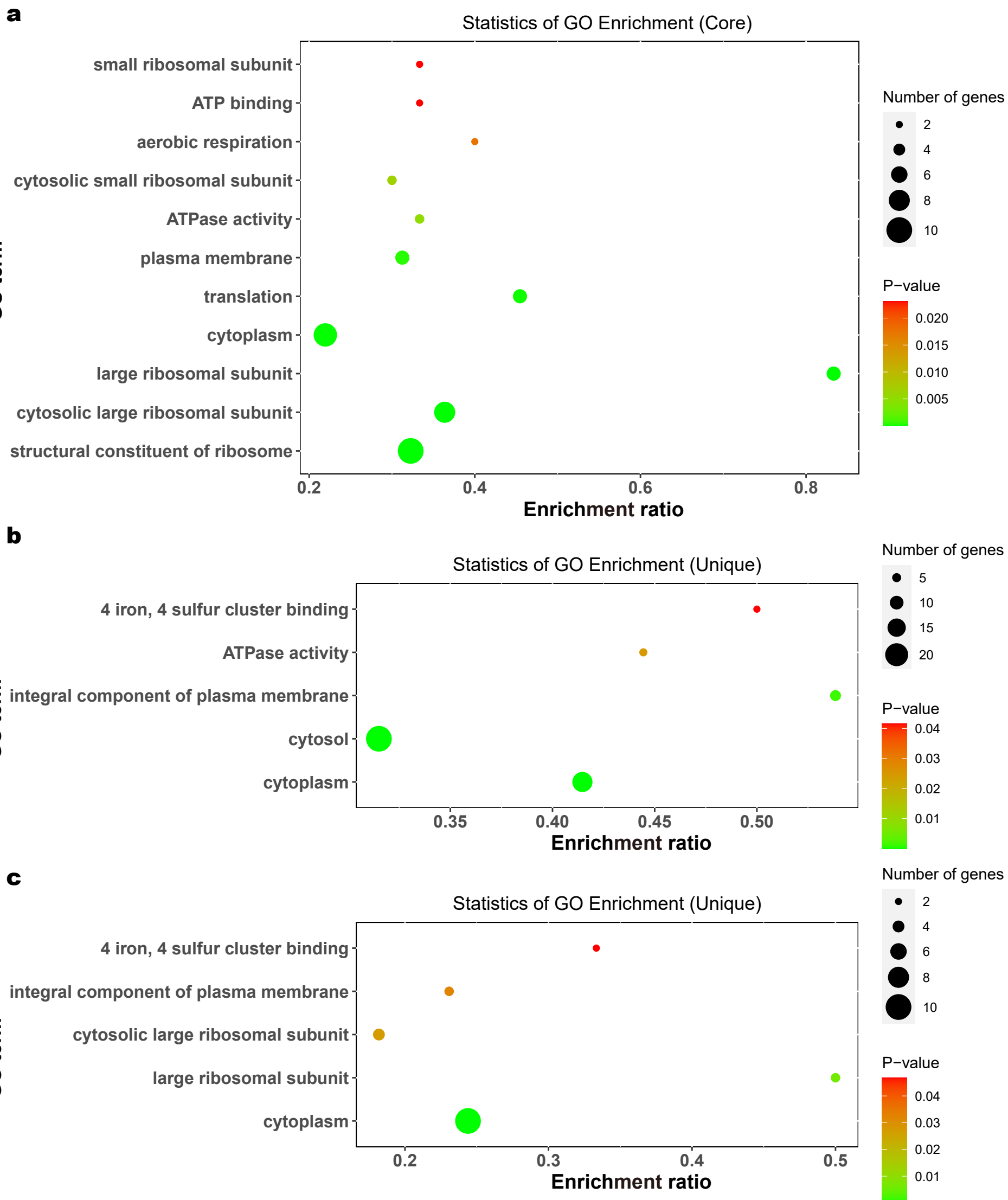


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