

Cluster I

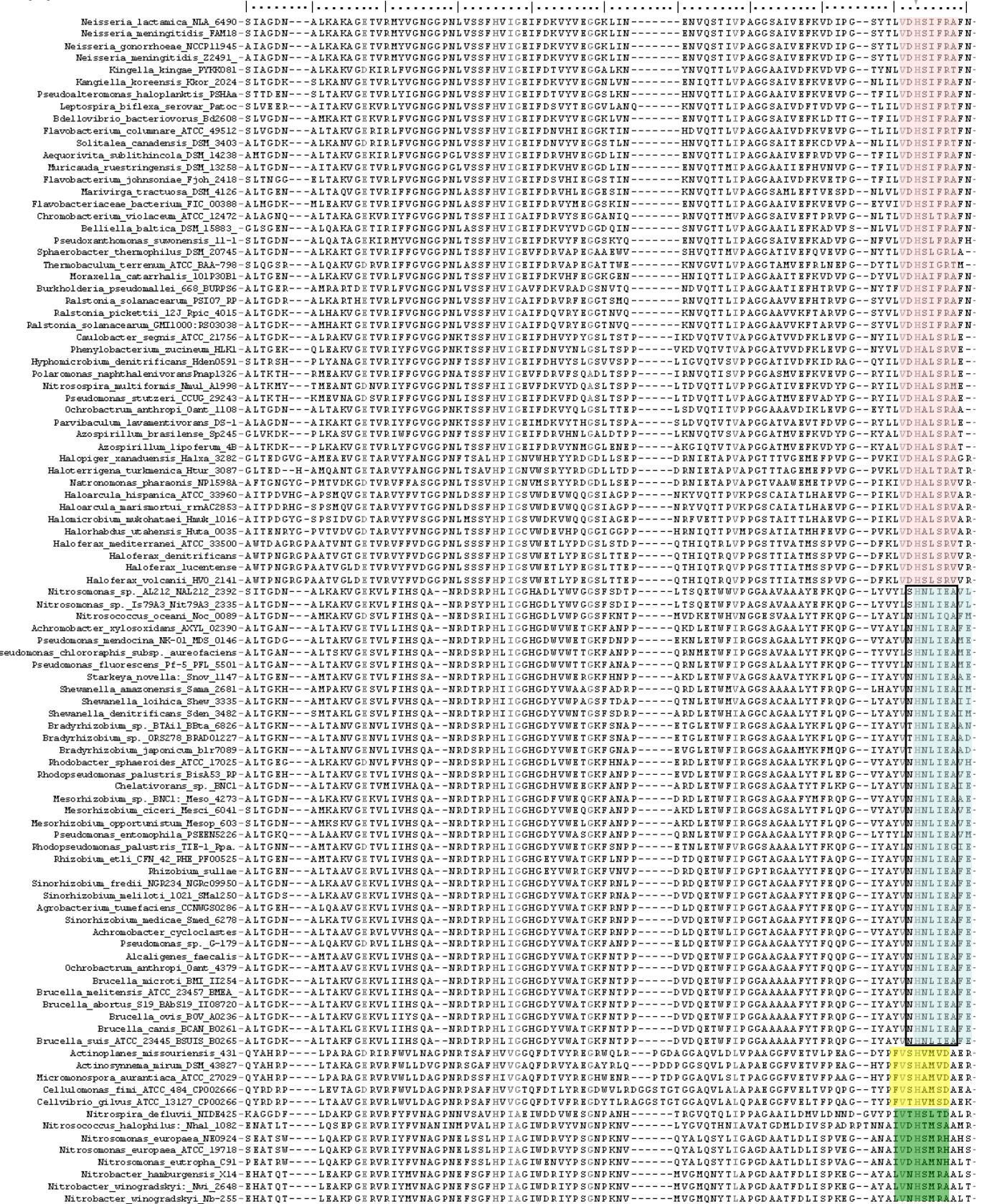
Cluster II

Cluster III

Cluster IV

Figure S1, Wei et al.

(b)



Cluster I

Cluster II

Cluster III

Cluster IV

Figure S1, Wei et al.

