*	TM35_000011050-t36_1	-	M	mTP (34-35)	C: 0.56	M: 0.88	S (45)	1	M
CAT	*Diplonema papillatum*	DIPPA_00897.mRNA.1	-	_	noTP	C: 0.88	C: 0.77	-	0	C
CAT	*Diplonema papillatum*	DIPPA_00900.mRNA.1	-	_	noTP	C: 0.88	C: 0.77	-	0	C
CAT	*Diplonema papillatum*	DIPPA_00901.mRNA.1	-	_	noTP	C: 0.88	C: 0.77	-	0	C
CAT	*Diplonema papillatum*	DIPPA_00904.mRNA.1	-	_	noTP	C: 0.8	C: 0.67	-	0	C
CAT	*Diplonema japonicum*	TRINITY_DN11173_c4_g2_i1	PTS1: SQA	_	SP (20-21)	S: 0.93	S: 0.94	S (16)	0	S
CAT	*Diplonema japonicum*	TRINITY_DN11173_c4_g3_i1	PTS1: SQA	_	SP (16-17)	S: 0.89	S: 0.92	S (16)	0	S
CAT	*Diplonema japonicum*	TRINITY_DN11173_c4_g3_i2	PTS1: SQA	_	SP (16-17)	S: 0.91	S: 0.92	S (16)	0	S

CAT	*Rhynchopus humris*	TRINITY_DN23544_c0_g1_i1	-	_	SP (19-20)	S: 0.91	S: 0.9	S (19)	0	S
CAT	*Sulcionema specki*	TRINITY_DN284_c0_g1_i1	-	_	SP (17-18)	S: 0.92	S: 0.94	S (17)	0	S
CAT	*Artemidia motanka*	TRINITY_DN17294_c8_g2_i1	-	_	SP (18-19)	S: 0.94	S: 0.92	S (18)	0	S
CAT	*Artemidia motanka*	TRINITY_DN17294_c8_g5_i1	-	_	SP (23-24)	S: 0.93	S: 0.95	S (16)	0	S
CAT	*Artemidia motanka*	TRINITY_DN17294_c8_g7_i1	-	_	SP (16-17)	S: 0.89	S: 0.86	S (16)	0	S
CAT	*Namystynia karyoxenos*	TRINITY_DN46753_c0_g1_i1	-	_	SP (19-20)	S: 0.91	S: 0.84	S (19)	0	S; truncated C
CAT	*Namystynia karyoxenos*	TRINITY_DN46753_c0_g1_i2	-	_	SP (19-20)	S: 0.9	S: 0.87	S (19)	0	S
CAT	*Namystynia karyoxenos*	TRINITY_DN46753_c0_g1_i3	-	_	SP (19-20)	S: 0.91	S: 0.9	S (19)	0	S
CAT	*Namystynia karyoxenos*	TRINITY_DN46753_c0_g1_i4	-	_	SP (19-20)	S: 0.91	S: 0.86	S (19)	0	S; truncated C
CAT	*Namystynia karyoxenos*	TRINITY_DN57307_c0_g1_i1	-	M	SP (17-18)	S: 0.96	C: 0.49	S (17)	0	S
CAT	*Novymonas esmeraldas*	ANJ89233	-	_	noTP	C: 0.91	C: 0.8	-	0	C
CAT	*Blastocrithidia* sp. P57	TRINITY_GG_3943_c1_g1_i1	-	_	noTP	C: 0.9	C: 0.79	-	0	C
CAT	*Blastocrithidia triatomae*	NODE_379_length_14747_cov_61.7013	-	_	noTP	C: 0.89	C: 0.79	-	0	C
CAT	*jaculum*	NODE_189_length_21547_cov_70.3833	-	_	SP (19-20)	M: 0.4	S: 0.47	S (19)	2	S
CAT	*Crithidia acanthocephali*	caca	-	_	noTP	C: 0.74	C: 0.67	-	0	C
CAT	*Crithidia bombi*	cbom	-	_	noTP	C: 0.91	C: 0.79	-	0	C
CAT	*Crithidia brevicula*	ANJ89235	-	_	noTP	C: 0.92	C: 0.82	-	0	truncated N&C
CAT	*Crithidia fasciculata*	CFAC1_160031400	-	_	noTP	C: 0.9	C: 0.79	-	0	C
CAT	*Crithidia mellificae*	cmel	-	_	noTP	C: 0.79	C: 0.78	-	0	C
CAT	*Crithidia thermophila*	ANJ89234	-	_	noTP	C: 0.87	C: 0.79	-	0	C
CAT	*Leptomonas pyrrhocoris*	XP_015656182	-	_	noTP	C: 0.9	C: 0.79	-	0	C
CAT	*Leptomonas seymouri*	KPI89353	-	_	noTP	C: 0.9	C: 0.79	-	0	C
CAT	*Lotmaria passim*	lpas	-	_	noTP	C: 0.9	C: 0.81	-	0	C

mitCCP, mitochondrial CCP

eHPX, euglenozoa specific heme peroxidase

k-hAPX-CCP, kinetoplastid specific hybrid APX-CCP

pt-hAPX-CCP, plastid hybrid APX-CCP

pt-hAPX-CCP-LGT, plastid hybrid APX-CCP, gained by LGT

pt/cytAPX-LGT, plastid/cytosolic APX, gained by LGT

g-ptAPX, green lineage specific plastid APX

CAT, catalase

M, mitochondrion

P, plastid

G, glycosome

S, secretory pathway

C, cytosol

N, nucleus

truncated N, truncated sequence at N-terminus

truncated C, truncated sequence at C-terminus

truncated N&C, truncated sequence at both termini

Table S2. Inferred expression levels and measurements of enzyme activities and oxygen uptake in studied euglenozoans.

			CATALALASE					ASCORBATE PEROXIDASE					RESPIRATION
lineage	species	condition	contig	FPKM	TPM	TPM mean	activity [U/mg]	contig	FPKM	TPM	TPM mean	activity [mU/mg]	[O2 µmol/ min*10^6 cells]
Diplonemids	*Diplonema papillatum*	rich	DIPPA_00897.mRNA.1	80.87	112.16	216.21	3.99 ± 1.48	n.a.	n.a.	n.a.	n.a.	0	2.42 ± 0.98
		medium	DIPPA_00900.mRNA.1	459.22	636.89								
			DIPPA_00901.mRNA.1	56.43	78.26								
			DIPPA_00904.mRNA.1	27.06	37.52								
		poor	DIPPA_00897.mRNA.1	92.55	131.25	256.86	6.27 ± 3.47	n.a.	n.a.	n.a.	n.a.	0	7.83 ± 2.81
		medium	DIPPA_00900.mRNA.1	505.04	716.26								
			DIPPA_00901.mRNA.1	107.16	151.97								
			DIPPA_00904.mRNA.1	19.72	27.97								
	Rhynchopus humris		TRINITY_DN23544_c0_g1_i1	30.45	25.39	25.39	0	n.a.	n.a.	n.a.	n.a.	3.69 ± 1.80	15.42 ± 6.09
Kinetoplastids	*Blastocrithidia* sp. P57		TRINITY_GG_3943_c1_g1_i1	21.04	26.93	26.93	0	n.a.	n.a.	n.a.	n.a.	2.06 ± 1.84	2.44 ± 0.67
	Leptomonas seymouri	14 °C	Lsey_0026_0490	1117.21	813.49	813.49	16.84 ± 1.94	Lsey_0078_0210	225.21	163.98	163.98	54.26 ± 21.32	5.84 ± 0.90
		23 °C	Lsey_0026_0490	106.45	116.80	116.80	12.90 ± 6.48	Lsey_0078_0210	15.23	16.71	16.71	39.79 ± 10.96	8.93 ± 0.52
		34 °C	Lsey_0026_0490	398.47	432.93	432.93	5.07 ± 3.81	Lsey_0078_0210	38.24	41.55	41.55	34.35 ± 7.93	7.86 ± 0.61
	Crithidia thermophila	14 °C	TR9337|c1_g1_i1/ANJ89234	384.23	567.61	567.61	17.19 ± 6.06	TR7333|c1_g1_i1/c6407_g1_i1	122.50	180.96	180.96	65.40 ± 28.87	6.21 ± 0.16
		23 °C	TR9337|c1_g1_i1/ANJ89234	457.21	678.91	678.91	13.19 ± 2.43	TR7333|c1_g1_i1/c6407_g1_i1	12.14	18.03	18.03	48.63 ± 19.51	10.92 ± 3.15
		34 °C	TR9337|c1_g1_i1/ANJ89234	646.46	972.86	972.86	4.79 ± 1.11	TR7333|c1_g1_i1/c6407_g1_i1	18.42	27.72	27.72	51.57 ± 27.44	11.82 ± 1.16
	Novymonas esmeraldas		TRINITY_GG_6749_c0_g1_i1/ANJ89233	927.28	1220.49	626.23	10.76 ± 2.43	NODE_82	56.08	73.81	73.81	206.63 ± 69.37	4.78 ± 0.20
			TRINITY_GG_6749_c0_g1_i2/ANJ89233	24.30	31.97								
	Trypanosoma brucei		n.a.	n.a.	n.a.	n.a.	0	n.a.	n.a.	n.a.	n.a.	0	2.95 ± 0.67
Euglenids	*Euglena gracilis*	light	n.a.	n.a.	n.a.	n.a.	0	GEFR01005776.1/BAC05484	12.51	13.79	12.00	625.22 ± 176.36	2.37 ± 1.22
								GEFR01016514.1/GDJR01039455.1	9.18	10.12			
		dark	n.a.	n.a.	n.a.	n.a.	0	GEFR01005776.1/BAC05484	9.27	9.87	8.30	0	15.81 ± 4.42
								GEFR01016514.1/GDJR01039455.1	6.55	6.79			
	Euglena longa		n.a.	n.a.	n.a.	n.a.	0	n.a.	n.a.	n.a.	n.a.	0	23.65 ± 3.69

n.a.; not available

File S1: Maximum-likelihood phylogenetic tree of Euglenozoa HPX possessing APX domains in Newick format.

