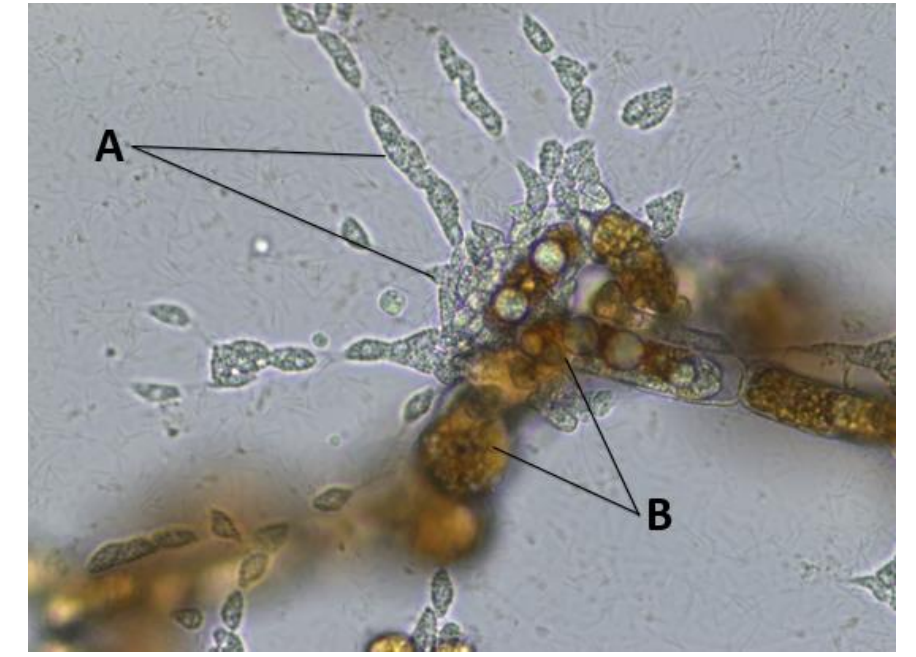


# ASE21002 – Monsoonal Variation in local Labyrinthulomycete Community

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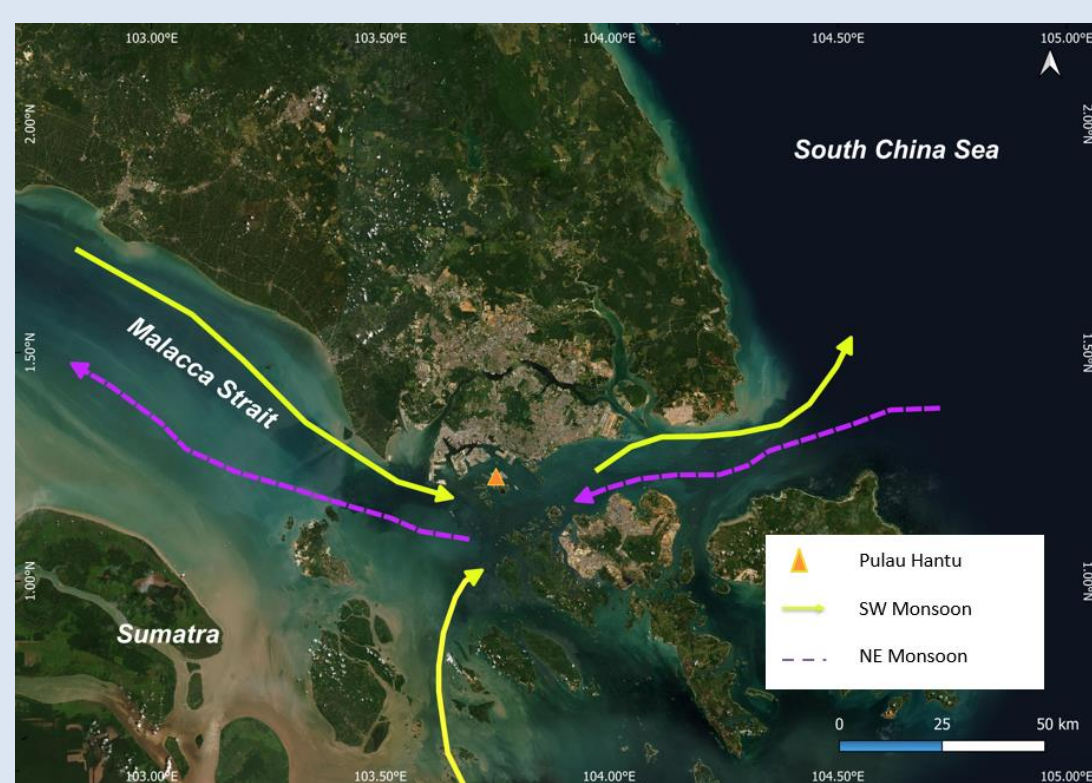