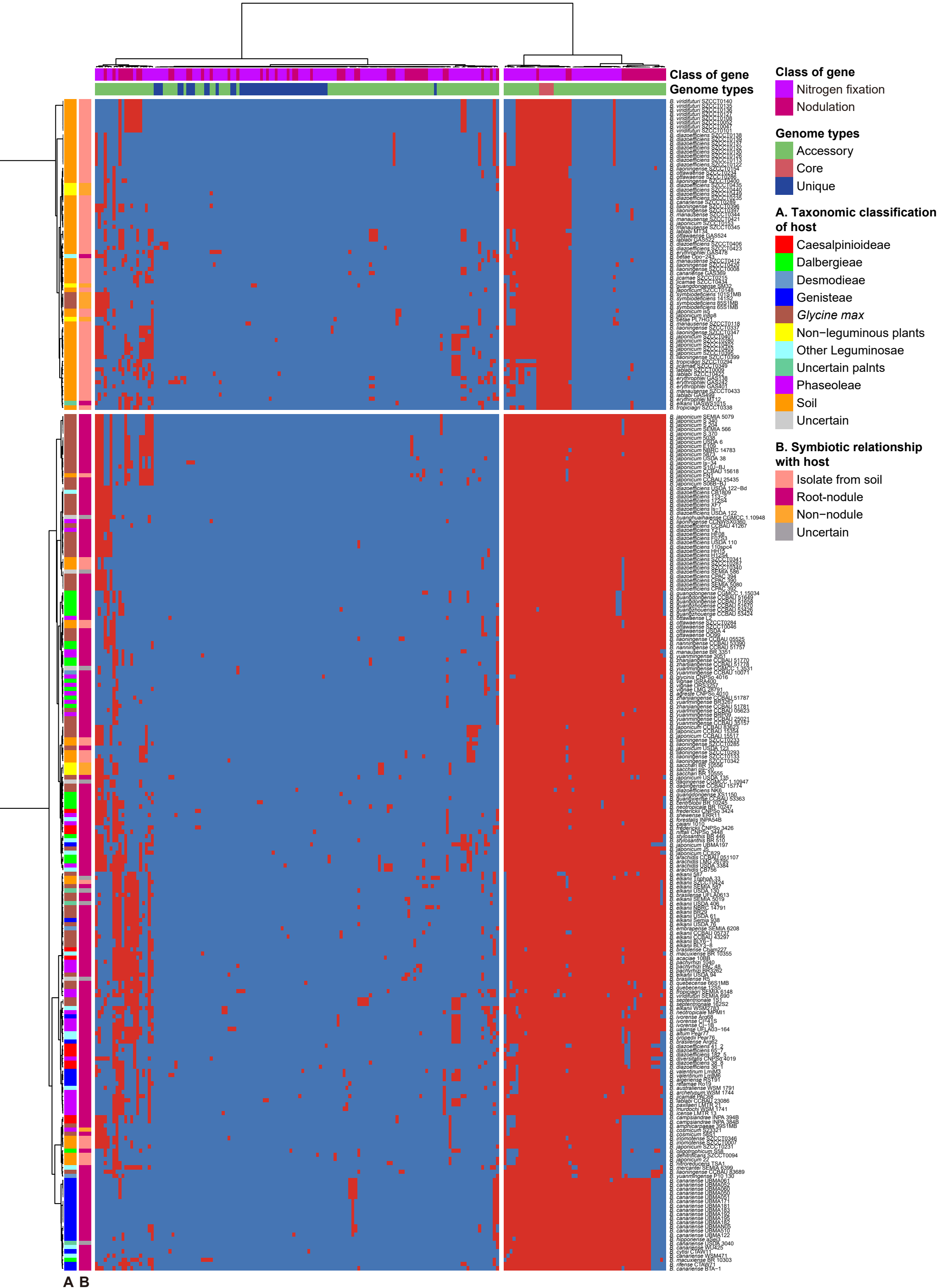
## Supplemental information

