Cyanobacteria EvoMining Results

Cyanobacteria phylum {Referencia}
Cyanobacteria is a photosynthetic phylum that inhabits a broad range of habitats. The broad adaptive potential is on part driven by gene-family enlargment [@larsson_genome_2011] by the analysis of 58 Cyanobacterial genomes concludes ancestor of cyanobacteria had a genome size of approx. 4.5 Mbp. Cyanobacteria produces natural products as pigments and toxins [@whitton_ecology_2012] Example of a PriA cluster toxins[@moustafa_origin_2009]

Fossil record situates Cyanobacteria [@whitton_ecology_2012] Molecular record and metabolic propoerties at [@battistuzzi_genomic_2004]

Tables

Table 1: Families on Cyanobacteria

Factors	Correlation between Parents & Child
GenomeDB	1245
Families	65

Expansions BoxPlot by metabolic family

```
label(path = "chapter5/expansion_plotCyanos.pdf", caption = "Expansions Boxplot",label = "Cyano_expansi
```

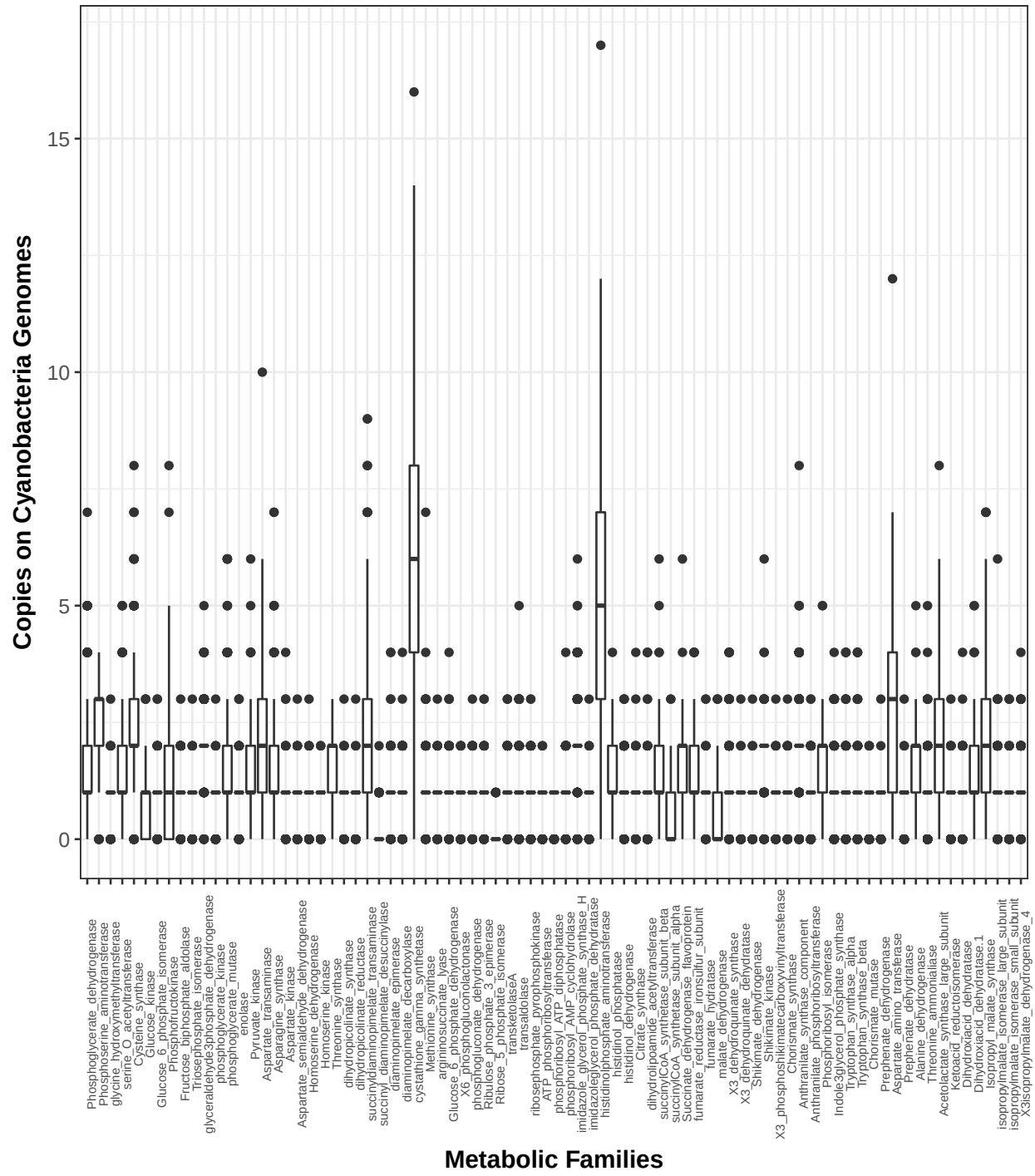

Figure 1: Expansions Boxplot

Here is a reference to the expansion boxplot: Figure 1.

