

Species that share traits do not necessarily form distinct and universally applicable functional effect groups

Fiona Murray^{1,2,*}, Alex Douglas^{1,**}, Martin Solan^{1,3,**}

¹Institute of Biological and Environmental Sciences, University of Aberdeen, Zoology Building, Tillydrone Avenue, Aberdeen AB24 2TZ, UK

²Present address: Centre for Marine Biodiversity and Biotechnology, School of Life Sciences, Heriot-Watt University, Edinburgh EH14 4AS, UK

³Present address: Ocean and Earth Science, National Oceanography Centre, Southampton, University of Southampton, Waterfront Campus, European Way, Southampton SO14 3ZH, UK

*Corresponding author: fiona.murray25@gmail.com

**These authors contributed equally to this work

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Supplement. Biomass data for each species and summaries of the statistical models used

Biomass data

Table S1. Mean and standard deviation values for biomass of each species

Species	Abbreviation	Biomass per aquarium (g, mean ± SD)
<i>Angulus tenuis</i>	<i>At</i>	2.533±0.224
<i>Alitta virens</i>	<i>Av</i>	5.414±0.317
<i>Crangon crangon</i>	<i>Cc</i>	0.179±0.092
<i>Cerastoderma edule</i>	<i>Ce</i>	15.994±1.310
<i>Hediste diversicolor</i>	<i>Hd</i>	1.114±0.186
<i>Nephtys hombergii</i>	<i>Nh</i>	0.966±0.294
<i>Pagurus bernhardus</i>	<i>Pb</i>	0.329±0.117

Structure of minimum adequate models

Summary of the statistical analyses of the 9 mixed effects models. For each model, the initial and final mixed effects models are listed with a comparison of the standardised residuals versus fitted values and a summary of the coefficient table where appropriate.

Model S1. Form of initial mixed effects model and the final model with variance covariate structure (incorporating species identity) for the effects of species identity on maximum luminophore depth (Lum_{max}) fitted using restricted maximum likelihood estimation.

Initial model: (a) $Lum_{max} \sim \text{species identity} + \text{random} = \text{run}$

Final model: (b) $Lum_{max} \sim \text{species identity} + \text{random} = \text{run}$,
weights = varIdent(form=~1|as.factor(species identity)), method= 'REML'

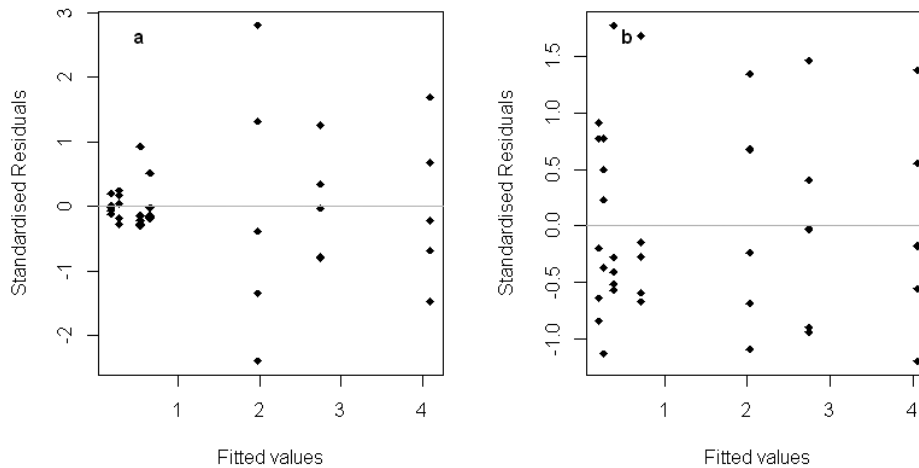


Fig. S1. Standardized residuals versus fitted values for the initial mixed effects model (a) and the minimum adequate model (b)

Table S2. Coefficient table for Model S1. Coefficients (\pm SE) and t -values are presented.

Significance (p) values are in parentheses (headers indicate the baseline). See Table S1 for species abbreviations

	<i>At</i>	<i>Av</i>	<i>Cc</i>	<i>Ce</i>	<i>Hd</i>	<i>Nh</i>
<i>Av</i>	2.535 \pm 0.313 8.109 (0.001)	–	–	–	–	–
<i>Cc</i>	0.058 \pm 0.060 0.972 (0.341)	–2.476 \pm 0.311 –7.956 ($<$ 0.001)	–	–	–	–
<i>Ce</i>	0.179 \pm 0.180 0.996 (0.329)	–2.356 \pm 0.354 –6.655 ($<$ 0.001)	0.121 \pm 0.170 0.712 (0.483)	–	–	–
<i>Hd</i>	3.840 \pm 0.396 9.686 ($<$ 0.001)	1.305 \pm 0.502 2.603 (0.016)	3.782 \pm 0.396 9.545 ($<$ 0.001)	3.661 \pm 0.431 8.495 ($<$ 0.001)	–	–
<i>Nh</i>	1.822 \pm 0.687 2.652 (0.014)	–0.713 \pm 0.753 –0.947 (0.354)	1.764 \pm 0.688 2.564 (0.017)	1.643 \pm 0.708 2.319 (0.029)	–2.018 \pm 0.792 –2.550 (0.018)	–
<i>Pb</i>	0.510 \pm 0.088 5.798 ($<$ 0.001)	–2.024 \pm 0.318 –6.356 ($<$ 0.001)	0.452 \pm 0.078 5.764 ($<$ 0.001)	0.331 \pm 0.187 1.773 (0.089)	–3.330 \pm 0.402 –8.287 ($<$ 0.001)	–1.312 \pm 0.691 –1.899 (0.070)