(c)

```

Halomonas_alimentaria_FJ686149-EFIVNIKETGVRLVNYENLDA--LSTVEIDTSRFLHDGG--WDAS---GRYFLTAANESNQIVVIDAQERELEAIVDVG--KIPHPGRG-
Halomonas_sp._PBN3-EFIVNIKETGVRLVNYENLDA--LSTVEIDTSRFLHDGG--WDAS---GRYFLTAANESNQIVVIDAQERELEAIVDVG--KIPHPGRG-
Halomonas_shengliensis_FJ686158-EFIVNIKETGVRLVNYENLDA--LSTVEIDTSRFLHDGG--WDAS---GRYFLTAANESNQIVVIDAQERELEAIVDVG--KIPHPGRG-
Halomonas_denitrificans_GQ384047-EFIVNVKETGVQLVNYENLEA--LSTVEIETSRLHDGG--WDAS---GRYFLTAANESNQIVVIDAQERELEAIVDVG--KIPHPGRG-
Halomonas_fontilapidosi_FJ686147-EFIVNIKETGVQLVNYEDLDA--LSTVEIETSRLHDGG--WDAS---GRYFLTAANESNQIVVIDALERELEEIVDVG--KIPHPGRG-
Halomonas_cerina_GQ384052-EFIVNVKETGVQLVNYEDLDA--LSTVEIDTSRFLHDGG--WDST---GRYFLTAANESNQIVVIDAQEREALEAIVDVG--KIPHPGRG-
Halomonas_nitroreducens_FJ686149-EFIVNVKETGVQLVNYEDLDA--LSTVEIDTSRFLHDGG--WDST---GRYFLTAANESNQIVVIDAQERELEAIVDVG--KIPHPGRG-
Kangielia_koreensis_DSM_16069-EFIVNVKETQIKLVNYSIDDN--LQVTITDAAPFLHDGG--WDSS---RRYFLTAANENDTIAVVAEADRELEALIPVE--RIPHPGRG-
Marinobacter_aquaeolei_VT8-EFIVNVKETKIMLVNYEDMEN--MNITSIDAELYHGG--WDAS---MRYFLTAANNSNKIAVVDAQDRNLEAIVDVG--KIPHPGRG-
Marinobacter_sp._ATCC49840-EFIVNVKETKIMLVNYEDMEN--MNITSIDAAKFLHDGG--WDAS---MRYFLTAANNSNKIAVVDAQDRNLEAIVDVG--KIPHPGRG-
Marinobacter_sp._C1870-EFIVNVKETKIMLVNYEDMEN--MNITSIDAAKFLHDGG--WDAS---MRYFLTAANNSNKIAVVDAQDRNLEAIVDVG--KIPHPGRG-
Hahella_chejuensis_KCTC_2396-EFIVNVKETKILLVNYEDINA--LKVTITDAARFLHDGG--WDNT---HRYFLTAANQSNKVAVIDSKDGAEALIDVG--AIPHPGRG-
Pseudomonas_stutzeri_ATCC_17588-EFIVNVKETKVMLVNYEDINN--LTTTMIGTAPFLHDGG--WDVS---HRYFMTAAANNSNKVAVIDSKERKMAALVDVG--KIPHPGRG-
Pseudomonas_stutzeri_CCUG_29243-EFIVNVKETKVLLVNYEDINN--LTTTMIGTAPFLHDGG--WDVS---HRYFMTAAANNSNKVAVIDSKERKMAALVDVG--KIPHPGRG-
Pseudomonas_fluorescens_Q8r1-96-EFIVNVKETKVMLVNYQD1KN--LTITSIDAAPFLHDGG--WDSS---HRYFMTAAANNSNKVAVIDSKERKTLALVDVG--KTPHPGRG-
Pseudomonas_sp._I-Bh25-14-EFIVNVKETKILLVNYKMDMN--LTTSINAAPFLHDRG--WDST---HRYFMTAAANNSNKVAVIDSKERKLSALVEVG--KIPHPGRG-
Pseudomonas_aeruginosa_PA7-EFIVNVKETKVLLVNYKID1N--LTITSIGAAPFLHDGG--WDSS---HRYFMTAAANNSNKVAVIDSRDRRLSALVDVG--KTPHPGRG-
Pseudomonas_aeruginosa_LESEBS8-EFIVNVKETKVLLVNYKID1N--LTVTISIGAAPFLHDGG--WDSS---HRYFMTAAANNSNKVAVIDSKDRRLSALVDVG--KTPHPGRG-
Achromobacter_sp._DETN3-EFIVNVKETKVLLVNYKID1N--LTVTISIGAAPFLHDGG--WDSS---HRYFMTAAANNSNKVAVIDSKDRRLSALVDVG--KTPHPGRG-
Burkholderia_cepacia_AB092344-EFIVNVKETKVLLVNYKID1N--LTVTISIGAAPFLHDGG--WDSS---HRYFMTAAANNSNKVAVIDSKDRRLSALVDVG--KTPHPGRG-
hiobacillus_denitrificans_ATCC_25259-EFIVNVKETKVLMANYEDINN--LKTVEIEAARFLHDGG--WDST---HRYFMSAANNSNKIAVVDSKKQKLTLALVEVG--KIPHPGRG-
Dechloromonas_aromatica_RCB-EFFIVNVKETMVYSVDYRDLNN--LKIIMIEAAPFLHDGG--FEST---HRYFMDAANASNKIAVIDTKEGKLEKLVPG--KTPHPGRG-
Dechlorosoma_suillum_PS-EFFIVNVKETMVYSVDYRDLNN--LKIIMIEAAPFLHDGG--FEST---HRYFMDAANASNKIAVIDTKDGKLAKLVDVG--KTPHPGRG-
Aromatoleum_aromaticum_EBn1-EFIVNVKETKTMVDSYDIQN--LKTTEIGSAPYLHDGG--WDAS---KRYFVMVAANQSNKVAIIDAKDGKLAGLVLVVG--KIPHPGRG-
Azarcus_sp._KH32C-EFIVNVKETKTMVDSYDIQN--LKTMEIGSARFLHDGG--WDLS---KRYFLVAANQSNKVAIDAKEGKLAGLIDVG--KIPHPGRG-
Rubrivivax_gelatinosus_IL144-EFIVNVKETKTMVDSYSLNDA--LKMTEIGSAPFLHDGG--WDAT---KRYFFVAANQSNKITVIDAKEDKLAIVEVG--KIPHPGRG-
Alicyclipilus_denitrificans_K601-EFIVNVKETKTMVMDYDSNINA--LKMTEIGSAPFLHDGG--WDSS---KRYFVMVAANNSNKVAIIDAKDGKLAGLTEVG--KIPHPGRG-
Acidovorax_ebreus_TPSY-EFIVNVKETKTMVMDYDSNINA--LKTTEIGSAPFLHDGG--WDAS---KRYFVMVAANNSNKIAIDAKDGKLAGLTEVG--KIPHPGRG-
Acidovorax_sp._JS42-EFIVNVKETKTMVMDYDSNINA--LKTTEIGSAPFLHDGG--WDAS---KRYFVMVAANNSNKIAIDAKDGKLAGLTEVG--KIPHPGRG-
Aquaspirillum_sp._DSM_12823-EFIVNAKETKVWMVDTYDLTN--LTKTKQIDTAKYLHDGG--FDAS---GRYFMTAAANASDKIVVIDTKESKLEAIVDVG--KIPHPGRG-
Comamonas_denitrificans_DQ865926-EFIVNAKETKVWMVDTYDLTN--LTKTKQIDTAKYLHDGG--FDAS---GRYFMTAAANASDKIVVIDTKESKLEAIVDVG--KIPHPGRG-
Comamonas_nitratirvorans_FN55565-EFIVNAKETKVWMVDTYDLTN--LTKTKQIDTAKYLHDGG--FDAS---GRYFMTAAANASDKIVVIDTKELESKLEAIVDVG--KIPHPGRG-
Brachymonas_denitrificans_ABI96831-EFIVNAKETK1YMWDTYDLTN--LKTTLTDSAKFLHDGG--FDST---GRYFMTAAANASNKIAVVDTKEDKLAALVDVG--KTPHPGRG-
Brachymonas_denitrificans_CBG92409-EFIVNAKETK1YMWDTYDLTN--MKITALDSAKFLHDGG--FDST---GRYFMTAAANASNKIAVVDTKEDKLAALVDVG--KTPHPGRG-
Sideroxydans_lithotrophicus_ES-1-EFIVNAKETK1YMVNYSIDLTN--LKMVTIDAARFLHDGG--FDST---GRYFMMVAANASNKIAVVDTKEDKLAAMVDVG--KTPHPGRG-
Pseudogulbenkiania_sp._NH8-EFIVNAKETK1MMVNYSDLN--LKTTLTDAAKFLHDGG--FDRT---GRYFVAANASNKIAVVDTKEDKLAGLVLVVG--KTPHPGRG-
Herbaspirillum_sp._I-Bh15-17-EFIVNAKETK1MIVNQD1LN--LKTTLTDAAKFLHDGG--FDST---GRYFVMVAANASNKIAVVDTKDDKLAALIDVG--TTPHPGRG-
Cupriavidus_metallicidurans_CH34-EFIVNAKETK1MVMVYSDSLN--LKTTTTIDSAKFLHDGG--FDST---GRYFLVAAANASDKIAVVDTCKEDKLAALVDVG--KTPHPGRG-
Cupriavidus_necator_location_1_1.778-EFIVNAKETK1MVMVYSDSLN--LKTTTTIDSAKFLHDGG--FDST---GRYFLVAAANASDKIAVVDTCKEDKLAALIDVG--KTPHPGRG-
