Supplementary Material

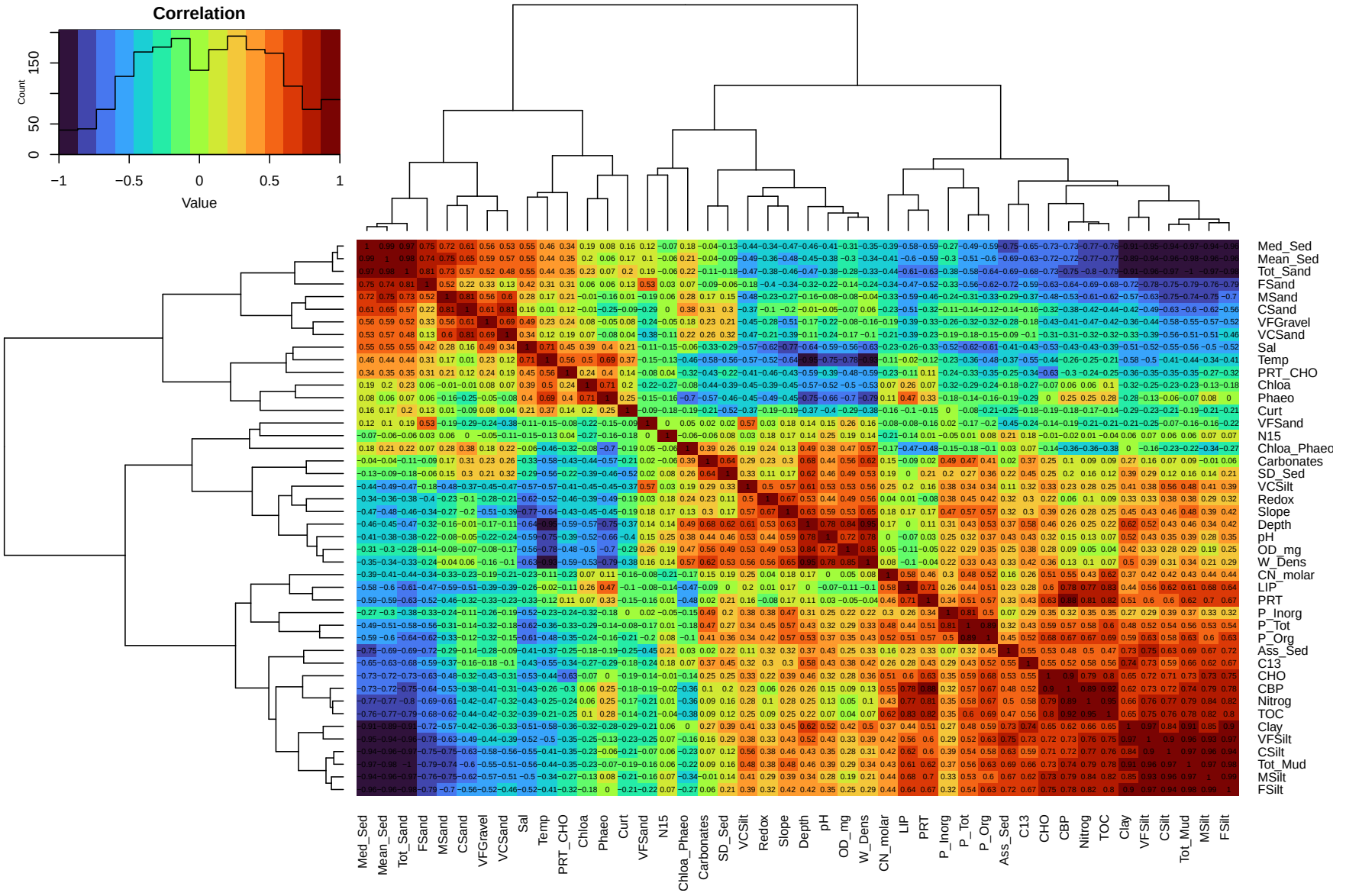
Supplementary Table S1. Abbreviation and analytical methods of the environmental variables considered as potential predictors for the nematode genera association model.