Model S2. Form of initial mixed effects model and the minimum adequate model with variance covariate structure (incorporating species identity) for the effects of species identity on mean maximum luminophore depth (Lum_{mean}) fitted using restricted maximum likelihood estimation. Initial model: (a) $Lum_{mean} \sim \text{species identity} + \text{random} = \text{run}$

Final model: (b) $Lum_{mean} \sim \text{species identity} + \text{random} = \text{run}$,
weights = `varIdent(form=~1|as.factor(species identity)), method='REML'`

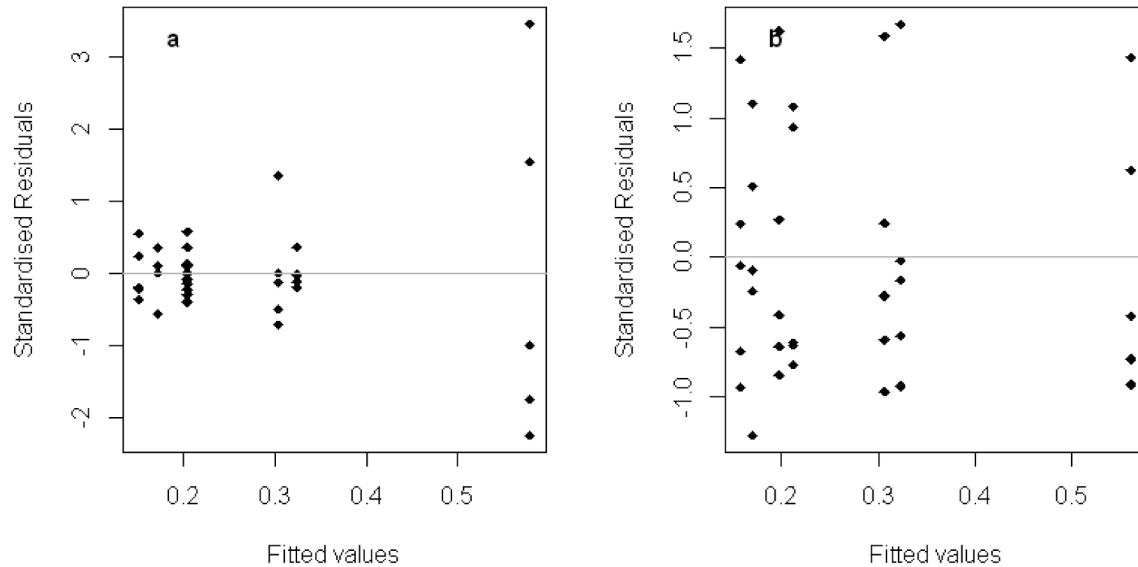


Fig. S2. Standardized residuals versus fitted values the initial mixed effects model (a) and the minimum adequate model (b)

Table S3. Coefficient table for Model S2. Coefficients (\pm SE) and t -values are presented. Significance (p) values are in parentheses (headers indicate the baseline). See Table S1 for species abbreviations

	<i>At</i>	<i>Av</i>	<i>Cc</i>	<i>Ce</i>	<i>Hd</i>	<i>Nh</i>
<i>Av</i>	0.2 \pm 0.04 4 (0.02)	–	–	–	–	–
<i>Cc</i>	0.0 \pm 0.03 1 (0.20)	–0.1 \pm 0.04 –3 (0.02)	–	–	–	–
<i>Ce</i>	0.0 \pm 0.04 1 (0.51)	–0.1 \pm 0.5 –3 (0.02)	0.0 \pm 0.04 0 (0.7)	–	–	–
<i>Hd</i>	0.4 \pm 0.17 2 (0.03)	0.2 \pm 0.18 1 (0.25)	0.3 \pm 0.18 2 (0.06)	0.4 \pm 0.18 2 (0.05)	–	–
<i>Nh</i>	0.1 \pm 0.06 2 (0.04)	0.0 \pm 0.07 0 (0.8)	0.1 \pm 0.07 1 (0.17)	0.1 \pm 0.07 2 (0.14)	–0.3 \pm 0.2 –1 (0.18)	–
<i>Pb</i>	0.0 \pm 0.03 0 (0.65)	–0.2 \pm 0.04 –4 (0.0006)	–0.1 \pm 0.03 –2 (0.08)	0.0 \pm 0.04 –1 (0.34)	–0.4 \pm 0.2 –2 (0.03)	–0.15 \pm 0.06 –2 (0.03)

Model S3. Form of initial mixed effects model and the minimum adequate model with variance covariate structure (incorporating species identity) for the effects of species identity on median maximum luminophore depth (Lum_{med}) fitted using restricted maximum likelihood estimation.