Central pathway expansions

Heat plot of central pathways expansions, Needs to be phylogenetically sorted.

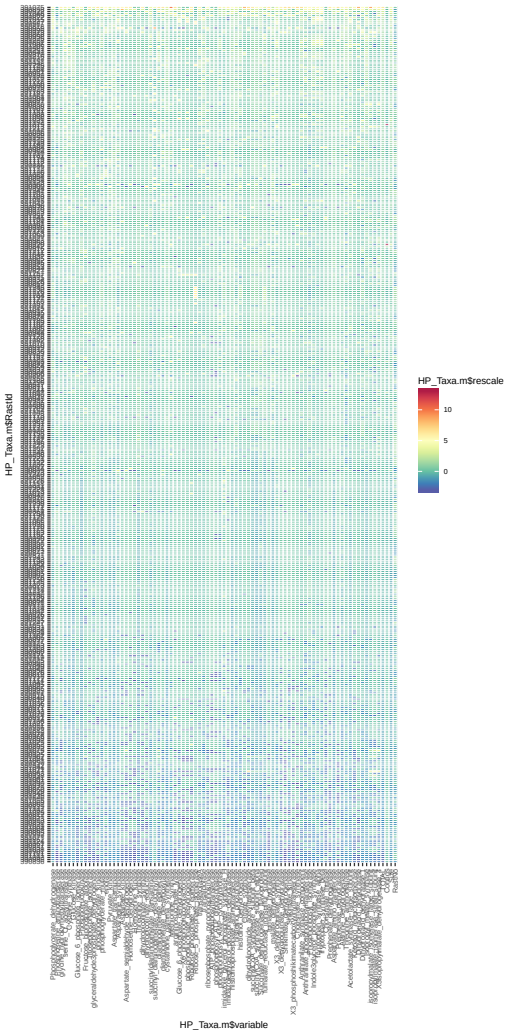

Figure 2: Cyanobacterial Heatplot

Here is a reference to the HeatPlot: Figure 2.

Genome Size correlations

Correlation between genome size and AntiSMASH products

Genome size vs Total antismash cluster coloured by order

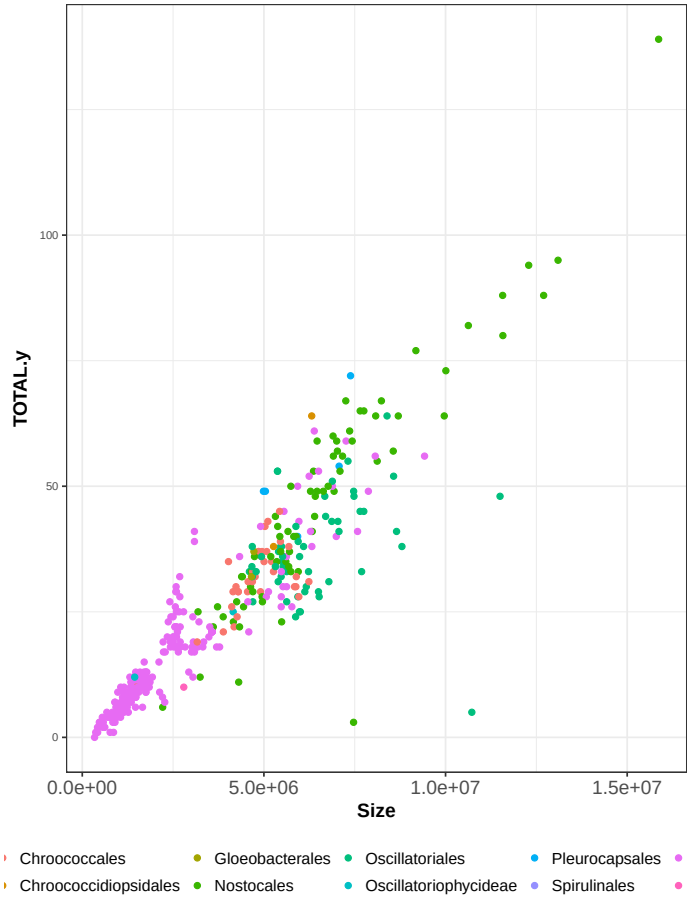

Figure 3: Correlation between genome size and antismash Natural products detection colored by Order

Here is a reference to Genome size vs Total antismash cluster: Figure 3.