Abbreviations	Variable	Analytic method	Reference
Depth	Water column (m)		Moreira et al. 2023
Temp	bottom water temperature (°C)		Moreira et al. 2024
Sal	bottom water salinity (g/kg)		Moreira et al. 2025
W_Dens	bottom water neutral density (kg/m³)		Moreira et al. 2026
OD_mg	bottom water dissolved oxygen (mg/L)		Moreira et al. 2027
Slope	Angle of the slope (°)		Moreira et al. 2023
Redox	Sediment redox potential (mV)	Portable pH meter Hanna Instruments 98191	Moreira et al. 2023
pH	Sediment acidity or alkalinity	Portable pH meter Hanna Instruments 98191	Moreira et al. 2023
Chloa	Chlorophyll - a (µg/g)	Spectrophotometric method proposed by Lorenzen (1967). The freeze-dried sediments were weighed into a Falcon tube (1.0 g ± 0.010 g) and 10 mL of 90% acetone was added. The tubes were vigorously shaken with a vortex, ultrasonicated for 3 minutes and stored overnight at 4 °C in the dark. Tubes were then centrifuged (3000 rpm for 10 minutes) and the absorbance of the supernatant was measured at the wavelengths of 750 and 665 nm against a blank of 90% acetone. For phaeopigment determination, the acetone extract was acidified directly in the cuvette with 2 drops of 0.1 N HCl and the absorbance was measured again at 750 and 665 nm. The chlorophyll-a and phaeopigments contents were calculated according to Lorenzen (1967).	Carreira et al. 2023
Phaeo	Phaeopigments (µg/g)		
Chloa_Phaeo	Ratio Chl.a/Phaeo		
TOC	Total Organic Content (mg/g)	Elemental analyzer equipped with a thermal conductivity detector (Flash 2000 model OEA) coupled to an isotope ratio mass spectrometer (Delta V 102 IRMS, Thermo).	Carreira et al. 2023
Nitrog	Nitrogen (molar)		
CN_molar	Ratio Carbon/Nitrogen		
C13	$\delta^{13}C$ (‰)		
N15	$\delta^{15}N$ (‰)		
P_Org	Organic Phosphorus (µg/g)	Digestion and spectrophotometric method (Aspila et al.,1976). For the total phosphorus determination, an aliquot (0.5 to 1.5 g ± 0.1 g) of freeze-dried sediments were combusted in a muffle furnace at 550 °C for 2h, followed by extraction of the residue with 1 M HCl during 12h at room temperature. After centrifugation (3000 rpm for 10 min), 2 mL of the supernatant were diluted with water to 50 mL and a blue complex with molybdenum was developed for spectrophotometric determination at 800 nm. The concentration of P-PO4, in µg g-1, was calculated based on a calibration curve of a potassium dihydrogen phosphate [KH2PO4] solution. The inorganic phosphorus was determined in another sediment aliquot following the same procedure for total phosphorus, excluding the thermal treatment. The organic phosphorus was calculated by the difference between total and inorganic phosphorus.	Carreira et al. 2023
P_Inorg	Inorganic Phosphorus (µg/g)		
P_Tot	Total Phosphorus (µg/g)		
CHO	Carbohydrates (mgC/g)	Colorimetric assay optimized based on the reaction between sugars and phenol in the presence of concentrated sulfuric acid (Danovaro, 2010). Absorbances were determined by spectrophotometry at 485 and 600 nm and results quantified in D-glucose equivalents by calibration curve.	Carreira et al. 2023
PRT	Proteins (mg/g)	Colorimetric method proposed by Bradford (1976) and Hartree (1972), modified by Rice (1982).	Carreira et al. 2023
PRT_CHO	Ratio Proteins/Carbohydrates	-	Carreira et al. 2023
LIP	Lipids (mg/g)	Determined by spectrophotometry at 375 nm and quantified through a calibration curve of tripalmitine equivalents (Danovaro, 2010)	Carreira et al. 2023
CBP	Biopolymeric Carbon (mg/g)	Sum of the carbon equivalents of the three main biochemical classes of organic compounds; carbohydrates, proteins, and lipids (conversion coefficients were 0.40, 0.49 and 0.75 µg C µg-1, respectively).	Carreira et al. 2023
Med_Sed	Median Grain Size (mm)	Folk and Ward (1957) equations	Figueiredo et al. 2023
Mean_Sed	Mean Grain Size (mm)		
SD_Sed	Standard Deviation of Grain Size (mm)		
Ass_Sed	Asymmetry of Grain Size Distribution		
Curt	Kurtosis of Grain Size Distribution		
Tot_Sand	Sand fractions total content	Content of each grain size class was measured with a Laser granulometer, without carbonates extraction.	Figueiredo et al. 2023
Tot_Mud	Mud fractions total content		
VFGravel	Very Fine Gravel content		
VCSand	Very Coarse Sand content		
CSand	Coarse Sand content		
MSand	Medium Sand content		
FSand	Fine Sand content		
VFSand	Very Fine Sand content		
VCSilt	Very Coarse Silt content		
CSilt	Coarse Silt content		
MSilt	Medium Silt content		
FSilt	Fine Silt content		
VFSilt	Very Fine Silt content		
Clay	Clay content		
Carbonates	Carbonate content	Calculated by weight loss in sediment before and after treatment with HCl.	Figueiredo et al. 2023