Initial model: (a) $Lum_{med} \sim \text{species identity} + \text{random} = \text{run}$

Final model: (b) $Lum_{med} \sim \text{species identity} + \text{random} = \text{run}$,
weights = varIdent(form= ~ 1 | as.factor(species identity)), method= 'REML'

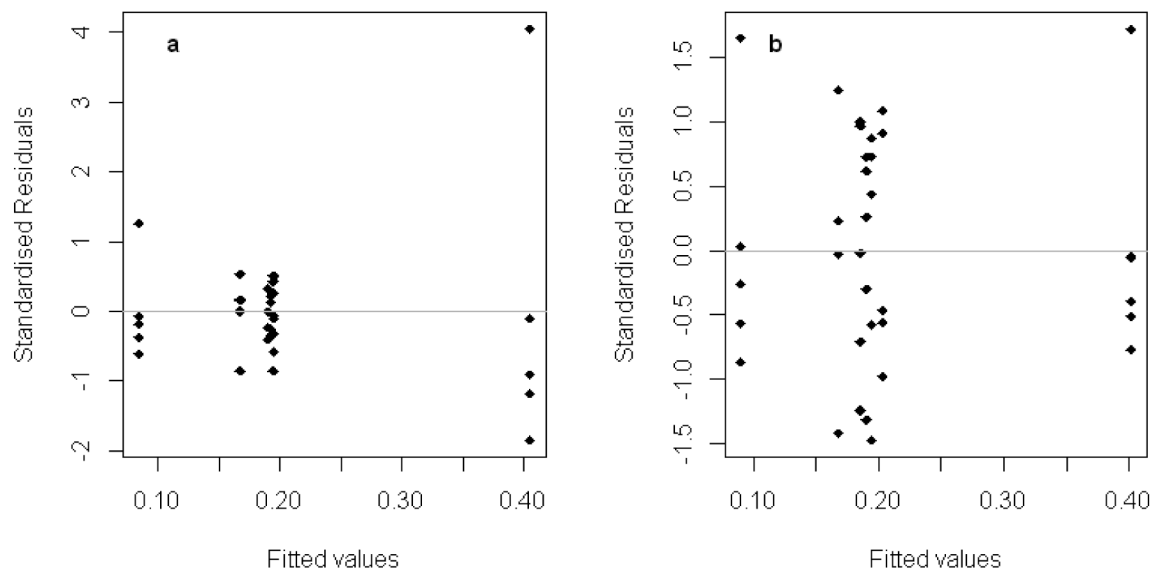


Fig. S3. Standardized residuals versus fitted values the initial mixed effects model (a) and the minimum adequate model (b)

Model S4. Form of initial mixed effects model and the minimum adequate model with variance covariate structure (incorporating species identity) for the effects of species identity on rugosity of the lower extent of the mixed layer (Lum_{rug}) fitted using restricted maximum likelihood estimation.

Initial model: (a) $Lum_{rug} \sim \text{species identity} + \text{random} = \text{run}$

Final model: b) $Lum_{rug} \sim \text{species identity} + \text{random} = \text{run}$,
weights = `varIdent(form=~1|as.factor(species identity)), method='REML'`

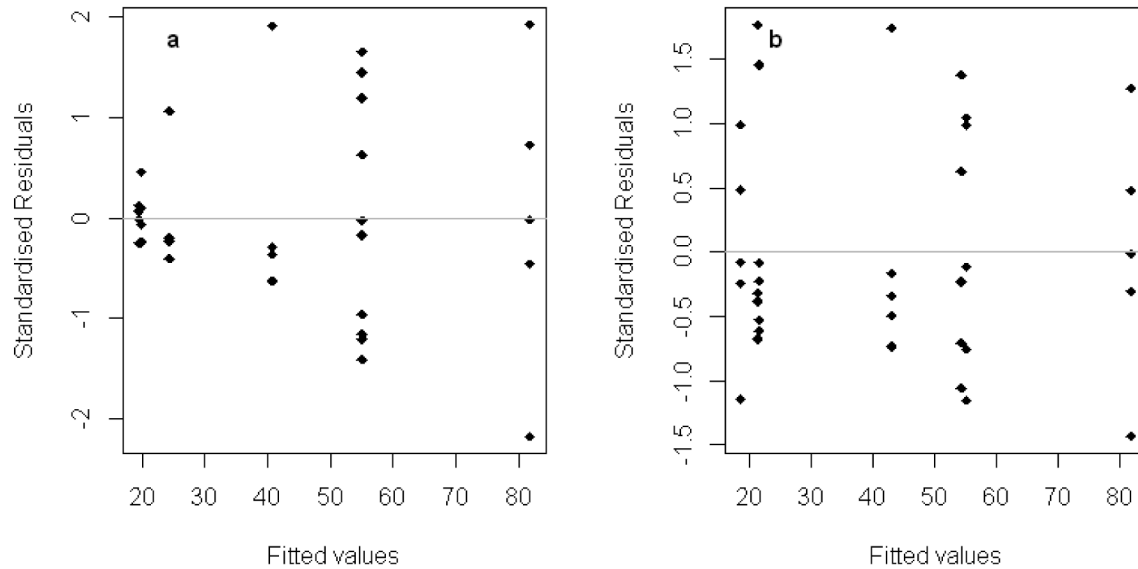


Fig. S4. Standardized residuals versus fitted values the initial mixed effects model (a) and the minimum adequate model (b)

