

## Hunter et al. Supplementary Information.

**Supplementary Data 1.** CAPSCALE Model investigating the relationship between changes in macrofaunal biomass C and environmental differences, between stations T1 800 m; T2 800 m; T2 1100 m.

### Permutation test for multivariate $\beta$ -dispersion (normality).

	Df	Sum Sq	Mean Sq	F	N.Perm	Pr(>F)
Groups	2	0.012299	0.006150	0.8494	1000	0.4216
Residuals	9	0.065159	0.007240			

Based on 1000 permutations.  
# No significant departure from multivariate normality.

### Model Selection.

Start: AIC = 8.15  
 $\sqrt{\text{BIOC} + 0.01} \sim 1$

	Df	AIC
$\sqrt{\text{BIOC} + 0.01} \sim \text{O2}$	2	7.0815
$\sqrt{\text{BIOC} + 0.01} \sim 1$		8.1511
$\sqrt{\text{BIOC} + 0.01} \sim \text{CN}$	1	8.9213

Step: AIC=7.08  
 $\sqrt{\text{BIOC} + 0.01} \sim \text{O2}$

	Df	AIC
$\sqrt{\text{BIOC} + 0.01} \sim \text{O2}$		7.0815
$\sqrt{\text{BIOC} + 0.01} \sim 1$	2	8.1511
$\sqrt{\text{BIOC} + 0.01} \sim \text{O2} + \text{CN}$	1	8.2957

**Final Model, providing the best description of the data.**  
 $\sqrt{(\text{BIOMASS\_C} + 0.01)} \sim \text{Oxygen Availability}$

	Inertia	Rank
Total	1.79428	
Constrained	0.62761	2
Unconstrained	1.19379	9
Imaginary	-0.02712	1

Inertia is squared Bray distance

Eigenvalues for constrained axes:

CAP1	CAP2
0.5075	0.1202

Eigenvalues for unconstrained axes:

MDS1	MDS2	MDS3	MDS4	MDS5
0.338994	0.268085	0.226760	0.167968	0.094651
MDS6	MDS7	MDS8	MDS9	NEG1
0.050166	0.030563	0.011023	0.005581	-0.027122