Burkholderiaceae_bacterium_N52-EFIVNAKETK1MVMVYAD1LN--LKTTTTIDSAKFLHDGG--FDAT---GRYFLVAAANASNKIAVVDTCKEDKLAALIDVG--KTPHPGRG-
Cupriavidus_sp._N24-EFIVNAKETK1MVMVYAD1LN--LKTTTTIDSAKFLHDGG--FDAT---GRYFLVAAANASNKIAVVDTCKEDKLAALIDVG--KTPHPGRG-
Ralstonia_eutropha_JMP134-EFIVNAKETK1MVMVYAD1LN--LKTTTTIDSAKFLHDGG--FDAT---GRYFLVAAANASDKIAVVDTCKEDKLAALIDVG--KTPHPGRG-
Cupriavidus_taiwanensis_IMG_19424-EFIVNAKETK1MVMVYSDSLN--LKTTTTIDSAKFLHDGG--FDST---GRYFLVAAANASDKIAVVDTCKEDKLAALVNVG--KTPHPGRG-
Ralstonia_pickettii_DTP0602-EFIVNAKETK1MVMVYSDSLN--LKTTTTIDSAKFLHDGG--FDST---GRYFLVAAANASDKIAVVDTCKEDKLAALVNVG--KTPHPGRG-
Cupriavidus_necator_N-1-EFIVNAKETK1MVMVYSDSLN--LKTTTTIDSAKFLHDGG--FDAT---GRYFLVAAANASDKIAVVDTCKEDKLAALIDVG--KTPHPGRG-
Ralstonia_eutropha_H16-EFIVNAKETK1MVMVYSDSLN--LKTTTTIDSAKFLHDGG--FDAT---GRYFLVAAANASDKIAVVDTCKEDKLAALIDVG--KTPHPGRG-
Accumulibacter_phosphatis_UW-1-EWVINIKETMIRLVNYSIDL--LKTETTINSAKFLHDGG--WDSS---KRYFLVAANASNKVAVVDTKEDKLAALVDTA--KIPHPGRG-
Dechlorospirillum_sp._I-Bh37-22-EWVINIKETQIKLVDYSD1KN--LKTETTIESAKFLHDGG--WDST---KRYFLVAANASNKVAVVDTKEDKLAALVDTK--SKPHPGRG-
Thaueria_sp._MZ1T-EWVINVKETQILLLVDS1KN--LKSIAIESAKFLHDGG--WDMS---KRYFVMVAANASNKVAAVDTKEDKLAALIDTA--KIPHPGRG-
Pseudomonas_stutzeri_DSM_10701-EWVINVKETQIMLVDTYD1KN--LKTTTTIESAKFLHDGG--WDAS---HRYFVMVAANASNKVAAVDTKGTGLAALIDTA--KIPHPGRG-
Bordetella_petrii_AM#02716-EWVINVKETQILLLVDTYD1KN--LKTTTTIESAKFLHDGG--WDAS---HRYFVMVAANASNKVAAVDTKGTGLAALIDTA--KIPHPGRG-
Comamonadaceae_bacterium_I-Bh25-7-EWVINIKETQILLLVDTYD1KN--LKTETTIGSAKFLHDGG--WDAS---KRYFLVAAANASNKIAAVDTKTGKLAALVDTA--KIPHPGRG-
Magnetospirillum_magenticum_AMB-1-EFIVNVKETQILLLVDS1KN--LKVTTIESAERFLHDGG--FDAS---KRYFLVAAANARNKIAVVDTCKEDKLVGMVEVG--ATPHPGRG-
Rhodanobacter_sp._D206a-EFIVNIKETQILLLVNYQD1KN--LKVTAIEAERFLHDGG--FDKT---GRYFLVAANARNKVAIVDTKDNLVLSVVESSG--QTPHPGRG-
occus_pantotrophus_location_1_1791-EFIVNVKETK1LLVDTYDLDN--LKTTEIEAERFLHDGG--LDGS---HRYFITAANARNKLVVIDTKEGKLVIAEDTGG--QTPHPGRG-
Paracoccus_sp._62-EFIVNVKETK1LLVDTYDLDN--LKTTEIEAERFLHDGG--LDGS---HRYFITAANARNKLVVIDTKEGKLVIAEDTGG--QTPHPGRG-
Paracoccus_sp._I-Bh37-1-EFIVNVKETK1LLVDTYDLDN--LKTTEIEAERFLHDGG--LDGS---HRYFITAANARNKLVVIDTKEGKLVIAEDTGG--QTPHPGRG-
Polymorphum_gilvum_SL003B-26A1-EFIVNVKETK1LLVDTYD1KN--LKTTEIEAERFLHDGG--LDST---HRYFLVAANARNKIAVVDTKEGKLTALIDTEG--QTPHPGRG-
Labrenzia_sp._C1B10-EFIVNVKETK1LLVDTYD1KN--LKTTEIEAERFLHDGG--FDST---KRYFLVAAANARGKVAVVDTKEGKLTALLETEG--QTPHPGRG-
Stappia_aggregata_IAM_12614-EFIVNVKETK1LLVDTYD1KN--LKTTEIEAERFLHDGG--FDST---KRYFLVAAANARGKVAVVDTKEGKLTALLETEG--QTPHPGRG-
Ruegeria_pomeroyi_DSS-3-EWVINIKETK1MILVDTYD1KN--LKTTEIEAERFLHDGG--FDSS---KRYFLVAAANARGKVAVVDTKEGKLTALLETEG--QTPHPGRG-
Roseobacter_shibae_DFL_12-EFIVNVKETK1LLVDTYD1KN--LKVTEIEAERFLHDGG--LDST---KRYFLTAANARNKIAVIDTKEGE LTALLSDG--LTPHPGRG-
Roseobacter_denitrificans_OCH_114-EFIVNVKETK1MMVDS1D1DA--LKTTEIEAERFLHDGG--LDST---QRYFLTAANARGKIVVIDTKESESKKVAIVIETEG--ETPHPGRG-
Roseobacter_litoralis_Och_149-EFIVNVKETK1MMVDS1D1DA--LKTTEIEAERFLHDGG--LDST---QRYFLTAANARGKIVVIDTKESESKKVAIVIETEG--ETPHPGRG-
Rhodothermus_marinus_DSM_4252-LWVINVKETQIWLLVDSQGAQGKVSIDVLKAEQFLHDGG--WDHT---KRYFLVAANNNKVKVVVWDVQKEKEVEAIVETVG--RRPHPGRG-
Methylomirabilis_oxyfera_FP565575-EWVINIKETQIWLVDYSD1LN--LKMTOQIYGKFLHDGG--WDST---KRYFVMVAANMANKVVVIDVEKGKLEAIFESG--IKPHPGRG-
Kuenenia_stuttgartiensis_CT573071-EWVINVKETQIWLVDYSD1LN--LKVTTIESERFLHDGG--WDKS---HRYFLVAANMRDKLVVVDTKTKLEAIVETVG--IKPHPGRG-
Nitratiruptor_sp._SB155-2-EWVINIKETQQWLLVNYSDPRD--PKIHMMLAERYLHDGG--WDLT---KRYFLVAANARNKVVAVDTKDKGEIAAIIPTEG--TKPHPGRG-
Methylomonas_methanica_MC09-IFAIALENAGQWVWIDYKEDGFP-VT-KIEKVRGLHDAF--LTHG---GKLMVASYDDSIVAAILDEERKLQPLAG--CVPHVGGG-
Methylomonas_sp._16a_G0241349-IFAIALENAGQWVWIDYKEDGFP-VT-KIEKVRGLHDAF--LTHG---GKLMVASYDDSIVAAILDEERKLQPLAG--CVPHVGGG-
Methylobacter_tundripalidum SV96-IFAIALENAGQWVWVVDLKEGFP-VT-KIEVGRHLHDAF--LSHG---GSKLMVASYDDSIVTAIDLKDRKIIKKLEAG--CVPHVGGG-
Methylomicrobium_album_EG8-VLVALENAGQWVWVVDLKDFFP-VT-KIEVGRHLHDAF--LTHN---GKLMVASYDDSIVTAIDLKERKIIKKLDAG--CVPHVGGG-
Nitratiruptor_salsugininis_DSM_16511-YFSFALKDGGHVYIVDYSKPDPF--VVGDPNIGKILHDGF--NEGVDEGRFVYVASQGSDLGMGVVFLKTKLAAKITYTGPDTKPHPQGQ-
Sulfurovum_sp._NBC37-1-YFSFALKDGHVYIVDYSKPDPF--IVGDIPNIGKILHDGF--ENEKEIGRYLMQASQGSDVMGVVDFKTKSLVAKVYTGPDSKPHPQGQ-
Sulfurimonas_autotrophica_DSM_16294-YIAFALKDGHVYIVDYSKPDPF--IVGDIPNIGDILHDGF--LNEGKEIGRYLFIASQSDVGVVDFKTKSLVTKIYTGPASKPHPQGQ-
Sulfurimonas_denitrificans_DSM_1251-YIAFALKDGGHVYIVDYSKPDPF--IVGDIPNIGDILHDGF--LNEGKEIGRYLFIASQSDVGVVDFKTKSLVTKIYTGPASKPHPQGQ-
Sulfurimonas_gotlandica_GD1-YIAFALKDGGHVYIVDYSKPDPF--IVGDIPNIGDILHDGF--LNEGKEIGRYLFIASQSDVGVVDFKTKSLVTKIYTGPASKPHPQGQ-