Table S4. Coefficient table for Model S4. Coefficients (\pm SE) and t -values are presented. Significance (p) values are in parentheses (headers indicate the baseline). See Table S1 for species abbreviations

	<i>At</i>	<i>Av</i>	<i>Cc</i>	<i>Ce</i>	<i>Hd</i>	<i>Nh</i>
<i>Av</i>	22 \pm 3 6 (0.00)	–	–	–	–	–
<i>Cc</i>	–3 \pm 4 –1 (0.39)	–63 \pm 21 –3 (0.005)	–	–	–	–
<i>Ce</i>	0 \pm 9 0 (0.97)	–61 \pm 22 –3 (0.01)	3 \pm 8 0 (0.73)	–	–	–
<i>Hd</i>	34 \pm 18 2 (0.07)	–27 \pm 27 –1 (0.3)	37 \pm 18 2 (0.05)	34 \pm 19 1.8 (0.09)	–	–
<i>Nh</i>	21 \pm 14 2 (0.13)	–39 \pm 24 –2 (0.1)	25 \pm 14 2 (0.09)	22 \pm 16 1.4 (0.18)	–12 \pm 22 –0.6 (0.587)	–
<i>Pb</i>	33 \pm 16 2 (0.05)	–27 \pm 26 –1 (0.3)	36 \pm 16 2 (0.03)	33 \pm 17 1.9 (0.07)	–1 \pm 23 0.0 (0.974)	11 \pm 20 1 (0.585)

Model S5. Form of initial mixed effects model and the minimum adequate model with variance covariate structure (incorporating species identity) for the effects of species identity on bioirrigation ($\Delta[\text{Br}^-]$) fitted using restricted maximum likelihood estimation.

Initial model: (a) $\Delta[\text{Br}^-] \sim \text{species identity} + \text{random} = \text{run}$

Final model: (b) $\Delta[\text{Br}^-] \sim \text{species identity} + \text{random} = \text{run}$,
weights = varIdent(form= ~ 1 |as.factor(species identity)), method= 'REML'

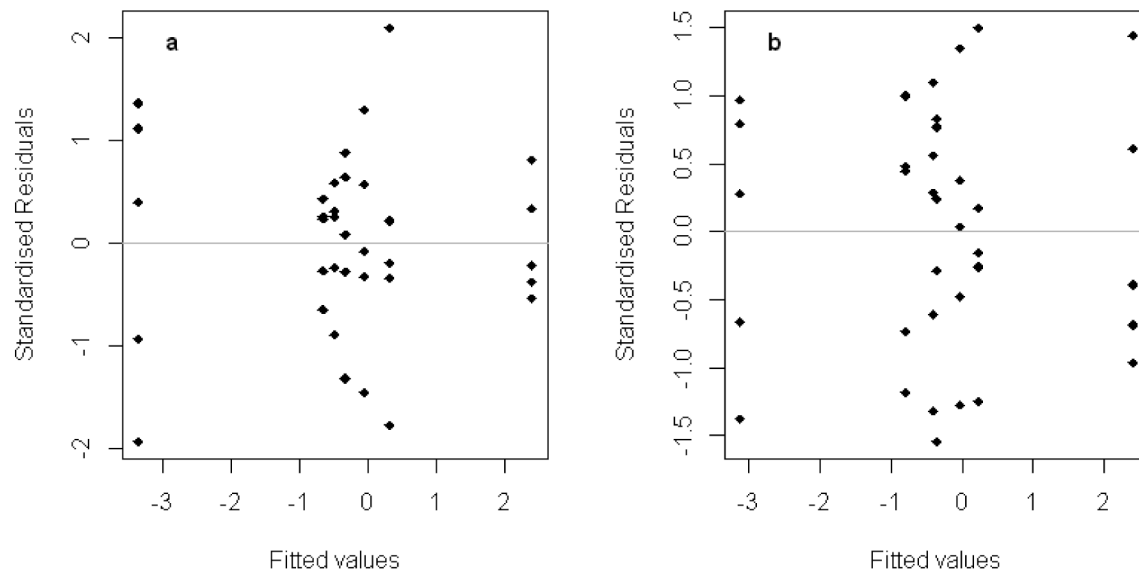


Fig. S5. Standardized residuals versus fitted values the initial mixed effects model (a) and the minimum adequate model (b)

Table S5. Coefficient table for Model S5. Coefficients (\pm SE) and t -values are presented. Significance (p) values are in parentheses (headers indicate the baseline). See Table S1 for species abbreviations