Genome size vs Total antismash cluster detected splitted by order

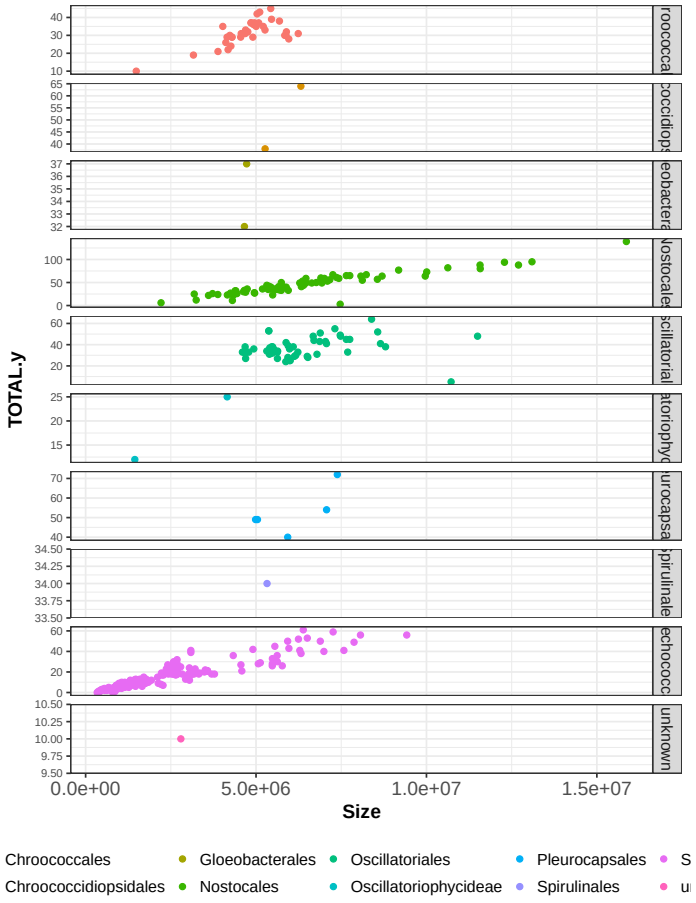

Figure 4: Correlation between genome size and antismash Natural products detection grided by Order

Here is a reference to Correlation between genome size and antismash Natural products detection grided by Order plot: Figure 4.