**Fig 1: (A)** Labyrinthulomycetes strain SMS 89 consuming **(B)** diatoms. The labyrinth-like net is what gives Labyrinthulomycetes their name.

## Introduction

Labyrinthulomycetes are a class of ubiquitous marine protists which are capable of parasitism and commensalism. Despite their prevalence in a wide range of habitats, little is known about the local community of Labyrinthulomycetes. Singapore experiences monsoonal variation in abiotic factors which may influence the Labyrinthulomycetes community.

## Methodology



**Fig 2:** The sample site (Pulau Hantu) is represented as a yellow triangle. The NE Monsoon takes place between mid-November and March while the SW Monsoon takes place between mid-May and mid-September<sup>[4]</sup>.



Seawater data collected at 5m depth using a Niskin bottle



Sediment data measured using SedPods – blocks which allow sediments to settle on its surface



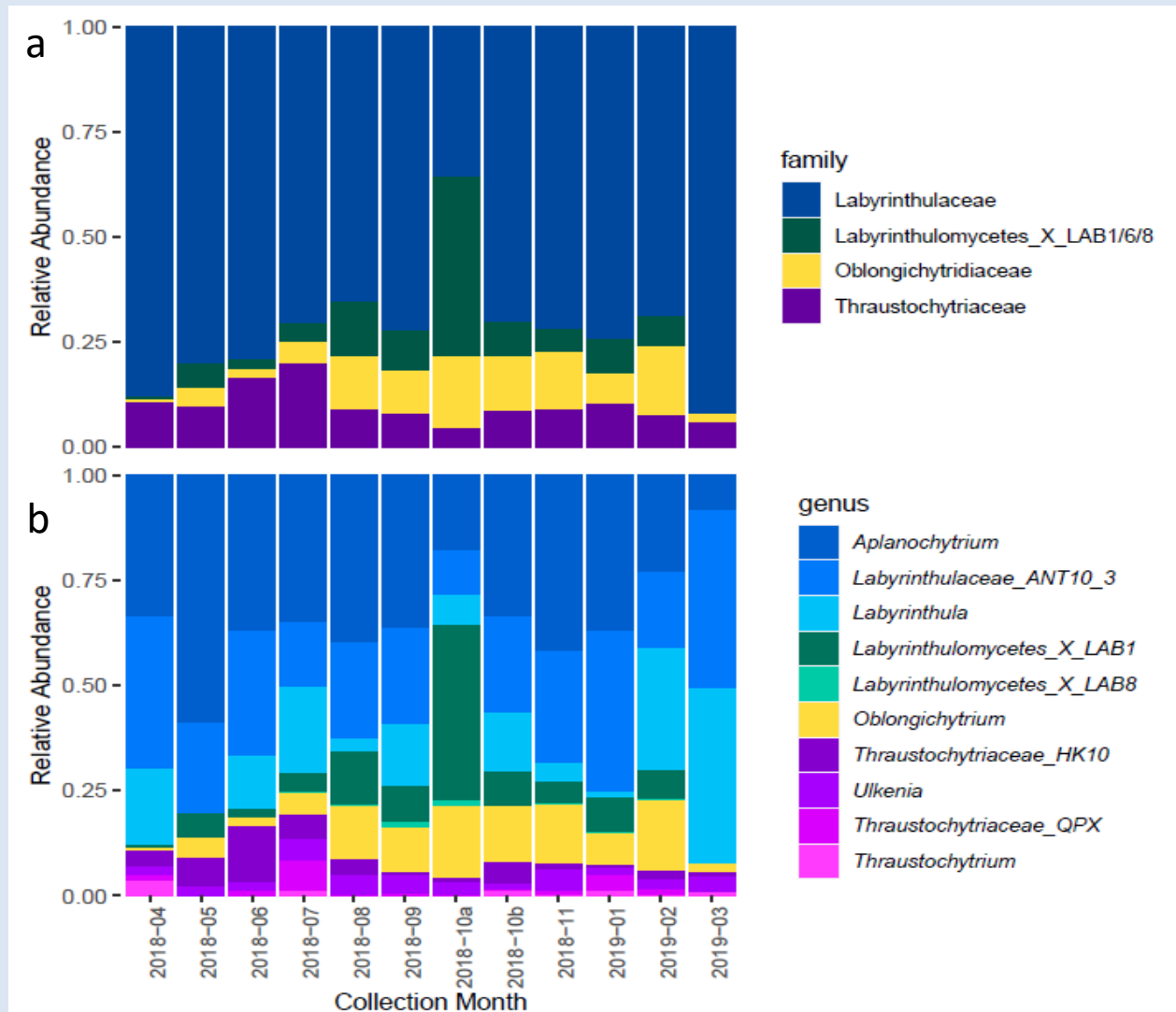
DNA was extracted from sediments and amplified using Labyrinthulomycetes-specific primers and sequenced using Illumina Miseq 2x250