**Comparative genomics analysis reveals genetic characteristics and nitrogen fixation profile of *Bradyrhizobium***

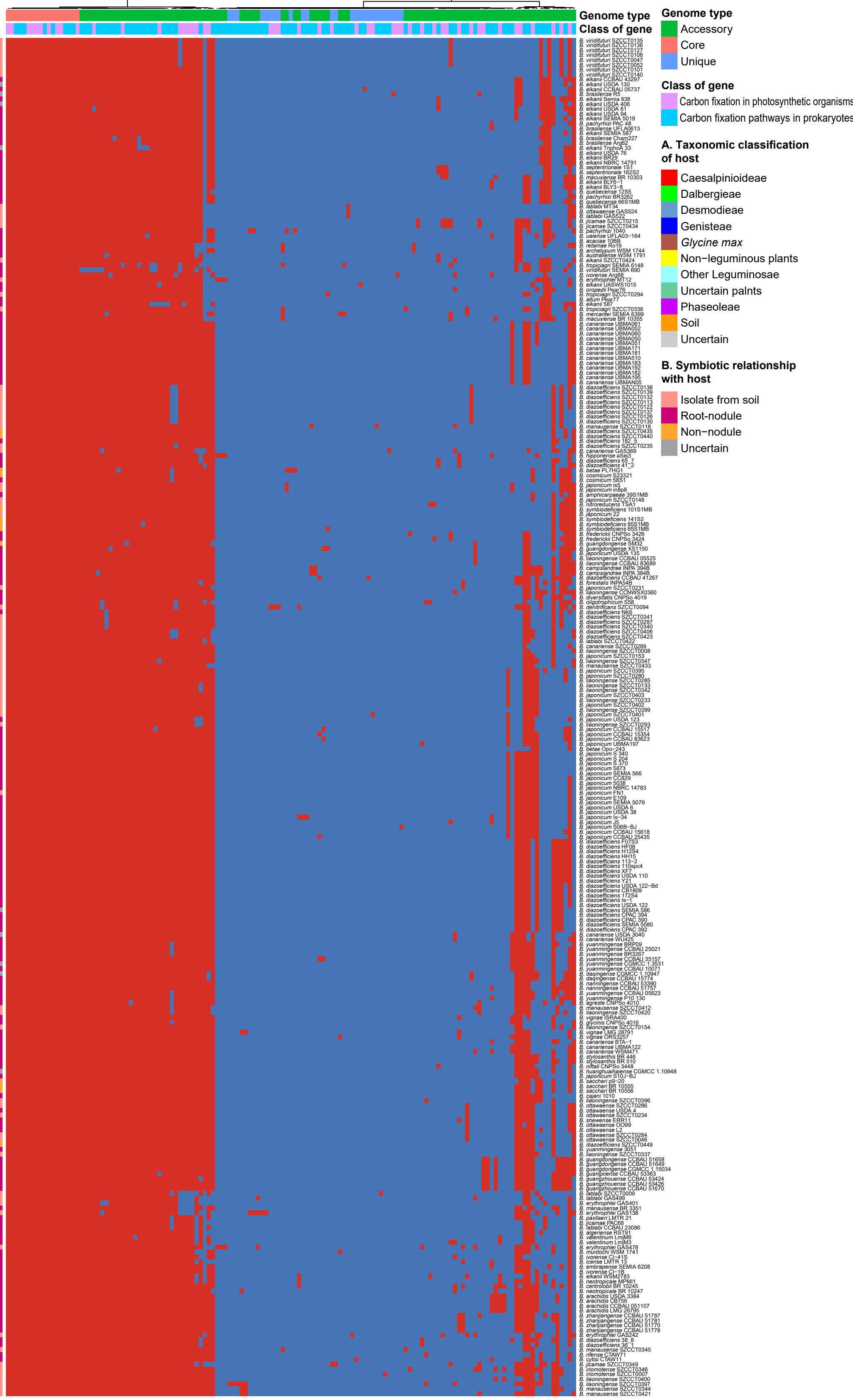
**Chaofang Zhong, Gang Hu, Cong Hu, Chaohao Xu, Zhonghua Zhang, and Kang Ning**



**Figure S1:** The GO enrichment analysis for core (a), accessory (b), and unique (c) genes, related to Figure 2. The size of bubbles represents the number of assigned genes, and the color of the bubbles indicates p-value. The larger the number of genes associated with the term, the larger the bubble.