Correlation between genome size and Central pathway expansions

Genome size vs Total central pathway expansion coloured by order

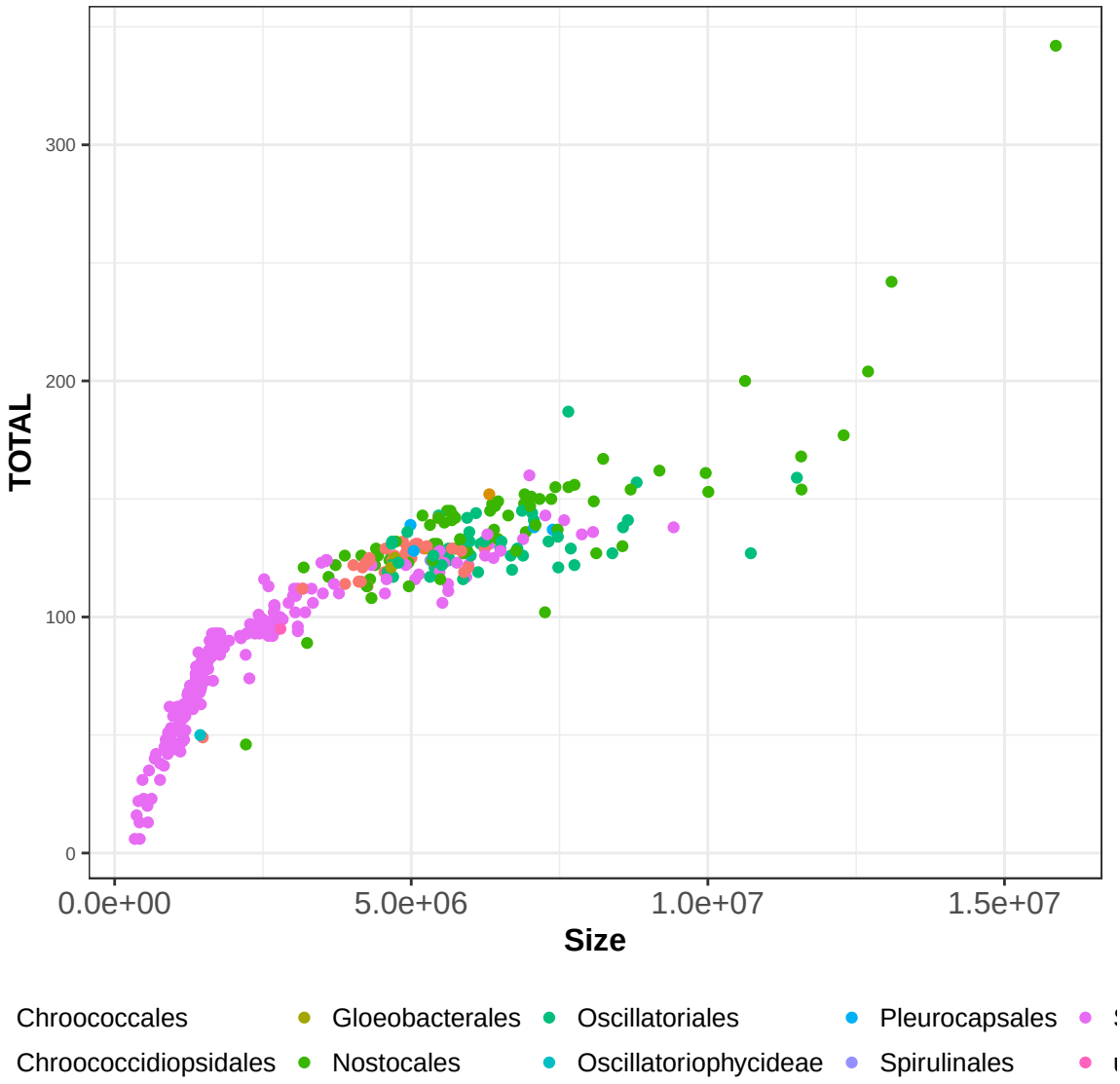

Figure 5: Correlation between genome size and central pathway expansions

Here is a reference to the size vs Total central pathway expansion plot: Figure 5.