Global distribution of Labyrinthulomycetes species retrieved from 41 Datasets across metaPR2  
<https://shiny.metapr2.org/>

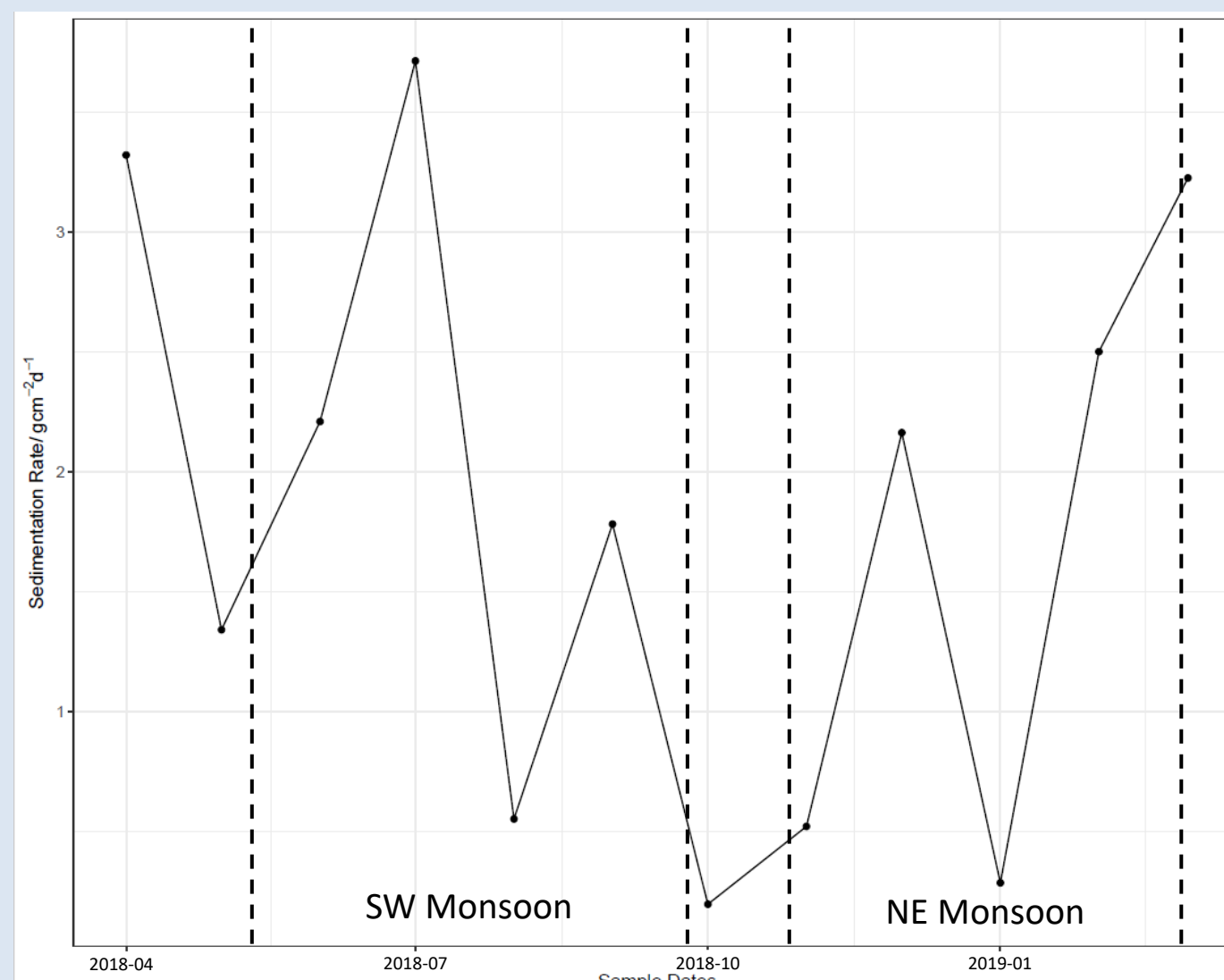
## Results

### Community Analysis in Sediment

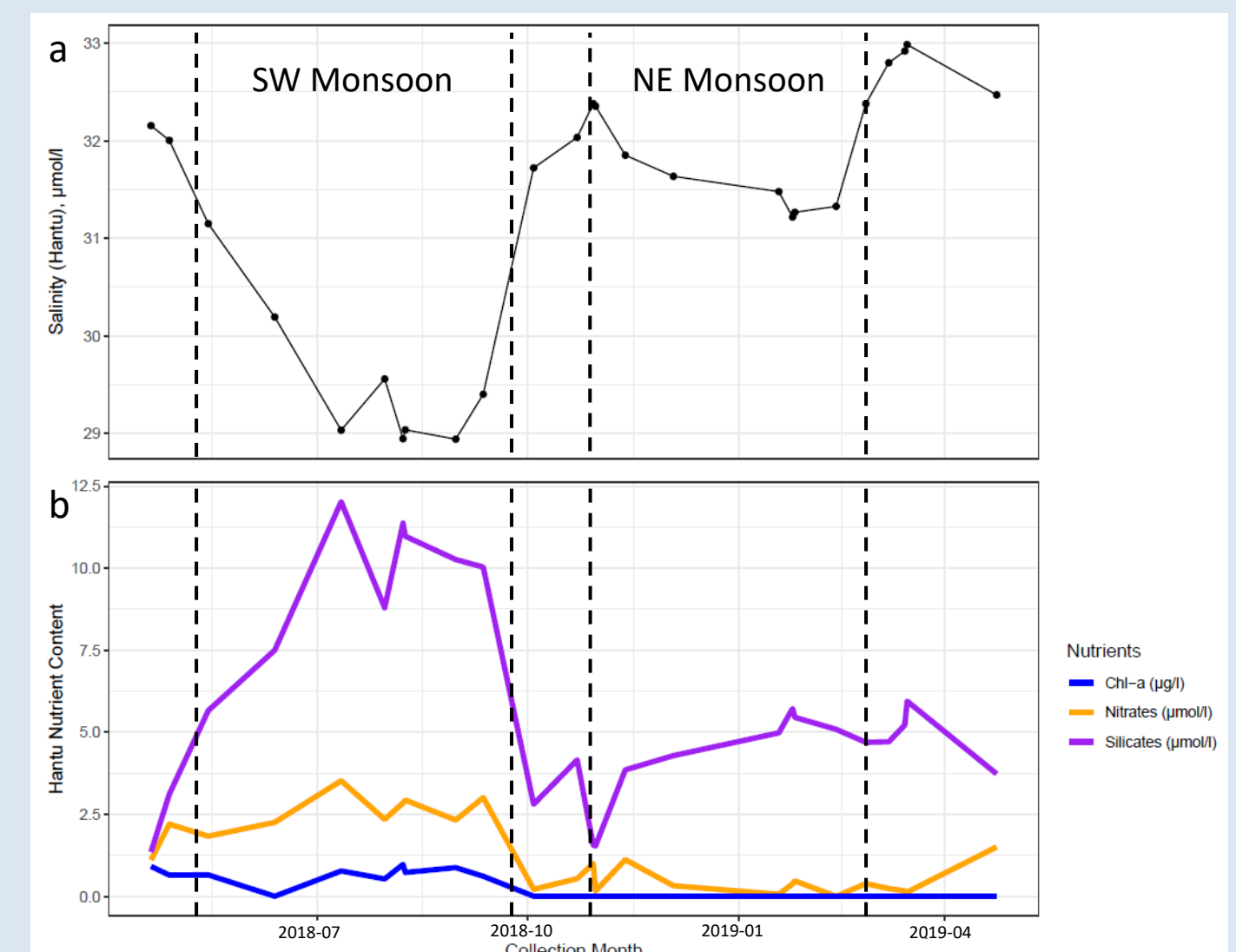


**Fig 3:** Relative abundance of a) top 5 Labyrinthulomycetes families and b) top 10 clades of those families. Thraustochytriceae peaks during the mid-SW Monsoon and genus *Aplanochytrium* follows trends in nitrates and silicates