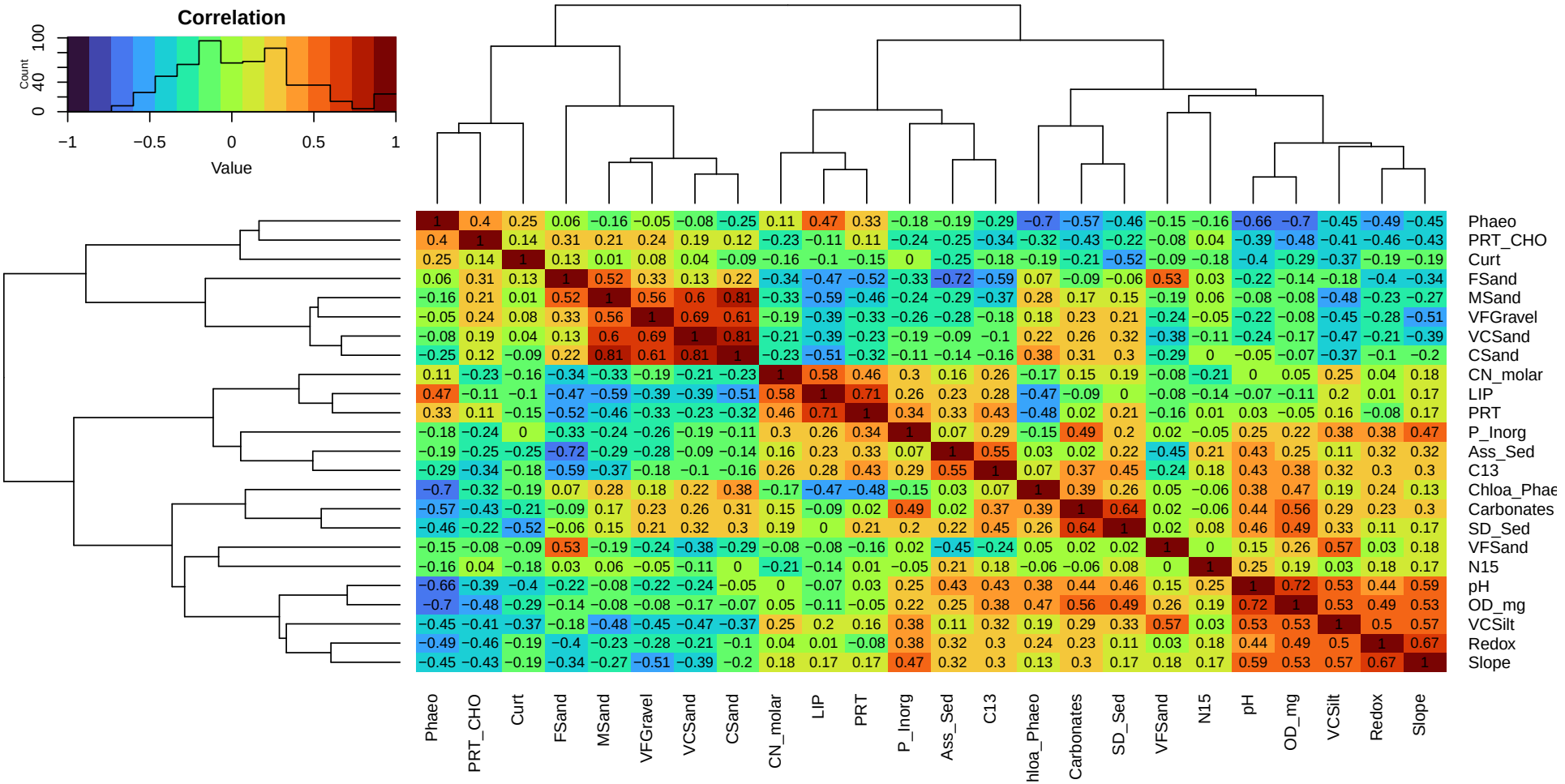
Supplementary Table S2. Results of the Analysis of Variance (ANOVA) test of the Richness (S), Abundance (N), Evenness (J), and Relative Dominance (Dom_rel) between the associations. A Tukey's honestly significant difference (Tukey's HSD) post-hoc test was later performanced; association with different letters (a, b and c) differ significantly between each other. Number of observations in Associations 1 to 6 was 8, 18, 7, 5, 12, and 49, respectively.

	DF	SS	MS	F	P	Associations					
						1	2	3	4	5	6
N	5	9619073.00	1923815.00	32.82	<0.001	a	a	b	c	a	c
res	93	5450917.00	58612.00								
S	5	5069.00	1013.70	9.72	<0.001	a	b	a,b	a,b	a	b
res	93	9701.00	104.30								
J	5	0.06	0.01	8.23	<0.001	a	c	a,b	b,c	a,b	a,b
res	93	0.13	0.00								
Dom_rel	5	0.14	0.03	9.61	<0.001	a	b	a,b	b	a	a
res	93	0.26	0.00								

Supplementary Figure S1. Heatmap of pairwise Spearman correlations of the 44 environmental variables.



Supplementary Figure S2. Heatmap of pairwise Spearman correlations of the 24 environmental variables not considered highly correlated. Pairwise Spearman correlations were calculated and the variables with correlations higher than 0.75 were considered highly correlated and removed, considering the largest mean absolute values of the correlations.



Supplementary Figure S3. Box plots with the observed data of the significant environmental variables grouped by association. Whiskers represent the minimum and maximum values, the box the 25% and 75% quartiles, the line the median value, and the dots the outliers. **(A)** Chlorophyll-a/Phaeopigments ratio; **(B)** Redox: sediment redox potential (mV); **(C)** Carbonates: sediment content of carbonate; **(D)** Coarse Sand: sediment content of coarse sand grain fraction; **(E)** pH: sediment pH; **(F)** Phaeopigments: sediment concentration of phaeopigments (μg/g).