Genome size vs Total central pathway expansion grided by order

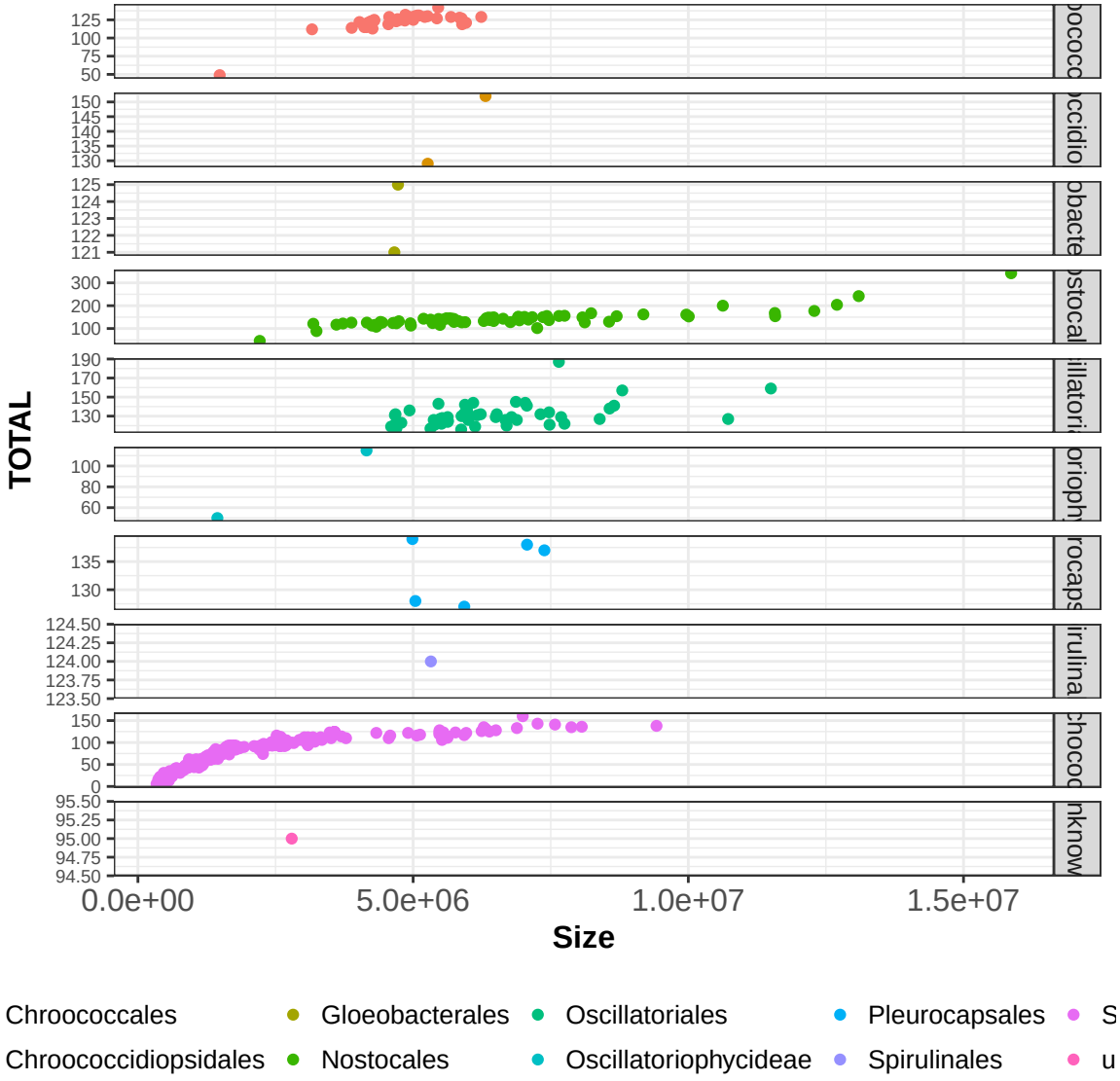

Figure 6: Correlation between genome size and central pathway expansions grided by order

Here is a reference to the Genome size vs Total central pathway expansion grided by order plot: Figure 6.

Correlation between genome size and each of the central pathway families. Data are coloured by metabolic family instead of coloured by taxonomical order. This treatment allows to answer how differente metabolic families grows when genome size grow.
Also I want to add form given by taxonomical order.

```
## Warning: The shape palette can deal with a maximum of 6 discrete values
## because more than 6 becomes difficult to discriminate; you have
## 10. Consider specifying shapes manually if you must have them.
```

```
## Warning: Removed 20418 rows containing missing values (geom_point).
```

Genome size vs Total central pathway expansion coloured by metabolic Family

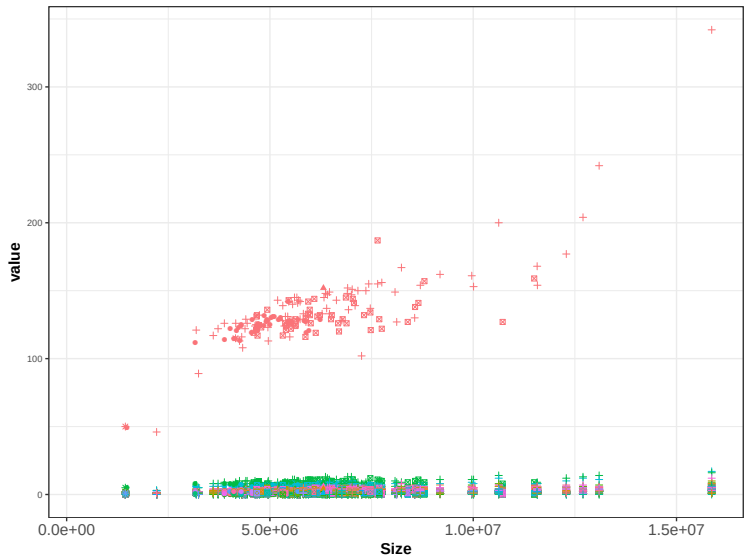

Figure 7: Correlation between Genome size vs Total central pathway expansion coloured by metabolic Family

Here is a reference to the Genome size vs Total central pathway expansion coloured by metabolic Family plot: Figure 7.