### Abiotic Conditions at Pulau Hantu

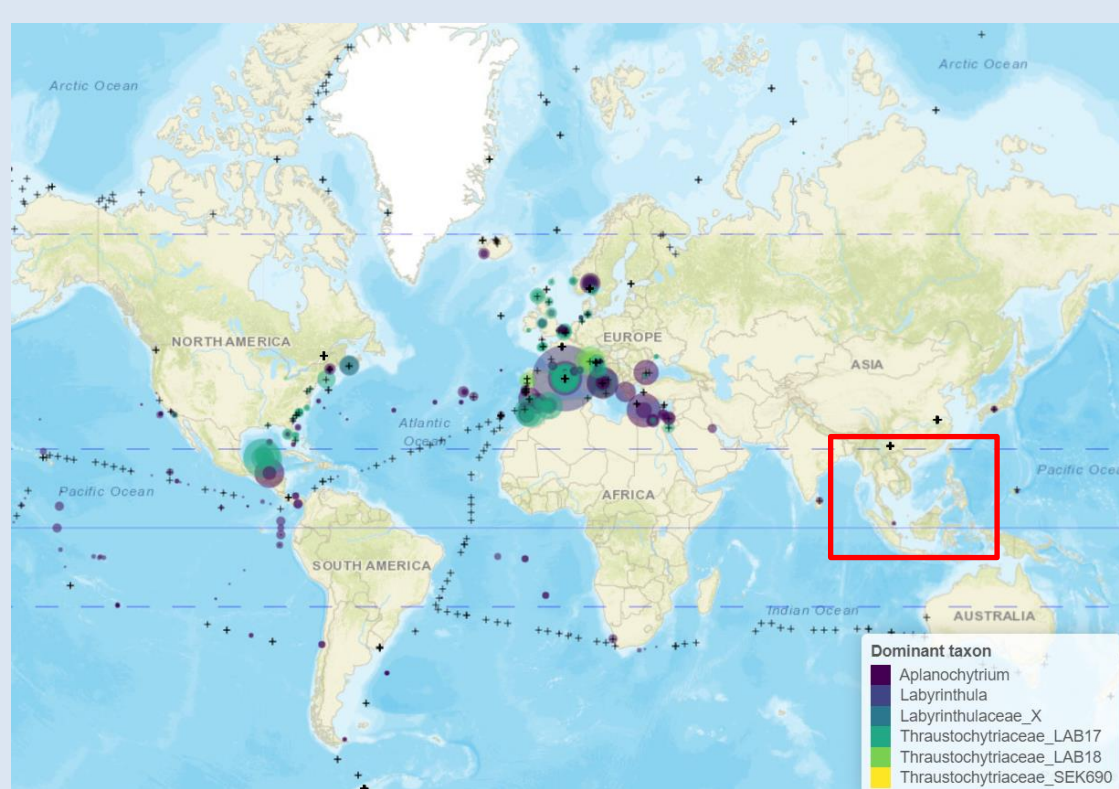


**Fig 4:** Sedimentation rate generally peaks in the middle of the monsoons.



**Fig 5:** a) Salinity increases during the NE Monsoon. b) Nitrates, silicates and chlorophyll peak during the mid-SW Monsoon.

### Global Distribution of Labyrinthulomycetes



**Fig 6:** Distribution of major Labyrinthulomycetes species (asv >2000). Labyrinthulomycetes are found largely in coastal areas

## Discussion

- Increase in nitrate and silicate concentrations during the mid-SW monsoon likely due to such nutrients being carried by terrestrial runoff from Sumatran peatlands.
- Salinity increase during the NE Monsoon likely due to high salinity water being brought in from the South China Sea.
- The family Thraustochytriceae peaks during mid SW-monsoon. This could be due to degrading terrestrial organic matter (Thraustochytriceae nutrient source<sup>[1]</sup>) being brought in via Sumatra-based terrestrial runoff. Their abundance increases only during the middle of the monsoon as phenolic compounds (in plant matter) which deter Thraustochytriceae growth<sup>[2]</sup> reduce in concentration throughout the monsoon.
- The genus *Aplanochytrium* follows trends in nitrates and silicates. They are known to have a positive relationship with diatom population<sup>[3]</sup> which rely on nitrates and silicates to grow. Chl-a, which is an indicator of diatom abundance, also follows the same trend.