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cytochrome_c_peroxidase_Ccp1:0.2768337217,xxx_Syncephalastrum_racemosum_ORY95648.1_heme_peroxidase:0.5169282062):0.2440827336):0.1091324916,(Dactylellina_haptotyla_XP_011116536.1_hypothetical_protein_H072_11173:0.2343327716,xxx_Aspergillus_udagawae_GAO84407.1_cytochrome_c_peroxidase__mitochondrial:0.2983428265):0.1088861692):0.0849053495):0.0335629720):0.0170138673,((((Bigelowiella-natans_MMETSP1054-20121227_11945_1:0.3953149117,Micromonas-pusilla_MMETSP1401-20130829_1406_1:0.3575994003):0.0307460238,(Chroomonas_cf._mesostigmatica_MMETSP0047_Transcript_38188-m.63215_Cryptophyta_Pyrenomonadales:0.5656322299,Hemiselmis-andersenii_MMETSP0043_2-20121206_17536_1:0.2335066119):0.1353223330):0.1994290312,Erythrolobus-madagascarensis_MMETSP1354-20130828_2272_1:0.3452992071):0.1533092822,Pavlova-lutheri_MMETSP1463-20131121_85637_1:0.3584389242):0.0520222623):0.0496034107):0.0576194258,((Hemiselmis-tepida_MMETSP1355-20121228_24535_1:0.3407153703,(SEED_Artemidia_motanka_TRINITY_DN15980_c4_g3_i1:0.2485103545,SEED_Namystynia_karyoxenos_TRINITY_DN77678_c0_g1_i1:0.2099694792):0.2373466782):0.0801886117,((((SEED_Diplonema_japonicum_TRINITY_DN10300_c4_g1_i2:0.3589844892,SEED_Diplonema_papillatum_TR110952__c20_g26_i1__m.25215:0.5573200448):0.1164637868,SEED_Lacrimia_lanifica_TRINITY_DN7350_c0_g1_i1:0.2015149014):0.0816468150,SEED_Diplonema_japonicum_TRINITY_DN10460_c6_g1_i1:0.6217692494):0.1784728353,SEED_Sulcionema_specki_TRINITY_DN80007_c0_g1_i1:0.2627372732):0.1957374477):0.0359762296):0.1123872761):0.0395786311,(Hemiselmis-andersenii_MMETSP0043_2-20121206_19730_1:0.7115808715,xxx_Basidiobolus_meristosporus_ORX96746.1_heme_peroxidase:0.8012166188):0.2060867501):0.0512122812,((((SEED_Artemidia_motanka_TRINITY_DN14823_c0_g2_i1:1.9799975320,SEED_Namystynia_karyoxenos_TRINITY_DN89651_c0_g1_i1:0.5586025663):0.6449962249,((SEED_Diplonema_japonicum_TRINITY_DN10282_c5_g3_i2:1.7089183301,SEED_Lacrimia_lanifica_TRINITY_DN4895_c0_g1_i1:0.6499795321):0.6023067963,SEED_Sulcionema_specki_TRINITY_DN77967_c0_g1_i1:0.9835455868):0.2953448439):0.1982942712,((SEED_Artemidia_motanka_TRINITY_DN6375_c0_g1_i2:0.4919748733,SEED_Namystynia_karyoxenos_TRINITY_DN15097_c0_g1_i1:0.2320110933):0.2853496216,SEED_Sulcionema_specki_TRINITY_DN23548_c0_g1_i2:0.3780959899):0.9118192544):0.1871486434,(((((SEED_Artemidia_motanka_TRINITY_DN24471_c0_g1_i1:0.3101525921,SEED_Namystynia_karyoxenos_TRINITY_DN52435_c0_g1_i1:0.3088393514):0.2525126253,SEED_Sulcionema_specki_TRINITY_DN10012_c0_g1_i1:0.5769621105):0.2224924329,(SEED_Diplonema_japonicum_TRINITY_DN8053_c0_g1_i1:0.3152424652,SEED_Diplonema_papillatum_TR8739__c0_g1_i1__m.830:0.3071094873):0.0752818023):0.0612374172,SEED_Lacrimia_lanifica_TRINITY_DN8638_c0_g1_i1:0.5335790780):0.1337988577,SEED_Rhynchopus_humris_TRINITY_DN40212_c0_g1_i1:0.5475506233):0.8435430484,(((((((SEED_Diplonema_japonicum_TRINITY_DN10642_c2_g3_i1:1.0677218664,SEED_Sulcionema_specki_TRINITY_DN70017_c0_g1_i1:0.2780614161):0.1255612069,SEED_Diplonema_papillatum_TR45711__c0_g1_i1__m.5672:0.5595834723):0.0000022146,SEED_Lacrimia_lanifica_TRINITY_DN11235_c0_g1_i6:1.0342145855):0.1457780245,SEED_Lacrimia_lanifica_TRINITY_DN11643_c1_g8_i2:0.3305463756):0.2632988621,(SEED_Rhynchopus_humris_TRINITY_DN63548_c0_g1_i1:0.0000023451,SEED_Sulcionema_specki_TRINITY_DN49103_c1_g2_i3:0.0000020772):0.5225223454):0.3371255584,SEED_Lacrimia_lanifica_TRINITY_DN11361_c1_g9_i2:0.7822948611):0.2878423704,(SEED_Rhynchopus_humris_TRINITY_DN23907_c1_g1_i1:0.8269978875,SEED_Rhynchopus_humris_TRINITY_DN57024_c0_g1_i1:0.9709829852):0.8894367916):0.4902632284):0.1452959348):0.0638294689):0.0622604622,(((Aplanochytrium_MMETSP0954_Transcript_13863-m.13298_Stramenopila_Labyrinthulomycetes:0.2794162704,Thraustochytrium-sp-LLF1b-20130905_75161_1:0.2664208160):0.0870635309,(Durinskia-baltica-CSIRO_CS-38-20140214_139959_1:0.4340835557,Exanthemachrysis_gayraliae_MMETSP1464_Transcript_20828-m.51128_Haptophyta_Pavlovales:0.3217449295):0.0770405286):0.2067844259,Tetrahymena_thermophila_EAS01806_Ciliata_Oligohymenophorea:0.6112365599):0.2051293920):0.1398580513,(((((SEED_Euglena_gracilis_GDJR01082147.1:0.0091837432,SEED_Euglena_gracilis_GEFR01009177.1:0.0030612601):0.0736777836,SEED_Euglena_gracilis_GDJR01082152.1:0.0657510340):0.0293354690,SEED_Euglena_gracilis_GEFR01013723.1:0.0702745706):0.0233927615,SEED_Euglena_gracilis_GEFR01042768.1:0.0459844183):0.0716424266,SEED_Euglena_longa_Contig45548:0.0170398498):0.7729524780):0.2784861030,(Goniomonas-pacifica-CCMP1869-20130911_167160_1:0.6129469780,((SEED_Diplonema_japonicum_TRINITY_DN8646_c0_g2_i1:0.3901908979,SEED_Diplonema_papillatum_TR130880__c10_g1_i1__m.31721:0.6313135691):0.1755021220,(SEED_Namystynia_karyoxenos_

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65739924):0.0880238012):0.1655910784)OROOT;

File S2: Maximum-likelihood phylogenetic tree of Eulgenozoa CAT in Newick format.

(Diplonema japonicum 1604_TRINITY_DN11173_c4_g2_i1:0.0713974632,(Diplonema japonicum 1604_TRINITY_DN11173_c4_g3_i1:0.0000023247,Diplonema japonicum 1604_TRINITY_DN11173_c4_g3_i2:0.0000023247)100:0.0276455492,(Rhynchopus humris 1608_TRINITY_DN23544_c0_g1_i1:0.2733067094,((((Artemidia motanka 1610_TRINITY_DN17294_c8_g2_i1:0.0921283120,Namystynia karyoxenos 1621_TRINITY_DN57307_c0_g1_i1:0.1226241664)100:0.3398950739,Sulcionema specki 1618_TRINITY_DN284_c0_g1_i1:0.3976283462)100:0.2904343898,((Diplonema papillatum DIPPA_00897.mRNA.1:0.0000000000,Diplonema papillatum DIPPA_00904.mRNA.1:0.0000000000):0.0000000000,Diplonema papillatum DIPPA_00901.mRNA.1:0.0000000000):0.0000022331,Diplonema papillatum DIPPA_00900.mRNA.1:0.0000028358)100:0.3735038339,((((((Fulvimarina pelagi @Fulvimarina_Aurantimonadaceae_Rhizobiales_Alphaproteobacteria_Proteobacteria_Bacteria WP_007068307:0.1613464657,Notoacmeibacter marinus @Notoacmeibacter_Notoacmeibacteraceae_Rhizobiales_Alphaproteobacteria_Proteobacteria_Bacteria WP_094075414:0.0780824844)100:0.1424227855,(Henriciella algicola @Henriciella_Hyphomonadaceae_Rhodobacterales_Alphaproteobacteria_Proteobacteria_Bacteria WP_119452489:0.0618716795,Henriciella aquimarina @Henriciella_Hyphomonadaceae_Rhodobacterales_Alphaproteobacteria_Proteobacteria_Bacteria WP_084396704:0.0746785559)41:0.0000022460)90:0.0316005220,Henriciella litoralis @Henriciella_Hyphomonadaceae_Rhodobacterales_Alphaproteobacteria_Proteobacteria_Bacteria WP_084417947:0.0994450417)100:0.0344748805,(Afifella pfennigii @Afifella_Rhodobiaceae_Rhizobiales_Alphaproteobacteria_Proteobacteria_Bacteria WP_026378988:0.0721710588,Acuticoccus kandeliae @Acuticoccus_Rhodobacteraceae_Rhodobacterales_Alphaproteobacteria_Proteobacteria_Bacteria WP_108661610:0.0648939940)54:0.0294813177)53:0.0253741086,Pararhizobium haloflavum @Pararhizobium_Rhizobium/Agrobacterium group_Rhizobiaceae_Rhizobiales_Alphaproteobacteria_Proteobacteria_Bacteria WP_099865259:0.1098414430)84:0.0144948880,Hirschia sp. @Hirschia_Hyphomonadaceae_Rhodobacterales_Alphaproteobacteria_Proteobacteria_Bacteria MBB34783:0.1173966329)95:0.0352536494)98:0.0505747318,Maritimibacter sp. @Maritimibacter_Rhodobacteraceae_Rhodobacterales_Alphaproteobacteria_Proteobacteria_Bacteria MAQ82580:0.1258301459)100:0.0750483495,(Bartonella apis @Bartonella_Bartonellaceae_Rhizobiales_Alphaproteobacteria_Proteobacteria_Bacteria WP_075870246:0.1413543555,Microbulbifer thermotolerans @Microbulbifer_Microbulbiferaceae_Cellvibrionales_Gammaproteobacteria_Proteobacteria_Bacteria WP_067149864:0.1887469458)67:0.0419655575)58:0.0203991220,((Nitratireductor sp. @Nitratireductor_Phyllobacteriaceae_Rhizobiales_Alphaproteobacteria_Proteobacteria_Bacteria MAS14710:0.0157045288,Nitratireductor aquibiodomus @Nitratireductor_Phyllobacteriaceae_Rhizobiales_Alphaproteobacteria_Proteobacteria_Bacteria WP_065816189:0.0236817282)100:0.0288127432,Nitratireductor indicus @Nitratireductor_Phyllobacteriaceae_Rhizobiales_Alphaproteobacteria_Proteobacteria_Bacteria WP_009452749:0.0337066649)100:0.0554085187)84:0.0450536975,(Aureimonas altamirensis @Aureimonas_Aurantimonadaceae_Rhizobiales_Alphaproteobacteria_Proteobacteria_Bacteria WP_039195226:0.1224910958,Ensifer adhaerens @Ensifer_Sinorhizobium/Ensifer group_Rhizobiaceae_Rhizobiales_Alphaproteobacteria_Proteobacteria_Bacteria WP_065372734:0.1563274774)54:0.0243764909)45:0.0216309904,((Actibacterium atlanticum @Actibacterium_Rhodobacteraceae_Rhodobacterales_Alphaproteobacteria_Proteobacteria_Bacteria WP_035247661:0.1683631644,Brevundimonas naejangsanensis

