# Combining multi-omics data to study in situ biosynthesis in natural plankton communities

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## Introduction

Fatty acids include essential molecules for growth and development, e.g. omega 3 long-chain polyunsaturated fatty acids (n-3 LC-PUFA). Marine phytoplankton is rich in n-3 LC-PUFA and many consumers depend on it for their dietary requirements. Diatoms and other phytoplankton groups synthesize n-3 LC-PUFA through aerobic pathways involving desaturase and elongase enzymes. High-throughput sequencing technologies allow us to study *in-situ* metabolic activities of such communities at scale. In our study, we combined metatranscriptomic data with fatty acids compositional profiles of microplankton-enriched samples from the Belgian Part of the North Sea.

Methods

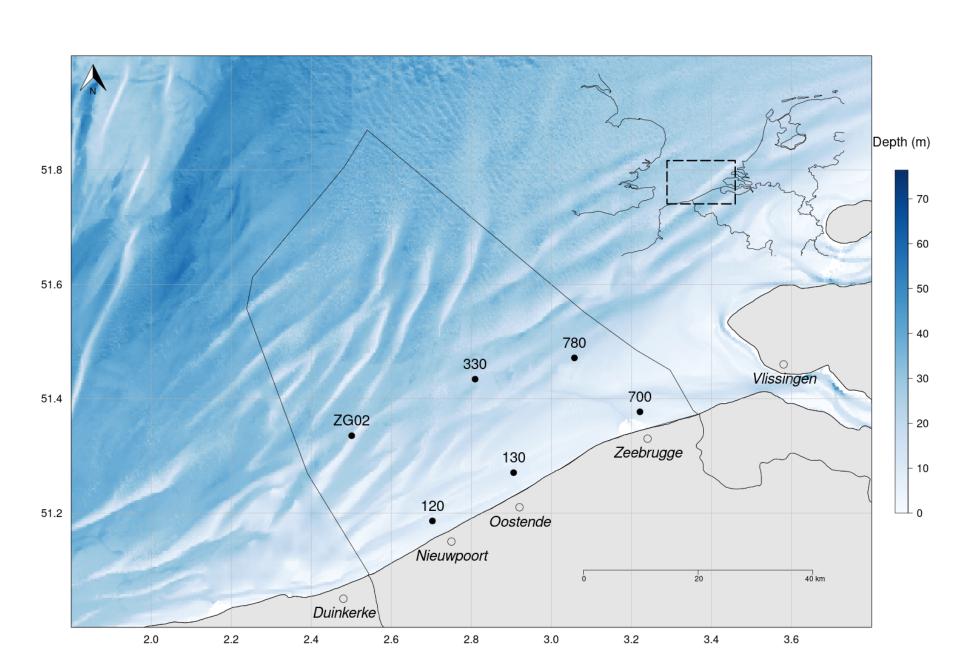


Fig. 1: Samples (50 L of sea surface water 50 - 250 µm) were taken monthly (July 2020 – July 2021) at six

