

Module 3: Project 2 by Team 5

Charting the distributed nitrogen cycle

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Abstract

This is the abstract. It consists of two paragraphs.

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1 Introduction

2 Materials and Experimental Configuration

2.1 Experimental Protocols

To understand the correlation of microbial diversity and oxygen concentration across samples, we report four experimentally designed test protocols:

P1. Analysis of the DNA abundance of norB with depth.

P2. Analysis of similarities between RNA and DNA abundance information of norB with depths.

P3. Reconstructing the associated taxa with norB and analyze variances of DNA and RNA based on depths.

P4. Analysis of the abundance of norB in relation to nitrogen species in Saanich.

2.2 Dataset

2.3 Data Preporocessing

Manipulate the data into a single data frame

3 Results

3.1 Analysis of the DNA abundance of norB with depth

Table 1: Unnormalized abundance of the norB gene (DNA) at different depths

Depth_m	Abundance_DNA
10	1.581131
100	101.397580
120	197.248612
135	345.156101
150	541.756037
165	137.576279
200	854.085568

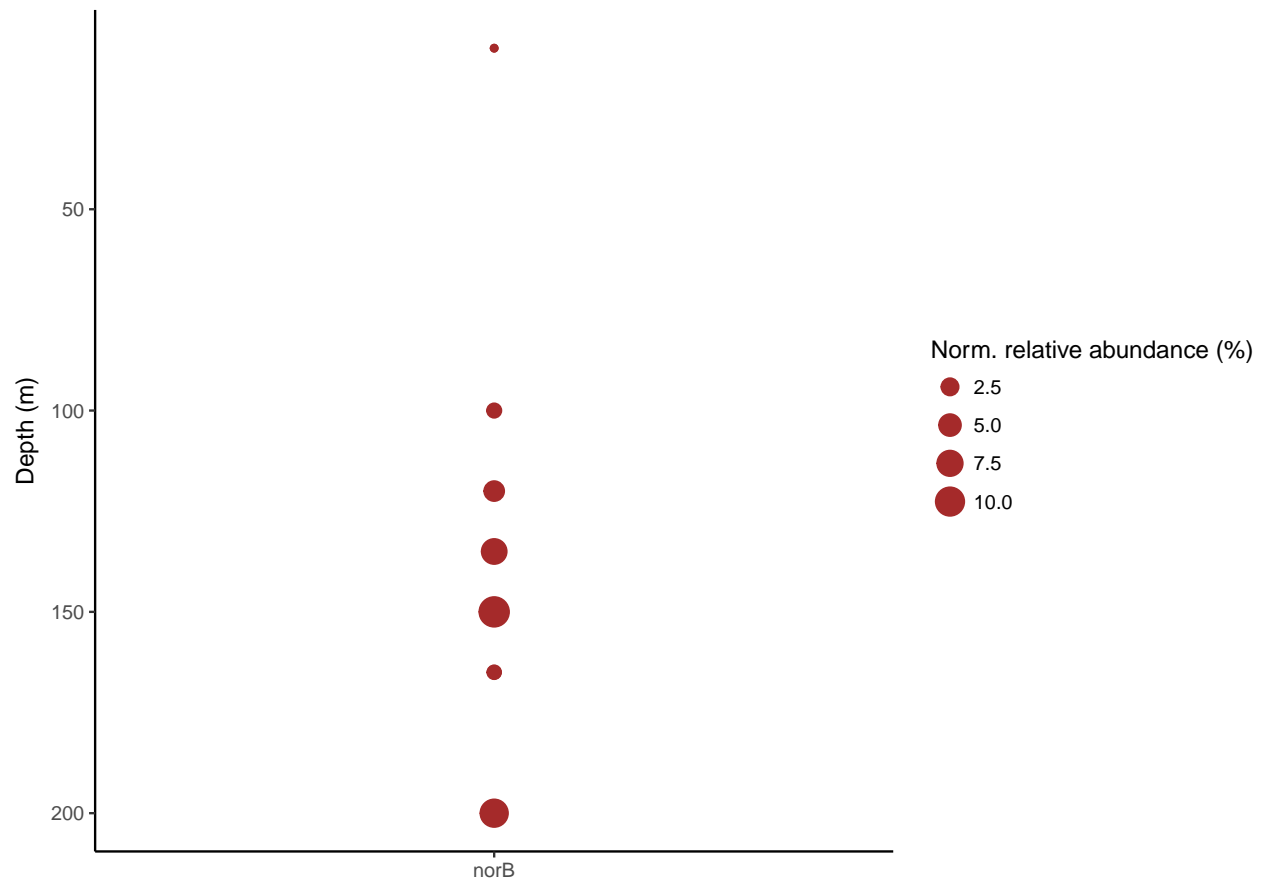


Figure 1: Normalized relative abundance (0–1) of the *norB* gene (DNA) at different depths