**Figure S2:** Presence (red)/absence (blue) pattern of genes involved in nodulation and nitrogen fixation in each Bradyrhizobium strain, related to Figure 4. A red box indicates presence of the gene in the corresponding strain while a blue box indicates an absence. The dendrogram was generated based on the ward.D method for clustering of euclidean distances.



**Figure S3:** Presence (red)/absence (blue) pattern of genes involved in carbon fixation in each *Bradyrhizobium* strain, related to Figure 3. A red box indicates presence of the gene in the corresponding strain while a blue box indicates an absence. The dendrogram was generated based on the ward.D method for clustering of euclidean distances.

MASH clustering

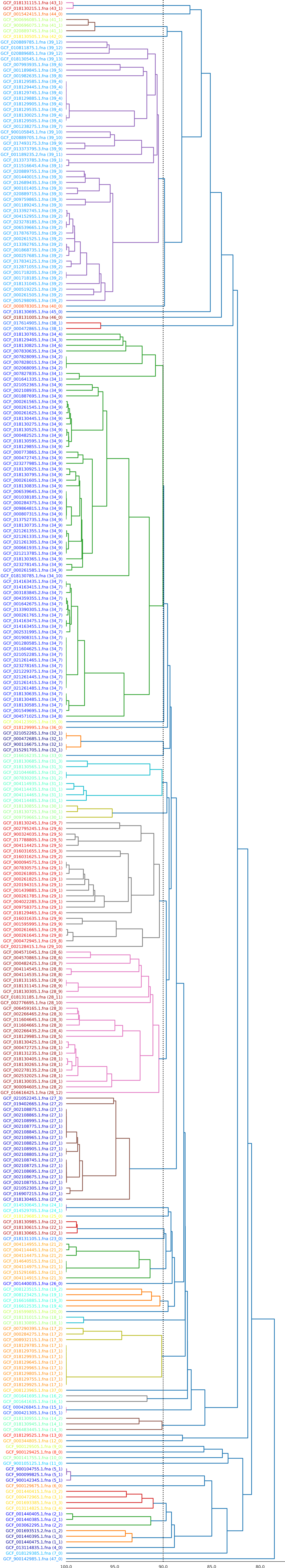


Figure S4: Pairwise mash distances between 278 genomes, related to STAR METHODS.