stations in Belgium

56 Samples

mRNA extraction

shotgun RNA sequencing

preprocessing

transcriptome assembly

functional annotation

quantification of FA-related transcripts

statistical analyses Fatty acids (FAs)
direct transesterification

gas chromatography

identification

quantification

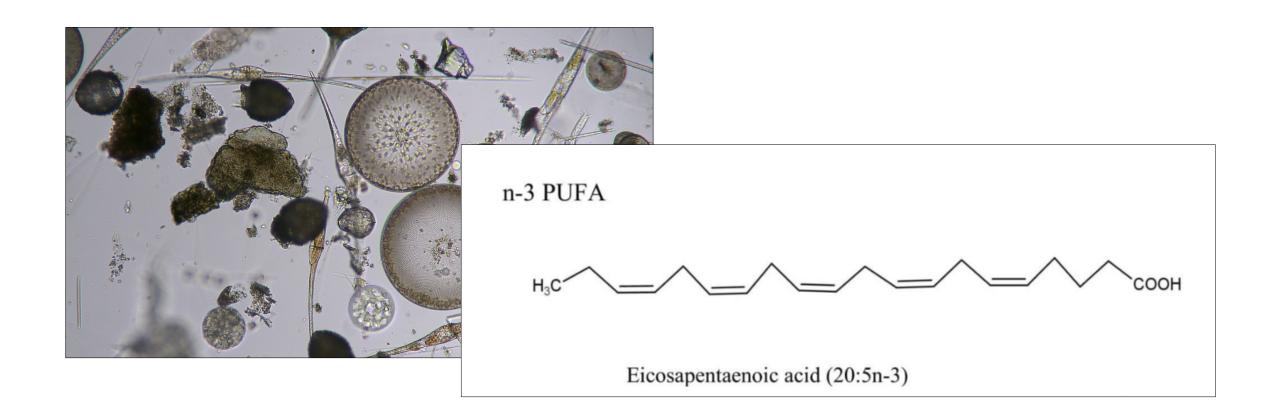
conversion to mass

relative concentrations of FAs

statistical analyses

### Goals

Describing seasonal and spatial variation in fatty acid composition of microeukaryotic plankton ecosystems, together with biodiversity and expression of transcripts involved in fatty acid metabolism.



