

Function	Rip8802	EpSB	EcSB	RgSB	RaSB	EaSB	EtSB	UCYN-A	Paul-A
Informational									
rRNA & tRNA	+	+	+	+	+	+	+	+	+
Ribosomal proteins	+	+	+	+	+	+	+	+	+
Aminoacyl-tRNA-synthases	+	+	+	+	+	+	+	95%	+
Transcription	+	+	+	+	+	+	+	+	+
DNA replication	+	+	+	+	+	+	+	+	75%
DNA repair	+	89%	89%	89%	89%	89%	89%	74%	37%
Energy production									
Glycolysis	+	90%+	90%+	90%+	90%+	90%+	90%+	90%	90%
Entner-Doudoroff	+	+	+	+	+	+	+	—	+
Pentose Phosphate	+	+	+	+	+	+	+	80%	80%
TCA (OAA, Pyr → 2-OG)	+	+	+	+	+	+	+	20%	20%
TCA (2-OG → OAA)	+	60%	60%	60%	20%	20%	20%	—	—
NAD(P)H oxidoreductase	+	+	+	+	+	+	+	+	+
Cytochrome b ₆ /f	+	+	+	+	+	+	+	+	75%
Cytochrome c oxidase	+	++	++	++	++	++	++	+	+
Heme biosynthesis	+	+	+	+	+	+	+	+	90%
ATP synthase	+	+	+	+	+	+	+	+	+
Photosystem I	+	—	—	—	—	—	—	+	64%
Photosystem II	+	—	5%	5%	5%	—	—	5%	+
Chlorophyll biosynthesis	+	80%	80%	80%	30%	—	—	90%	+
Antenna proteins	+	—	—	—	—	—	—	—	90%
Carotenoid biosynthesis	+	+	+	+	+	+	+	57%	86%
Nitrogen fixation									
Nitrogenase and cofactor	+	+	+	+	+	+	+	+	10%—
Ammonia assimilation	+	+	+	+	+	+	+	43%	29%
Metabolism									
Glycogen metabolism	+	+	+	+	+	+	+	20%	20%
Phospholipid synthesis	+	+	+	+	+	+	+	83%	83%
Fatty acid synthesis	+	+	+	+	+	+	+	+	+
Purine synthesis	+	+	+	+	+	+	+	35%	35%
Pyrimidine synthesis	+	+	+	+	+	+	+	88%	62%
Amino acid synthesis	Ala	+	+	+	+	+	+	+	—
	Arg	+	+	+	+	+	+	25%	38%
	Asn	+	+	+	+	+	+	+	+
	Asp	+	+	+	+	+	+	50%	—
	Cys	+	+	+	+	+	+	+	67%
	Gln	+	+	+	+	+	+	+	+
	Glu	+	+	+	+	+	+	+	—
	Gly	+	+	+	+	+	+	+	+
	His	+	+	+	+	+	+	—	50%
	Ile	+	+	+	+	+	+	—	88%
	Leu	+	+	+	+	+	+	—	83%
	Lys	+	+	+	+	+	+	+	+
	Met	+	+	+	+	+	+	50%	50%
	Phe	+	+	+	+	+	+	70%	80%
	Pro	+	+	+	+	+	+	33%	67%
	Ser	+	+	+	+	+	+	67%	+
	Thr	+	+	+	+	+	+	80%	80%
	Trp	+	+	+	+	+	+	50%	42%
	Tyr	+	+	+	+	+	+	60%	70%
	Val	+	+	+	+	+	+	—	+
Cofactor synthesis									
Biotin	80%	60%	60%	60%	60%	40%	40%	20%	20%
Folate	89%	56%	67%	67%	67%	67%	56%	56%	56%
Lipoic acid	+	+	+	+	+	+	+	—	+
NAD/NADP	+	+	+	+	+	+	+	50%	—
Pantothenate/CoA	+	78%	89%	89%	89%	89%	89%	44%	44%
Pseudocobalamin	86%	86%	86%	86%	86%	14%	14%	86%	5%
Pyridoxal 5-phosphate	71%	71%	71%	71%	71%	71%	71%	71%	57%
Riboflavin	83%	83%	83%	83%	83%	83%	83%	67%	—
Thiamine	75%	75%	75%	75%	75%	75%	75%	67%	33%

Fig. 4 Summary of metabolic capabilities of endosymbionts and related cyanobacterium. Green represents presence of pathway, red indicates absence, and intermediate colors indicate presence of some but not all enzymes and initial substrates. Percentages indicate the fraction of a pathway recognizable in the genome. Lists of the specific enzymes used in the calculation of percentages are given in Supplemental Table S2. If the percentage is followed by a “+” (or a cell contains an extra “+”), then the indicated pathway is supplemented with a capability that goes beyond that possessed by R8802. A cell surrounded by a red outline indicates that the hole in the pathway was filled by importing a protein encoded by the nucleus of *Braarudosphaera bigelowii* [Coale et al, 2024] or *Paulinella chromatophore* [Singer et al, 2017]. If the outline is dashed, then only one of multiple holes was filled. Organism/endosymbiont abbreviations are explained in Fig. 1.