**Permutatiion Test of significance.**

Permutation test for all constrained eigenvalues

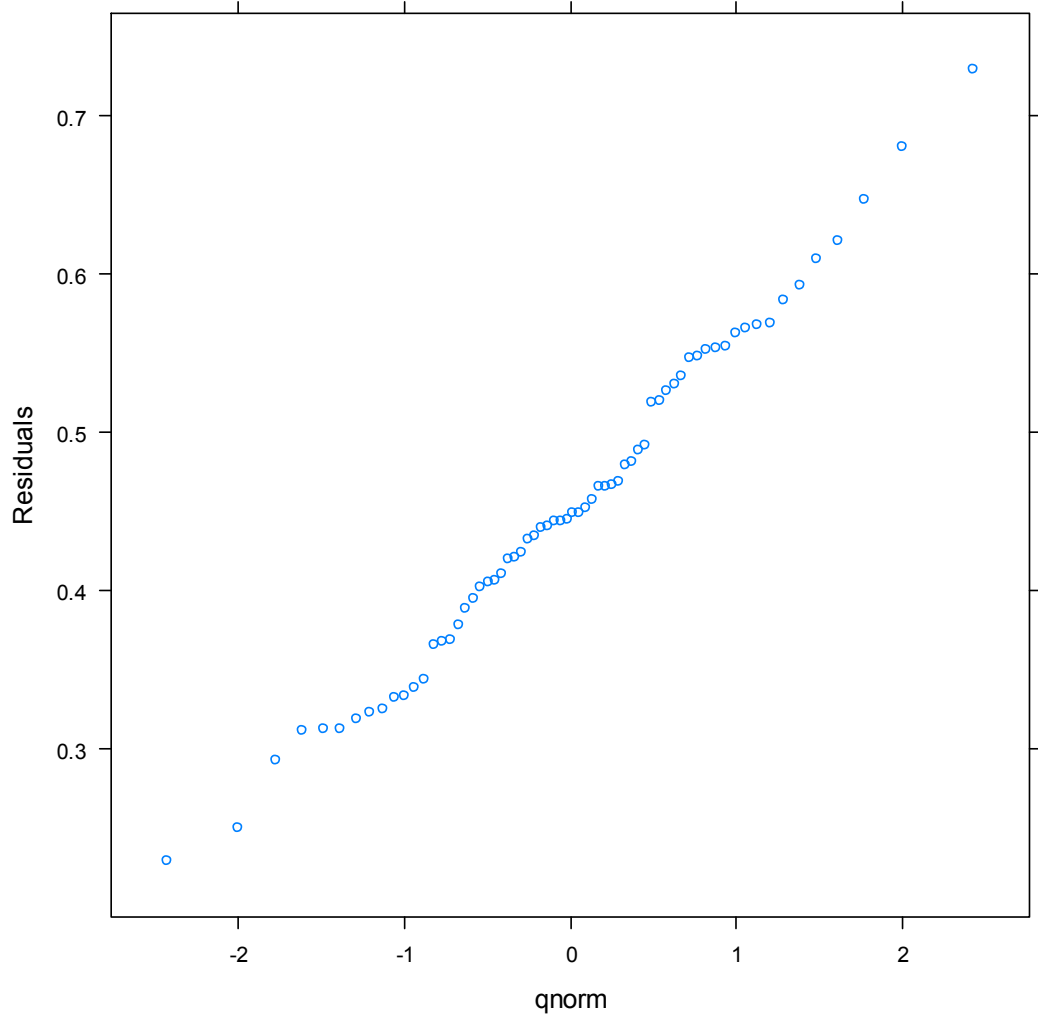
Pseudo-F: 2.365768

Significance: 0.006

Based on 1000 permutations under reduced model.

Model shows a highly significant relationship between Oxygen concentration and macrofaunal assemblage structure (Biomass C).

# QQMath Plot of Model Residuals



**Supplementary 2.** CAPSCALE Model investigating the relationship between changes in macrofaunal biomass N and environmental differences, between stations T1 800 m; T2 800 m; T2 1100 m.

**Permutation test for multivariate  $\beta$ -dispersion (normality).**

	Df	Sum Sq	Mean Sq	F	N.Perm	Pr(>F)
Groups	2	0.023470	0.011735	2.2691	1000	0.1499
Residuals	9	0.046544	0.005172			

Based on 1000 permutations.  
 # No significant departure from multivariate normality.

**Model Selection.**

Start: AIC = 3.51  
 $\sqrt{(\text{BION} + 0.01)} \sim 1$

	Df	AIC
$\sqrt{(\text{BION} + 0.01)} \sim \text{O2}$	2	2.8970
$\sqrt{(\text{BION} + 0.01)} \sim 1$		3.5092
$\sqrt{(\text{BION} + 0.01)} \sim \text{CN}$	1	4.4022

Step: AIC=2.9  
 $\sqrt{(\text{BION} + 0.01)} \sim \text{O2}$

	Df	AIC
$\sqrt{(\text{BION} + 0.01)} \sim \text{O2}$		2.8970
$\sqrt{(\text{BION} + 0.01)} \sim 1$	2	3.5092
$\sqrt{(\text{BION} + 0.01)} \sim \text{O2} + \text{CN}$	1	3.9243

**Final Model, providing the best description of the data.**  
 **$\sqrt{(\text{BIOMASS\_N} + 0.01)} \sim \text{Oxygen Availability}$**

	Inertia	Rank
Total	1.22154	
Constrained	0.39477	2
Unconstrained	0.84234	9
Imaginary	-0.01557	2

Inertia is squared Bray distance

Eigenvalues for constrained axes:

CAP1	CAP2
0.30595	0.08882

Eigenvalues for unconstrained axes:

MDS1	MDS2	MDS3	MDS4	MDS5
0.2470411	0.2032270	0.1487994	0.1015461	0.0772297
MDS6	MDS7	MDS8	MDS9	NEG1
0.0329481	0.0221446	0.0092465	0.0001539	-0.0046934
NEG2				
-0.0108756				