- Majority of metabarcoding studies focused in regions of higher latitudes (Fig 6)
- Lack of research data regarding Labyrinthulomycetes in the region (red box) causes poor understanding of microbial interactions and changes due to abiotic factors

## References

- [1] H. Kimura, M. Sato, C. Sugiyama, T. Naganuma (2001). Coupling of thraustochytrids and POM, and of bacterio- and phytoplankton in a semi-enclosed coastal area: implication for different substrate preference by the planktonic decomposers. <https://doi.org/10.3354/ame025293>
- [2] Seshagiri Raghukumar (2002). Ecology of the marine protists, the Labyrinthulomycetes (Thraustochytrids and Labyrinthulids). <https://doi.org/10.1078/0932-4739-00832>
- [3] Hamamoto Y, Honda D (2019). Nutritional intake of Aplanochytrium (Labyrinthulea, Stramenopiles) from living diatoms revealed by culture experiments suggesting the new prey-predator interactions in the grazing food web of the marine ecosystem. PLoS One. 2019;14(1):e0208941. <https://doi.org/10.1371/journal.pone.0208941>
- [4] Zhou, Y., Evans, C. D., Chen, Y., Chang, K. Y. W., & Martin, P. (2021). Extensive remineralization of peatland-derived dissolved organic carbon and ocean acidification in the Sunda Shelf Sea, Southeast Asia. Journal of Geophysical Research: Oceans, 126, e2021JC017292. <https://doi.org/10.1029/2021JC017292>