Temporal and spatial dynamics of Bacteria, Archaea

² and protists in equatorial coastal waters

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¹⁴ Supplementary material

¹⁵ All supplementary material is available at https://github.com/slimelab/Singapore-metabarcodes

16 Supplementary Data

- ¹⁷ Supplementary Data S1: (R/Singapore metadata.xlsx) List of samples collected with environ-
- ¹⁸ mental parameters.
- ¹⁹ Supplementary Data S2 (R/Singapore ASV_table.xlsx). Sheet ASV: List of ASVs with taxonomic
- ²⁰ affiliation, assignment bootstrap values for eukaryotes, sequence and number of reads in each
- ²¹ sample (only samples from four stations, STJ, EC, SBW and PR are used in this paper). Sheet
- ²² Blast eukaryotes: Summary of BLAST assignments against PR² and GenBank for Eukaryota
- ²³ ASVs (nuclear 18S rRNA).

24 Supplementary Figures



Figure S1. Map of Singapore showing the four stations sampled in this study. The map was generated with ArcMap version 10.7.1 using the following Esri ArcGIS Basemap: Esri. "World Imagery" 1:250,000. "Sampling Sites". Aug 31, 2019.

https://services.arcgisonline.com/ArcGIS/rest/services/World_Imagery/MapServer



Figure S2. Temperature, prokaryotic abundance, silicates, ammonium and NO_x during the 18-month time series in Singapore coastal waters. Highlights in grey and blue represent NE period and SW periods respectively.



Figure S3. Taxonomic composition of the microbial communities in Singapore coastal waters focusing on the top 20 most abundant groups (Class level) for the three domains (Archaea, Bacteria, Eukaryota as shades of red, blue and green, respectively).



Figure S4. Tree map with the major taxonomic groups in Singapore and Johor Straits for the 3 domains: Archaea, Bacteria and Eukaryota.



Figure S5. Thirty most abundant Archaea and Bacteria (top) and Eukaryota (bottom) ASVs for Singapore (left) and Johor (right) straits. ASVs that are unique to one Strait are in bold and labelled with a plus sign.

asv_0067-HOC36 asv_0052-Clade Ia asv_0054-Clade Ib asv_0054-Clade Ib asv_0054-Clade Ib asv_0037-Clade II asv_0036-Clade I asv_0036-Clade I asv_0028-Clade Ia asv_0028-Clade Ia asv_0028-Clade Ia asv_0028-Clade Ib asv_0017-SAR86 clade asv_0017-SAR86 clade asv_0015-Clade Ib asv_00017-SAR86 clade asv_0015-Clade Ib asv_0003-Cynechococcus asv_0003-Synechococcus asv_0003-Synechococcus asv_0003-Synechococcus asv_0003-Synechococcus asv_0022-Marinoscillum asv_0021-NS4 marine group asv_0021-NS5 marine group asv_0004-Candidatus Nitrosopumilus asv_007-Candidatus Nitrosopumilus asv_0005-Candidatus Nitrosopumilus asv_005-Candidatus Nitrosopumilus asv_005-Candidatus Nitrosopumilus asv_005-Candidatus Nitrosopumilus asv_0022-Marine Group II asv_0024-Marine Group II asv_0010-Marine Group II

Z

	asv_0063-Burkholderiaceae + asv_0057-Rhodobacteraceae + asv_0057-Rhodobacteraceae + asv_0050-Gammaproteobacteria asv_0041-Chromatiales asv_0039-Tropicimonas asv_0039-Rhodobacteraceae asv_0029-Luminiphilus asv_0019-Rhodobacteraceae asv_0015-Clade Ib asv_0015-Clade Ib asv_0015-Clade Ib asv_0015-Clade Ib asv_0001-HIMB11 asv_0009-OM60(NOR5) clade asv_0001-HIMB11 asv_0002-Cyanobium PCC-6307 + asv_0004-Cyanobium PCC-6307 + asv_0048-Cryomorphaceae asv_003-Rhavobacteriaceae asv_003-Rhavobacteriaceae asv_0040-Fluviicola + asv_0048-Flavobacteriaceae asv_0048-Flavobacteriaceae asv_0046-Bacteria asv_0040-Cryomorphaceae asv_0048-Cryomo
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Singapore

Reads 10,000 1,000 100 10

_SM . ■ . ■ 's∖∕

Johor



Figure S6. Sample heatmap of the thirty most abundant Archaea and Bacteria ASVs for Singapore (top) and Johor (bottom) straits. ASVs that represent more than 10 sequences and are unique to one Strait are in bold and labelled with a plus sign.