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mirabilis @Lautropia_Burkholderiaceae_Burkholderiales_Betaproteobacteria_Proteobacteria_Bacteria WP_083799446:0.1952217437,(Mitsuaria chitosanitabida @Mitsuaria_Burkholderiales_Betaproteobacteria_Proteobacteria_Bacteria WP_067066110:0.0672379133,Roseateles depolymerans @Roseateles_Burkholderiales_Betaproteobacteria_Proteobacteria_Bacteria WP_058933257:0.0615116423)100:0.1029929909)20:0.0039646424)82:0.0230733997)70:0.0208147645,(Leptonema illini @Leptonema_Leptospiraceae_Leptospirales_Spirochaetes_Bacteria WP_002775558:0.1150727527,(Tepidiphilus margaritifer @Tepidiphilus_Hydrogenophilaceae_Hydrogenophilales_Hydrogenophilalia_Proteobacteria_Bacteria WP_028874022:0.2323455736,Thorsellia anophelis @Thorsellia_Thorselliaceae_Enterobacterales_Gammaproteobacteria_Proteobacteria_Bacteria WP_093320748:0.1741141860)83:0.0206695242)98:0.0696750152)76:0.0253912516)93:0.0183130048)100:0.0397427060,(Neptunomonas japonica @Neptunomonas_Oceanospirillales_Gammaproteobacteria_Proteobacteria_Bacteria WP_028469634:0.1434916304,(Saccharophagus degradans @Saccharophagus_Cellvibrionaceae_Cellvibrionales_Gammaproteobacteria_Proteobacteria_Bacteria WP_011467313:0.0986705640,Terasakiispira papahanaumokuakeensis @Terasakiispira_unclassified Oceanospirillales_Oceanospirillales_Gammaproteobacteria_Proteobacteria_Bacteria WP_068997014:0.1585884154)79:0.0410285808)100:0.0564000229)98:0.0252864959)84:0.0209862941,Pleomorphomonas oryzae @Pleomorphomonas_Methylocystaceae_Rhizobiales_Alphaproteobacteria_Proteobacteria_Bacteria WP_026792454:0.1353188965)90:0.0250532314,(Estrella lausannensis @Estrella_Criblamydiaceae_Parachlamydiales_Chlamydiae_Bacteria WP_098038142:0.2045816356,Lysobacter spongiicola @Lysobacter_Xanthomonadaceae_Xanthomonadales_Gammaproteobacteria_Proteobacteria_Bacteria WP_078757159:0.3102800927)99:0.0425415104)87:0.0169396798,(Hyphomicrobium denitrificans @Hyphomicrobium_Hyphomicrobiaceae_Rhizobiales_Alphaproteobacteria_Proteobacteria_Bacteria WP_013216473:0.1763541728,((Hyphomicrobium sulfonivorans @Hyphomicrobium_Hyphomicrobiaceae_Rhizobiales_Alphaproteobacteria_Proteobacteria_Bacteria WP_068462615:0.3020530026,Nesiotobacter exalbescens @Nesiotobacter_Rhodobacteraceae_Rhodobacterales_Alphaproteobacteria_Proteobacteria_Bacteria WP_028480076:0.1212641002)97:0.0826810638,Mongoliimonas terrestris @Mongoliimonas_Rhizobiales_Alphaproteobacteria_Proteobacteria_Bacteria WP_075214554:0.1706506079)90:0.0388043015)85:0.0150738582)100:0.0744740379,Kaistia soli @Kaistia_Rhizobiaceae_Rhizobiales_Alphaproteobacteria_Proteobacteria_Bacteria WP_073052405:0.1387744950)100:0.0715206398,((((((Acetobacter indonesiensis @Acetobacter_Acetobacteraceae_Rhodospirillales_Alphaproteobacteria_Proteobacteria_Bacteria WP_048844948:0.0825424587,((((Acidomonas methanolica @Acidomonas_Acetobacteraceae_Rhodospirillales_Alphaproteobacteria_Proteobacteria_Bacteria WP_042055227:0.1602272467,Neoasaia chiangmaiensis @Neoasaia_Acetobacteraceae_Rhodospirillales_Alphaproteobacteria_Proteobacteria_Bacteria WP_077808070:0.1626696438)92:0.0192876327,((Bombella intestini @Bombella_Acetobacteraceae_Rhodospirillales_Alphaproteobacteria_Proteobacteria_Bacteria WP_077396864:0.0368832555,Parasaccharibacter apium @Parasaccharibacter_Acetobacteraceae_Rhodospirillales_Alphaproteobacteria_Proteobacteria_Bacteria WP_099026622:0.0442033696)100:0.1487417897,Saccharibacter floricola @Saccharibacter_Acetobacteraceae_Rhodospirillales_Alphaproteobacteria_Proteobacteria_Bacteria WP_018979905:0.1137026535)100:0.1173498522)97:0.0232310989,Gluconobacter frateurii @Gluconobacter_Acetobacteraceae_Rhodospirillales_Alphaproteobacteria_Proteobacteria_Bacteria WP_010504439:0.0977653602)97:0.0257512956,Tanticharoenia sakaeratensis @Tanticharoenia_Acetobacteraceae_Rhodospirillales_Alphaproteobacteria_Proteobacteria_Bacteria WP_048849766:0.1117188195)100:0.1165100170)100:0.1216298662,Granulibacter bethesdensis @Granulibacter_Acetobacteraceae_Rhodospirillales_Alphaproteobacteria_Proteobacteria_Bacteria AHJ63856:0.0816112810)100:0.1169938268,Roseomonas deserti

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WP_027133691:0.1773181498,(Microvirga vignae
@Microvirga_Methylobacteriaceae_Rhizobiales_Alphaproteobacteria_Proteobacteria_Bacteria
WP_047188237:0.0925246327,Prosthecomicrobium hirschii
@Prosthecomicrobium_Hyphomicrobiaceae_Rhizobiales_Alphaproteobacteria_Proteobacteria_Bacteria
WP_054360216:0.0778440183)99:0.0240114456)100:0.0393140249,Methyloversatilis thermotolerans
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WP_018411871:0.2346371946)93:0.0668599289)98:0.0571096675,Caulobacter henricii
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WP_062149950:0.2120705067)99:0.0769091272,(((((Arcobacter canalis @Arcobacter_Arcobacter
group_Campylobacteraceae_Campylobacterales_Epsilonproteobacteria_Proteobacteria_Bacteria
WP_099333861:0.2246720927,(Campylobacter fetus
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WP_065842202:0.2373597164,Helicobacter rodentium
@Helicobacter_Helicobacteraceae_Campylobacterales_Epsilonproteobacteria_Proteobacteria_Bacteria
WP_026943187:0.2418216093)100:0.1398818527)100:0.1327647041,Sulfurospirillum barnesii
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WP_078812524:0.0781204925,Rubritalea squalenifaciens DSM 18772
@Rubritalea_Rubritaleaceae_Verrucomicrobiales_Verrucomicrobiae_Verrucomicrobia_Bacteria
SHI66560:0.1496174649)100:0.0913410885)99:0.0350893446,(Methylocella silvestris
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WP_012591463:0.1822753455,Oceanibaculum pacificum
@Oceanibaculum_Rhodospirillaceae_Rhodospirillales_Alphaproteobacteria_Proteobacteria_Bacteria
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PIS45166:0.2473021924)100:0.0632233417,(Herpetosiphon geysericola
@Herpetosiphon_Herpetosiphonaceae_Herpetosiphonales_Chloroflexia_Chloroflexi_Bacteria
WP_054536643:0.1231415357,Spirochaeta lutea
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KZC21690:0.1298918186)100:0.0633115706,(Frateuria aurantia
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WP_014402021:0.1726691660,Kerstersia gyiorum
@Kerstersia_Alcaligenaceae_Burkholderiales_Betaproteobacteria_Proteobacteria_Bacteria
WP_068372127:0.1955028720)89:0.0537732315)89:0.0406607652)100:0.0722590092,Salpingoeca rosetta
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silvestris @Solibacillus_Planococcaceae_Bacillales_Bacilli_Firmicutes_Bacteria
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WP_053585603:0.0531496339)59:0.0095521803,Ureibacillus thermosphaericus
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WP_016837596:0.1666978400)100:0.0222074143)95:0.0208371435,Rummeliibacillus pycnus
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WP_005385023:0.3224277245)97:0.0666996282)32:0.0048052985,Natribacillus halophilus
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WP_060681902:0.0426012043)100:0.0287452146,Sporosarcina ureae
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WP_071137235:0.0183553953)100:0.0462853092,Ignatzschineria larvae
@Ignatzschineria_Gammaproteobacteria_Proteobacteria_Bacteria
WP_026879052:0.1925459453)100:0.0264707717,Sphaerochaeta globosa
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WP_094765957:0.1790738189)100:0.1377253790,(((Anaerococcus prevotii
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WP_015777503:0.0581699185,Peptoniphilus timonensis

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WP_019138835:0.0774951900)100:0.1890738436,Ignavigranum ruoffiae
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WP_092571913:0.1873574510)98:0.0521424552,Porphyromonas bennonis
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WP_094206890:0.2234343980)74:0.0480511215,(((Anaerococcus vaginalis
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WP_004839131:0.0432226427,Neofamilia massiliensis @Neofamilia_Clostridiales_Clostridia_Firmicutes_Bacteria
WP_054253000:0.0429381743)72:0.0134681656,Lagierella massiliensis
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WP_055078472:0.0194247783)71:0.0130180417,Ezakiella peruensis @Ezakiella_Tissierellia_Firmicutes_Bacteria
WP_099950882:0.0694442759)100:0.2429533798)73:0.0185793036,((Aerococcus suis
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WP_084099345:0.1696847992,Tetragenococcus muriaticus
@Tetragenococcus_Enterococcaceae_Lactobacillales_Bacilli_Firmicutes_Bacteria
WP_028789464:0.0764336662)100:0.0830307568,Alloiococcus otitis
@Alloiococcus_Carnobacteriaceae_Lactobacillales_Bacilli_Firmicutes_Bacteria
WP_003778169:0.1873921111)95:0.0899730660)62:0.0155607089,Dehalobacterium formicoaceticum
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WP_018366408:0.1872860825)99:0.0296960912,(Methanosarcina flavescens
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WP_054298813:0.0825639797,(Proteocatella sphenisci
@Proteocatella_Peptostreptococcaceae_Clostridiales_Clostridia_Firmicutes_Bacteria
WP_051188457:0.0526408873,Tissierella creatinophila
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WP_075726643:0.1134675803)100:0.0790421079)100:0.0435043558)84:0.0324943108,Peptococcus niger
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WP_014729999:0.1032517841)80:0.0130116113,Brevibacillus panacihumi
@Brevibacillus_Paenibacillaceae_Bacillales_Bacilli_Firmicutes_Bacteria
WP_023558005:0.1369335102)81:0.0071833380,(((Desulfitobacterium dichloroeliminans
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WP_015261510:0.0735559860,Methanomethylovorans hollandica
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WP_072914854:0.0497930409,Succinispira mobilis
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WP_087861573:0.1085535000,Levilinea saccharolytica
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WP_062419119:0.0564209093)100:0.0283675863,Methanofollis liminatans
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WP_004039435:0.0988908401)100:0.0647177833)97:0.0233600023,(((((Novymonas esmeraldas
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pyrrhocoris @Leptomonas_Leishmaniinae_Trypanosomatidae_Kinetoplastida_Euglenozoa_Eukaryota
XP_015656182:0.0378107848,Crithidia bombi
@Crithidia_Leishmaniinae_Trypanosomatidae_Kinetoplastida_Euglenozoa_Eukaryota
cbom:0.0879193281)95:0.0142676505,Leptomonas seymouri
@Leptomonas_Leishmaniinae_Trypanosomatidae_Kinetoplastida_Euglenozoa_Eukaryota
KPI89353:0.0885137957)92:0.0197396085,((((Lotmaria passim
@Lotmaria_Leishmaniinae_Trypanosomatidae_Kinetoplastida_Euglenozoa_Eukaryota lpas:0.0553465761,(Crithidia
brevicula @Crithidia_Leishmaniinae_Trypanosomatidae_Kinetoplastida_Euglenozoa_Eukaryota
ANJ89235:0.0333763363,Crithidia thermophila
@Crithidia_Leishmaniinae_Trypanosomatidae_Kinetoplastida_Euglenozoa_Eukaryota
ANJ89234:0.0664633266)100:0.0317160545)100:0.0271287706,Crithidia mellificae
@Crithidia_Leishmaniinae_Trypanosomatidae_Kinetoplastida_Euglenozoa_Eukaryota
cmel:0.0207400574)93:0.0103341547,Crithidia fasciculata
@Crithidia_Leishmaniinae_Trypanosomatidae_Kinetoplastida_Euglenozoa_Eukaryota
cfas:0.0270345862)89:0.0112766145,Crithidia acanthocephali
@Crithidia_Leishmaniinae_Trypanosomatidae_Kinetoplastida_Euglenozoa_Eukaryota
caca:0.0000024489)96:0.0297215541)100:0.0969569255)100:0.0892873903,((((Brachyspira alvinipulli
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murdochii @Brachyspira_Brachyspiraceae_Brachyspirales_Spirochaetes_Bacteria
WP_104619231:0.0088163209)100:0.0166880855,Brachyspira innocens
@Brachyspira_Brachyspiraceae_Brachyspirales_Spirochaetes_Bacteria
WP_020003575:0.0048580455)100:0.0226507990,(Brachyspira intermedia
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WP_013243239:0.0108092900)100:0.0084074423)99:0.0044311768,Brachyspira hampsonii
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WP_025892754:0.0310153121,Mediterranea massiliensis
@Mediterranea_Bacteroidaceae_Bacteroidales_Bacteroidia_Bacteroidetes_Bacteria
WP_072546537:0.0276883909)100:0.0684985759,Porphyromonas cangingivalis
@Porphyromonas_Porphyromonadaceae_Bacteroidales_Bacteroidia_Bacteroidetes_Bacteria
WP_036850591:0.0609312032)100:0.0521346478,(Chromobacterium vaccinii
@Chromobacterium_Chromobacteriaceae_Neisseriales_Betaproteobacteria_Proteobacteria_Bacteria
WP_046166820:0.0070125286,Pseudogulbenkiania ferrooxidans
@Pseudogulbenkiania_Chromobacteriaceae_Neisseriales_Betaproteobacteria_Proteobacteria_Bacteria
WP_021478981:0.0100361174)100:0.1415099621)94:0.0193643755)74:0.0298723847,Akkermansia muciniphila
@Akkermansia_Akkermansiaceae_Verrucomicrobiales_Verrucomicrobiae_Verrucomicrobia_Bacteria
WP_102712127:0.1751904834)26:0.0098258769,((((((Alistipes obesi
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secundus @Coprobacter_Barnesiellaceae_Bacteroidales_Bacteroidia_Bacteroidetes_Bacteria
WP_044229047:0.0000028009,Gabonia massiliensis
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WP_055100169:0.0040461564)100:0.1199006360,(Gabonibacter massiliensis
@Gabonibacter_Porphyromonadaceae_Bacteroidales_Bacteroidia_Bacteroidetes_Bacteria