**Table S4: 139 genes potentially involved in carbon fixation, related to Figure 3.**

ID	Genome set	KO	Gene name	Class
WP_038384397.1	Unique	K00626	ACAT	prokaryotes
WP_038967712.1	Unique	K01610	pckA	photosynthetic organisms
WP_041961059.1	Unique	K01902	sucD	prokaryotes
WP_041961099.1	Unique	K00626	ACAT	prokaryotes
WP_043854822.1	Unique	K02160	accB	prokaryotes
WP_148750643.1	Unique	K00134	GAPDH	photosynthetic organisms
WP_201280180.1	Unique	K00242	sdhD	prokaryotes
WP_212226591.1	Unique	K00626	ACAT	prokaryotes
WP_211407045.1	Unique	K00246	frdC	prokaryotes
WP_012040783.1	Unique	K03841	FBP	photosynthetic organisms
WP_012040787.1	Unique	K00927	pgk	photosynthetic organisms
WP_012042813.1	Unique	K01602	rbcS	photosynthetic organisms
WP_212234116.1	Unique	K01849	mcmA2	prokaryotes
WP_212354841.1	Unique	K00615	tktA	photosynthetic organisms
WP_249158379.1	Unique	K00241	sdhC	prokaryotes
WP_249155512.1	Unique	K00855	PRK	photosynthetic organisms
WP_212435597.1	Unique	K00246	frdC	prokaryotes
WP_212435598.1	Unique	K00240	sdhB	prokaryotes
WP_246563647.1	Unique	K00247	frdD	prokaryotes
WP_229177710.1	Unique	K00615	tktA	photosynthetic organisms
WP_248890080.1	Unique	K00150	gap2	photosynthetic organisms
WP_176937106.1	Unique	K01624	FBA	photosynthetic organisms
WP_244549119.1	Unique	K03737	por	prokaryotes
WP_079604826.1	Unique	K01902	sucD	prokaryotes
WP_172842551.1	Unique	K00925	ackA	prokaryotes
WP_079572650.1	Unique	K00626	ACAT	prokaryotes
cluster1042	Core	K02160	accB	prokaryotes
cluster1079	Core	K01803	TPI	photosynthetic organisms
cluster11314	Accessory	K00925	ackA	prokaryotes
cluster1160	Core	K01676	fumA	prokaryotes
cluster1199	Core	K01679	fumC	prokaryotes
cluster12123	Accessory	K00240	sdhB	prokaryotes
cluster14008	Accessory	K01491	folD	prokaryotes
cluster141	Accessory	K00626	ACAT	prokaryotes
cluster1421	Accessory	K01006	ppdK	photosynthetic organisms
cluster1443	Accessory	K09709	meh	prokaryotes
cluster14615	Accessory	K09709	meh	prokaryotes
cluster1499	Accessory	K00241	sdhC	prokaryotes
cluster15424	Accessory	K01958	PC	prokaryotes
cluster1632	Accessory	K01595	ppc	photosynthetic organisms
cluster16926	Accessory	K01491	folD	prokaryotes
cluster17045	Accessory	K00626	ACAT	prokaryotes
cluster1717	Accessory	K05606	MCEE	prokaryotes
cluster17443	Accessory	K01491	folD	prokaryotes
cluster1770	Accessory	K00031	IDH1	prokaryotes
cluster17737	Accessory	K00615	tktA	photosynthetic organisms
cluster1808	Accessory	K15022	fdhB	prokaryotes
cluster1809	Accessory	K00175	korB	prokaryotes
cluster184	Core	K00029	maeB	photosynthetic organisms
cluster18443	Accessory	K00626	ACAT	prokaryotes
cluster1892	Accessory	K00297	metF	prokaryotes
cluster1907	Accessory	K00174	korA	prokaryotes
cluster19084	Accessory	K00615	tktA	photosynthetic organisms
cluster19098	Accessory	K00615	tktA	photosynthetic organisms
cluster19635	Accessory	K00615	tktA	photosynthetic organisms