	<i>At</i>	<i>Av</i>	<i>Cc</i>	<i>Ce</i>	<i>Hd</i>	<i>Nh</i>
<i>Av</i>	2.168 \pm 1.542 1.406 (0.233)	–	–	–	–	–
<i>Cc</i>	–0.260 \pm 1.629 –0.160 (0.875)	–2.428 \pm 1.224 –1.983 (0.059)	–	–	–	–
<i>Ce</i>	–3.355 \pm 1.892 –1.774 (0.089)	–5.523 \pm 1.532 –3.605 (0.002)	–3.095 \pm 1.567 –1.976 (0.060)	–	–	–
<i>Hd</i>	–0.641 \pm 1.434 –0.447 (0.659)	–2.808 \pm 0.994 –2.826 (0.010)	–0.381 \pm 1.123 –0.339 (0.738)	2.715 \pm 1.479 1.835 (0.079)	–	–
<i>Nh</i>	–1.027 \pm 1.387 –0.741 (0.466)	–3.195 \pm 0.924 –3.459 (0.002)	–0.767 \pm 1.070 –0.717 (0.480)	2.328 \pm 1.434 1.623 (0.118)	–0.387 \pm 0.764 –0.506 (0.678)	–
<i>Pb</i>	–0.588 \pm 1.563 –0.376 (0.710)	–2.756 \pm 1.159 –2.377 (0.026)	–0.328 \pm 1.254 –0.262 (0.796)	2.767 \pm 1.593 1.737 (0.095)	0.053 \pm 1.018 0.052 (0.959)	0.439 \pm 0.967 0.454 (0.654)

Model S6. Form of initial mixed effects model and the minimum adequate model with variance covariate structure (incorporating species identity) for the effects of species identity on the change in ammonium concentration ($\Delta[\text{NH}_4\text{-N}]$) fitted using restricted maximum likelihood estimation.

Initial model: (a) $\Delta[\text{NH}_4\text{-N}] \sim \text{species identity} + \text{random} = \text{run}$

Final model: (b) $\Delta[\text{NH}_4\text{-N}] \sim \text{species identity} + \text{random} = \text{run}$,
weights = varIdent(form= ~ 1 |as.factor(species identity)), method= 'REML'

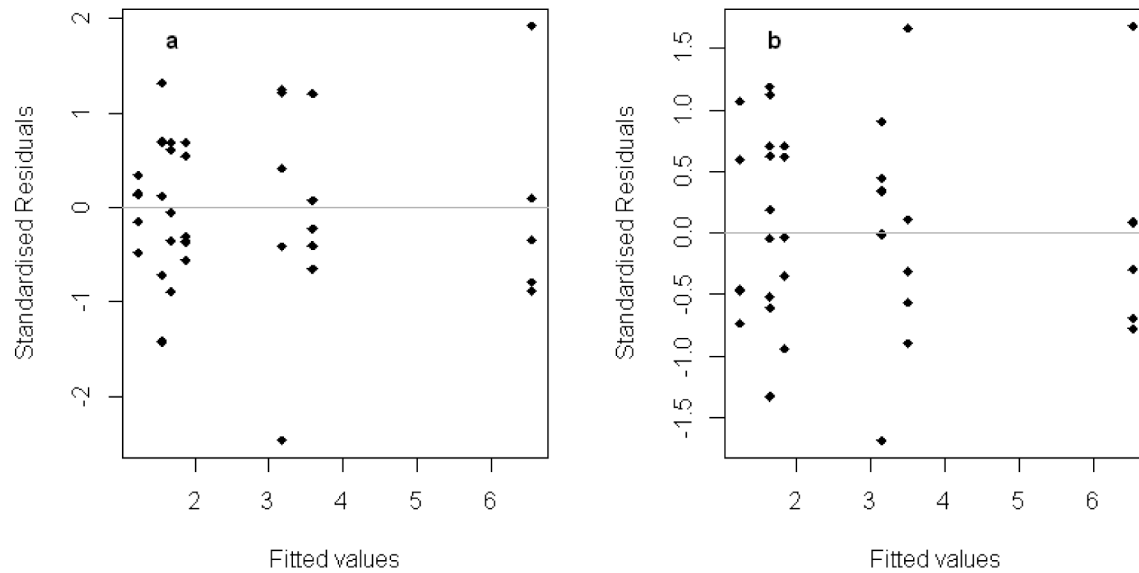


Fig. S6. Standardized residuals versus fitted values the initial mixed effects model (a) and the minimum adequate model (b)

Table S6. Coefficient table for Model S6. Coefficients (\pm SE) and t -values are presented. Significance (p) values are in parentheses (headers indicate the baseline). See Table S1 for species abbreviations

