

Assembly and annotation of euryarchaeal sequences

- ① **Assembly.** Metagenomic reads from MedDCM-JUL2012, MedDCM-SEP2014, Med-Io7-77mDCM, Med-Ae2-600mDeep and the fosmid reads from MedDCM-OCT2007, KM3 and AD1000 were independent and systematically assembled using IDBA_UD.
- ② **Annotation.** Assembled DNA fragments were annotated using the NCBI nr-database, Pfam, COGs, arCOGs and TIGRfam. Only those fragments which have more than 50% of their ORFs annotated as Euryarchaeota were taken for further analysis (in black).

Retrieving of euryarchaeal sequences

- ③ **Recruitment.** Search of Euryarchaeota sequences within different marine databases. Only those metagenomes where our initial genomic fragments recruited more than 3 rpkg were selected.
- ④ **Assembly and annotation** of the selected metagenomes (as described previously). DNA fragments classified as euryarchaeota were collected.

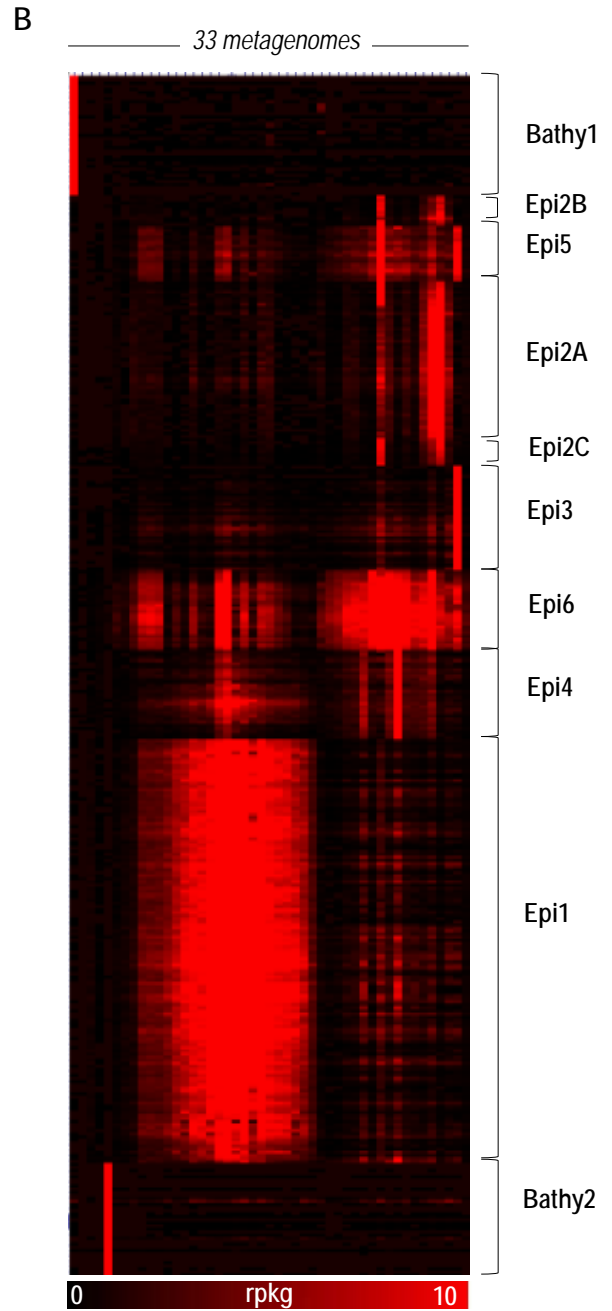
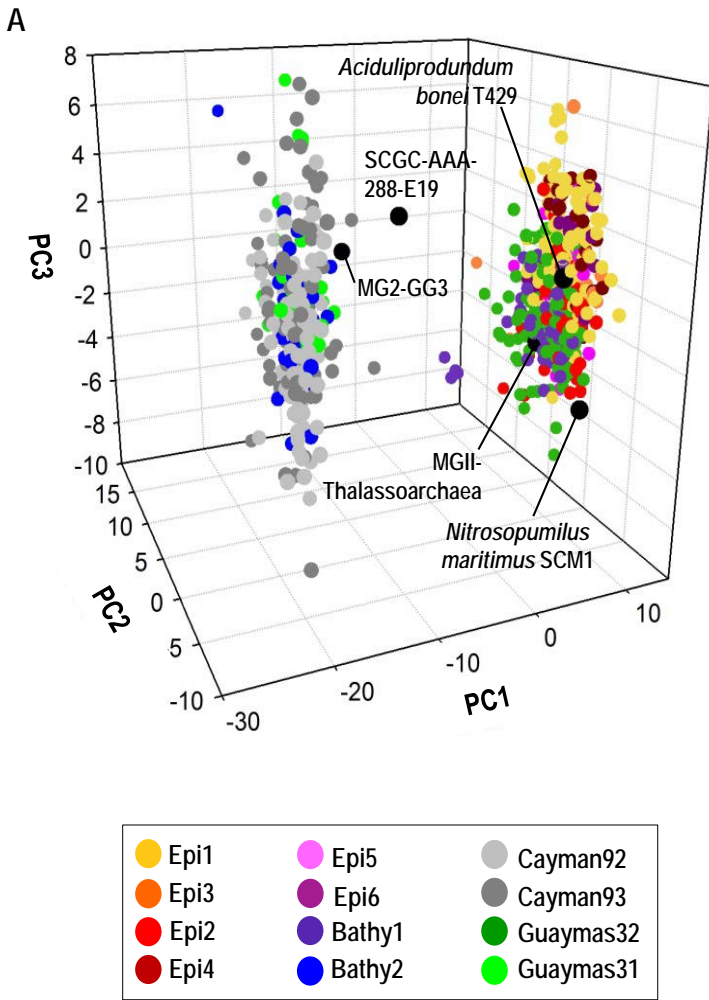
Binning of MG-III by tetranucleotide frequencies, %GC and differential coverage

- ⑤ **Binning** of the MG-III sequences by tetranucleotide frequencies, %GC and differential coverage among 33 metagenomes.

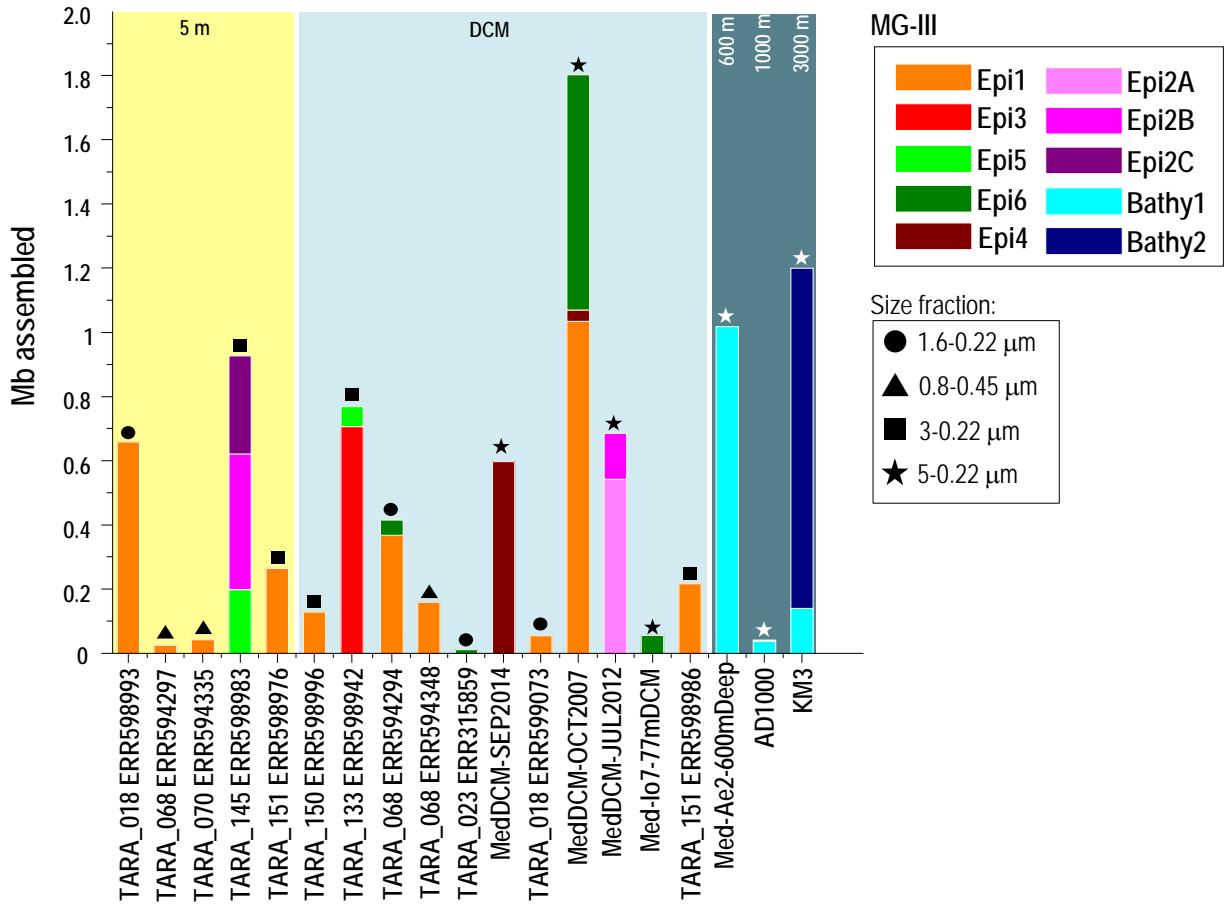
Re-assembly

- ⑥ **Alignment** of the sequences >10 Kb of one specific bin against the metagenomic reads where those contigs came from using BWA. The process was made for all the bins. The reads extracted were used in the following step.
- ⑦ **Assembly** of the reads with SPADES using the DNA fragments for scaffolding with the parameter `-trusted_contigs`. The re-assembly was done for all the bins and their products are called «composite genome» (CG).