```

Cluster I

Cluster II

Cluster III

Figure S1, Wei et al.

**(d)**

*Halomonas\_alimentaria*\_FJ686149-ANFVDPEHGPVWATSHLGDATIQLIGTDP----EGHPDNAWKVVR--TLEGQGGGSLEIKTHPESDNLYVD  
*Halomonas\_sp.*\_PBN3-ANFVDPEHGPVWATSHLGDATIQLIGTDP----EGHPDNAWKVVR--TLEGQGGGSLEIKTHPESDNLYVD  
*Halomonas\_shengliensis*\_FJ686158-ANFVDPEFGPVPWATSHLGDATIQLIGTDP----EGHPDNAWQVVR--TLQGQGGGSLEIKTHPESDNLYVD  
*Halomonas\_denitrificans*\_GQ384047-ANFVDPEFGPVPWATSHLGDATIQLIGTDP----EGHPDNAWQVVR--TLDGQGGGSLEIKTHPESDNLYVD  
*Halomonas\_fontilapidosi*\_FJ686147-ANFVDAEHGPVWATSHLGDNТИLIGTDP----EGHPDNAWKVVR--TLEGQGGGSLEIKTHPESDNLYVD  
*Halomonas\_cerina*\_GQ384052-ANFVDPEFGPVPWATSHLGDATVQLIGTDP----EGHPDNAWQVVR--TLQGQGGGSLEIKTHPESDNLYVD  
*Halomonas\_nitroreducens*\_FJ686148-ANFVDPEFGPVPWATSHLGDNТИLIGTDP----EGHPDQAWQVVR--TLEGQGGGSLEIKTHPESDNLYVD  
*Kangieilla\_koreensis*\_DSM\_16069-ANFIDPDNGPVWATSLGNANITLIGTDP----EKHKDNAFKVVR--ILEGQGGGSLEIKTHPKSKNLIWVD  
*Marinobacter\_aquaeolei*\_VT8-ANFVDPEHGPVWATSHLGDTIQMIGTDP----EGHPDKAWKVVR--TVDGQGGGSLEVTKTHPKSKNLIWVD  
*Marinobacter\_sp.*\_ATCC49840-ANFVDPEHGPVWATSHLGDTIQMIGTDP----EGHPDKAWKVVR--TVDGQGGGSLEVTKTHPESTNLYVD  
*Marinobacter\_sp.*\_C1870-ANFVDPEHGPVWATSHLGDTIQMIGTDP----EGHPDKAWKVVR--TVDGQGGGSLEVTKTHPESTNLYVD  
*Mahella\_chéjuensis*\_KTC\_2396-ANFTDAKYGPDATSHLGDDSIASLIGTDP----DKHGDYAWKVVR--SLNAQGGGSLEIKTHPKSKNLIYVD  
*Pseudomonas\_stutzeri*\_ATCC\_17588-ANFVHPKFGPVWATSHLGDETISLIGTDP----DKHPKNAWKVVE--TLKGQGGGSLEIKTHPKSKHLYLD  
*Pseudomonas\_stutzeri*\_CCUG\_29243-ANFVHPKFGPVWATSHLGDETISLIGTDP----DKHPKNAWKVVE--TLKGQGGGSLEIKTHPKSKHLYLD  
*Pseudomonas\_fluorescens*\_Q8r1-96-ANFNHPLYGPVWATSHLGDAGVSLIGTDP----VNHPQYAWKVHS--TLQGQGGGSLEIKTHPASRHYLD  
*Pseudomonas\_sp.*\_I-BH25-14-ANFNHPKYGPVWATSHLGDDSIASLIGTDP----KNHPQYAWKVHS--TLKGQGGGSLEIKTHPKSKHLYLD  
*Pseudomonas\_aeruginosa*\_PA7-ANFVHPKYGPVWATSHLGDDSIASLIGTDP----KNHPQYAWKVKA--ELQGQGGGSLEIKTHPKSSHLYVD  
*Pseudomonas\_aeruginosa*\_PA01-ANFVHPKYGPVWATSHLGDDSIASLIGTDP----KNHPQYAWKVKA--ELQGQGGGSLEIKTHPKSSHLYVD  
*Pseudomonas\_aeruginosa*\_LESB58-ANFVHPKYGPVWATSHLGDDSIASLIGTDP----KNHPQYAWKVKA--ELQGQGGGSLEIKTHPKSSHLYVD  
*Achromobacter\_sp.*\_DBTN3-ANFVHPKYGPVWATSHLGDDSIASLIGTDP----KNHPQYAWKVKA--ELQGQGGGSLEIKTHPKSSHLYVD  
*Burkholderia\_cepaciae*\_AB092344-ANFVHPKYGPVWATSHLGDDSIASLIGTDP----KNHPQYAWKVKA--ELQGQGGGSLEIKTHPKSSHLYVD  
*hiobacillus\_denitrificans*\_ATCC\_25259-ANFVDPKFGPVPWATGHLGDDSIASLIGTDP----VKHKANAWKVVR--TLKGQGGGSLEIKTHPKSKNLIWVD  
*Dechloromonas\_aromatica*\_RCB-ANFIDPKFGPVPWATGHLGDESIASLIGTDP----KKHPDNAWKVVR--TLKGQGGGSLEIKTHPKSKNLIWVD  
*Dechlorosoma\_suillum*\_PS-ANFVDPKFGPVPWATGHLGDDSIASLIGTDP----VKHGDNAWKVVR--TLKGQGGGSLEIKTHPKSKNLIWVD  
*Aromatoleum\_aromaticum*\_EBN1-ANFTHPKYGPVWATGHLGDDTIASLIGTDP----VKHKQYAWKMV--TLKSQGGGSLEIKTHPKSKHLYVD  
*Azoarcus\_sp.*\_KH32C-ANFVHPKYGPVWATGHLGDDTIASLIGTDP----EKKHQYAWKMV--TLKSQGGGSLEIKTHPKSKHLYVD  
*Rubrivivax\_gelatinosus*\_IL144-ANFVHPKFGPVWATGHLGDETISLIGTDP----VKHKQYAFAKEVA--LTGQGGGNLELKSHPKSQHLYVD  
*Alicyphilus\_denitrificans*\_K601-ANFTHPKYGPVWATGHLGDETISLIGTDP----KKNKQYAFAKEVA--LTGPGGGALEIKTHPKSKNLIWSD  
*Acidovorax\_ebreus*\_TPSY-ANFTHPKYGPVWATGHLGDETISLIGTDP----QKNKQYAFAKEVA--KLKGPGGGALEIKTHPKSKHLYWD  
*Acidovorax\_sp.*\_JS42-ANFTHPKYGPVWATGHLGDETISLIGTDP----QKNKQYAFAKEVA--KLKGPGGGALEIKTHPKSKHLYWD  
*Aquaspirillum\_sp.*\_DSM\_12823-ANFKHPKFGPVWATSDLGDEGISLIGTDP----KKNNDHAWKVVR--TLKGQGGGSLEIKTHPKSTNLIWVD  
*Comamonas\_denitrificans*\_DQ865926-ANFKHPKFGPVWATSDLGDEGISLIGTDP----KKNNDHAWKVVR--TLKGQGGGSLEIKTHPKSTNLIWVD  
*Comamonas\_nitrativorans*\_FN555565-ANFKHPKFGPVWATSGLGDESIASLIGTDP----KKHKANAWKVVE--TLKGQGGGSLEIKTHPKSTNLIWVD  
*Brachymonas\_denitrificans*\_AB196831-ANFEPHKPFGPVPWATSHLGDESIASLIGTDP----VKHKANAWKVVR--TMKGQGGGSLEIKTHPKSKNLIWVD  
*Brachymonas\_denitrificans*\_CBG92409-ANFEPHKPFGPVPWATSHLGDESIASLIGTDP----VKHKANAWKVVR--TIKGQGGGSLEIKTHPKSKNLIWVD  
*Sideroxydans\_lithotrophicus*\_ES-1-ANFIDPKFGPVPWATGHLGDESIASLIGTDP----VKHKQNAWKVVR--TITQGQGGGSLEIKTHPKSTNLIWVD  
*Pseudogulbenkiania\_sp.*\_NH8B-ANFVHPKFGPVWATGHLGDDSIASLIGTDP----VKHKQYAWKMV--SIQGQGGGSLEIKTHPKSKNLIWVD  
*Herbaspirillum\_sp.*\_I-BH15-17-ANFMHPKFGPVWATSHLGDDTVPVSLIGTDP----VKHKQYAWKVVR--TIKGQGGGSLEIKTHPKSKNLIWVD  
*Cupriavidus\_metallicolorans*\_CH34-ANFVHPKFGPVWATSHLGDETISLIGTDP----INHKQQAWKVVE--TLKGQGGGSLEIKTNPKSKHLYWD  