**Permutatiion Test of significance.**

Permutation test for all constrained eigenvalues

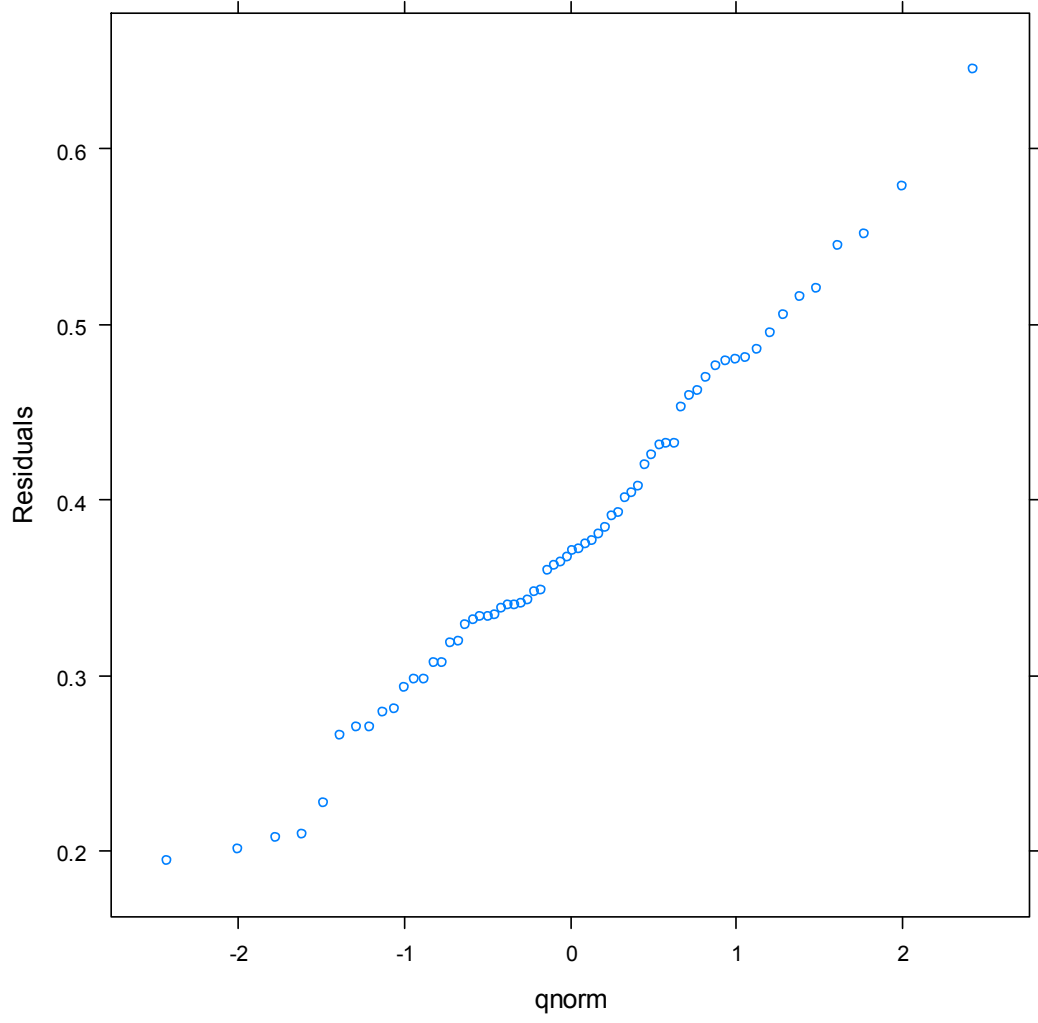
Pseudo-F: 2.108965

Significance: 0.009

Based on 1000 permutations under reduced model.

Model shows a highly significant relationship between Oxygen concentration and macrofaunal assemblage structure (Biomass N).

# QQMath Plot of Residuals



**Supplementary 3.** CAPSCALE Model investigating the relationship between macrofaunal <sub>phyto</sub>C uptake and environmental changes, between stations T1 800 m; T2 800 m; T2 1100 m.

**Permutation test for multivariate  $\beta$ -dispersion (normality).**

	Df	Sum Sq	Mean Sq	F	N.Perm	Pr(>F)
Groups	2	0.012740	0.006370	1.2724	1000	0.3247
Residuals	9	0.045054	0.005006			

Based on 1000 permutations.  
# No significant departure from multivariate normality.