	<i>At</i>	<i>Av</i>	<i>Cc</i>	<i>Ce</i>	<i>Hd</i>	<i>Nh</i>
<i>Av</i>	4.682 \pm 0.442 10.592 (<0.001)	–	–	–	–	–
<i>Cc</i>	–0.597 \pm 0.065 –9.210 (<0.001)	–5.279 \pm 0.443 –11.928 (0)	–	–	–	–
<i>Ce</i>	1.664 \pm 0.142 11.756 (<0.001)	–3.018 \pm 0.459 –6.575 (<0.001)	2.261 \pm 0.126 17.913 (<0.001)	–	–	–
<i>Hd</i>	1.308 \pm 0.293 4.464 (<0.001)	–3.374 \pm 0.525 –6.387 (<0.001)	1.905 \pm 0.296 6.441 (<0.001)	–0.356 \pm 0.321 –1.107 (0.279)	–	–
<i>Nh</i>	–0.190 \pm 0.115 –1.645 (0.113)	–4.872 \pm 0.455 –10.715 (<0.001)	0.407 \pm 0.127 3.202 (0.004)	–1.854 \pm 0.179 –10.367 (<0.001)	–1.498 \pm 0.313 –4.788 (<0.001)	–
<i>Pb</i>	–0.193 \pm 0.196 –0.988 (0.333)	–4.876 \pm 0.480 –10.149 (<0.001)	0.403 \pm 0.196 2.057 (0.051)	–1.857 \pm 0.233 –7.971 (<0.001)	–1.502 \pm 0.349 –4.305 (<0.001)	–0.004 \pm 0.223 –0.016 (0.988)

Model S7. Form of initial mixed effects model and the minimum adequate model with variance covariate structure (incorporating species identity) for the effects of species identity on change in combined nitrate and nitrite concentration ($\Delta[\text{NO}_x\text{-N}]$) fitted using restricted maximum likelihood estimation.

Initial model: (a) $\Delta[\text{NO}_x\text{-N}] \sim \text{species identity} + \text{random} = \text{run}$

Final model: (b) $\Delta[\text{NO}_x\text{-N}] \sim \text{species identity} + \text{random} = \text{run}$,
weights = varIdent(form= ~ 1 |as.factor(species identity)), method= 'REML'

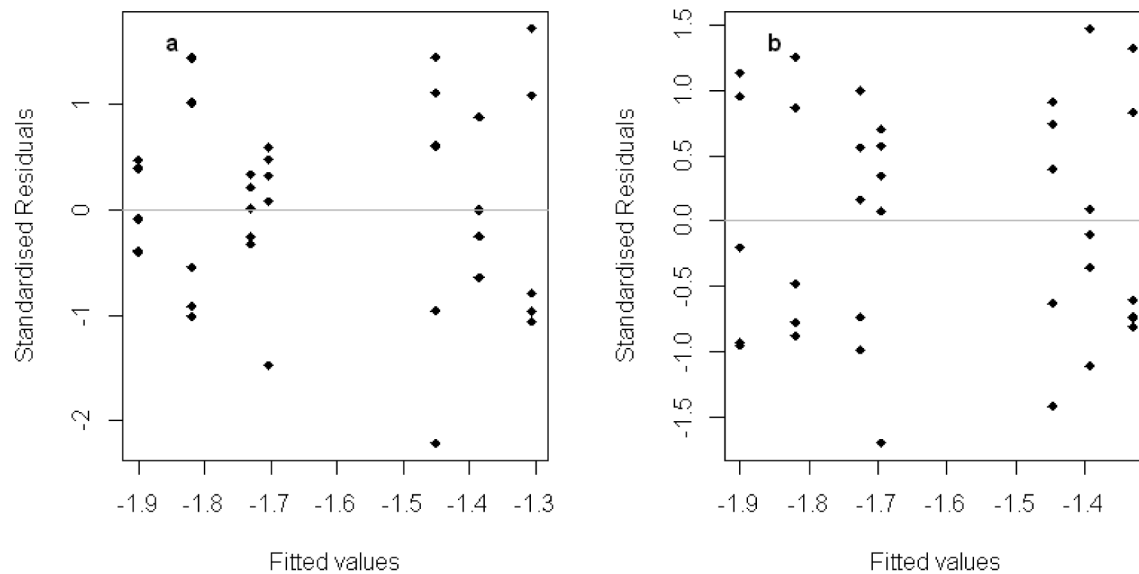


Fig. S7. Standardized residuals versus fitted values the initial mixed effects model (a) and the minimum adequate model (b)

Table S7. Coefficient table for Model S7. Coefficients (\pm SE) and t -values are presented. Significance (p) values are in parentheses (headers indicate the baseline). See Table S1 for species abbreviations

	<i>At</i>	<i>Av</i>	<i>Cc</i>	<i>Ce</i>	<i>Hd</i>	<i>Nh</i>
<i>Av</i>	-0.175 \pm 0.100 -1.749 (0.155)	-	-	-	-	-
<i>Cc</i>	0.333 \pm 0.082 4.039 (0.001)	0.508 \pm 0.113 4.481 (<0.001)	-	-	-	-
<i>Ce</i>	0.396 \pm 0.168 2.353 (0.027)	0.571 \pm 0.183 3.126 (0.005)	0.063 \pm 0.167 0.376 (0.710)	-	-	-
<i>Hd</i>	-0.094 \pm 0.140 -0.677 (0.505)	0.801 \pm 0.163 0.495 (0.626)	-0.427 \pm 0.153 -2.798 (0.010)	-0.490 \pm 0.212 -2.315 (0.030)	-	-
<i>Nh</i>	0.030 \pm 0.108 0.282 (0.781)	0.205 \pm 0.137 1.949 (0.148)	-0.302 \pm 0.126 -2.406 (0.024)	-0.365 \pm 0.193 -1.896 (0.070)	0.125 \pm 0.170 0.735 (0.470)	-
<i>Pb</i>	0.279 \pm 0.183 1.527 (0.140)	0.454 \pm 0.200 2.267 (0.033)	-0.054 \pm 0.190 -0.283 (0.780)	-0.117 \pm 0.241 -0.484 (0.633)	0.373 \pm 0.223 1.674 (0.107)	0.249 \pm 0.206 1.208 (0.239)