Supplementary Figure S2



Supplementary Figure S3



%GC
 30 40 50 60

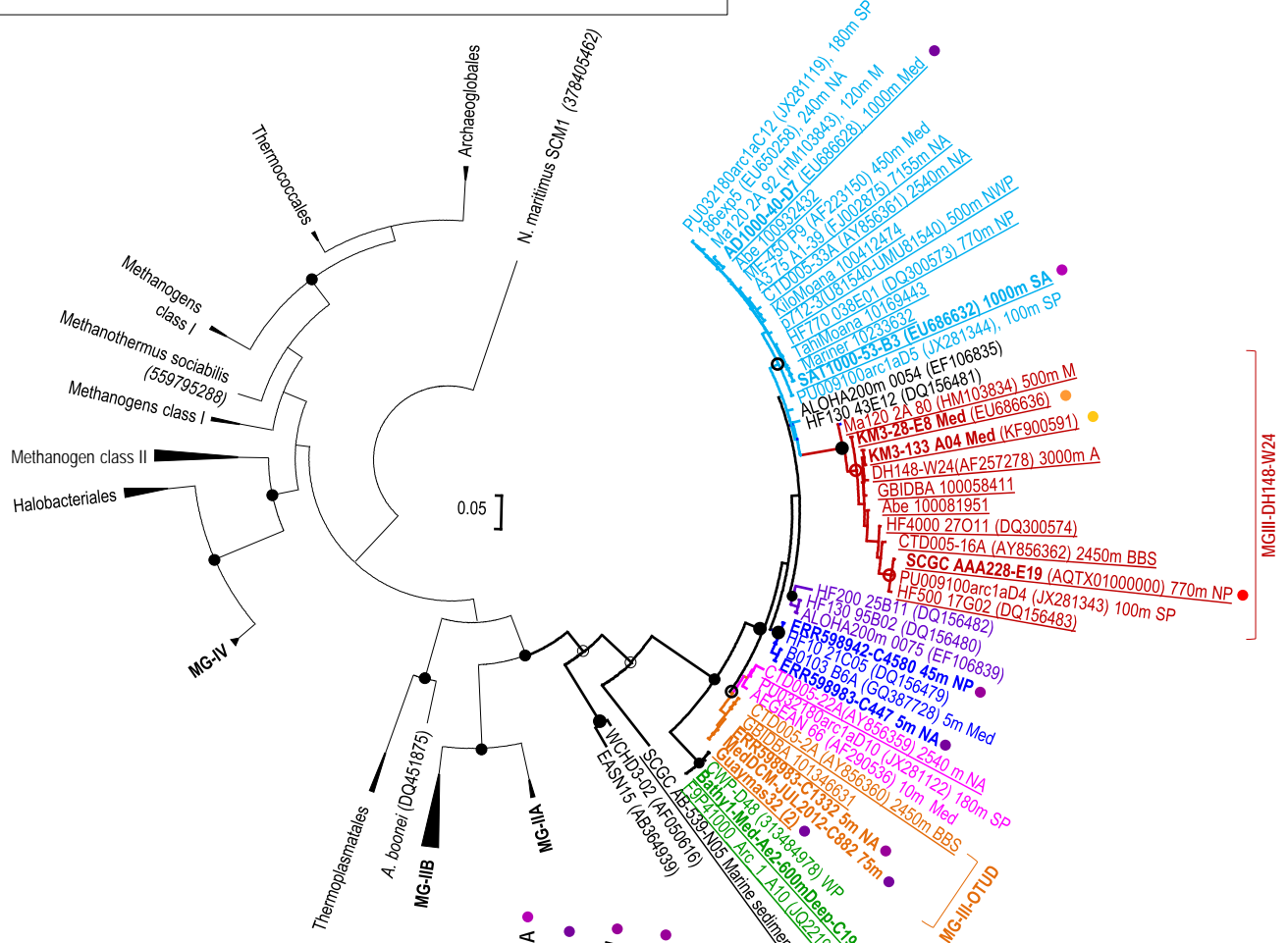
● >70%
 ○ >50%

(underlined: >500 m)

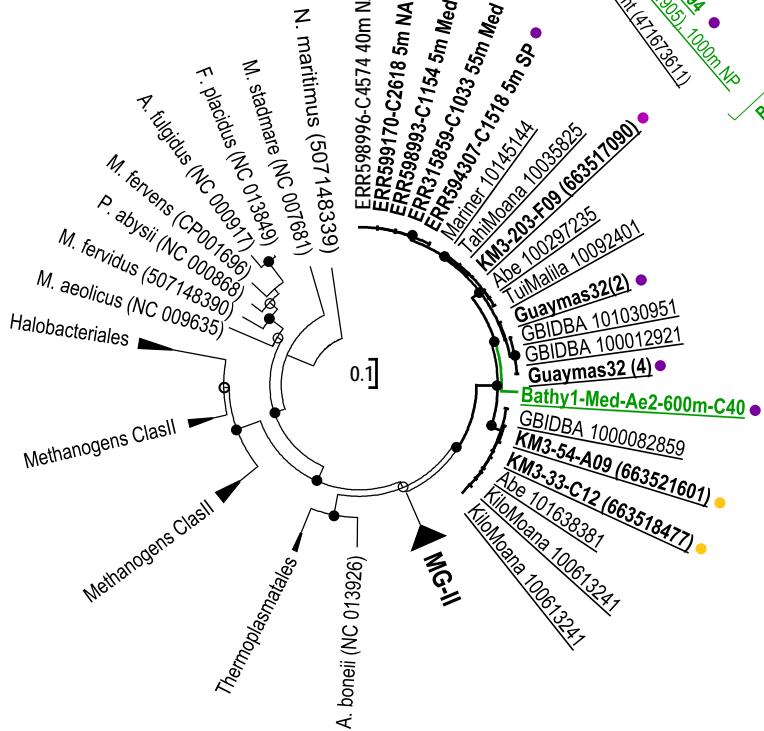
NA – North Atlantic
 SA – South Atlantic
 NP – North Pacific
 NWP – North West Pacific
 WP – West Pacific
 SP – South Pacific
 Med – Mediterranean Sea
 A – Antarctic

M – Marmara
 BBS – Baby Bare Seamount
 GBIDBA (Guaymas) – Gulf of California (NP)
 HFXXX – Hawaii (NP)
 ALOHA – Hawaii (NP)
 KiloMoana, TahiMoana, Lau Basin, Mariner, TuiMailla, Abe – South Pacific