WP_059026437:0.0040711272,Sanguibacteroides justesenii
@Sanguibacteroides_Porphyromonadaceae_Bacteroidales_Bacteroidia_Bacteroidetes_Bacteria
WP_041504213:0.0000029332)100:0.0916053116)100:0.0647932103)100:0.0584378031,Bacteroides fragilis
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WP_032543326:0.0504711844)96:0.0385563829,Parabacteroides distasonis
@Parabacteroides_Tannerellaceae_Bacteroidales_Bacteroidia_Bacteroidetes_Bacteria
WP_057328702:0.0780843792)100:0.0486343854,(Faecalibacterium prausnitzii
@Faecalibacterium_Ruminococcaceae_Clostridiales_Clostridia_Firmicutes_Bacteria
WP_055205053:0.1407572687,(Millionella massiliensis
@Millionella_Rikenellaceae_Bacteroidales_Bacteroidia_Bacteroidetes_Bacteria WP_071133620:0.0264252289,Rikenella microfusus @Rikenella_Rikenellaceae_Bacteroidales_Bacteroidia_Bacteroidetes_Bacteria
WP_037291894:0.0662140890)100:0.0821638153)100:0.0321927420)100:0.0671598840,(Desulfuromonas acetexigens
@Desulfuromonas_Desulfuromonadaceae_Desulfuromonadales_Deltaproteobacteria_Proteobacteria_Bacteria
WP_092054230:0.0610222887,Pelobacter acetylenicus
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WP_072285874:0.1032701455)100:0.1031280705)98:0.0317292030,((((((((((((Anaerocolumna xylanovorans
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WP_073587377:0.0499408195,(Cellulosilyticum lentocellum
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WP_013655203:0.0132188903,Lachnoclostridium phytofermentans
@Lachnospiraceae_Clostridiales_Clostridia_Firmicutes_Bacteria
WP_029505074:0.0327077123)95:0.0320226931)87:0.0327833505,((Anaerosphaera aminiphila
@Anaerosphaera_Peptoniphilaceae_Tissierellales_Tissierellia_Firmicutes_Bacteria
WP_073183221:0.1134603818,((Catabacter hongkongensis
@Catabacter_Catabacteriaceae_Clostridiales_Clostridia_Firmicutes_Bacteria
WP_046443954:0.0624594923,Robinsoniella peoriensis
@Robinsoniella_Lachnospiraceae_Clostridiales_Clostridia_Firmicutes_Bacteria
WP_047832716:0.0735570771)96:0.0365053220,(Clostridium termitidis
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WP_004624845:0.0711250052,Sphaerochaeta coccoides
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WP_013738892:0.0742088349)72:0.0000023554)94:0.0215103094)86:0.0369416267,Treponema brennaborense
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WP_095174123:0.0684137447)91:0.0345485395,Bittarella massiliensis
@Bittarella_Ruminococcaceae_Clostridiales_Clostridia_Firmicutes_Bacteria
WP_059004798:0.0917002776)97:0.0302452492,((Eisenbergiella massiliensis
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WP_066864481:0.0273940205)100:0.0227510028,Hungatella hathewayi
@Hungatella_Clostridiaceae_Clostridiales_Clostridia_Firmicutes_Bacteria
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WP_050699064:0.0531842157,Bariatricus massiliensis
@Bariatricus_Lachnospiraceae_Clostridiales_Clostridia_Firmicutes_Bacteria
WP_066733821:0.0974098959)83:0.0000027895)99:0.0456685735,Methanomassiliicoccus intestinalis
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WP_066649157:0.1303966906,Pygmaiobacter massiliensis
@Pygmaiobacter_Ruminococcaceae_Clostridiales_Clostridia_Firmicutes_Bacteria
WP_102051103:0.3006047994)99:0.0159777718)100:0.1013731024,Anaerorhabdus furcosa
@Anaerorhabdus_Bacteroidaceae_Bacteroidales_Bacteroidia_Bacteroidetes_Bacteria
WP_078712294:0.2375950392)100:0.0700766100,Methanocorpusculum parvum
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WP_095642576:0.1679164003)84:0.0358579694,((((Arabia massiliensis
@Arabia_Eggerthellaceae_Eggerthellales_Coriobacteriia_Actinobacteria_Bacteria
WP_080800673:0.0287778645,Gordonibacter massiliensis
@Gordonibacter_Eggerthellaceae_Eggerthellales_Coriobacteriia_Actinobacteria_Bacteria
WP_080144252:0.0353819253)85:0.0257405238,Clostridioides difficile
@Clostridioides_Peptostreptococcaceae_Clostridiales_Clostridia_Firmicutes_Bacteria
EQI16178:0.0220557788)48:0.0117882714,Eggerthella timonensis
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WP_101721206:0.0267580178)61:0.0378441084,Raoultibacter massiliensis
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WP_102375673:0.0902431237)100:0.2269796465)74:0.0431248077,Methanomethylophilus alvus @Candidatus
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a WP_048097703:0.2183142471)100:0.1683990615)26:0.0094722523)90:0.0189718260)97:0.0297587789,Chrysiogenes
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WP_027389929:0.0908786495)86:0.0167453002,Methanothrix soehngenii
@Methanothrix_Methanotrichaceae_Methanosarcinales_Methanomicrobia_Stenosarchaea
group_Euryarchaeota_Archaea WP_013718126:0.1417812823)94:0.0118257070,(((Brocadia sinica @Candidatus
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KXK25293:0.1591455729,(Desulfofaba hansenii
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WP_100390614:0.0748697274,Desulfovibrio frigidus
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@Desulforegula_Desulfobacteraceae_Desulfobacterales_Deltaproteobacteria_Proteobacteria_Bacteria
WP_027358937:0.0771083760,Geobacter anodireducens
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WP_066357887:0.1347745299)94:0.0255804397,(Desulfotalea psychrophila
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WP_011190244:0.1712737130,Scalindua brodae @Candidatus Scalindua_Candidatus Brocadiaceae_Candidatus
Brocadiales_Planctomycetia_Planctomycetes_Bacteria
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propionicus @Pelobacter_Desulfuromonadaceae_Desulfuromonadales_Deltaproteobacteria_Proteobacteria_Bacteria
WP_011735807:0.0838350540,Syntrophobacter fumaroxidans
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WP_011698578:0.0653045150)100:0.0659612465)81:0.0114912278)85:0.0208548563,((Bilophila wadsworthia
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WP_029436121:0.1008569506,Desulfovibrio aminophilus
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WP_027177109:0.1265318920)85:0.0501628979,(((Desulfobacter postgatei
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WP_004071151:0.1197526589,Syntrophus aciditrophicus
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WP_041585147:0.0572652042)98:0.0573152891,(Desulfobulbus elongatus
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WP_028317960:0.0871289918,Desulfomicrobium norvegicum
@Desulfomicrobium_Desulfomicrobiaceae_Desulfovibrionales_Deltaproteobacteria_Proteobacteria_Bacteria
WP_092194216:0.0283657498)98:0.0310470850)100:0.0197958532,Syntrophorhabdus aromaticivorans
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WP_088447726:0.2399774924,(((((((Acinetobacter albensis
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WP_092718430:0.1463077446,(((Acinetobacter populi
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WP_087619460:0.0679780296,Gallibacterium anatis
@Gallibacterium_Pasteurellaceae_Pasteurellales_Gammaproteobacteria_Proteobacteria_Bacteria
WP_039150242:0.0450682935)36:0.0183137508,Avibacterium gallinarum
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WP_103853672:0.0327509804)38:0.0167790680,(Chelonobacter oris
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WP_034616271:0.0057264712,Pasteurella testudinis
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WP_084256723:0.0197880381)100:0.0321501365)82:0.0187414742)59:0.0031821477,(((((Idiomarina indica
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WP_092592176:0.0956982226,Pseudoalteromonas haloplanktis
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WP_011328413:0.0695753150)100:0.0366531684,Psychrobacter urativorans
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WP_062535327:0.0925148126)99:0.0310203509,Klebsiella quasipneumoniae
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WP_101862728:0.1267731366)70:0.0156596476,Moraxella boevrei
@Moraxella_Moraxellaceae_Pseudomonadales_Gammaproteobacteria_Proteobacteria_Bacteria
WP_019519938:0.0956623562)58:0.0147608165,(Paenalcaligenes hominis
@Paenalcaligenes_Alcaligenaceae_Burkholderiales_Betaproteobacteria_Proteobacteria_Bacteria
WP_077733848:0.2134404487,(Snodgrassella alvi
@Snodgrassella_Neisseriaceae_Neisseriales_Betaproteobacteria_Proteobacteria_Bacteria
WP_100100401:0.2052617691,Suttonella ornithocola
@Suttonella_Cardiobacteriaceae_Cardiobacteriales_Gammaproteobacteria_Proteobacteria_Bacteria
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s capsulatus @Actinobacillus_Pasteurellaceae_Pasteurellales_Gammaproteobacteria_Proteobacteria_Bacteria
WP_018652786:0.0214742112,Simonsiella muelleri
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WP_002641686:0.0355852339)100:0.0717719673,((Conchiformibius kuhniae
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WP_027009529:0.0464356570,Mannheimia varigena
@Mannheimia_Pasteurellaceae_Pasteurellales_Gammaproteobacteria_Proteobacteria_Bacteria
WP_025248258:0.0401503967)90:0.0211313211,Neisseria weaveri
@Neisseriaceae_Neisseriales_Betaproteobacteria_Proteobacteria_Bacteria
WP_036494282:0.0379176937)34:0.0093934219)91:0.0318054598,Moraxella caviae