Model S8. Form of initial mixed effects model and the minimum adequate model with variance covariate structure (incorporating species identity) for the effects of species identity on change in phosphate concentration ($\Delta[\text{PO}_4\text{-P}]$) fitted using restricted maximum likelihood estimation.

Initial model: (a) $\Delta[\text{PO}_4\text{-P}] \sim \text{species identity} + \text{random} = \text{run}$

Final model: (b) $\Delta[\text{PO}_4\text{-P}] \sim \text{species identity} + \text{random} = \text{run}$,
weights = varIdent(form= ~ 1 |as.factor(species identity)), method= 'REML'

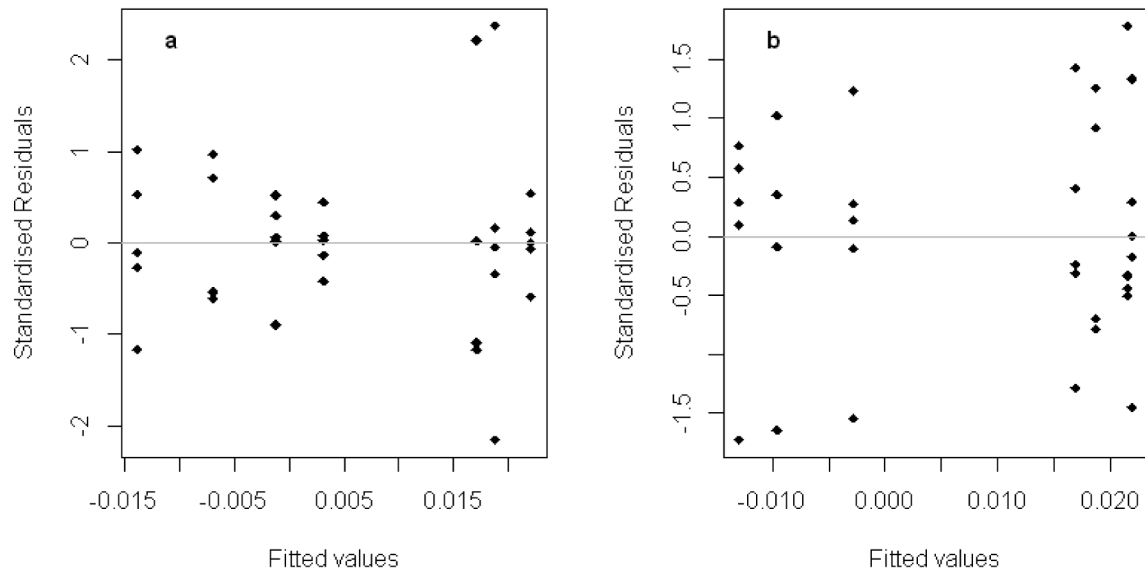


Fig. S8. Standardized residuals versus fitted values the initial mixed effects model (a) and the minimum adequate model (b)

Table S8. Coefficient table for Model S8. Coefficients (\pm SE) and t -values are presented. Significance (p) values are in parentheses (headers indicate the baseline). See Table S1 for species abbreviations

	<i>At</i>	<i>Av</i>	<i>Cc</i>	<i>Ce</i>	<i>Hd</i>	<i>Nh</i>
<i>Av</i>	0.032 \pm 0.008 3.967 (0.017)	–	–	–	–	–
<i>Cc</i>	0.031 \pm 0.029 1.076 (0.293)	–0.000 \pm 0.030 –0.013 (0.990)	–	–	–	–
<i>Ce</i>	0.028 \pm 0.015 1.916 (0.067)	–0.003 \pm 0.017 –0.193 (0.849)	–0.003 \pm 0.032 –0.086 (0.932)	–	–	–
<i>Hd</i>	0.007 \pm 0.022 0.302 (0.765)	–0.025 \pm 0.024 –1.047 (0.306)	–0.024 \pm 0.037 –0.667 (0.511)	–0.023 \pm 0.027 –0.806 (0.428)	–	–
<i>Nh</i>	–0.003 \pm 0.005 –0.670 (0.509)	–0.035 \pm 0.009 –3.886 (0.001)	–0.035 \pm 0.029 –1.181 (0.249)	–0.032 \pm 0.015 –2.064 (0.050)	–0.010 \pm 0.023 0.446 (0.660)	–
<i>Pb</i>	0.027 \pm 0.041 0.641 (0.528)	–0.005 \pm 0.042 –0.119 (0.907)	–0.005 \pm 0.051 –0.091 (0.928)	–0.002 \pm 0.044 –0.041 (0.968)	0.020 \pm 0.047 0.420 (0.678)	0.030 \pm 0.042 0.719 (0.479)

Model S9. Form of initial mixed effects model and the minimum adequate model with variance covariate structure (incorporating species identity) for the effects of species identity on change in silicate concentration ($\Delta[\text{SiO}_2\text{-Si}]$) fitted using restricted maximum likelihood estimation.