## Preliminary results

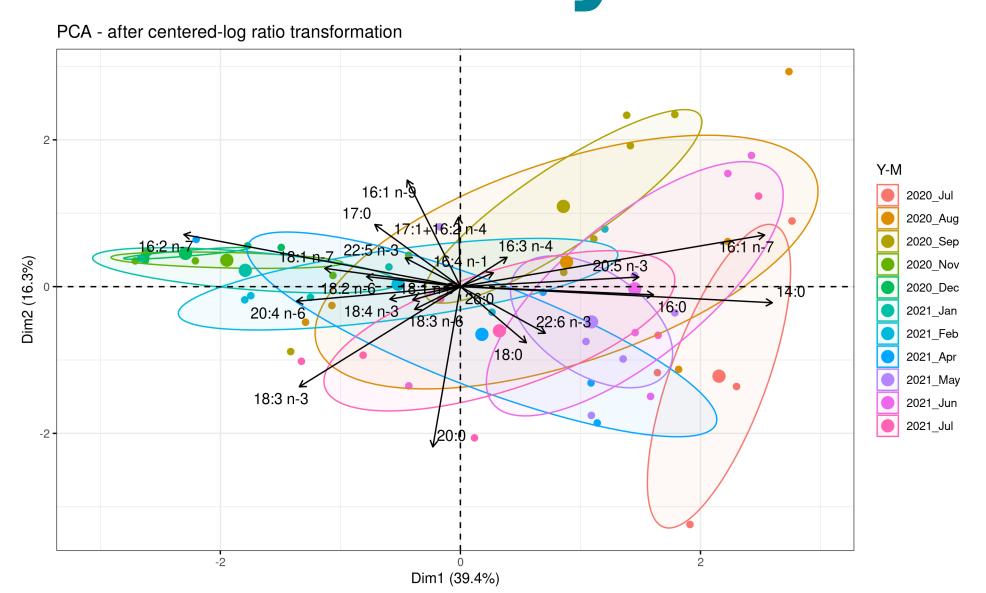
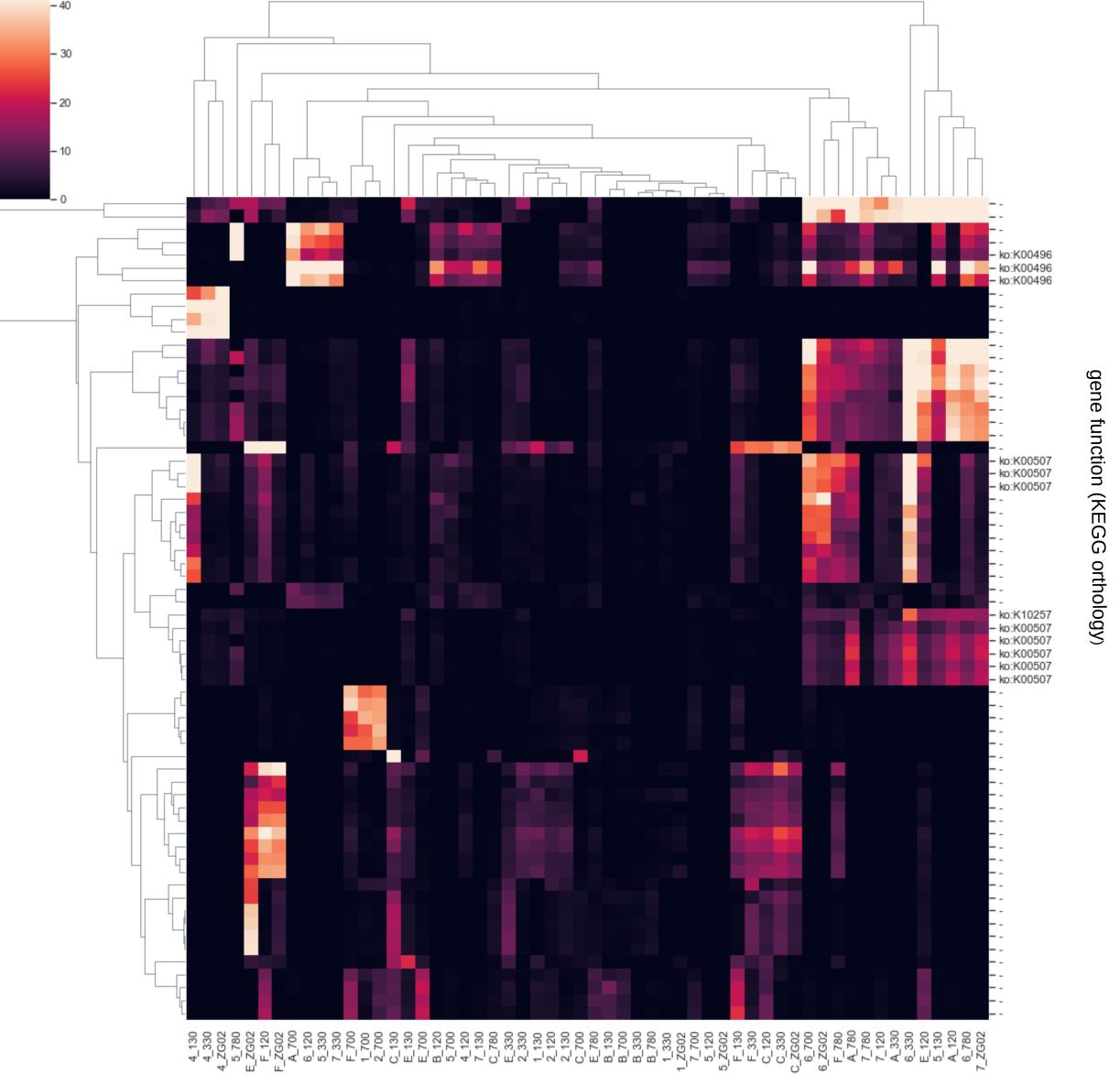


Fig. 2: A total of 23 different fatty acids (FAs) was found in the 56 samples. PCA on the clr-transformed relative FA composition revealed seasonal shifts in FA composition (winter to the left, summer to the right).



Month\_Station code: A – F : Jul – Dec 2020, 1 – 7 : Jan – Jul 2021

Fig. 3: Ordinated heatmap (sample x gene function) visualizing the expression of transcripts identified as FA desaturases. We found considerable variation over the sampling period.



Acknowledgements

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