- asv 0287-Leptocylindrus aporus asv_0060-Chaetoceros_sp. asv_0620-Pseudocubus_obeliscus + asv_0326-Acanthometron sp. asv_0210-Novel-clade-2_X sp. asv_0193-RAD-B-Group-IV_X sp. + asv_0319-Chrysochromulina sp. asv_0136-Geminigera cryophila asv_0127-Micromonas_clade_B5 asv_0079-Micromonas_clade_B5 asv_0052-Mino-Group-II-Clade-7_X sp. + asv_0432-Dino-Group-II-Clade-1_X sp. asv_0434-Dino-Group-II-Clade-1_X sp. + asv_0439-Strombidiida_G XX sp. + asv_0434-Dino-Group-II-Clade-1_K sp. + asv_0434-Dino-Group-II-Clade-1_K sp. + asv_0396-Dinophyceae_XXX sp. + asv_0324-Strombidiida_C XX sp. + asv_0324-Strombidiida_C XX sp. + asv_0247-Heterocapsa_sp. asv_0192-Gyrodinium_gutrula asv_0115-Dinophyceae_XXX_sp. + asv_0011-Gyrodinium_fusiforme
- asv_0780-Chaetoceros_pumilum + asv_0626-Shionodiscus_ritscheri asv_0478-Cyclotella_meneghiniana + asv_036-Skeletonema_menzellii asv_0299-Cerataulina_pelagica asv_0235-Shionodiscus_ritscheri asv_0226-Cyclotella_choctawhatcheeana asv_0221-Thalassiosira_hispida + asv_0179-Cyclotella_choctawhatcheeana asv_0177-Cerataulina_pelagica + asv_0071-Thalassiosira_sp. + asv_0060-Chaetoceros_sp. asv_0071-Thalassiosira_sp. + asv_0071-Thalassiosira_sp. + asv_062-Chaetoceros_sp. asv_0625-Protaspa_longipes + asv_0523-Picochlorum_sp. + asv_0523-Picochlorum_sp. + asv_0231-Ostreococcus_clade_B asv_0207-Ostreococcus_sp. asv_0173-Ostreococcus_sp. + asv_0150-Picochlorum_sp. + asv_0141-Picochlorum_sp. + asv_0141-Picochlorum_sp. asv_0127-Micromonas_clade_B5 asv_0356-Pelagostrobilidium_minutum asv_0355-Parastrombidinopsis_sp. asv_0351-Gonyaulax_fragilis + asv_0351-Gonyaulax_fragilis + asv_0343-Dinophyceae_XXX_sp. + asv_0201-Woloszynskia_halophila + asv_0192-Gyrodinium_gutrula asv_0043-Gonyaulax_spinifera + asv_0011-Gyrodinium_fusiforme



Singapore





10,000 1.000 100 10

Johor



8/11



Figure S8. Non-metric multidimensional scaling (nMDS) of Bray-Curtis similarity index for Johor Strait (PR and SBW stations). Each sample is labelled based on location and monsoon period. The arrows represent environmental parameters with p < 0.05 when performing an *envfit* analysis.



Figure S9. Top. Gneiss analysis for Singapore strait based on monsoon period. The Gneiss analysis uses balance trees to explain how different environmental variables affect the relative taxonomic distribution in a sample grouping. The log ratio of the global balances shown here tests whether the species distribution in different Monsoon seasons is significantly different and shows that the SW Monsoon communities are significantly different from the those of the NW and the inter-monsoon seasons. Bottom. Members of the communities that drive the difference between the NE and SW monsoons for Singapore Strait stations (21 samples) based on DESeq2 analysis using a threshold p-value < 0.01. Symbol transparency is inversely proportional to ASV rank.



Figure S10. First-distances volatility values computed on the unweighted Unifrac distance matrix of the two Straits. The dotted line indicates the global average and error bars the individual sample dispersion from the Strait average



Figure S11. Correlation between DIN and salinity in Johor strait.