Initial model: (a) $\Delta[\text{SiO}_2\text{-Si}] \sim \text{species identity} + \text{random} = \text{run}$

Final model: (b) $\Delta[\text{SiO}_2\text{-Si}] \sim \text{species identity} + \text{random} = \text{run}$,
weights = varIdent(form= ~ 1 |as.factor(species identity)), method= 'REML'

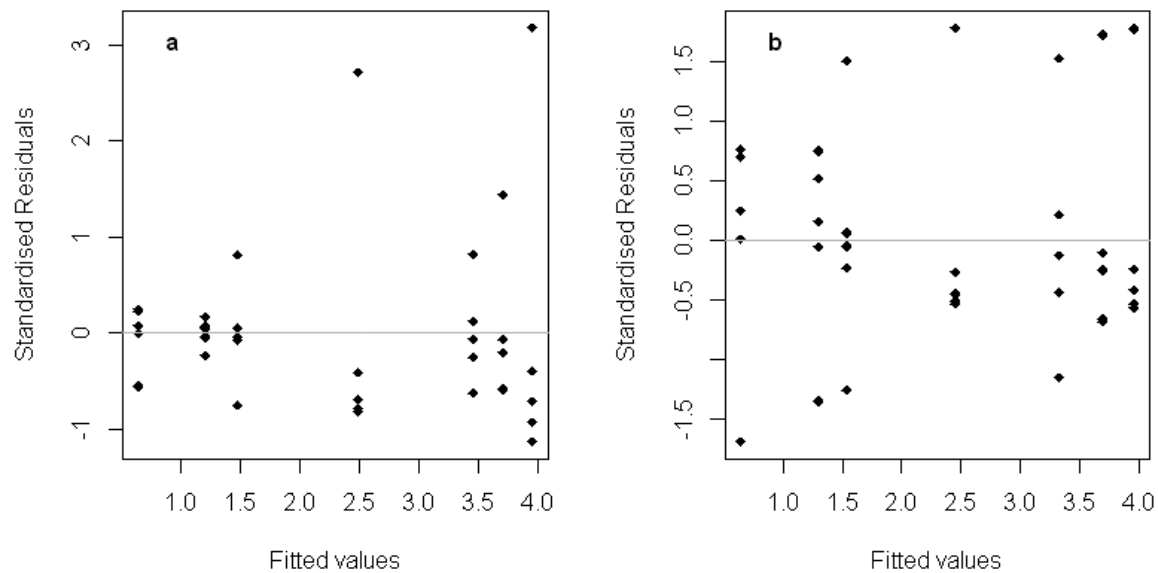


Fig. S9. Standardized residuals versus fitted values the initial mixed effects model (a) and the minimum adequate model (b)

Table S9. Coefficient table for Model S9. Coefficients (\pm SE) and t -values are presented. Significance (p) values are in parentheses (headers indicate the baseline). See Table S1 for species abbreviations

	<i>At</i>	<i>Av</i>	<i>Cc</i>	<i>Ce</i>	<i>Hd</i>	<i>Nh</i>
<i>Av</i>	-3.059 \pm 1.242 -2.462 (0.070)	-	-	-	-	-
<i>Cc</i>	-2.399 \pm 1.140 -2.104 (0.046)	0.659 \pm 0.562 1.173 (0.253)	-	-	-	-
<i>Ce</i>	-1.245 \pm 2.185 -0.570 (0.574)	1.813 \pm 1.945 0.932 (0.361)	1.154 \pm 1.869 0.617 (0.543)	-	-	-
<i>Hd</i>	-0.371 \pm 1.308 -0.283 (0.779)	2.688 \pm 0.867 3.099 (0.005)	2.029 \pm 0.709 2.863 (0.009)	0.875 \pm 1.995 0.438 (0.665)	-	-
<i>Nh</i>	0.260 \pm 2.435 0.107 (0.916)	3.319 \pm 2.230 1.489 (0.150)	2.659 \pm 2.177 1.222 (0.234)	1.505 \pm 2.866 0.525 (0.604)	0.631 \pm 2.270 0.278 (0.784)	-
<i>Pb</i>	-2.161 \pm 1.290 -1.676 (0.107)	0.898 \pm 0.828 1.084 (0.290)	0.238 \pm 0.647 0.369 (0.716)	-0.915 \pm 1.975 -0.464 (0.647)	-1.790 \pm 0.931 -1.922 (0.067)	-2.421 \pm 2.257 -1.073 (0.294)