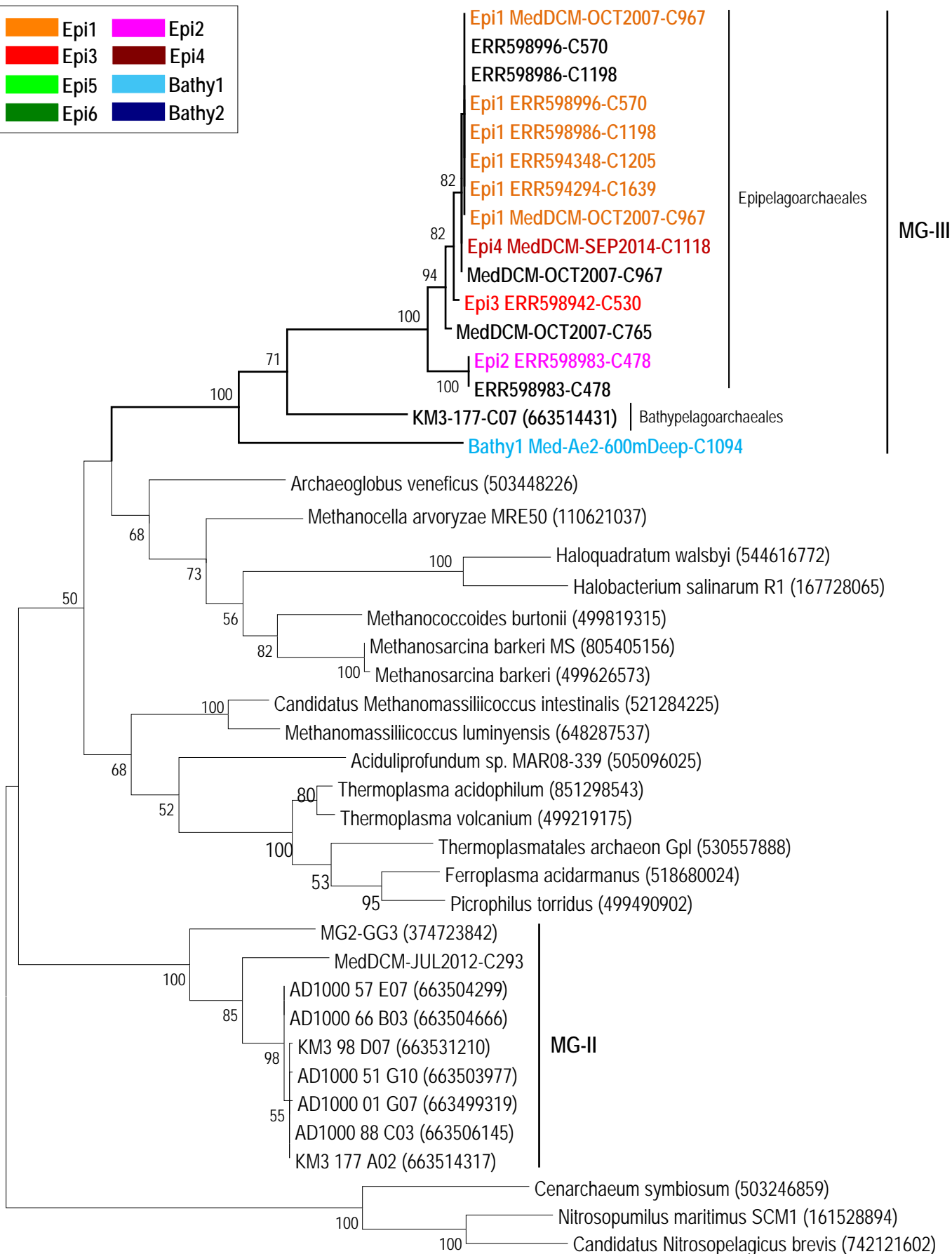
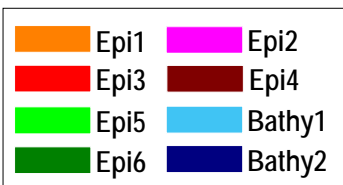
A