**Model Selection.**

Start: AIC = 6.22  
 $\sqrt[3]{(\text{UPTAKE} + 0.01)} \sim 1$

	Df	AIC
$\sqrt[3]{(\text{UPTAKE} + 0.01)} \sim \text{O2}$	2	4.0971
$\sqrt[3]{(\text{UPTAKE} + 0.01)} \sim \text{CN}$	1	6.1274
$\sqrt[3]{(\text{UPTAKE} + 0.01)} \sim 1$		6.2232

Step: AIC=4.09  
 $\sqrt[3]{(\text{UPTAKE} + 0.01)} \sim \text{O2}$

	Df	AIC
$\sqrt[3]{(\text{UPTAKE} + 0.01)} \sim \text{O2} + \text{CN}$	1	4.1757
$\sqrt[3]{(\text{UPTAKE} + 0.01)} \sim \text{O2}$		4.0971
$\sqrt[3]{(\text{UPTAKE} + 0.01)} \sim 1$	2	6.2232

**Final Model, providing the best description of the data.**  
 **$\sqrt[3]{(\text{Uptake\_C} + 0.01)} \sim \text{Oxygen Availability}$**

	Inertia	Rank
Total	1.50651	
Constrained	0.61402	2
Unconstrained	0.93706	8
Imaginary	-0.04456	3

Inertia is squared Bray distance

Eigenvalues for constrained axes:

CAP1	CAP2
0.3626	0.2514

Eigenvalues for unconstrained axes:

MDS1	MDS2	MDS3	MDS4	MDS5
2.440e-01	2.051e-01	1.839e-01	9.401e-02	9.209e-02
MDS6	MDS7	MDS8	NEG1	NEG2
8.618e-02	3.169e-02	9.148e-05	-4.692e-05	-1.940e-02
NEG3				
-2.512e-02				