*Cupriavidus\_necator*\_location\_1\_-778-ANFVHPKFGPVWATSHLGDETISLIGTDP----INHKQQAWKVVE--TLKGQGGGSLEIKTNPKSKHLYWD  
*Burkholderiaceae\_bacterium*\_N52-ANFVHPKFGPVWATSHLGDETISLIGTDP----VAHKQQAWKVVR--TVKGQGGGSLEIKTHPKSSNLIWVD  
*Cupriavidus\_sp.*\_N24-ANFAHPKFGPVWATSHLGDETISLIGTDP----VGHKQQAWKVVR--TVKGQGGGSLEIKTHPKSSNLIWVD  
*Ralstonia\_eutropha*\_JMP134-ANFVHPKFGPVWATSHLGDETISLIGTDP----VGHKQQAWKVVR--TVKGQGGGSLEIKTHPKSTNLIWVD  
*Cupriavidus\_taiwanensis*\_LMG\_19424-ANFTHPQFGPVPWATSHLGDETISLIGTDP----AGHPQAQWKVVR--TVKGQGGGSLEIKTHPKSSNLIWVD  
*Ralstonia\_pickettii*\_DTP0602-ANFTHPKFGPVWATSHLGDEAISLIGTDP----AGHPQAQWKVVR--TLKGQGGGSLEIKTHPKSSNLIWVD  
*Cupriavidus\_necator*\_N-1-ANFTHPKFGPVWATSHLGDETISLIGTDP----VGHPAQAWKVVR--TIKGQGGGSLEIKTHPKSSNLIWVD  
*Ralstonia\_eutropha*\_H16-ANFMHPKLGPVWATSHLGDETISLIGTDP----AGHPQAQWKVVR--TIKGQGGGSLEIKTHPKSSNLIWVD  
*Accumulibacter\_phosphatis*\_UW-1-ANFKHPKYGPVWATSHLGADVISVIGTDP----AGNPQSAWKVVR--ELKNHGANSLEIKTHPKSENLIWAD  
*Dechlorospirillum\_sp.*\_I-BH37-22-ANFIHPKYGPVWATSHLGADVISLIGTDP----EKHPQYAWKVVR--ELKNHGGSGLIEKTHPKSKHLYWD  
*Thauera\_sp.*\_MZ1T-ANFVHPKFGPVWATSHLGDDTSLISTASDPKFAKYKEHNWKVVR--QLKMPGAGNLIEKTHPKSKHLYWD  
*Pseudomonas\_stutzeri*\_DSM\_10701-ANFVHPQFGPVPWATSHLGDDVVSLSITPSDESYAKYKEHNWKVVR--ELKMPGAGNLIEKTHPKSKHLYWD  
*Bordetellla\_petrii*\_AM902716-ANFVHKQFGPVPWATGHLGDEVVSLISTASDKESEHAKFKQHNWKVVR--ELKMPGAGNLIEKTHPKSKHLYWD  
*Comamonadaceae\_bacterium*\_I-Bh25-7-ANFVHPKFGPVWATGHLGADVVSLISTASDKESEHAKFKQHNWKVVR--ELKMPGAGNLIEKTHPKSKHLYWD  
*Magnetospirillum\_magnum*\_AMB-1-TNFVHPKFGPVWATGHLGDDDSVALIGTDP----KGHPQAWTKVVA--SLTGQGGGSLEIKTHPKSKNLIWVD  
*Rhodanobacter\_sp.*\_D206a-ANFIHPKFGPVWATSHLGDETISFIGTDP----EKNKQNAWKVVR--KVNGQGGGSLEIKTHPKSENLYVD  
*occus\_pantotrophus*\_location\_1..1791-ANFVHPTEGPVWATSHMGDDDSVALIGTDP----EGHPDNAWKILD--SFALPGGGSLIEKTHPNSQYLYVD  
*Paracoccus\_sp.*\_62-ANFVHPTEGPVWATSHMGDDDSVALIGTDP----EGHPDNAWKILD--SFALPGGGSLIEKTHPNSQYLYVD  
*Paracoccus\_denitrificans*\_PD1222-ANFVHPTEGPVWATSHMGDDDSVALIGTDP----EGHPDNAWKILD--SFALPGGGSLIEKTHPNSQYLYVD  
*Paracoccus\_sp.*\_I-Bh37-1-ANFVHPTEGPVWATSHLGDEDSVALIGTDP----EGHPDQAWKIVD--TFPALPGGGSLIEKTHPKSHLYLYD  
*Polymorphum\_gilvum*\_SL003B-26A1-ANFTHPTEGPVWATSHLGDEDSVALIGTDP----EGHPDNAWKILD--SFYALPGGGSLIEKTHPNSNHLYVD  
*Labrenzia\_sp.*\_C1B10\_ANLHHPKYGPVWATSHLGDETVALIGTDP----EGHPDSAWKVVR--TLYGLGGGSLEVKSHPKSNHLYVD  
*Stappia\_aggregata*\_IAM\_12614\_ANLHHPTYGPVWATSHLGDETVALIGTDP----EGHPDNAWKVVR--TLYQAGGGSLIEVKSHPTSENLYVD  
*Ruegeria\_pomeroyi*\_DSS-3\_ANLMHPTYGPVWATSHLGDETVALIGTDP----EGHPDNAWKVVR--TLYQAGGGSLIEVKSHPTSENLYVD  
*Dinoroseobacter\_shibae*\_DFL\_12\_ANLNHNPVHPGVWATSHLGDETVALIGTDP----EGHPDPAWTVVQ--QLYAMGGGSLEVKSHPTSENLYVD  
*Roseobacter\_denitrificans*\_OCh\_114\_ANINHPTYGPVWATSHLGDDTVALIGTDP----EGNPDPHAWKMVQ--QLYALGGGSLEVKSHPTSENLYVD  
*Roseobacter\_litoralis*\_Och\_149\_ANINHPTYGPVWATSHLGDDTVALIGTDP----EGNPDPHAWKMVQ--QLYALGGGSLEVKSHPTSENLYVD  
*Rhodothermus\_marinus*\_DSM\_4252-ANFYNPETYGHLPWATGHLGDNТИIATDP----GPQNQWKVVKKLELPVGGGTLEIKTHPKSKHLYWD  
*Methylomirabilis\_oxyfera*\_FP565575-ANWIDPKGPVNGTPHLGEKGIAVYGTDP----AKHK-ESAWKVVR--DLKTLLGGGLIEKTHPKSKNVIWWD  
*Kuenenia\_stuttgartiensis*\_CT573071-TNEKDPEYGVWYATPHLGEAAVALVCTKP---RHDKTENRWKVVVR--KLKVAQDGGLIEKTHPKSKHLYWD  
*Nitratiruptor\_sp.*\_SB155-2-ANVSHPKYGPICWTGHIGSNDVVCIGTDP----TYHPQYAWRVVADIKLPGNGGGNLIEKTHPKSKHLYWD  
*Methylomonas\_methanica*\_MC09-SAVVSDGRTLGFGTNFGDCDKMMVSVWDL-----DKMEVVKQ--IPVSGGTESPAAHANAPYVAVDII  
*Methylomonas\_sp.*\_16a\_GQ241349-AAVVDGRTLGFGTNFGDCDKMMVSVWDL-----DKMEVVKQ--VPVSGGTESPAAHANAPYVAVDII  
*Methyllobacter\_tundripaludum*\_SV96-SVVEVDGRTLGFGTNFGDCDKMMVSVWDL-----DKMEVVKQ--VPVSGGTESPAAHANAPYVAVDII  
*Methylomicrobium\_album*\_BG8-AAVQVDGRTLGFGTNFGDCDKMMVSVWDL-----DKMEVVKQ--VPVAGGTESPAAHQNAPYVAVDII  
*Nitratiruptor\_salsuginis*\_DSM\_16511-SSWYNDKYG-QLNATN-SMNVGDVVIWNM-----DN-KVVAN--VPTAGGGFLVFTSKDTPYLWSD  
*Sulfurovum\_sp.*\_NBC37-1-SSWFNKKMGKQLNATN-SMNFGSVVIWES-----PSWKIVKK--IKTSGGGFLVFTGEHTPWIWSD  
*Sulfurimonas\_autotrophica*\_DSM\_16294-SSWYNDRYG-QLYATN-SMNVGDVVIW-----SNWDVVAH--VRTAGGGFLVFTSEHTPFIWSD  
*Sulfurimonas\_denitrificans*\_DSM\_1251-SSWYNETLGQQQLGATV-NMNLGQVTIWD-----DHFDVIRQ--IPTGGGLFLVFTSEHTPFIWAD  
*Sulfurimonas\_gotlandica*\_GD1-SSWYNEQLGQQLGATV-NMNLGQVTIWD-----DNFDVIRQ--IPIGGGLFLGFTSEHTPFIWAD