B

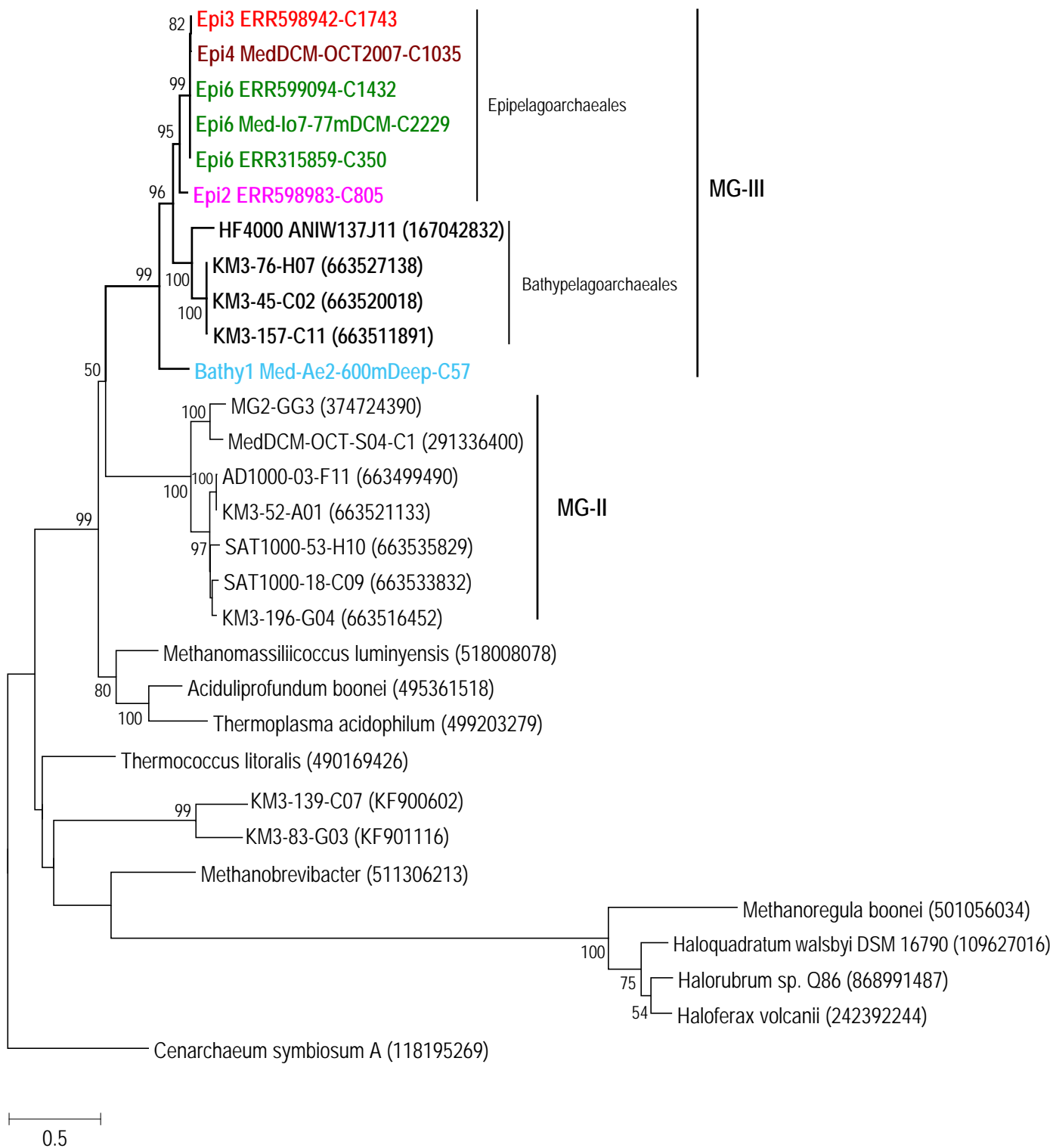


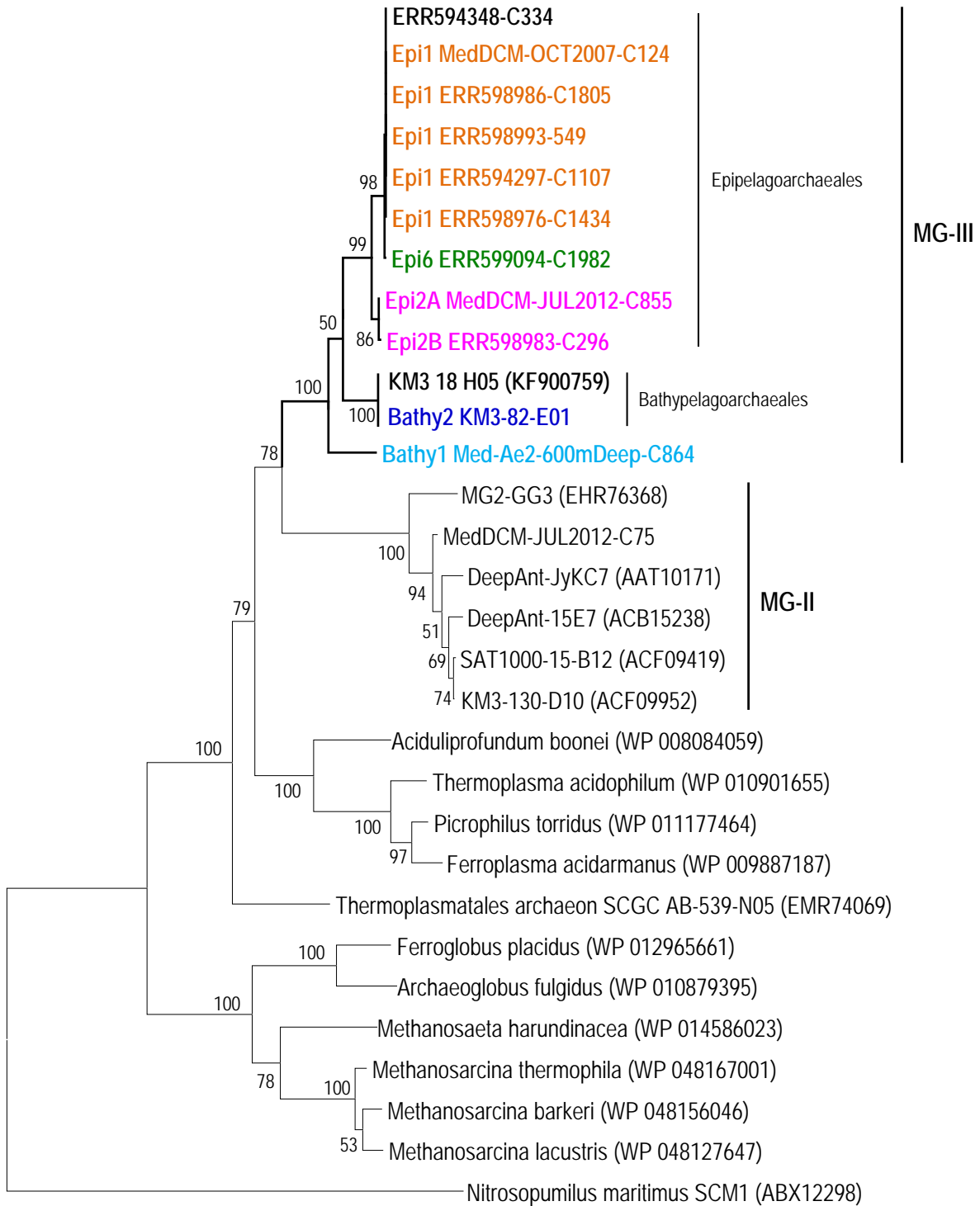
Supplementary Figure S6



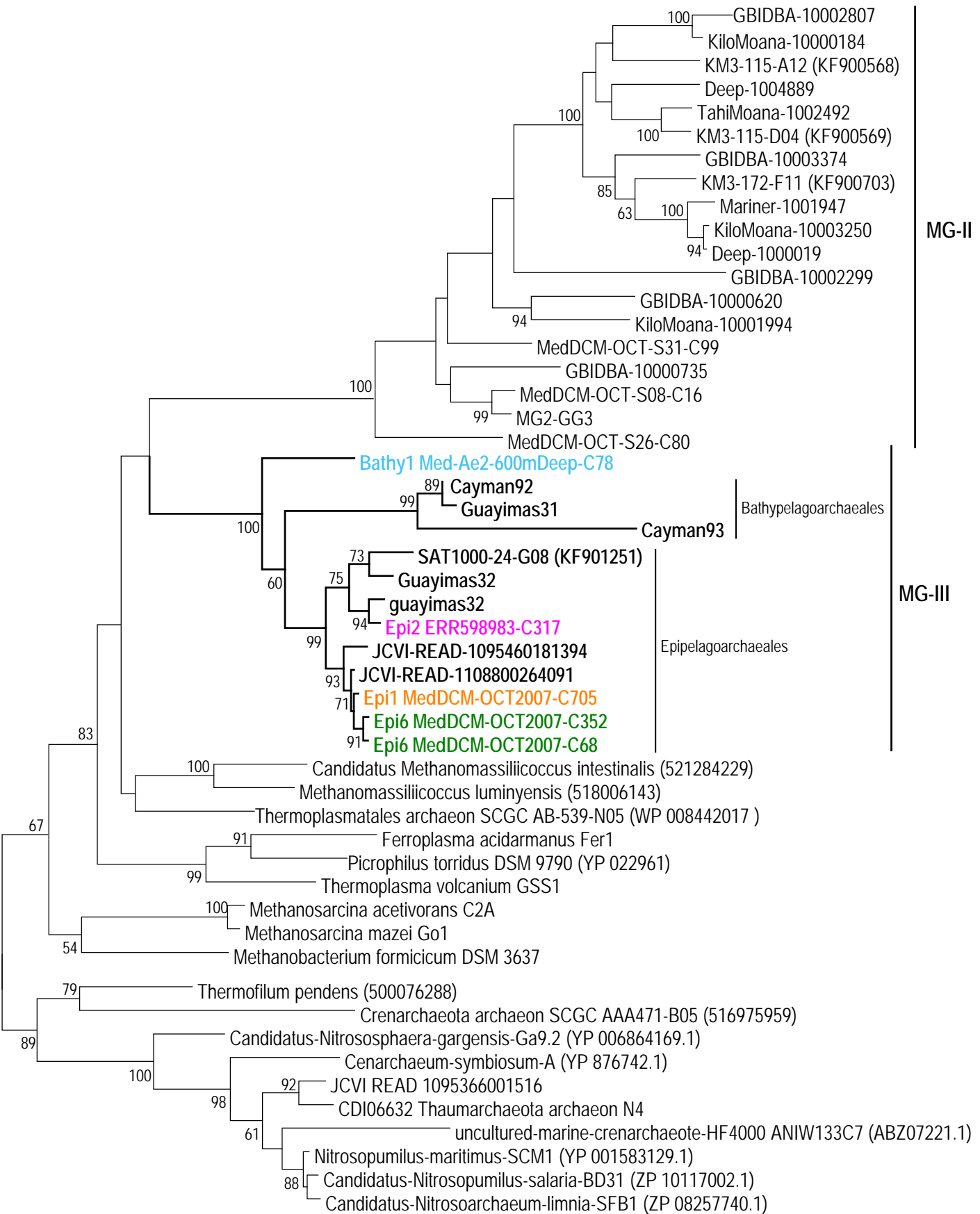