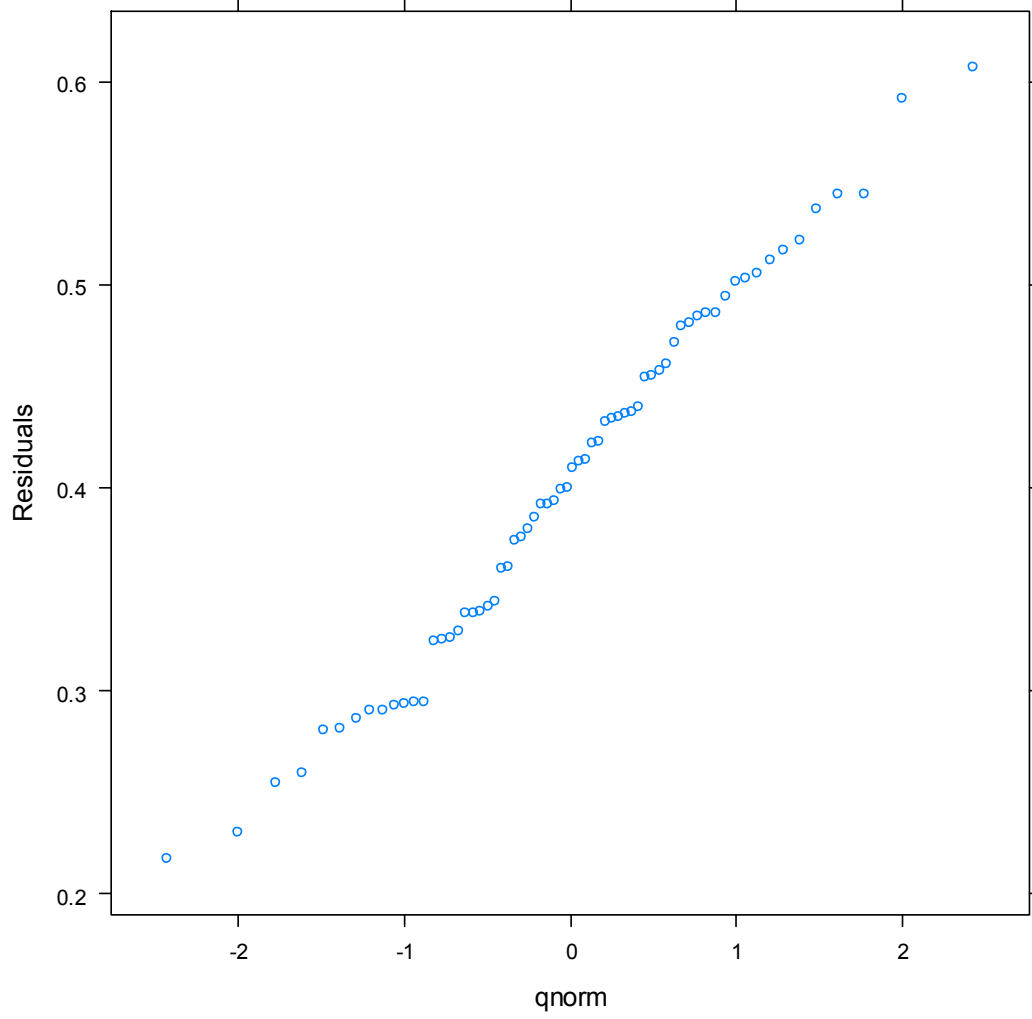
**Permutatiion Test for significance.**

Based on 1000 permutations under reduced model.  
Permutation test for all constrained eigenvalues  
Pseudo-F: 2.948680  
Significance: < 0.001

Model shows a highly significant relationship between Oxygen concentration and macrofaunal  $\text{phytoC}$  uptake.



# QQMath Plot of Residuals



**Supplementary 4.** CAPSCALE Model investigating the relationship between macrofaunal  $_{\text{phyto}}\text{N}$  uptake and environmental changes, between stations T1 800 m; T2 800 m; T2 1100 m.

**Permutation test for multivariate  $\beta$ -dispersion (normality).**

	Df	Sum Sq	Mean Sq	F	N.Perm	Pr(>F)
Groups	2	0.0090670	0.0045335	2.5601	1000	0.1229
Residuals	9	0.0159373	0.0017708			

Based on 1000 permutations.  
# No significant departure from multivariate normality.

**Model Selection**

Start: AIC = -4.54  
 $^3\sqrt{(\text{UPTAKEN} + 0.01)} \sim 1$

	Df	AIC
$^3\sqrt{(\text{UPTAKEN} + 0.01)} \sim \text{O2}$	2	-6.0931
$^3\sqrt{(\text{UPTAKEN} + 0.01)} \sim \text{CN}$	1	-4.5790
$^3\sqrt{(\text{UPTAKEN} + 0.01)} \sim 1$		-4.5354

Step: AIC=-6.09  
 $^3\sqrt{(\text{UPTAKEN} + 0.01)} \sim \text{O2}$

	Df	AIC
$^3\sqrt{(\text{UPTAKEN} + 0.01)} \sim \text{O2}$		-6.0931
$^3\sqrt{(\text{UPTAKEN} + 0.01)} \sim \text{O2} + \text{CN}$	1	-5.4829
$^3\sqrt{(\text{UPTAKEN} + 0.01)} \sim 1$	2	-4.5354

**Final Model, providing the best description of the data.**

$\sqrt[3]{(\text{Uptake\_C} + 0.01)} \sim \text{Oxygen Availability}$

	Inertia	Rank
Total	0.62376	
Constrained	0.23457	2
Unconstrained	0.39822	9
Imaginary	-0.00904	1

Inertia is squared Bray distance

Eigenvalues for constrained axes:

CAP1	CAP2
0.15619	0.07838

Eigenvalues for unconstrained axes:

MDS1	MDS2	MDS3	MDS4	MDS5
0.1031283	0.0941879	0.0660056	0.0435336	0.0388873
MDS6	MDS7	MDS8	MDS9	NEG1
0.0366128	0.0103887	0.0052931	0.0001858	-0.0090401

**Permutatiion Test of significance.**

Based on 1000 permutations under reduced model.  
Permutation test for all constrained eigenvalues  
Pseudo-F: 2.650727  
Significance: 0.003

Model shows a highly significant relationship between Oxygen concentration and macrofaunal  $\text{phytoN}$  uptake.

# QQMath Plot of Residuals