Future Work: Genome size vs Total central pathway expansion grided by metabolic Family For clarity I need to also grid and group by Metabolic Pathway

Here is a reference to Genome size vs Total central pathway expansion grided by metabolic Family plot: **??**.

Natural products

Natural products recruitments from EvoMining heatplot

We can see natural products recruitment after central pathways expansions colored by their kingdom. Natural products recruited by metabolic family, colored by phylogenetic origin.

Recruitments after central pathways expansions coloured by Kingdom

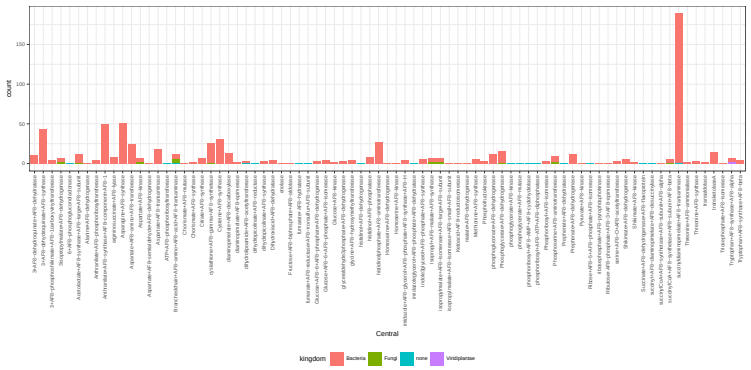

Figure 8: Recruitmens on central families coloured by kingdom

Here is a reference to Recruitments after central pathways expansions colourd by Kingdom plot: Figure 8.

Recruitments after central pathways expansions colourd by taxonomy

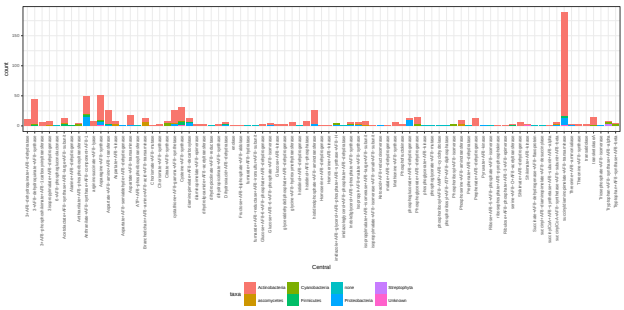

Figure 9: Recruitmens on central families coloured by taxonomy

Here is a reference to Recruitments after central pathways expansions colourd by taxa plot: Figure 9.

Cyanobacterias AntiSMASH

Taxonomical diversity on Cyanobacteria Data

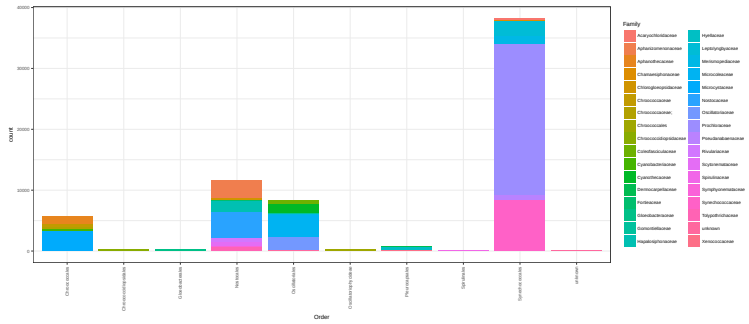

Figure 10: Diversity

Here is a reference to Recruitments after central pathways expansions colourd by taxa plot: Figure 10.

Smash diversity

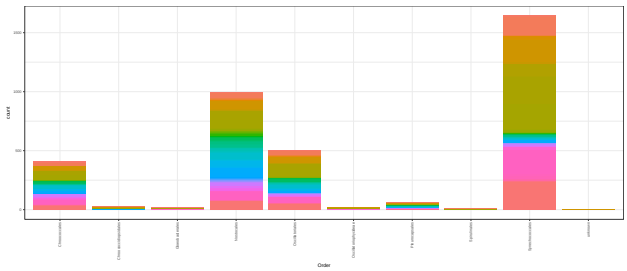

Figure 11: Smash

Here is a reference to Recruitments after central pathways expansions colourd by taxa plot: **??**.