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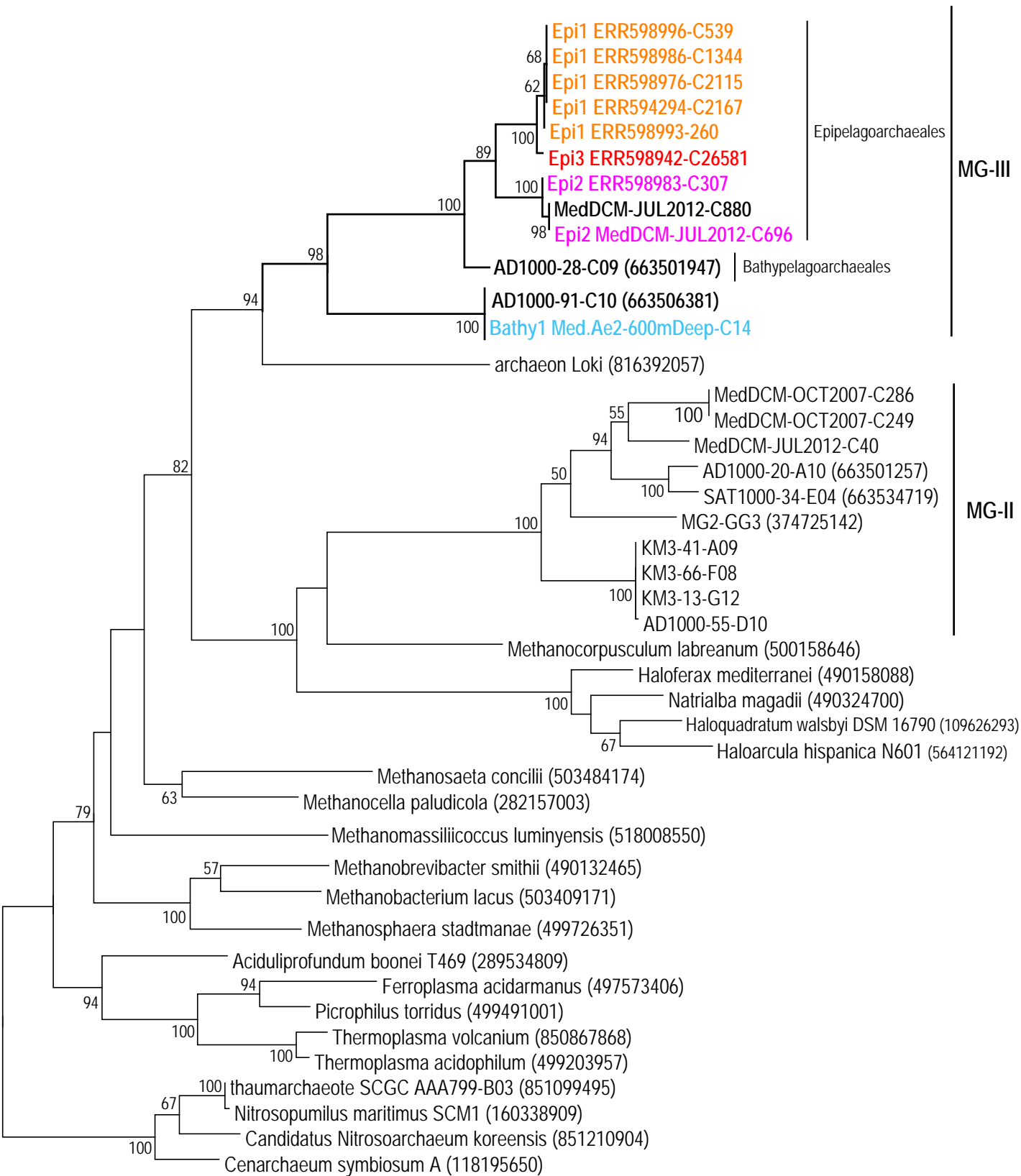
Supplementary Figure S7