@Moraxella_Moraxellaceae_Pseudomonadales_Gammaproteobacteria_Proteobacteria_Bacteria
WP_078276912:0.0646690874)43:0.0049880800,(((Aggregatibacter segnis
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WP_048750208:0.0175729757,Haemophilus influenzae
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AAA20441:0.0238222884)100:0.0198915440,((Morococcus cerebrosus
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donghaensis @Neisseria_Neisseriaceae_Neisseriales_Betaproteobacteria_Proteobacteria_Bacteria
WP_060975515:0.0085904331)100:0.0273290529,Rodentibacter ratti
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WP_077435008:0.0266385245)62:0.0130604495)98:0.0242656212,(Bergeriella denitrificans
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WP_066077770:0.0350567666,Moraxella cuniculi
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WP_076555797:0.0683554105)98:0.0343602493)87:0.0172463264)54:0.0082892006)89:0.0223757053,Stenoxybacter
acetivorans @Stenoxybacter_Neisseriaceae_Neisseriales_Betaproteobacteria_Proteobacteria_Bacteria
WP_037587031:0.1093140333)44:0.0106716658,(Haemophilus massiliensis
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WP_032108847:0.0258562600,Necropsobacter rosorum
@Pasteurellaceae_Pasteurellales_Gammaproteobacteria_Proteobacteria_Bacteria
WP_032092002:0.0391795618)100:0.0934981399)84:0.0314414979,Lysobacter tolerans
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WP_076585075:0.1502531165)65:0.0000029980,(((((Brachymonas chironomi
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WP_018715399:0.0330937967,Ottowia thiooxydans
@Ottowia_Comamonadaceae_Burkholderiales_Betaproteobacteria_Proteobacteria_Bacteria
WP_028601395:0.0992156329)94:0.0330980375,(Comamonas badia
@Comamonas_Comamonadaceae_Burkholderiales_Betaproteobacteria_Proteobacteria_Bacteria
WP_024539421:0.1118955930,(Methylobacillus rhizosphaerae
@Methylobacillus_Methylophilaceae_Nitrosomonadales_Betaproteobacteria_Proteobacteria_Bacteria
WP_089374667:0.0409031731,Thauera butanivorans
@Thauera_Zoogloeaceae_Rhodocyclales_Betaproteobacteria_Proteobacteria_Bacteria
WP_068639643:0.0464917459)57:0.0049035177)61:0.0153645753)75:0.0453605902,Halomonas halocynthiae
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WP_027966272:0.1775214463)100:0.0563834136,((((Marinobacter aromaticivorans
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WP_100688184:0.0183015274,Marinospirillum insulare
@Marinospirillum_Oceanospirillales_Gammaproteobacteria_Proteobacteria_Bacteria
WP_027851800:0.0277898974)100:0.0212946209,Pseudorhodobacter aquimaris
@Pseudorhodobacter_Rhodobacteraceae_Rhodobacterales_Alphaproteobacteria_Proteobacteria_Bacteria
WP_050525797:0.0470436244)100:0.1509855146,Sphingomonas histidinilytica
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WP_079646465:0.0564248510)100:0.0294067779,(Sphingobium cloacae
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WP_066515242:0.0303662278,Sphingopyxis granuli
@Sphingopyxis_Sphingomonadaceae_Sphingomonadales_Alphaproteobacteria_Proteobacteria_Bacteria
WP_076074723:0.0230732006)98:0.0155765616)99:0.0309179230)99:0.0273331323,(((Lampropedia cohaerens
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WP_046740293:0.0459990358,Thermomonas fusca

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WP_038216207:0.0357593568)100:0.0290982405)72:0.0153958369)99:0.0354456132,(((((Bdellovibrio exovorus
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WP_075066858:0.0302546872)100:0.1083726533,(Pseudomonas geniculata
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WP_057502581:0.0404393846,Stenotrophomonas humi
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WP_057635794:0.0692896434)100:0.1796830798)86:0.0176324232,Lysobacter enzymogenes
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WP_096377497:0.1230338317)81:0.0314383401,Novosphingobium rosa
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WP_068090466:0.1627545114)77:0.0026067918,Bordetella bronchialis
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WP_019373065:0.0131720436)100:0.0092731700,Diaphorobacter polyhydroxybutyrativorans
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WP_012206071:0.0594795215)100:0.1179711972,Lampropedia hyalina
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WP_033288641:0.1221834266,Mycobacterium aquaticum
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WP_030638643:0.0880250927)100:0.0502710640,Ruania albidiflava
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WP_053103017:0.0232942146,Thiopseudomonas denitrificans
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WP_005438011:0.0258574210,Saccharopolyspora antimicrobica
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WP_093155793:0.0577320591)72:0.0243598463)74:0.0203530560,Pseudonocardia asaccharolytica
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WP_093521375:0.1519933348)93:0.0239035016,Ruegeria conchae
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WP_015811294:0.2169805854,Mucilaginibacter gossypiicola
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WP_107039984:0.0501030084,Salegentibacter echinorum
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WP_072875679:0.2968461594)100:0.0310321589)100:0.0822767299,Flavobacterium columnare
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WP_011802041:0.1004453352,Ramlibacter tataouinensis
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WP_090627803:0.1689538870,Thauera terpenica
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WP_069295827:0.1358664686)81:0.0338631175,Psychromonas arctica
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WP_077288174:0.1829761799,Oceanisphaera profunda

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WP_019623314:0.1200668237,Marinobacterium jannaschii
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SBT06867:0.0742997570)99:0.0283736329,Novimethylophilus kurashikiensis
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WP_048900285:0.0128868812,Vibrio tapetis
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WP_107298421:0.0886286856,Vibrio rotiferianus
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WP_034437035:0.0552343441,Nitrospira japonica @Nitrospira_Nitrospiraceae_Nitrospirales_Nitrospirae_Bacteria
WP_080886730:0.1042100763)100:0.0445431056)58:0.0061550303,Insolitispirillum peregrinum
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WP_076400359:0.1147315775)95:0.0206760835)94:0.0275503007,Nitrosospira multiformis
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WP_011237006:0.0877144107,Azotobacter chroococcum
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WP_039804619:0.0944003809)65:0.0480219642,Paraburkholderia oxyphila
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WP_028220834:0.1212696257)37:0.0087790606,Sterolibacterium denitrificans

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WP_048877987:0.1671379517)64:0.0181607562,Afipia broomeae
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PJJ38015:0.0990360238)76:0.0216245462,Sphingopyxis fribergensis
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WP_060341185:0.0586602498,Paraburkholderia bannensis
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WP_034483796:0.0549961550,Rhizobium tropici @Rhizobium/Agrobacterium
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WP_047630520:0.0391106114)100:0.0676635251,Bordetella flabilis
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WP_066657172:0.0671695211)100:0.0139499685,Bradyrhizobium japonicum
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WP_102114272:0.0840504620,Sorangium cellulosum
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WP_104985532:0.1330801502)99:0.0258609935)91:0.0190834150)59:0.0164386632,(Agrobacterium tumefaciens
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WP_060726440:0.1686229736,Rhizobium leguminosarum @Rhizobium_Rhizobium/Agrobacterium
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WP_090510702:0.1857904301)7:0.0158146624,(Aquincola tertiaricarbonis
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WP_083440319:0.1904606805,((Burkholderia stagnalis @Burkholderia cepacia
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WP_060159306:0.0185878010,Cupriavidus necator
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WP_011617236:0.0366985554)100:0.1510883581,Pelomonas puraquae
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WP_066697727:0.3158829240)95:0.0720039280,(Caballeronia glathei
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WP_073103036:0.0660811852,Pusillimonas noertemannii
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WP_079572443:0.1019330590,Luteibacter rhizovicinus
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WP_063573683:0.1650341759)100:0.1057260785,((Burkholderia stabilis @Burkholderia cepacia
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WP_065501452:0.0851884648,Cupriavidus metallidurans
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WP_011520006:0.0791296968)100:0.0789669440,Pseudomonas lutea
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WP_016835371:0.1459333669,Pseudoduganella violaceinigra
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KLO02150:0.0567118108)100:0.0181163605,Providencia sneebia
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WP_072309884:0.0088703349,Obesumbacterium proteus
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WP_027274394:0.0378952091,Metakosakonia massiliensis
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WP_082811990:0.2117880124)89:0.0714497038)88:0.0218911671,Microvirgula aerodenitrificans
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WP_078240429:0.0155467958,Pasteurella dagmatis
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WP_096721039:0.0839555176)100:0.0289411436,Paraburkholderia aromaticivorans
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WP_101445558:0.0720040745)97:0.0676092370,Chitinophaga pinensis

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WP_021068502:0.1583636437)95:0.1710638008,Solitalea canadensis
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WP_041893026:0.2977808396,Saprospira grandis
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WP_002660980:0.2343748435)94:0.1283795112)74:0.0054425702,Dyadobacter koreensis
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WP_096355717:0.1640194203)73:0.0217937874,(Cyclobacterium marinum

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WP_072938503:0.1684726139)99:0.0817981528)75:0.0243795948,Confluentibacter citreus
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WP_027886099:0.0621820898,Zunongwangia mangrovi
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WP_018746178:0.1512749303)100:0.1884220509,(((Commensalibacter intestini
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WP_025420757:0.1393254010)100:0.1780944008,(Pseudomonas rhodesiae
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WP_040265615:0.0689803111,Stenotrophomonas rhizophila
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WP_085753626:0.2028071614)67:0.0406514030,Hydrocarboniphaga daqingensis
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WP_072894211:0.2217501403)67:0.0295639520,(Duganella sacchari
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WP_072780888:0.1413448874,(Massilia timonae
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WP_005669980:0.1528163255,Rugamonas rubra
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WP_093388005:0.1122905041)98:0.0391087594)98:0.0783955436)100:0.1685025336,Polyangium brachysporum
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WP_051978768:0.2719314761,Granulicella mallensis
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WP_014266585:0.3357420436)99:0.1073053955,(Methylobacterium populi
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WP_012452302:0.2870771143,Rhodopirellula europaea
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WP_008661361:0.3858800961)100:0.4622527905)21:0.0487185905,Sulfurovum lithotrophicum
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WP_041649679:0.2353968676,Solimonas aquatica
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WP_093283025:0.2502734202)100:0.1179783869,Sulfurifustis variabilis
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WP_096462460:0.1659881844)100:0.1269800523,Deinococcus grandis
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WP_091049111:0.1734183268,Haloglycomyces albus
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WP_095990067:0.0730974098,Melittangium boletus
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WP_089208948:0.1302162777)85:0.0440757771,Thermobispora bispora @Thermobispora_Actinobacteria incertae
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WP_041521924:0.1597603655)100:0.0525494397,Pseudomonas pachastrellae
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SFM12811:0.1289166074)100:0.0222696399,((Desulfonatronovibrio hydrogenovorans
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WP_028575723:0.0859858678,Geoalkalibacter subterraneus
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WP_040198876:0.0827969061)100:0.1345447494,Salinicola tamaricis
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@Pseudoclavibacter_Microbacteriaceae_Micrococcales_Actinobacteria_Bacteria
WP_068479326:0.3770110309,Saccharomonospora viridis
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WP_015786373:0.0558282411)89:0.0173509210,Thermobifida fusca
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WP_091184477:0.2066750516)58:0.0544896207,Rathayibacter tritici
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WP_104272064:0.0999219580)28:0.0257527599,Curtobacterium luteum
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WP_058726032:0.1449617595)45:0.0306874166,Clavibacter capsici
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WP_053773749:0.2036839036)100:0.1459255471,Nocardia amikacinitolerans
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WP_068826875:0.1892620184)100:0.0912296221,Endozoicomonas arenosclerae
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PTA51134:0.0673008495)100:0.1827949676,Ferrimonas balearica
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WP_015205685:0.0543193798)99:0.0221942665,Nostoc calcicola
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WP_073641506:0.0369179119)99:0.0258575535,Mastigocladopsis repens