Cluster I

Cluster II

Cluster III

**Figure S1 Wei et al.**

(a)

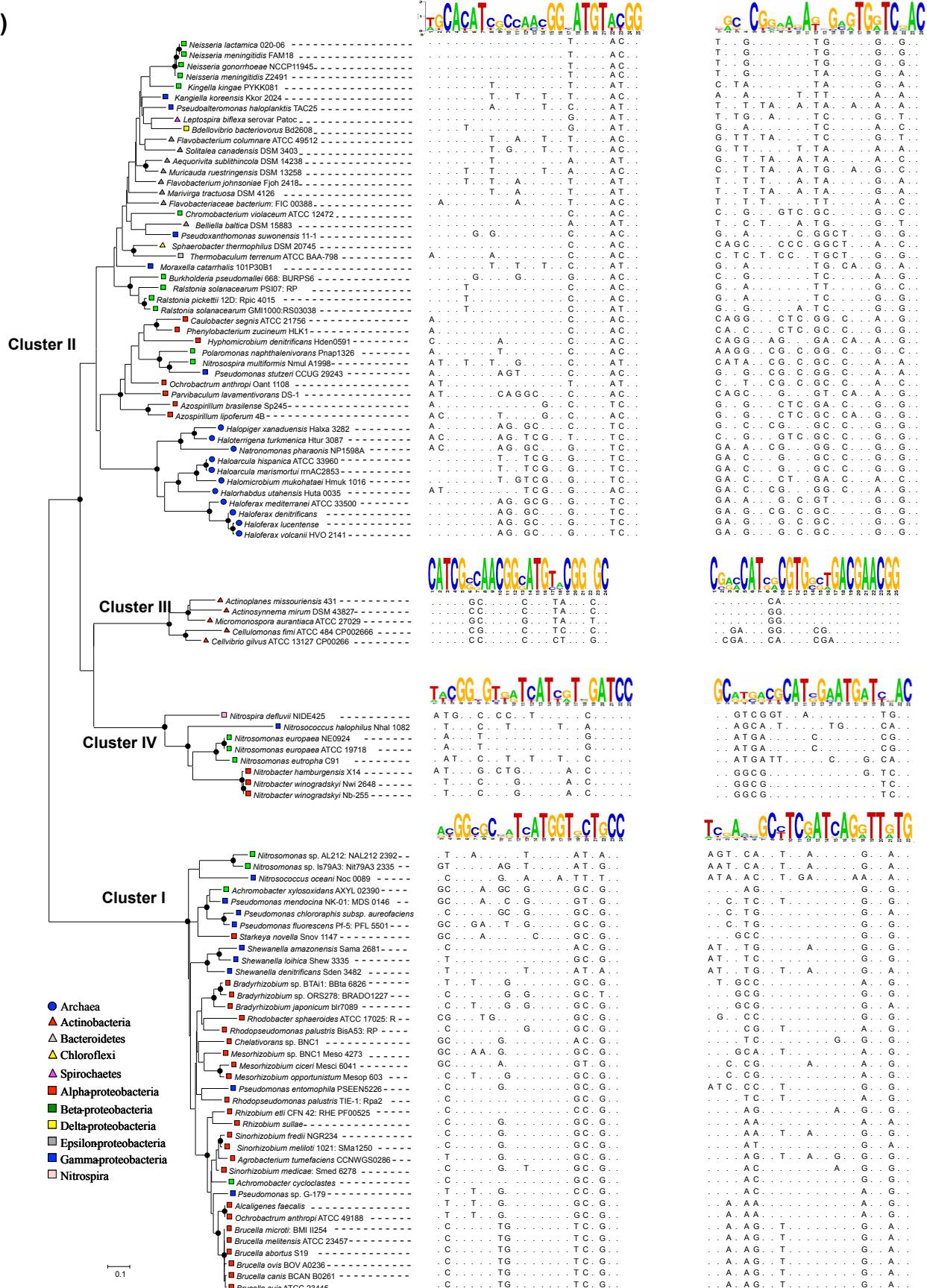


Figure S2, Wei et al.