3.2 Analysis of similarities between RNA and DNA abundance information of *norB* with depths

Table 2: Unnormalized abundance of the *norB* gene (DNA vs. RNA) at different depths

Depth_m	Abundance_DNA	Abundance_RNA
10	1.581131	0.000000
100	101.397580	4.256517
120	197.248612	8.066146
135	345.156101	55.932741
150	541.756037	788.040985
165	137.576279	912.117306
200	854.085568	944.915908

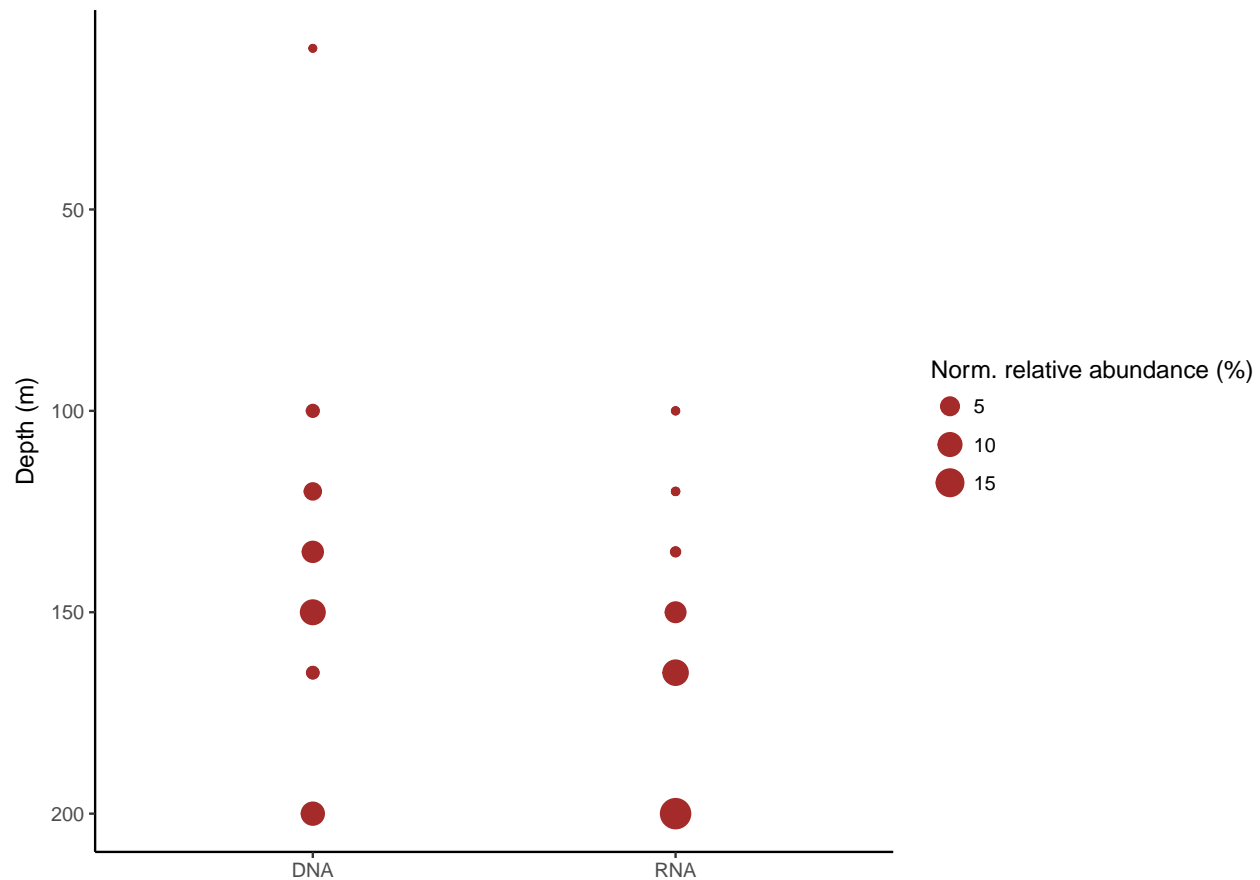


Figure 2: Normalized relative abundance (0–1) of the *norB* gene (DNA vs. RNA) at different depths