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WP_044448815:0.0000025164)100:0.0401597577,Oscillatoria nigro-viridis
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WP_026871538:0.1028369170)91:0.0301908191,Skermanella aerolata
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WP_062410260:0.1003858020)100:0.0684858177,Alicyclobacillus acidiphilus
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WP_091572558:0.0276276213,Paludifilum halophilum
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WP_090087065:0.0544547812)100:0.0994340496,Tenuibacillus multivorans
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WP_093856636:0.0635170021)100:0.0795046318,Piscibacillus halophilus
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WP_091773624:0.0278369835)99:0.0474005727,Oceanobacillus iheyensis
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WP_042203871:0.0640962395)99:0.0167375270,Domibacillus aminovorans
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@Risungbinella_Thermoactinomycetaceae_Bacillales_Bacilli_Firmicutes_Bacteria
WP_044640681:0.0458382134)2:0.0056580235)82:0.0236292890,Bacillus soli
@Bacillus_Bacillaceae_Bacillales_Bacilli_Firmicutes_Bacteria
WP_066064705:0.1536417001)94:0.0114538353,((Fictibacillus arsenicus
@Fictibacillus_Bacillaceae_Bacillales_Bacilli_Firmicutes_Bacteria WP_066290043:0.0543252076,Thalassobacillus
devorans @Thalassobacillus_Bacillaceae_Bacillales_Bacilli_Firmicutes_Bacteria
WP_028783654:0.0965677267)98:0.0280139607,((Gorillibacterium massiliense
@Gorillibacterium_Paenibacillaceae_Bacillales_Bacilli_Firmicutes_Bacteria WP_040949987:0.1123212846,Paenibacillus
alginolyticus @Paenibacillus_Paenibacillaceae_Bacillales_Bacilli_Firmicutes_Bacteria
WP_029195217:0.0701029191)97:0.0425251652,Streptococcus pneumoniae
@Streptococcus_Streptococcaceae_Lactobacillales_Bacilli_Firmicutes_Bacteria
CJF61396:0.0334741107)31:0.0123200186)36:0.0200369092)25:0.0095916997,Terribacillus aidingensis
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WP_038564789:0.0926031711)23:0.0102130196,(Bacillus testis
@Bacillus_Bacillaceae_Bacillales_Bacilli_Firmicutes_Bacteria WP_050616318:0.1379062580,Sporosarcina globispora
@Sporosarcina_Planococcaceae_Bacillales_Bacilli_Firmicutes_Bacteria
WP_053436003:0.0450690077)55:0.0413220013)81:0.0156352295,(Jeotgalibacillus soli
@Jeotgalibacillus_Planococcaceae_Bacillales_Bacilli_Firmicutes_Bacteria WP_041087390:0.0519156002,(Planococcus
kocurii @Planococcus_Planococcaceae_Bacillales_Bacilli_Firmicutes_Bacteria
WP_058386576:0.0613620680,Planomicrobium glaciei

@Planomicrobium_Planococcaceae_Bacillales_Bacilli_Firmicutes_Bacteria
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peptonophila @Seinonella_Thermoactinomycetaceae_Bacillales_Bacilli_Firmicutes_Bacteria
WP_073152289:0.1004661902)99:0.0327072297)86:0.0156037531,(Sediminibacillus halophilus
@Sediminibacillus_Bacillaceae_Bacillales_Bacilli_Firmicutes_Bacteria WP_074600731:0.0159788713,Virgibacillus
senegalensis @Virgibacillus_Bacillaceae_Bacillales_Bacilli_Firmicutes_Bacteria
WP_053217524:0.0109062914)100:0.1225590153)86:0.0295954853,((Brochothrix campestris
@Brochothrix_Listeriaceae_Bacillales_Bacilli_Firmicutes_Bacteria WP_035314486:0.3682049191,Sporolactobacillus
vineae @Sporolactobacillus_Sporolactobacillaceae_Bacillales_Bacilli_Firmicutes_Bacteria
WP_010630572:0.1326396441)72:0.0890939203,(Carnobacterium divergens
@Carnobacterium_Carnobacteriaceae_Lactobacillales_Bacilli_Firmicutes_Bacteria
SPC41601:0.1613343862,(((Enterococcus plantarum
@Enterococcus_Enterococcaceae_Lactobacillales_Bacilli_Firmicutes_Bacteria
WP_069654240:0.1789346098,Lactobacillus curvatus
@Lactobacillus_Lactobacillaceae_Lactobacillales_Bacilli_Firmicutes_Bacteria
WP_089557236:0.3424157930)100:0.2520726003,(Floricoccus tropicus
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minor @Weissella_Leuconostocaceae_Lactobacillales_Bacilli_Firmicutes_Bacteria
KRN77299:0.0750883038)100:0.3843287907)100:0.1255739581,Enterococcus sulfureus
@Enterococcus_Enterococcaceae_Lactobacillales_Bacilli_Firmicutes_Bacteria
WP_016186031:0.2790658747)94:0.1328714246)61:0.0430184924)69:0.0091464944)90:0.0265998056)100:0.0319440
357,Pontibacillus yanchengensis @Pontibacillus_Bacillaceae_Bacillales_Bacilli_Firmicutes_Bacteria
WP_036822790:0.2610180860)100:0.0210804361,Halobacillus hunanensis
@Halobacillus_Bacillaceae_Bacillales_Bacilli_Firmicutes_Bacteria
WP_079525393:0.1795451681)100:0.0972310647,Caenibacillus caldisaponilyticus
@Caenibacillus_Sporolactobacillaceae_Bacillales_Bacilli_Firmicutes_Bacteria
WP_077615303:0.1004900830)100:0.0748704059,Novibacillus thermophilus
@Novibacillus_Thermoactinomycetaceae_Bacillales_Bacilli_Firmicutes_Bacteria
WP_077720394:0.1372792485)98:0.0540288863)100:0.0462688098)99:0.0605376542,((Calothrix parietina
@Calothrix_Rivulariaceae_Nostocales_Cyanobacteria_Bacteria WP_015196241:0.3439169707,Rubritalea profundi
@Rubritalea_Rubritaleaceae_Verrucomicrobiales_Verrucomicrobiae_Verrucomicrobia_Bacteria
WP_105043638:0.6185465823)85:0.0318162085,Ktedonobacter racemifer
@Ktedonobacter_Ktedonobacteraceae_Ktedonobacterales_Ktedonobacteria_Chloroflexi_Bacteria
WP_007915547:0.3644547654)100:0.0886017795)100:0.0737477816,(((((Akkermansia glycaniphila
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WP_067777657:0.3134417742,Mucispirillum schaedleri
@Mucispirillum_Deferribacteraceae_Deferribacterales_Deferribacteres_Bacteria
WP_023275781:0.3564461331)100:0.1027477185,Methanobrevibacter cuticularis
@Methanobrevibacter_Methanobacteriaceae_Methanobacteriales_Methanobacteria_Euryarchaeota_Archaea
WP_067259161:0.3341699529)100:0.1027281731,(Desulfotomaculum ruminis
@Desulfotomaculum_Peptococcaceae_Clostridiales_Clostridia_Firmicutes_Bacteria
WP_013841441:0.3353210611,(Dysgonomonas gadei
@Dysgonomonas_Dysgonamonadaceae_Bacteroidales_Bacteroidia_Bacteroidetes_Bacteria
WP_006800148:0.3006348031,Methanomassiliicoccus luminyensis
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ea WP_019178123:0.4353218904)68:0.0436525285)68:0.0204507479)98:0.0514134482,Deinococcus misasensis
@Deinococcus_Deinococcaceae_Deinococcales_Deinococci_Deinococcus-Thermus_Bacteria
WP_034342422:0.6367869587)98:0.0268903460,((((Desulfarculus baarsii

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WP_013257625:0.0715096167,(Desulfovibrio alkalitolerans
@Desulfohalovibrio_Desulfovibrionaceae_Desulfovibrionales_Deltaproteobacteria_Proteobacteria_Bacteria
WP_020887383:0.1206489193,(Methanococcoides vulcani
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WP_091690036:0.0594081814,((Methanolobus psychrophilus
@Methanolobus_Methanosarcinaceae_Methanosarcinales_Methanomicrobia_Euryarchaeota_Archaea
WP_015053150:0.0839971537,Methanosarcina barkeri
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group_Euryarchaeota_Archaea WP_011305841:0.0515268592)100:0.0115627219,Methanosalsum zhilinae
@Methanosalsum_Methanosarcinaceae_Methanosarcinales_Methanomicrobia_Stenosarchaea
group_Euryarchaeota_Archaea
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a acetoxidans @Desulfobacca_Syntrophaceae_Syntrophobacterales_Deltaproteobacteria_Proteobacteria_Bacteria
WP_013706143:0.1495177408)96:0.0297736858,Desulfocarbo indianensis
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WP_049673636:0.1206356591)96:0.0364488381,(Desulfocurvus vexinensis
@Desulfocurvus_Desulfovibrionaceae_Desulfovibrionales_Deltaproteobacteria_Proteobacteria_Bacteria
WP_028588583:0.1191967434,(Halodesulfovibrio aestuarii
@Halodesulfovibrio_Desulfovibrionaceae_Desulfovibrionales_Deltaproteobacteria_Proteobacteria_Bacteria
WP_027362245:0.1468686499,Pseudodesulfovibrio aespoeensis
@Desulfovibrionaceae_Desulfovibrionales_Deltaproteobacteria_Proteobacteria_Bacteria
WP_013513775:0.0278071054)100:0.0762862138)100:0.0871504100)100:0.2055232586)99:0.1004485690)78:0.02064
52436,((((((((((((((((Acanthisitta chloris
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KFP73266:0.0089028638,((Corvus cornix cornix
@Corvus_Corvidae_Corvoidea_Passeriformes_Neognathae_Aves_Coelurosauria_Theropoda_Saurischia_Dinosauria_Arc
hosauria_Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
XP_019149262:0.0048449075,(Lonchura striata domestica
@Lonchura_Estrildinae_Estrildidae_Passeroidea_Passeriformes_Neognathae_Aves_Coelurosauria_Theropoda_Saurischi
a_Dinosauria_Archosauria_Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
XP_021411590:0.0170761407,Manacus vitellinus
@Manacus_Pipridae_Passeriformes_Neognathae_Aves_Coelurosauria_Theropoda_Saurischia_Dinosauria_Archosauria_
Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
KFW74074:0.0359000355)42:0.0004525154)50:0.0044425480,Cyanistes caeruleus
@Cyanistes_Paridae_Passeriformes_Neognathae_Aves_Coelurosauria_Theropoda_Saurischia_Dinosauria_Archosauria_
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XP_023784204:0.0085444082)100:0.0271669924)58:0.0088669165,(Columba livia
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uria_Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
XP_005511099:0.0000027612,Patagioenas fasciata monilis
@Patagioenas_Columbidae_Columbiformes_Neognathae_Aves_Coelurosauria_Theropoda_Saurischia_Dinosauria_Arch
osauria_Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
OPJ74063:0.0086820364)100:0.0355591168)59:0.0046765949,(Buceros rhinoceros silvestris
@Buceros_Bucerotidae_Bucerotiformes_Neognathae_Aves_Coelurosauria_Theropoda_Saurischia_Dinosauria_Archosau
ria_Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota KFO89341:0.0368773449,Nestor
notabilis
@Nestor_Psittacidae_Psittaciformes_Neognathae_Aves_Coelurosauria_Theropoda_Saurischia_Dinosauria_Archosauria

_Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
KFQ41818:0.0070359618)99:0.0102983828)97:0.0047657527,(Antrostomus carolinensis
@Antrostomus_Caprimulgidae_Caprimulgiformes_Neognathae_Aves_Coelurosauria_Theropoda_Saurischia_Dinosauria
_Archosauria_Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
KFZ50498:0.0080311418,Egretta garzetta
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Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
KFP14470:0.0134170787)92:0.0085840526)92:0.0037929531,(Haliaeetus albicilla
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uria_Archosauria_Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
KFQ09747:0.0042457198,Leptosomus discolor
@Leptosomus_Leptosomidae_Coraciiformes_Neognathae_Aves_Coelurosauria_Theropoda_Saurischia_Dinosauria_Arch
osauria_Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
KFQ13842:0.0128297177)87:0.0000029698)95:0.0000024625,Eurypyga helias
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_Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
KFV95075:0.0042851582)94:0.0042617550,(((Aptenodytes forsteri
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chosauria_Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
KFM01548:0.0000023247,Pygoscelis adeliae
@Pygoscelis_Spheniscidae_Sphenisciformes_Neognathae_Aves_Coelurosauria_Theropoda_Saurischia_Dinosauria_Arch
osauria_Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
KFW62695:0.0000023247)100:0.0085812396,Balearica regulorum gibbericeps
@Balearica_Gruidae_Gruiformes_Neognathae_Aves_Coelurosauria_Theropoda_Saurischia_Dinosauria_Archosauria_Arc
helosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
KFO10016:0.0000022151)96:0.0042496764,(Fulmarus glacialis
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osauria_Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
KFV90292:0.0400369529,Podiceps cristatus
@Podiceps_Podicipedidae_Podicipediformes_Neognathae_Aves_Coelurosauria_Theropoda_Saurischia_Dinosauria_Arc
hosauria_Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
KFZ69041:0.0085341006)79:0.0000021381)71:0.0000022662)97:0.0042534196,Nipponia nippon
@Nipponia_Threskiornithidae_Pelecaniformes_Neognathae_Aves_Coelurosauria_Theropoda_Saurischia_Dinosauria_Ar
chosauria_Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
KFQ94150:0.0085964217)97:0.0079036046,(Gallus gallus
@Gallus_Phasianinae_Phasianidae_Galliformes_Galloanserae_Neognathae_Aves_Coelurosauria_Theropoda_Saurischia
_Dinosauria_Archosauria_Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
NP_001026386:0.0121294910,Numida meleagris
@Numida_Numididae_Galliformes_Galloanserae_Neognathae_Aves_Coelurosauria_Theropoda_Saurischia_Dinosauria_
Archosauria_Archelosauria_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota
XP_021258124:0.0136434621)100:0.0407287842)100:0.0415305027,Pelodiscus sinensis
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ata_Metazoa_Eukaryota NP_001273863:0.0774860047)61:0.0256744834,((Carassius auratus ssp. Pengze
@Carassius_Cyprinidae_Cypriniformes_Ostariophysi_Teleostei_Neopterygii_Actinopterygii_Euteleostomi_Vertebrata_C
raniata_Chordata_Metazoa_Eukaryota AGC50801:0.1365754981,Protopterus annectens
@Protopterus_Protopteridae_Lepidosireniformes_Dipnoi_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Euka
ryota AGV06209:0.1059244432)93:0.0190611740,Xenopus laevis
@Xenopus_Xenopus_Xenopodinae_Pipidae_Pipoidea_Anura_Batrachia_Amphibia_Euteleostomi_Vertebrata_Craniata_
Chordata_Metazoa_Eukaryota ABK62836:0.1605094732)56:0.0115694065)66:0.0046142503,(((Bos taurus

@Bos_Bovinae_Bovidae_Pecora_Ruminantia_Cetartiodactyla_Laurasiatheria_Eutheria_Mammalia_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota NP_001030463:0.0459219762,(Homo sapiens @Homo_Hominidae_Catarrhini_Haplorrhini_Primates_Euarchontoglires_Eutheria_Mammalia_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota AAK29181:0.0494848687,Phascolarctos cinereus @Phascolarctos_Phascolarctidae_Diprotodontia_Metatheria_Mammalia_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota XP_020819557:0.0874653434)96:0.0307006955)93:0.0191192270,Felis catus @Felis_Felinae_Felidae_Feliformia_Carnivora_Laurasiatheria_Eutheria_Mammalia_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota XP_003993206:0.0212681759)92:0.0294332857,Mus musculus @Mus_Mus_Murinae_Muridae_Muroidea_Myomorpha_Rodentia_Glires_Euarchontoglires_Eutheria_Mammalia_Euteleostomi_Vertebrata_Craniata_Chordata_Metazoa_Eukaryota NP_033934:0.0270298357)94:0.0320380781)100:0.2264771956,(Penaeus monodon @Penaeus_Penaeidae_Penaeoidea_Dendrobranchiata_Decapoda_Eucarida_Eumalacostraca_Malacostraca_Crustacea_Arthropoda_Ecdysozoa_Metazoa_Eukaryota ALM09355:0.0657539503,Portunus trituberculatus @Portunus_Portunidae_Portunoidea_Eubrachyura_Brachyura_Pleocyemata_Decapoda_Eucarida_Eumalacostraca_Malacostraca_Crustacea_Arthropoda_Ecdysozoa_Metazoa_Eukaryota ACI13850:0.1275517281)100:0.0959915592)54:0.0213264959,(((((Bombyx mori @Bombyx_Bombycinae_Bombycidae_Bombycoidea_Ditrysia_Glossata_Lepidoptera_Holometabola_Neoptera_Pterygota_Insecta_Hexapoda_Arthropoda_Ecdysozoa_Metazoa_Eukaryota NP_001036912:0.2792061881,Drosophila obscura @Sophophora_Drosophila_Drosophilidae_Ephydroidea_Muscomorpha_Brachycera_Diptera_Holometabola_Neoptera_Pterygota_Insecta_Hexapoda_Arthropoda_Ecdysozoa_Metazoa_Eukaryota XP_022221427:0.2185664817)100:0.1229501923,Camponotus floridanus @Camponotus_Formicinae_Formicidae_Vespoidea_Aculeata_Apocrita_Hymenoptera_Holometabola_Neoptera_Pterygota_Insecta_Hexapoda_Arthropoda_Ecdysozoa_Metazoa_Eukaryota EFN66292:0.2297158758)95:0.0390271198,Locusta migratoria manilensis @Locusta_Oedipodinae_Acrididae_Acridoidea_Acridomorpha_Acrididea_Caelifera_Orthoptera_Polyneoptera_Neoptera_Pterygota_Insecta_Hexapoda_Arthropoda_Ecdysozoa_Metazoa_Eukaryota AOG21082:0.1553260651)99:0.0427783803,Toxocara canis @Toxocara_Toxocaridae_Ascaridoidea_Ascaridida_Chromadorea_Nematoda_Ecdysozoa_Metazoa_Eukaryota KHN75905:0.5119322441)94:0.0596994182,((Crassostrea hongkongensis @Crassostrea_Ostreidae_Ostreoidea_Ostreoida_Pteriomorphia_Bivalvia_Mollusca_Lophotrochozoa_Metazoa_Eukaryota ADZ76134:0.2174859959,Octopus vulgaris @Octopus_Octopodidae_Incirrata_Octopoda_Octopodiformes_Neocoleoidea_Coleoidea_Cephalopoda_Mollusca_Lophotrochozoa_Metazoa_Eukaryota AGZ63441:0.1903649015)100:0.0596777073,(Eisenia fetida @Eisenia_Lumbricinae_Lumbricidae_Lumbricina_Haplotaxida_Oligochaeta_Clitellata_Annelida_Lophotrochozoa_Metazoa_Eukaryota AEO50756:0.3872004363,Perinereis aibuhitensis @Perinereis_Nereididae_Phyllodocida_Aciculata_Palpata_Polychaeta_Annelida_Lophotrochozoa_Metazoa_Eukaryota AHY86343:0.2436466822)95:0.0660521646)84:0.0323340553)91:0.0456898981)96:0.0981836638,((((Aphanomyces astaci @Aphanomyces_Saprolegniaceae_Saprolegniales_Oomycetes_Stramenopiles_Eukaryota RHZ15061:0.1339938022,(Achlya hypogyna @Achlya_Saprolegniaceae_Saprolegniales_Oomycetes_Stramenopiles_Eukaryota OQR84492:0.0461407583,Saprolegnia diclina VS20 @Saprolegnia_Saprolegniaceae_Saprolegniales_Oomycetes_Stramenopiles_Eukaryota XP_008617088:0.0738481678)100:0.0776856540)100:0.1463797862,((Phytophthora parasitica P1569 @Phytophthora_Peronosporales_Oomycetes_Stramenopiles_Eukaryota ETI55580:0.0966476684,Phytophthora sojae @Phytophthora_Peronosporales_Oomycetes_Stramenopiles_Eukaryota XP_009527353:0.1654292377)56:0.0448577348,Pythium oligandrum @Pythium_Pythiaceae_Pythiales_Oomycetes_Stramenopiles_Eukaryota TMW58298:0.2172462929)100:0.0644063198)100:0.1361711470,Fistulifera solaris @Fistulifera_Naviculaceae_Naviculales_Bacillariophycidae_Bacillariophyceae_Bacillariophyta_Stramenopiles_Eukaryota GAX17996:0.3682953009)100:0.0440983945,(Nannochloropsis gaditana

@Nannochloropsis_Monodopsidaceae_Eustigmatales_Eustigmatophyceae_Stramenopiles_Eukaryota EWM20937:0.0082267766,Nannochloropsis salina CCMP1776 @Microchloropsis salina_Microchloropsis_Monodopsidaceae_Eustigmatales_Eustigmatophyceae_Stramenopiles_Eukaryota TFJ82773:0.0087639525)100:0.1999472930)100:0.0807459434)100:0.3243746265,((Basidiobolus meristosporus CBS 931.73 @Basidiobolus_Basidiobolaceae_Basidiobolales_Basidiobolomycetes_Entomophthoromycotina_Zoopagomycota_Fungi_Eukaryota ORY01796:0.1561755504,(Mucor ambiguus @Mucor_Mucoraceae_Mucorineae_Mucorales_Mucoromycotina_Mucoromycota_Fungi_Eukaryota GAN01536:0.0733179637,Rhizopus microsporus @Rhizopus_Rhizopodaceae_Mucorineae_Mucorales_Mucoromycotina_Mucoromycota_Fungi_Eukaryota CEG67568:0.0698658425)100:0.1183312210)100:0.1966430474,(((Oxytricha trifallax @Oxytricha_Oxytrichinae_Oxytrichidae_Sporadotrichida_Stichotrichia_Spirotrichea_Intramacronucleata_Ciliophora_Alveolata_Eukaryota EJY78794:0.0840639828,Stylonychia lemnae @Stylonychia_Stylonychinae_Oxytrichidae_Sporadotrichida_Stichotrichia_Spirotrichea_Intramacronucleata_Ciliophora_Alveolata_Eukaryota CDW81170:0.1375539831)100:0.3409798474,((Tetrahymena thermophila SB210 @Tetrahymena_Tetrahymenidae_Tetrahymenina_Hymenostomatida_Oligohymenophorea_Intramacronucleata_Ciliophora_Alveolata_Eukaryota XP_001026590:0.1611247828,Paramecium tetraurelia strain d4-2 @Paramecium_Parameciidae_Peniculida_Oligohymenophorea_Intramacronucleata_Ciliophora_Alveolata_Eukaryota XP_001450296:0.2566902175)63:0.0671894324,Plasmodiophora brassicae @Plasmodiophora_Plasmodiophoridae_Plasmodiophorida_Imbricatea_Cercozoa_Rhizaria_Eukaryota CEO97147:0.4521296198)84:0.0588709453)99:0.0543269031,(((Toxoplasma gondii ME49 @Toxoplasma_Sarcocystidae_Eimeriorina_Eucoccidiorida_Coccidia_Conoidasida_Apicomplexa_Alveolata_Eukaryota XP_002368095:0.0000023268,Hammondia hammondi @Hammondia_Sarcocystidae_Eimeriorina_Eucoccidiorida_Coccidia_Conoidasida_Apicomplexa_Alveolata_Eukaryota KEP63689:0.0084064801)100:0.0349076326,Neospora caninum Liverpool @Neospora_Sarcocystidae_Eimeriorina_Eucoccidiorida_Coccidia_Conoidasida_Apicomplexa_Alveolata_Eukaryota XP_003883469:0.0781026336)100:0.3582475588,Vitrella brassicaformis @Vitrella_Chromerida_Alveolata_Eukaryota AND95675:0.1972696722)100:0.1629941855)86:0.0614465668)64:0.0364366294)53:0.0340927246,(Acanthamoeba castellanii @Acanthamoeba_Acanthamoebidae_Centramoebida_Longamoebia_Discosea_Amoebozoa_Eukaryota XP_004337981:0.2974592797,((Dictyostelium discoideum @Dictyostelium_Dictyosteliida_Mycetozoa_Amoebozoa_Eukaryota AAC36743:0.1293274778,(Acytostelium subglobosum LB1 @Acytostelium_Dictyosteliida_Mycetozoa_Amoebozoa_Eukaryota XP_012758538:0.0663382908,Cavenderia fasciculata @Cavenderia_Cavenderiaceae_Acytosteliales_Dictyostelids_Mycetozoa_Amoebozoa_Eukaryota XP_004355480:0.0886457860)100:0.0208319273)91:0.0274998385,Tieghemostelium lacteum @Tieghemostelium_Raperosteliaceae_Dictyosteliales_Dictyostelids_Mycetozoa_Amoebozoa_Eukaryota AGC69744:0.0821501099)100:0.1658421897)100:0.1024952410)93:0.0616302915)100:0.6901944555,((Pyropia haitanensis @Pyropia_Bangiaceae_Bangiales_Bangiophyceae_Rhodophyta_Eukaryota AJA71274:0.1233947745,Pyropia yezoensis @Pyropia_Bangiaceae_Bangiales_Bangiophyceae_Rhodophyta_Eukaryota ADO23652:0.0785126040)100:0.0729864074,Porphyra umbilicalis @Porphyra_Bangiaceae_Bangiales_Bangiophyceae_Rhodophyta_Eukaryota OSX73109:0.2768928258)100:1.3097377070)100:0.3615151100,((((((((((((Bassia scoparia @Bassia_Camphorosmeae_Camphorosmoideae_Chenopodiaceae_Caryophyllales_Pentapetalae_Gunneridae_eudicotyledons_Magnoliophyta_Spermatophyta_Tracheophyta_Embryophyta_Streptophyta_Viridiplantae_Eukaryota AIP93616:0.0308248542,Beta vulgaris subsp. vulgaris @Beta_Betoideae_Chenopodiaceae_Caryophyllales_Pentapetalae_Gunneridae_eudicotyledons_Magnoliophyta_Spermatophyta_Tracheophyta_Embryophyta_Streptophyta_Viridiplantae_Eukaryota XP_010692546:0.0421971660)92:0.0128064383,Spinacia oleracea @Spinacia_Anserineae_Chenopodioideae_Chenopodiaceae_Caryophyllales_Pentapetalae_Gunneridae_eudicotyledons_