AntisSMASH vs Central Expansions

Is it a correlation between pangenome grow and central pathways expansions?

Total central pathway expansions by genome vs Total antismash cluster detected coloured by order

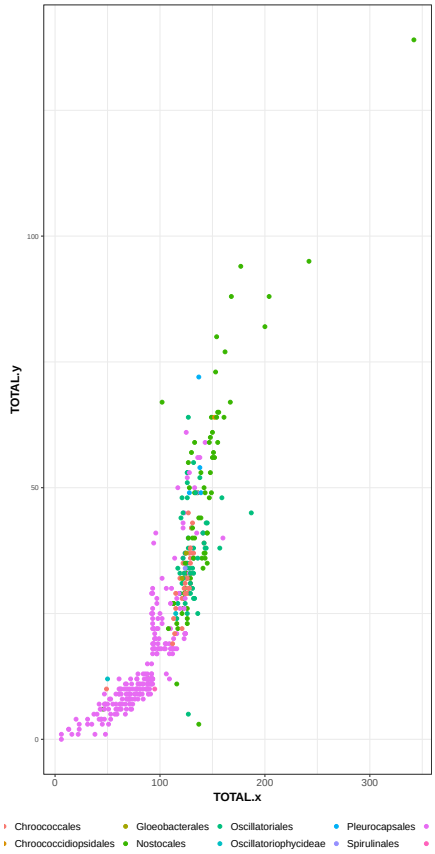

Figure 12: Correlation between central pathway axpnasions and antismash Natural products detection

Here is a reference to the expansions vs antismash NP's clusters plot: Figure 12.

Total central pathway expansions by genome vs Total antismash cluster detected splitted by order

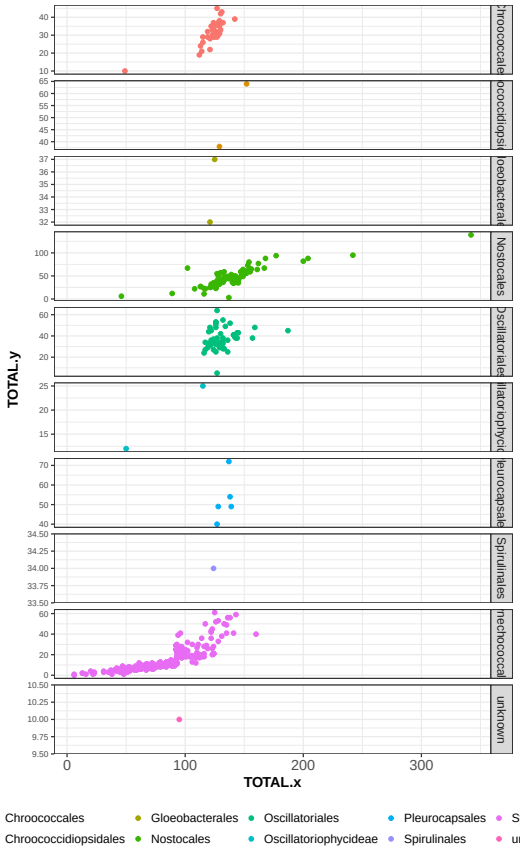

Figure 13: Correlation between central pathway axpnasions and antismash Natural products detection

Here is a reference to the expansions vs antismash NP's clusters splitted by order plot **??**.