3.3 Reconstructing the associated taxa with *norB* and analyze variances of DNA and RNA based on depths

Table 3: Taxa associated (including NA values) with unnormalized abundance of the *norB* gene (DNA vs. RNA) at all depths

Phylum	Genus	Abundance_DNA	Abundance_RNA
Bacteroidetes	Formosa	1.603260	0.000000
Bacteroidetes	Muricauda	23.368146	37.471377
Bacteroidetes	Zobellia	3.161290	0.000000
Bacteroidetes	NA	13.861010	19.271124
Chlorobi	NA	7.638090	13.089740
Proteobacteria	Achromatium	32.188300	120.183600
Proteobacteria	Beggiatoa	0.961576	0.000000
Proteobacteria	Candidatus Competibacter	238.590000	112.869170
Proteobacteria	Endozoicomonas	0.398583	0.000000
Proteobacteria	Gallionella	227.856175	24.256090
Proteobacteria	Thiocapsa	57.156660	60.359952

Phylum	Genus	Abundance_DNA	Abundance_RNA
Proteobacteria	unclassified Rhizobiales	1.037770	0.000000
Proteobacteria	NA	1482.607652	2309.819911
unclassified Bacteria	NA	9.950229	3.264051
NA	NA	78.422567	12.744589

The total unnormalized abundances computed from DNA and RNA data is 2178.801308 and 2713.3296034, respectively; however, only 26.9102904% and 13.0887227% have known genera for both DNA and RNA. We impute NA with **unclassified** for phylum and genus.