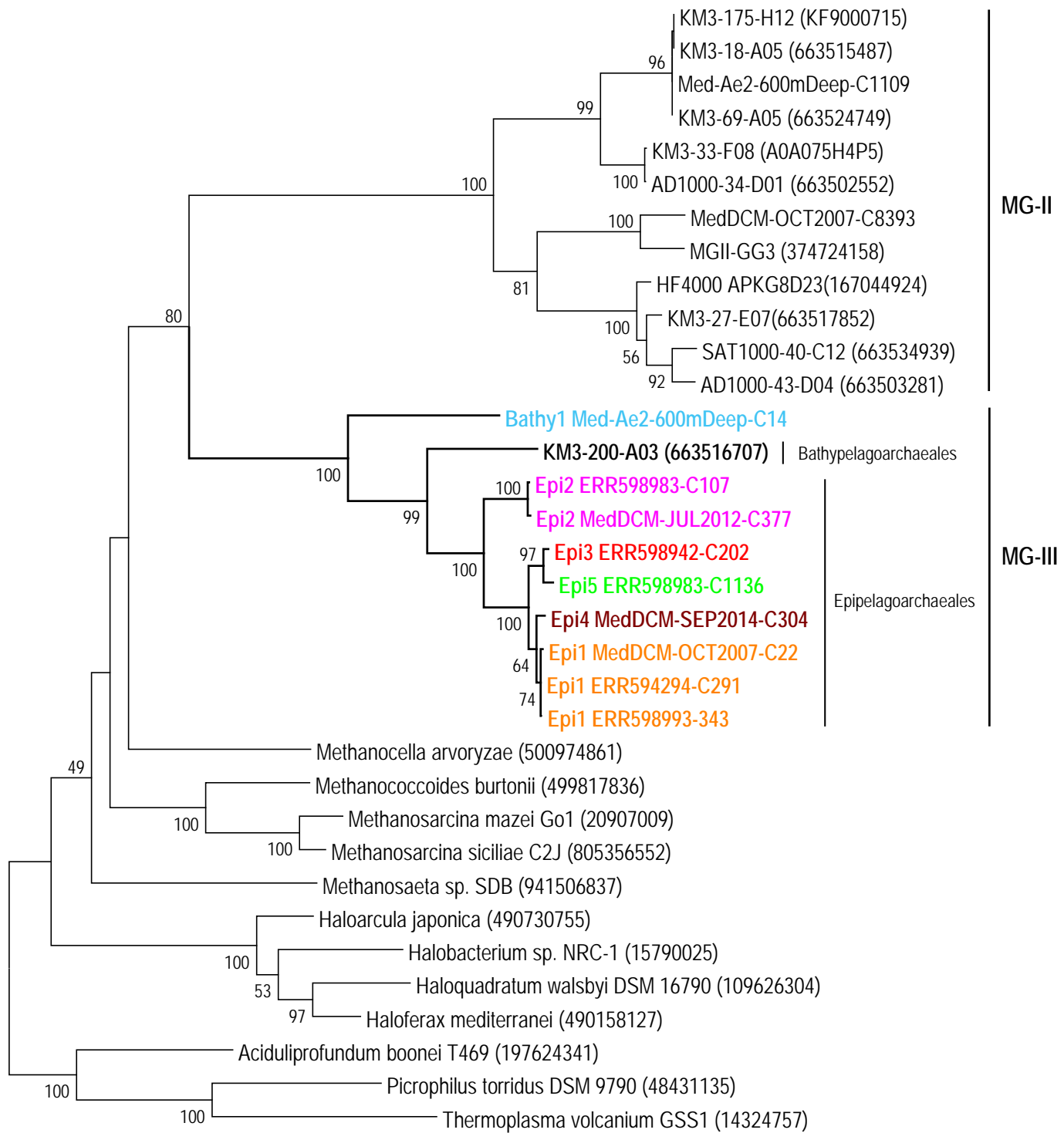


0.2

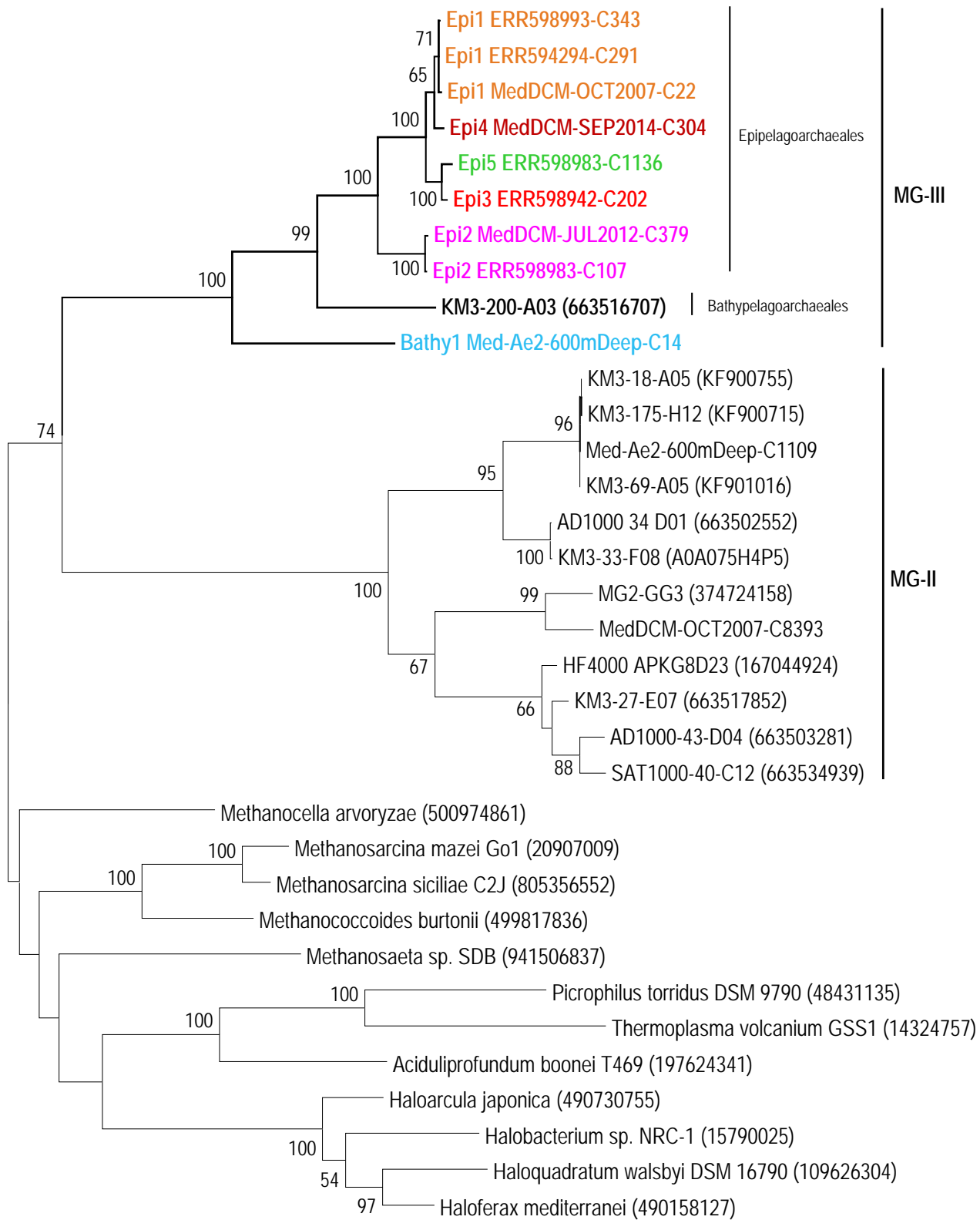




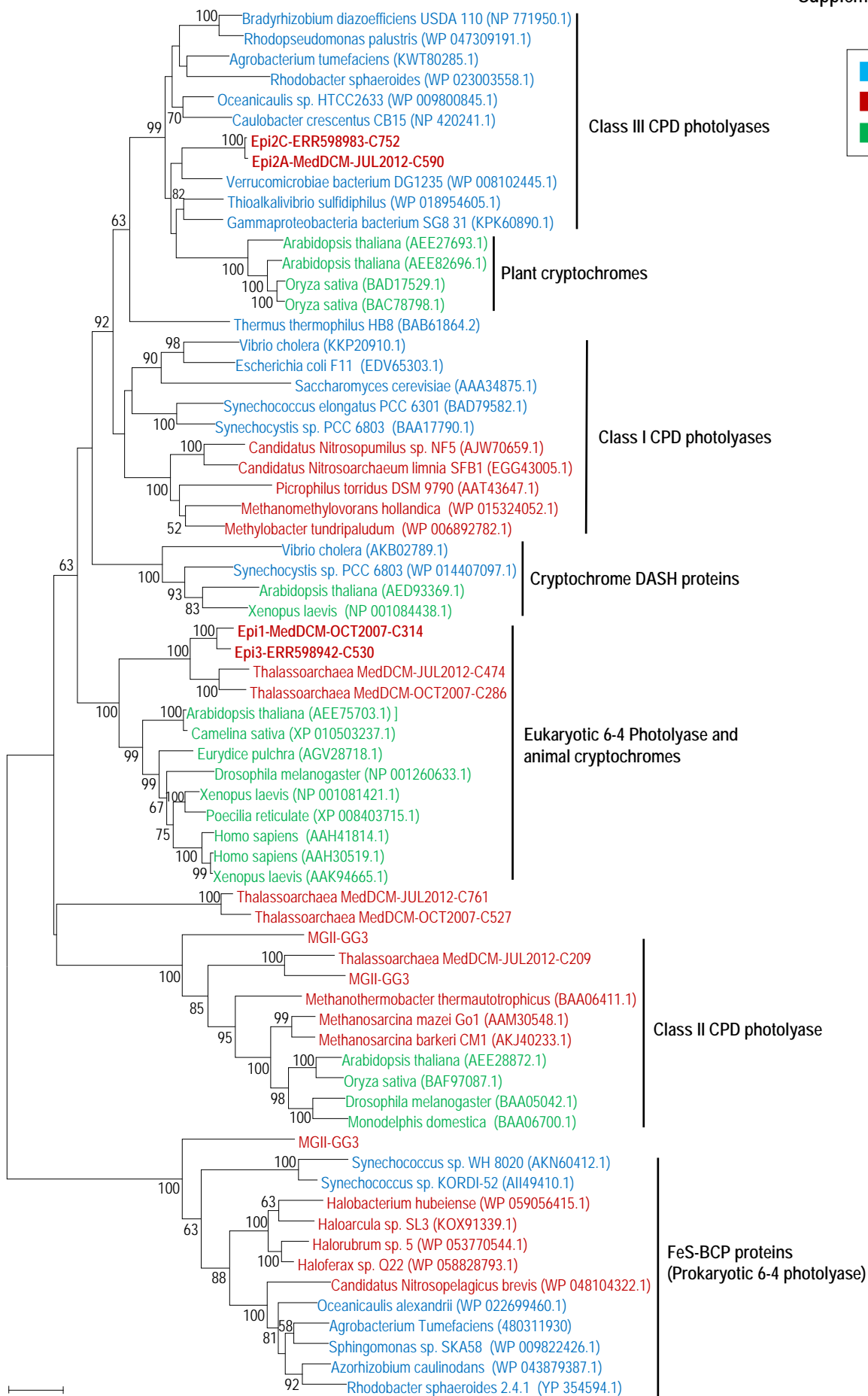
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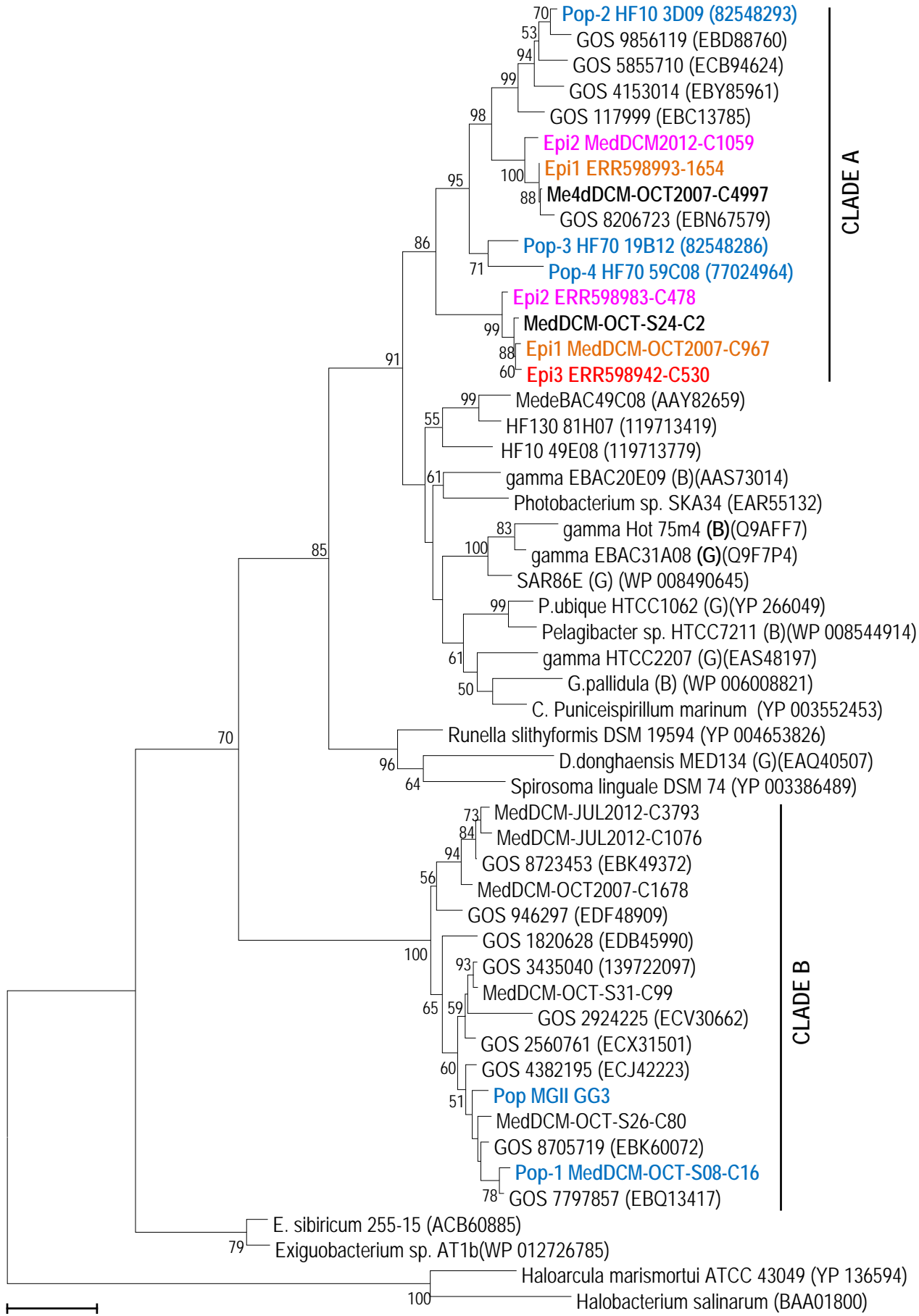
0.1