cluster19915	Accessory	K01895	ACSS1_2	prokaryotes
cluster20	Core	K00615	tktA	photosynthetic organisms
cluster2023	Accessory	K01902	sucD	prokaryotes
cluster2032	Accessory	K01962	accA	prokaryotes
cluster209	Core	K00626	ACAT	prokaryotes
cluster21717	Accessory	K01783	rpe	photosynthetic organisms
cluster21950	Accessory	K01902	sucD	prokaryotes
cluster2210	Accessory	K01783	rpe	photosynthetic organisms
cluster22224	Accessory	K14470	mct	prokaryotes
cluster22581	Accessory	K02160	accB	prokaryotes
cluster2380	Accessory	K00029	maeB	photosynthetic organisms
cluster23846	Accessory	K01006	ppdK	photosynthetic organisms
cluster2398	Accessory	K01491	folD	prokaryotes
cluster244	Accessory	K01895	ACSS1_2	prokaryotes
cluster25	Core	K01624	FBA	photosynthetic organisms
cluster250	Accessory	K01847	MUT	prokaryotes
cluster25185	Accessory	K01624	FBA	photosynthetic organisms
cluster25666	Accessory	K00024	mdh	photosynthetic organisms
cluster25743	Accessory	K00626	ACAT	prokaryotes
cluster2626	Accessory	K00626	ACAT	prokaryotes
cluster2628	Accessory	K01601	rbcL	photosynthetic organisms
cluster26334	Accessory	K00029	maeB	photosynthetic organisms
cluster26673	Accessory	K00615	tktA	photosynthetic organisms
cluster26751	Accessory	K01676	fumA	prokaryotes
cluster2680	Accessory	K01961	accC	prokaryotes
cluster27142	Accessory	K00626	ACAT	prokaryotes
cluster27274	Accessory	K00240	sdhB	prokaryotes
cluster28651	Accessory	K00626	ACAT	prokaryotes
cluster2971	Accessory	K01621	xfp	photosynthetic organisms
cluster2981	Accessory	K03841	FBP	photosynthetic organisms
cluster30134	Accessory	K00626	ACAT	prokaryotes
cluster3020	Accessory	K00626	ACAT	prokaryotes
cluster30269	Accessory	K01679	fumC	prokaryotes
cluster32180	Accessory	K15020	PSES	prokaryotes
cluster3262	Accessory	K00626	ACAT	prokaryotes
cluster32890	Accessory	K00240	sdhB	prokaryotes
cluster32891	Accessory	K00242	sdhD	prokaryotes
cluster32892	Accessory	K00241	sdhC	prokaryotes
cluster33109	Accessory	K01849	mcmA2	prokaryotes
cluster3347	Accessory	K00626	ACAT	prokaryotes
cluster33752	Accessory	K14449	mch	prokaryotes
cluster34009	Accessory	K01902	sucD	prokaryotes
cluster346	Accessory	K00626	ACAT	prokaryotes
cluster350	Core	K00239	sdhA	prokaryotes
cluster37050	Accessory	K00626	ACAT	prokaryotes
cluster3720	Accessory	K00925	ackA	prokaryotes
cluster37692	Accessory	K00240	sdhB	prokaryotes
cluster39009	Accessory	K01595	ppc	photosynthetic organisms
cluster39103	Accessory	K14534	abfD	prokaryotes
cluster39704	Accessory	K00615	tktA	photosynthetic organisms
cluster40303	Accessory	K00241	sdhC	prokaryotes
cluster40360	Accessory	K00174	korA	prokaryotes
cluster40374	Accessory	K00175	korB	prokaryotes
cluster41182	Accessory	K00626	ACAT	prokaryotes
cluster412	Core	K00134	GAPDH	photosynthetic organisms
cluster42505	Accessory	K00626	ACAT	prokaryotes
cluster426	Accessory	K00626	ACAT	prokaryotes
cluster4435	Accessory	K00925	ackA	prokaryotes

cluster4554	Accessory	K00625	pta	prokaryotes
cluster4800	Accessory	K01610	pckA	photosynthetic organisms
cluster4870	Accessory	K01783	rpe	photosynthetic organisms
cluster556	Accessory	K01602	rbcS	photosynthetic organisms
cluster5684	Accessory	K00615	tktA	photosynthetic organisms
cluster572	Core	K11532	glpX-SEBP	photosynthetic organisms
cluster5736	Accessory	K00615	tktA	photosynthetic organisms
cluster576	Accessory	K00855	PRK	photosynthetic organisms
cluster584	Accessory	K01903	sucC	prokaryotes
cluster5932	Accessory	K00615	tktA	photosynthetic organisms
cluster661	Core	K00024	mdh	photosynthetic organisms
cluster6709	Accessory	K08691	mcl	prokaryotes
cluster6787	Accessory	K01808	rpiB	photosynthetic organisms
cluster687	Core	K01807	rpiA	photosynthetic organisms
cluster6916	Accessory	K01679	fumC	prokaryotes
cluster7597	Accessory	K01006	ppdK	photosynthetic organisms
cluster7795	Accessory	K01007	pps	prokaryotes
cluster841	Core	K00242	sdhD	prokaryotes
cluster842	Core	K00240	sdhB	prokaryotes
cluster8585	Accessory	K14534	abfD	prokaryotes
cluster886	Core	K01963	accD	prokaryotes
cluster8897	Accessory	K02160	accB	prokaryotes
cluster8965	Accessory	K01961	accC	prokaryotes
cluster966	Core	K01623	ALDO	photosynthetic organisms
cluster967	Core	K00927	pgk	photosynthetic organisms
cluster9679	Accessory	K01491	folD	prokaryotes

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