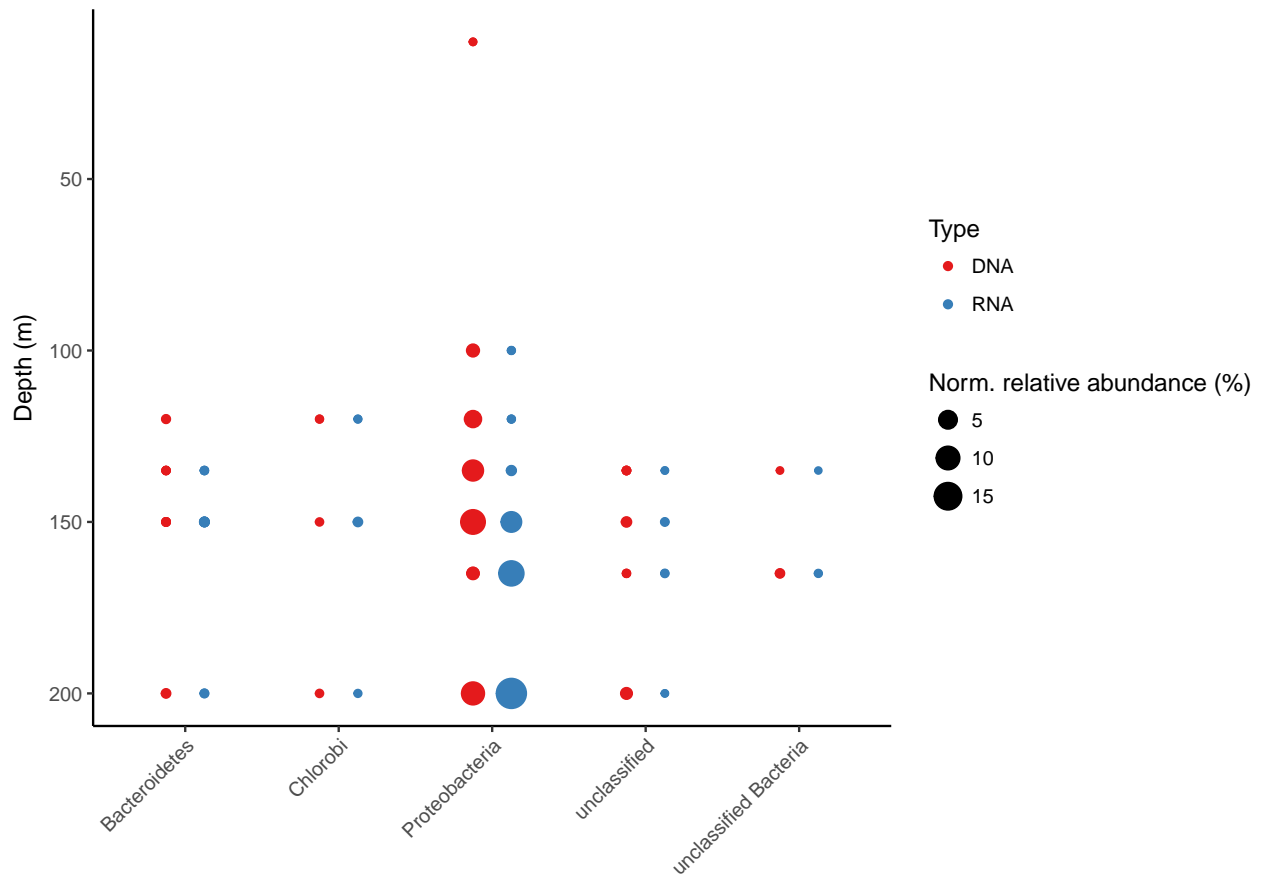


Figure 3: Abundance of Phyla with norB (DNA vs. RNA) at different depths

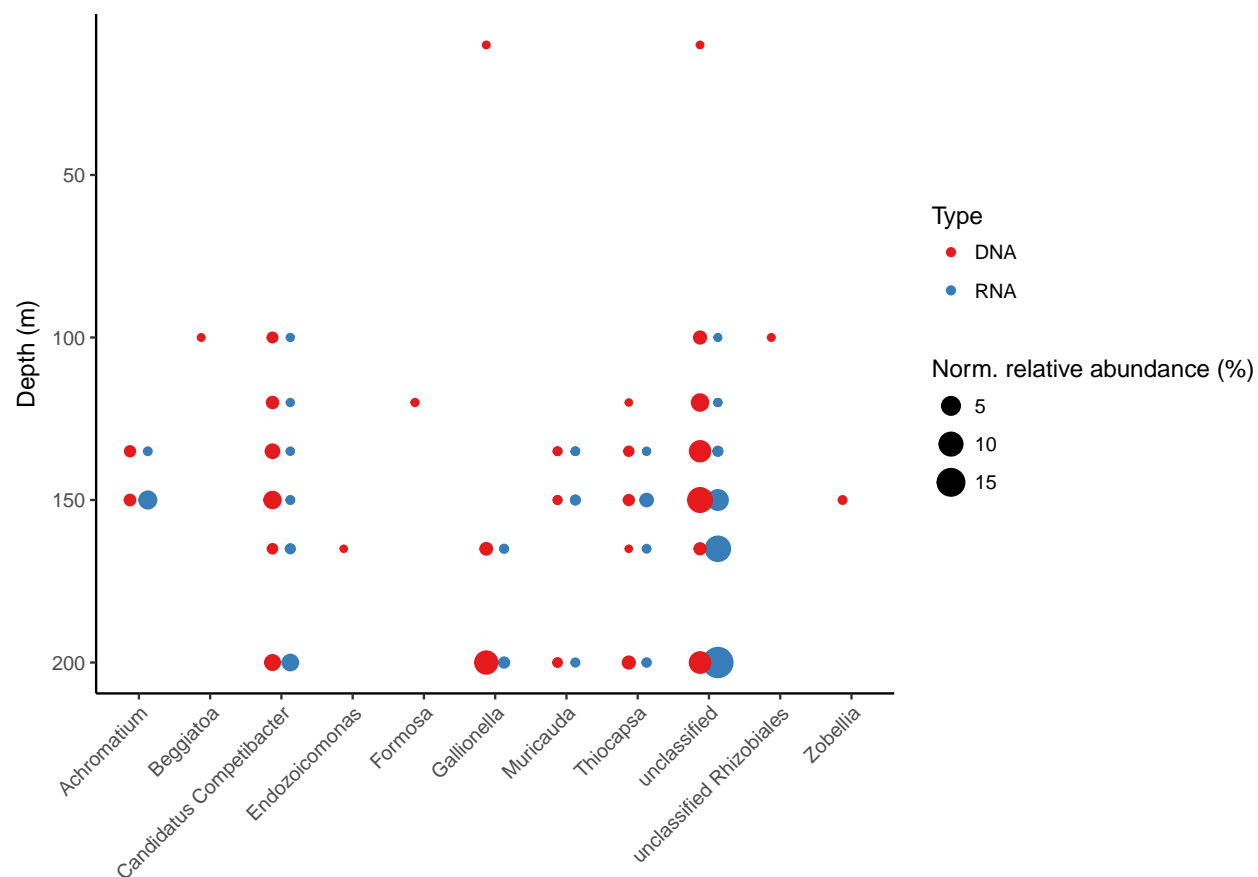


Figure 4: Abundance of genera with *norB* (DNA vs. RNA) at different depths