(b)

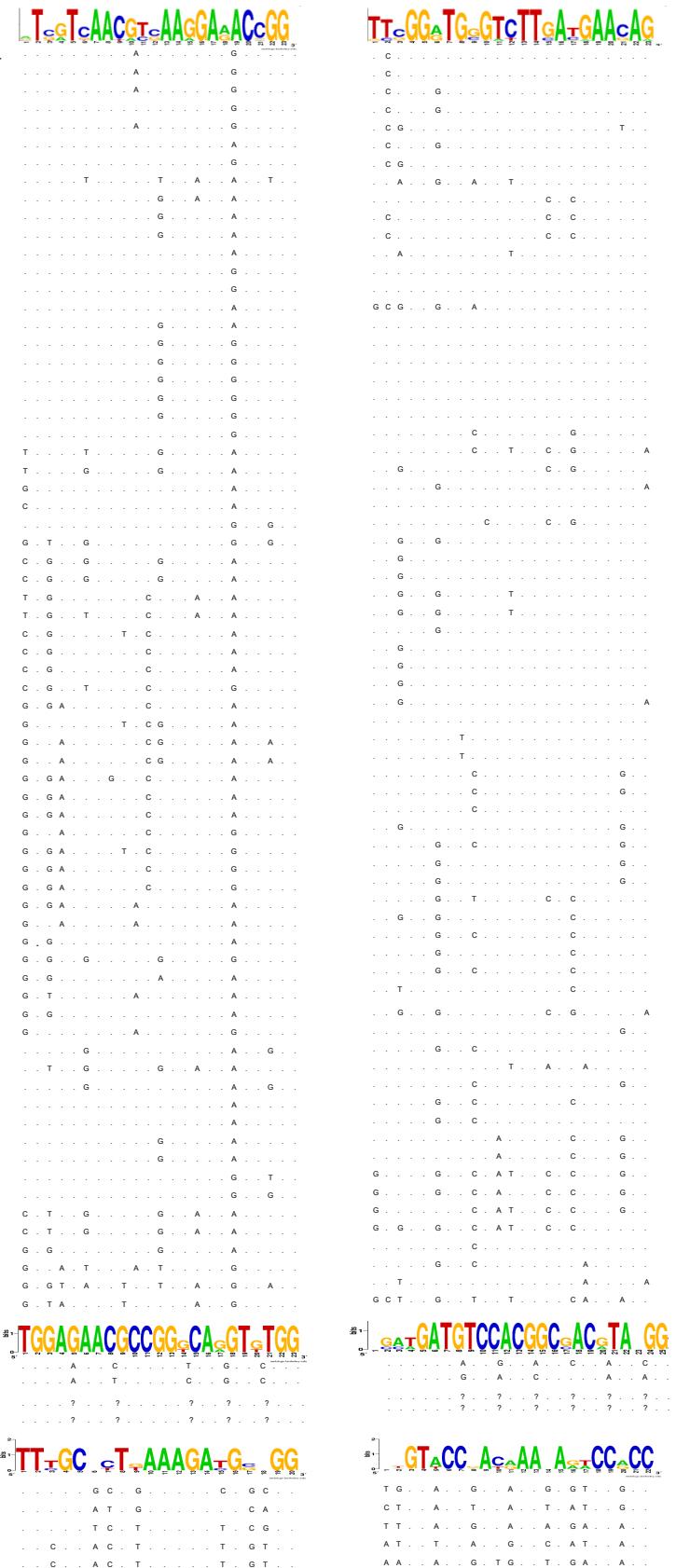
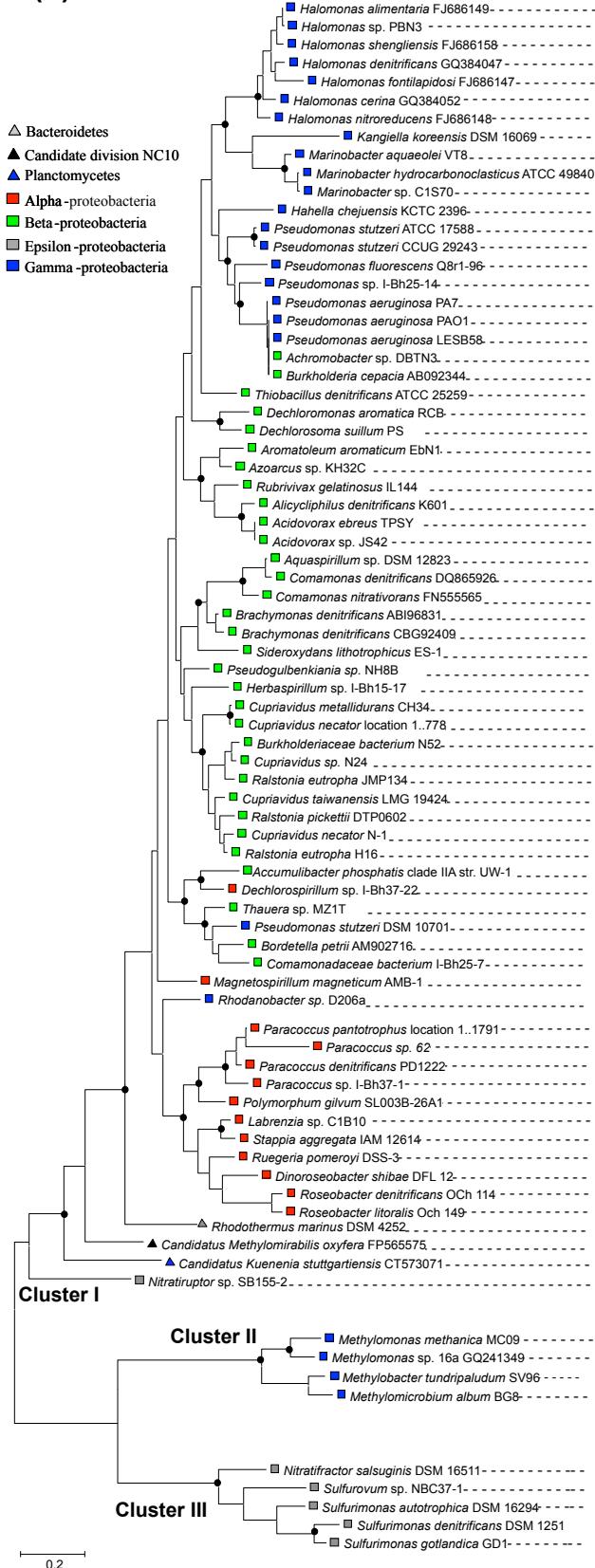
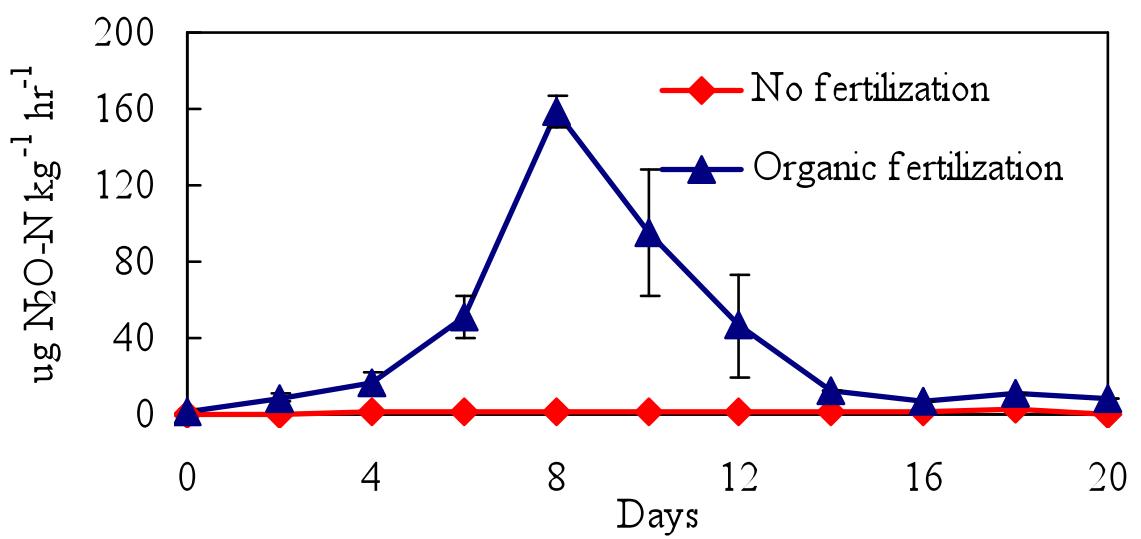