Magnoliophyta_Spermatophyta_Tracheophyta_Embryophyta_Streptophyta_Viridiplantae_Eukaryota XP_021845231:0.0141728492)99:0.0373520844,Mesembryanthemum crystallinum @Cryophytum_Mesembryanthemum_Aizoaceae_Caryophyllales_Pentapetalae_Gunneridae_eudicotyledons_Magnoliophyta_Spermatophyta_Tracheophyta_Embryophyta_Streptophyta_Viridiplantae_Eukaryota AAC19397:0.0524467824)93:0.0354835282,((Brachypodium distachyon @Brachypodium_Brachypodieae_Pooideae_BOP clade_Poaceae_Poales_Liliopsida_Magnoliophyta_Spermatophyta_Tracheophyta_Embryophyta_Streptophyta_Viridiplantae_Eukaryota XP_003558892:0.0076161350,(Triticum aestivum @Triticum_Triticinae_Triticeae_Triticodae_Pooideae_BOP clade_Poaceae_Poales_Liliopsida_Magnoliophyta_Spermatophyta_Tracheophyta_Embryophyta_Streptophyta_Viridiplantae_Eukaryota AIZ77475:0.0000029032,Triticum aestivum @Triticum_Triticinae_Triticeae_Triticodae_Pooideae_BOP clade_Poaceae_Poales_Liliopsida_Magnoliopsida_Spermatophyta_Tracheophyta_Embryophyta_Streptophyta_Viridiplantae_Eukaryota Q43206:0.0042548308)100:0.0648797926)100:0.0342981937,(Oryza brachyantha @Oryza_Oryzinae_Oryzeae_Oryzoideae_BOP clade_Poaceae_Poales_Liliopsida_Magnoliophyta_Spermatophyta_Tracheophyta_Embryophyta_Streptophyta_Viridiplantae_Eukaryota XP_006649332:0.0000023444,Oryza sativa Japonica Group @Oryza_Oryzinae_Oryzeae_Oryzoideae_BOP clade_Poaceae_Poales_Liliopsida_Magnoliophyta_Spermatophyta_Tracheophyta_Embryophyta_Streptophyta_Viridiplantae_Eukaryota XP_015629749:0.0251132815)100:0.0028779593)100:0.0863188496)91:0.0244233219,((Glycine max @Soja_Glycine_Phaseoleae_indigoferoid/millettioid clade_NPAAA clade_50 kb inversion clade_Papilionoideae_Fabaceae_Fabales_fabids_rosids_Pentapetalae_Gunneridae_eudicotyledons_Magnoliopsida_Spermatophyta_Tracheophyta_Embryophyta_Streptophyta_Viridiplantae_Eukaryota NP_001237556:0.0170038778,Glycine max @Soja_Glycine_Phaseoleae_indigoferoid/millettioid clade_NPAAA clade_50 kb inversion clade_Papilionoideae_Fabaceae_Fabales_fabids_rosids_Pentapetalae_Gunneridae_eudicotyledons_Magnoliopsida_Spermatophyta_Tracheophyta_Embryophyta_Streptophyta_Viridiplantae_Eukaryota NP_001235974:0.0042145431)100:0.0412085640,Glycine max @Soja_Glycine_Phaseoleae_indigoferoid/millettioid clade_NPAAA clade_50 kb inversion clade_Papilionoideae_Fabaceae_Fabales_fabids_rosids_Pentapetalae_Gunneridae_eudicotyledons_Magnoliopsida_Spermatophyta_Tracheophyta_Embryophyta_Streptophyta_Viridiplantae_Eukaryota NP_001237571:0.0762774642)100:0.0294582179)94:0.0333081758,(((Brassica oleracea var. oleracea @Brassica_Brassiceae_Brassicaceae_Brassicales_malvids_rosids_Pentapetalae_Gunneridae_eudicotyledons_Magnoliophyta_Spermatophyta_Tracheophyta_Embryophyta_Streptophyta_Viridiplantae_Eukaryota XP_013597488:0.0000023247,Brassica napus @Brassica_Brassiceae_Brassicaceae_Brassicales_malvids_rosids_Pentapetalae_Gunneridae_eudicotyledons_Magnoliophyta_Spermatophyta_Tracheophyta_Embryophyta_Streptophyta_Viridiplantae_Eukaryota XP_013704129:0.0041645941)100:0.0045501088,Brassica rapa @Brassica_Brassiceae_Brassicaceae_Brassicales_malvids_rosids_Pentapetalae_Gunneridae_eudicotyledons_Magnoliophyta_Spermatophyta_Tracheophyta_Embryophyta_Streptophyta_Viridiplantae_Eukaryota VDC97981:0.0038218795)100:0.0128731985,(Arabidopsis thaliana @Arabidopsis_Camelineae_Brassicaceae_Brassicales_malvids_rosids_Pentapetalae_Gunneridae_eudicotyledons_Magnoliophyta_Spermatophyta_Tracheophyta_Embryophyta_Streptophyta_Viridiplantae_Eukaryota NP_564121:0.0037199337,Arabidopsis lyrata subsp. lyrata @Arabidopsis_Camelineae_Brassicaceae_Brassicales_malvids_rosids_Pentapetalae_Gunneridae_eudicotyledons_Magnoliophyta_Spermatophyta_Tracheophyta_Embryophyta_Streptophyta_Viridiplantae_Eukaryota XP_020866686:0.0087703340)100:0.0356611437)100:0.0763191757)100:0.1184887774,((Auxenochlorella protothecoides @Auxenochlorella_Chlorellaceae_Chlorellales_Trebouxiophyceae_Chlorophyta_Viridiplantae_Eukaryota XP_011396830:0.3664369474,Chlorella sorokiniana @Chlorella_Chlorellaceae_Chlorellales_Trebouxiophyceae_Chlorophyta_Viridiplantae_Eukaryota PRW57738:0.1185992698)83:0.0327381903,Coccomyxa subellipsoidea C-169

@Coccomyxa_Coccomyxaceae_Trebouxiophyceae incertae
sedis_Trebouxiophyceae_Chlorophyta_Viridiplantae_Eukaryota
XP_005645077:0.1299473810)76:0.0170090578)93:0.1308224812,Ulva prolifera
@Ulva_Ulvaceae_Ulvales_Ulvophyceae_Chlorophyta_Viridiplantae_Eukaryota
AKA94107:0.1917208931)53:0.0332916894,((Chlamydomonas reinhardtii
@Chlamydomonas_Chlamydomonadaceae_Chlamydomonadales_Chlorophyceae_Chlorophyta_Viridiplantae_Eukaryota
XP_001696763:0.0382687025,Gonium pectorale
@Gonium_Volvocaceae_Chlamydomonadales_Chlorophyceae_Chlorophyta_Viridiplantae_Eukaryota
KXZ42175:0.0375302086)100:0.0170043992,Volvox carteri f. nagariensis
@Volvox_Volvocaceae_Chlamydomonadales_Chlorophyceae_Chlorophyta_Viridiplantae_Eukaryota
XP_002950455:0.0293213789)100:0.1069165101)100:0.2366222472,Galdieria sulphuraria
@Galdieria_Cyanidiaceae_Cyanidiales_Bangiophyceae_Rhodophyta_Eukaryota
XP_005708279:0.3142130702)97:0.1269010294,Cyanidioschyzon merolae strain 10D
@Cyanidioschyzon_Cyanidiaceae_Cyanidiales_Bangiophyceae_Rhodophyta_Eukaryota
XP_005536240:0.4106928932)98:0.1275135482,(Gracilariopsis chorda
@Gracilariopsis_Gracilariaceae_Gracilariales_Rhodymeniophycidae_Florideophyceae_Rhodophyta_Eukaryota
PXF41280:0.0805346893,Chondrus crispus
@Chondrus_Gigartinaceae_Gigartinales_Rhodymeniophycidae_Florideophyceae_Rhodophyta_Eukaryota
XP_005712277:0.1142702163)100:0.5705163940)100:0.2412167763)100:0.5780204087,(Capsaspora owczarzaki ATCC
30864 @Capsaspora_Ichthyosporea_Eukaryota XP_004366029:0.0000023575,Capsaspora owczarzaki ATCC 30864
@Capsaspora_Ichthyosporea_Eukaryota
KJE89728:0.0135875883)100:0.3916137017)99:0.2283105084)100:0.2424705610,((Artemidia motanka
1610_TRINITY_DN17294_c8_g5_i1:0.0893553446,((Namystynia karyoxenos
1621_TRINITY_DN46753_c0_g1_i1:0.0000025789,(Namystynia karyoxenos
1621_TRINITY_DN46753_c0_g1_i3:0.0164221334,Namystynia karyoxenos
1621_TRINITY_DN46753_c0_g1_i4:0.0000020027)89:0.0220656348)85:0.0140495432,Namystynia karyoxenos
1621_TRINITY_DN46753_c0_g1_i2:0.0114415135)100:0.0588496080)100:0.0715317049,Artemidia motanka
1610_TRINITY_DN17294_c8_g7_i1:0.0872784928)100:0.0633324660)97:0.0513058525)100:0.0865857645);