3.4 Analysis of the abundance of *norB* in relation to nitrogen species in Saanich

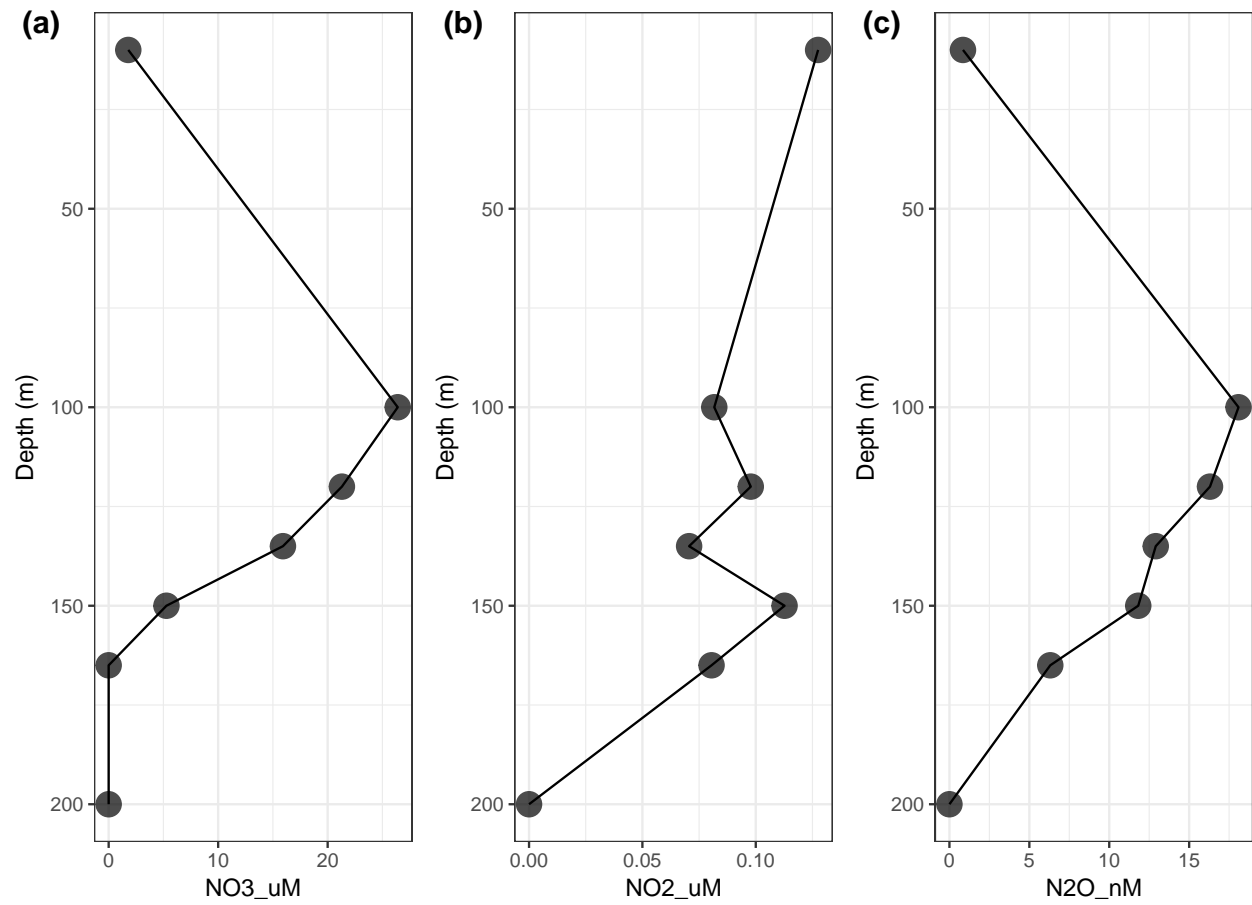


Figure 5: Abundance of norB in relation to nitrogen species across depths

4 Discussion

5 References