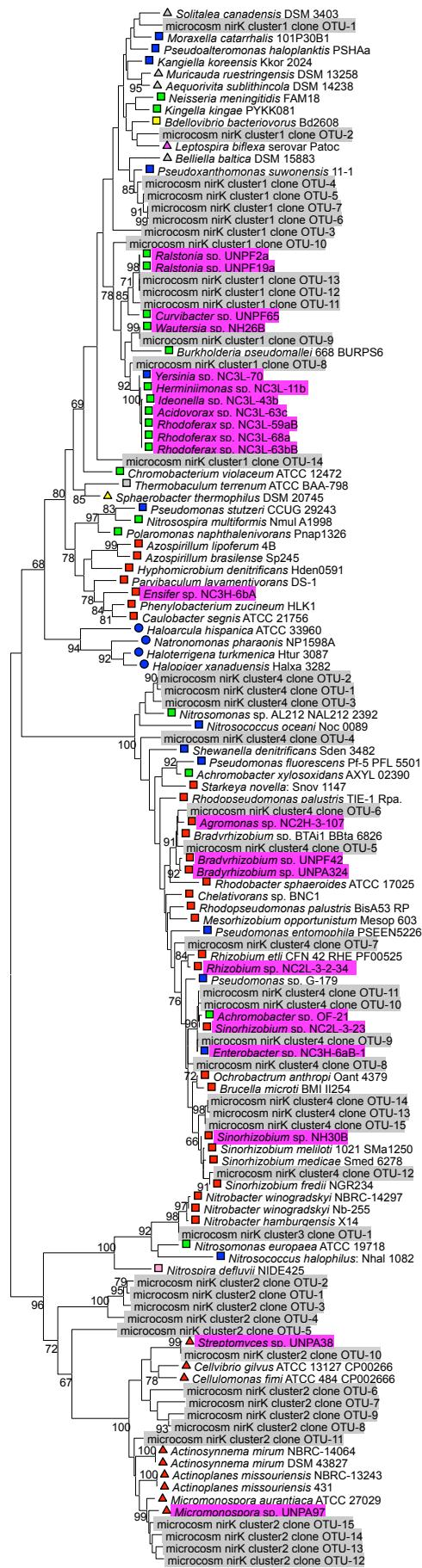
Figure S2, Wei et al.



**Figure S3, Wei et al.**

(a)

- Archaea
- ▲ Actinobacteria
- △ Bacteroidetes
- Chloroflexi
- ▲ Spirochaetes
- Alpha-proteobacteria
- Beta-proteobacteria
- Delta-proteobacteria
- Epsilon-proteobacteria
- Gamma-proteobacteria
- Nitrospira



Cluster II

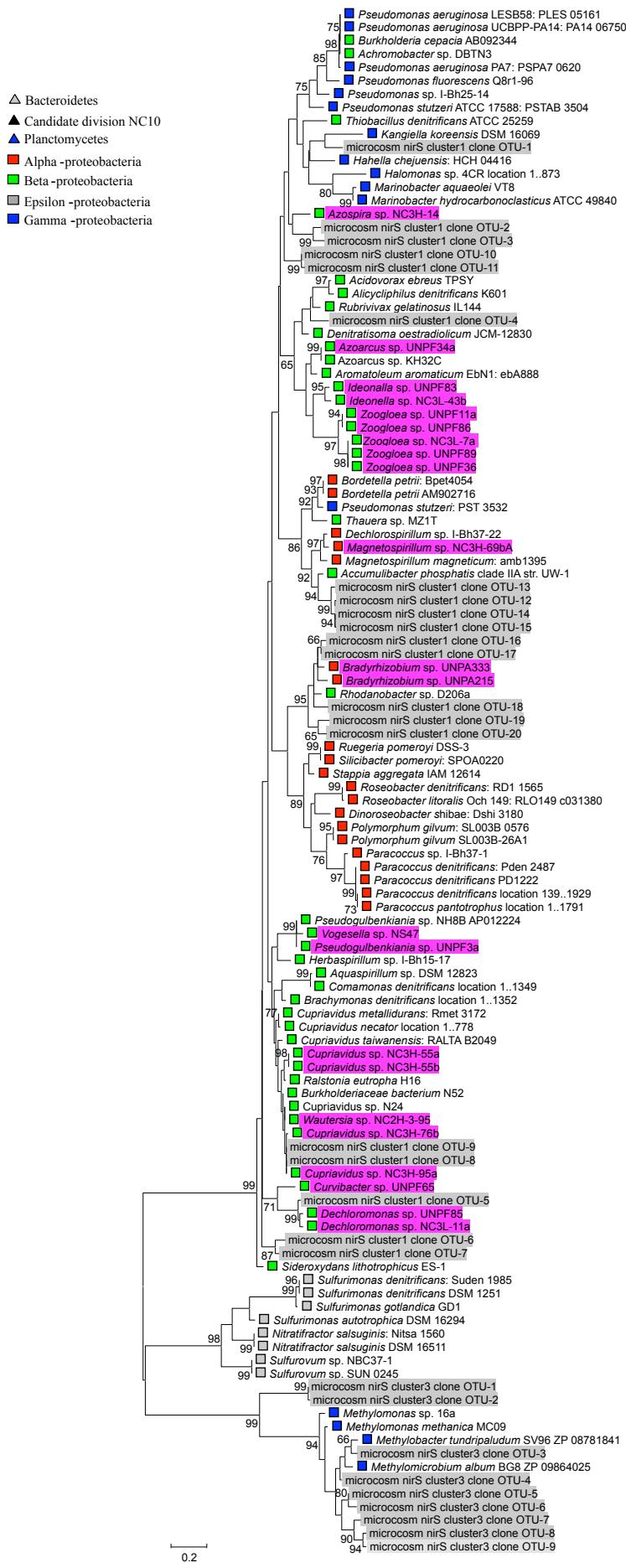
Cluster I

Cluster IV

Cluster III

Figure S4, Wei et al.

(b)



Cluster I

Cluster III

Cluster II

Figure S4 Wei et al.