0.1

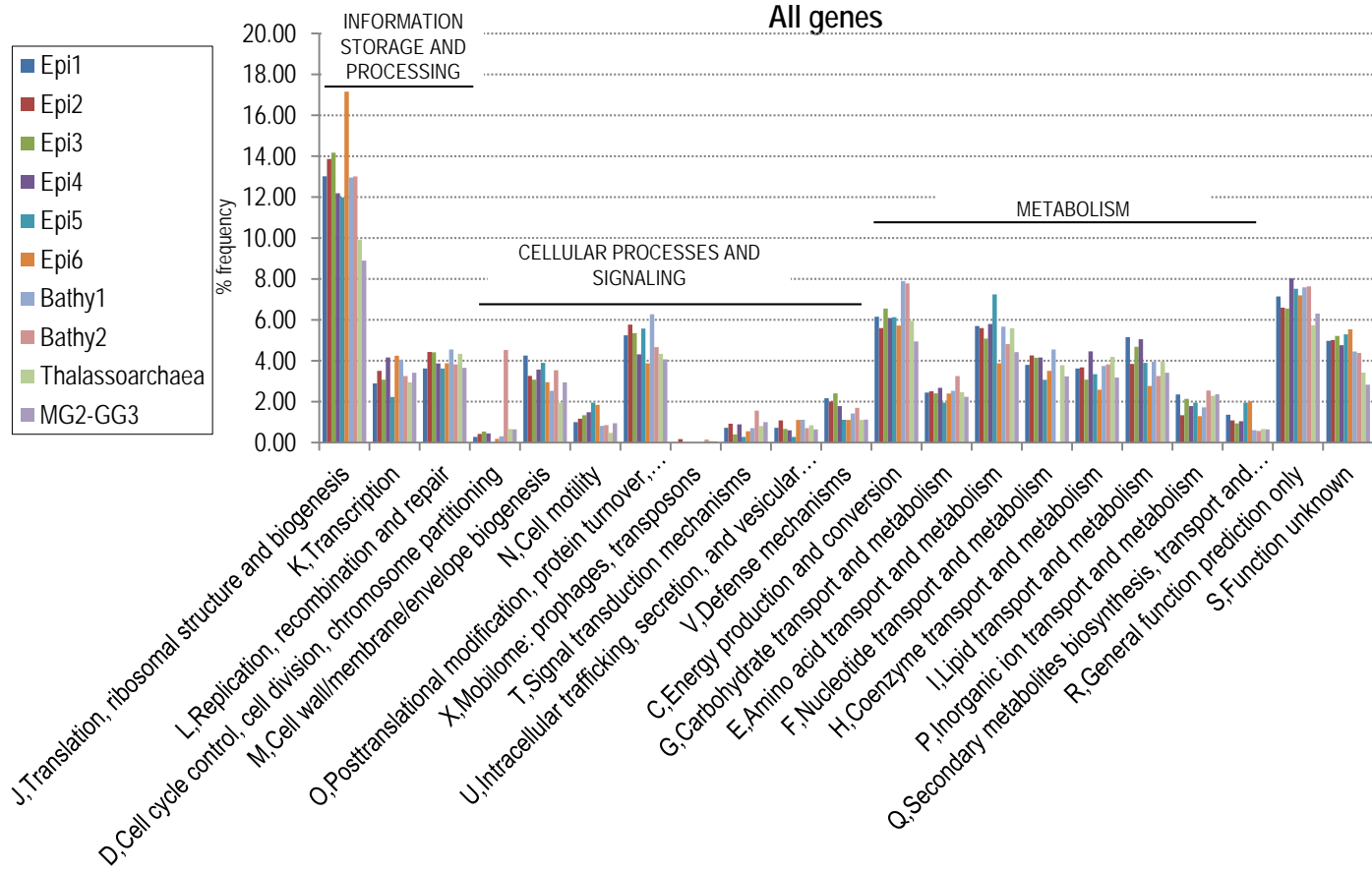


Supplementary Figure S14

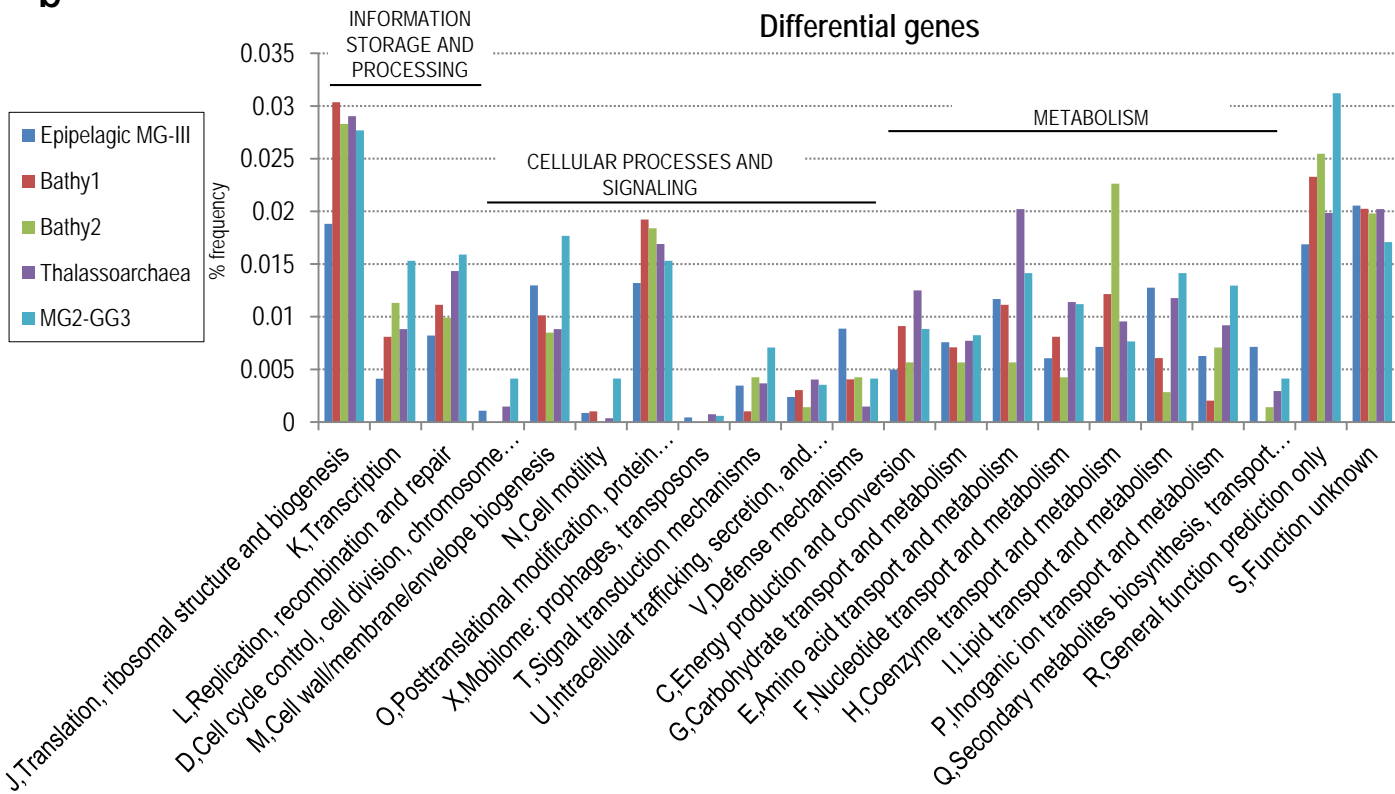


0.5

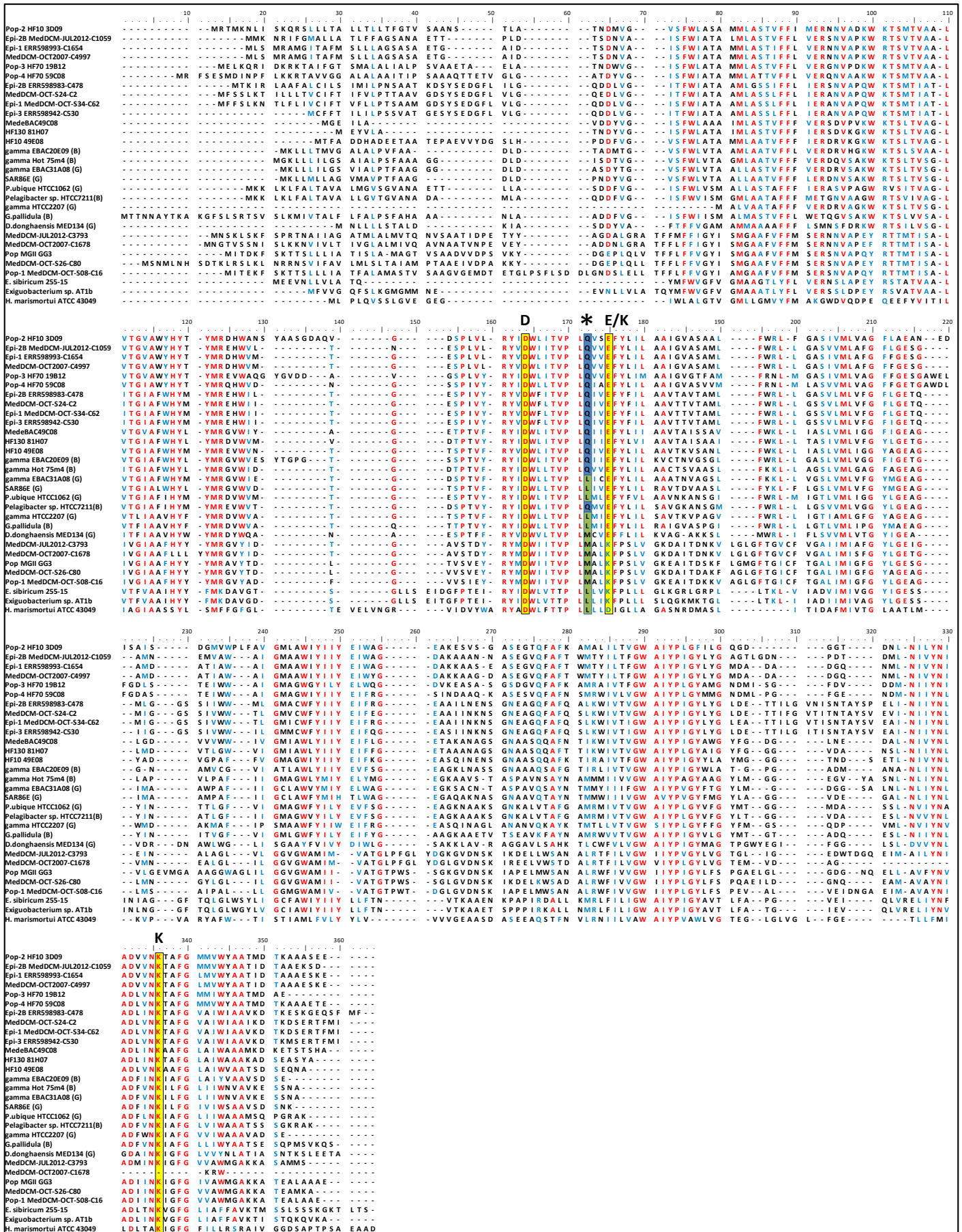
a