AntisMAsh vs Expansions by taxonomic Family

Natural products colured by family

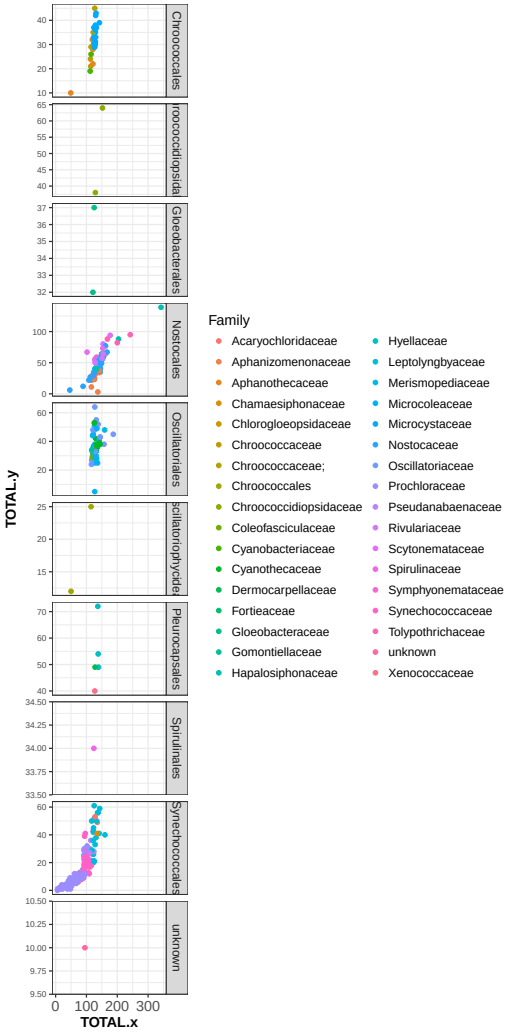

Figure 14: Natural products by family

Here is a reference to the Natural products colured by family plot Figure 14.

Selected trees from EvoMining

Phosphoribosyl_isomerase_3 family
Figure from EvoMining

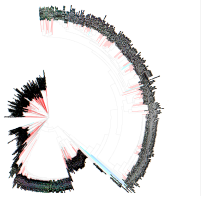

Figure 15: Phosphoribosyl isomerase EvoMiningtree

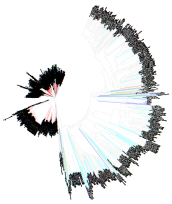

Figure 16: Phosphoglycerate dehydrogenase EvoMiningtree

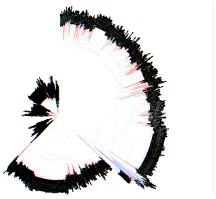

Figure 17: Phosphoserine aminotransferase EvoMiningtree

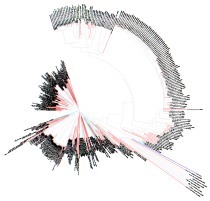

Figure 18: Triosephosphate isomerase EvoMiningtree

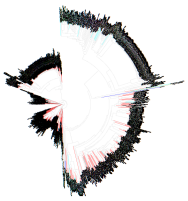

Figure 19: glyceraldehyde3phosphate dehydrogenase EvoMiningtree

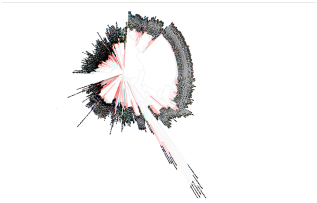

Figure 20: phosphoglycerate kinase EvoMiningtree

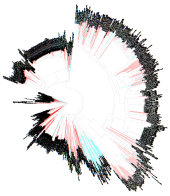

Figure 21: phosphoglycerate mutaseEvoMiningtree

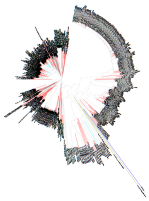

Figure 22: enolase EvoMiningtree

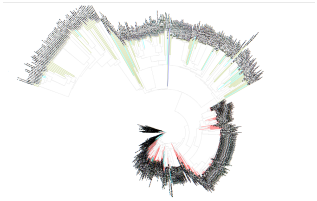

Figure 23: Pyruvate kinase EvoMiningtree

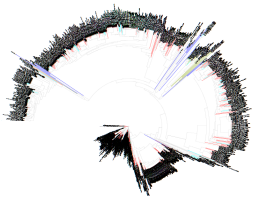

Figure 24: Aspartate transaminase EvoMiningtree

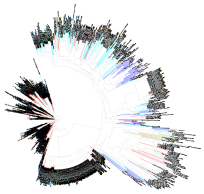

Figure 25: Asparagine synthase EvoMiningtree

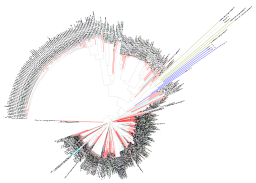

Figure 26: Aspartate kinase EvoMiningtree

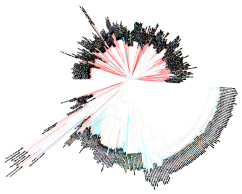

Figure 27: Aspartate semialdehyde dehydrogenase EvoMiningtree

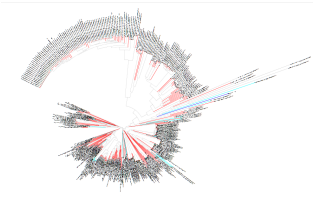

Figure 28: Homoserine dehydrogenase EvoMiningtree