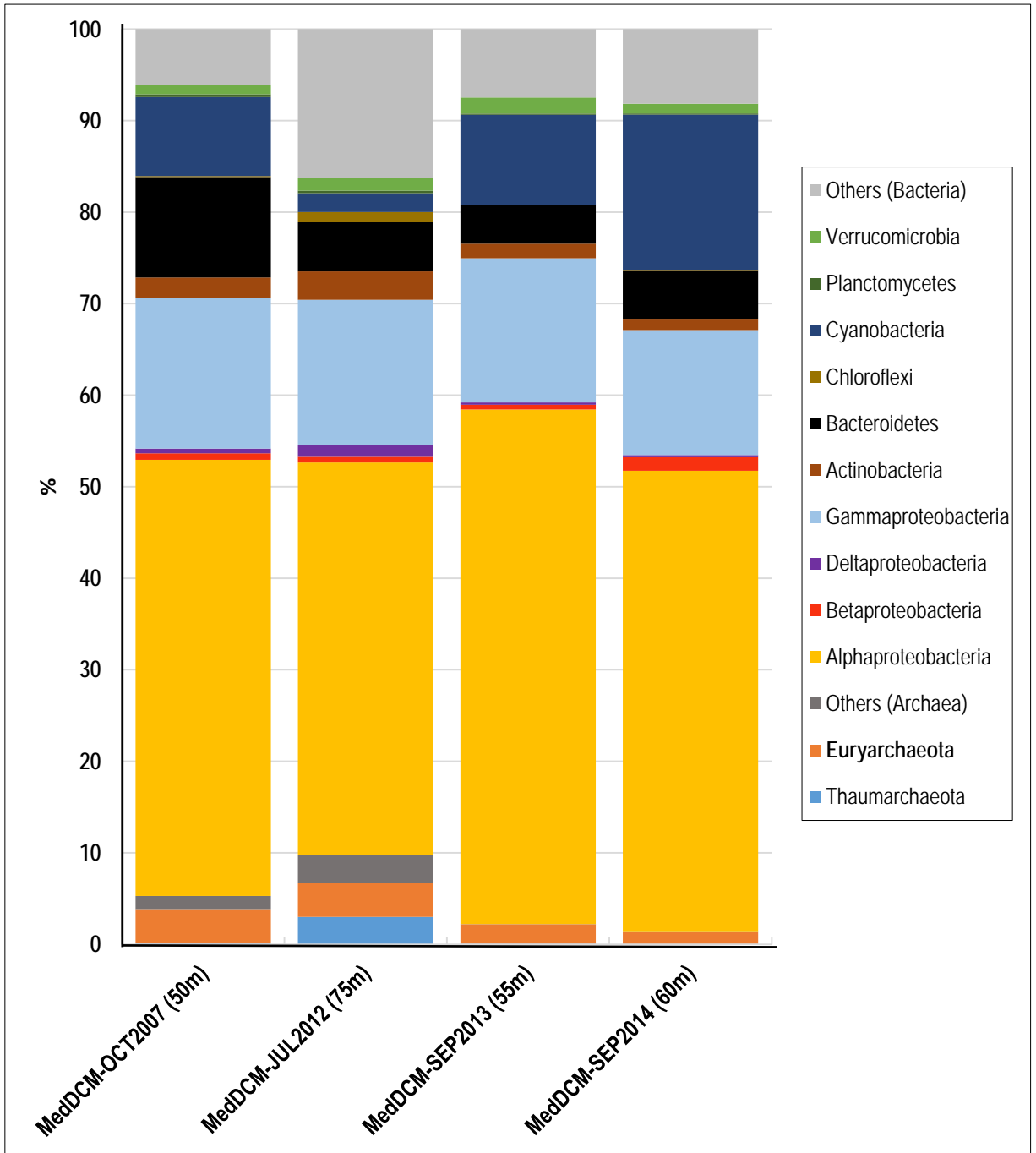
b



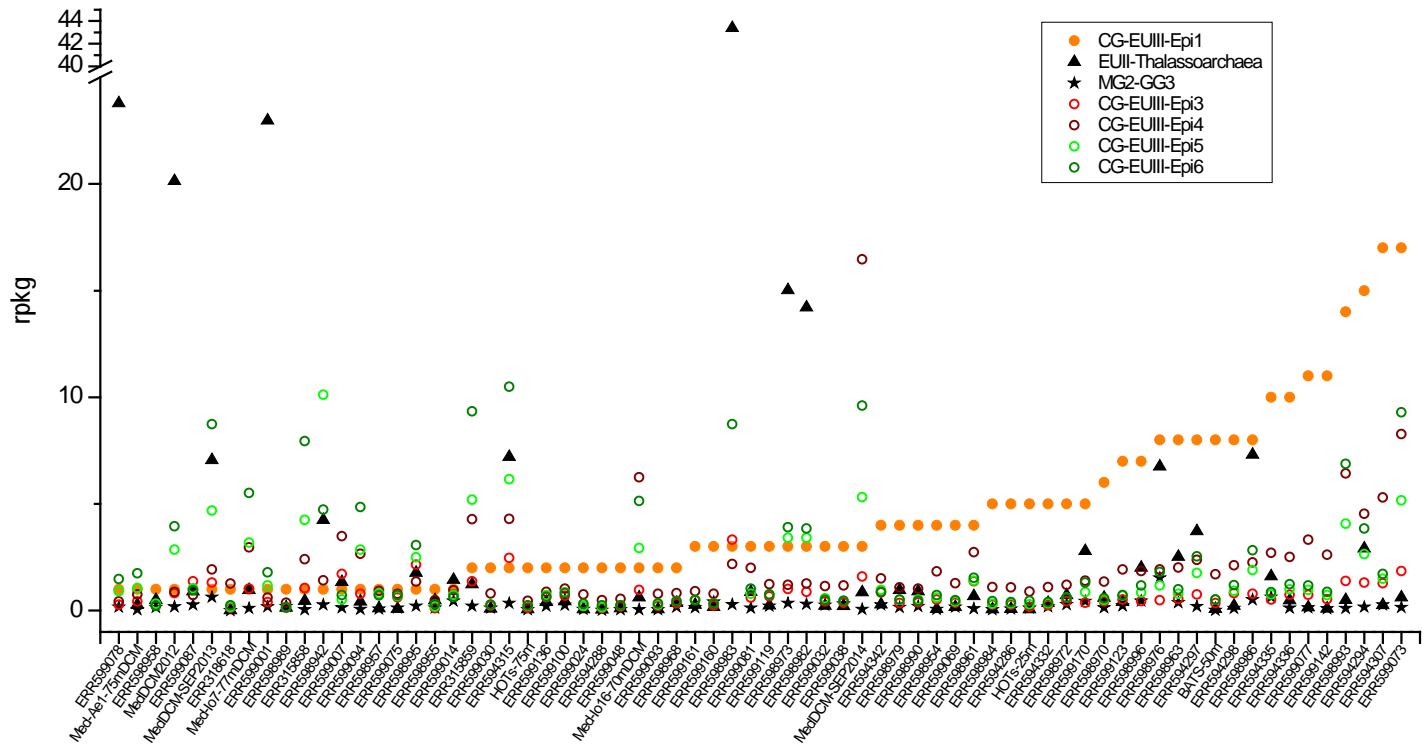
Supplementary Figure S16



Supplementary Figure S17



Supplementary Figure S18



Supplementary Figure S19

