

# Application of non-linear quantile regression to macrozoobenthic species distribution modelling: comparing two contrasting basins

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**Supplement 1.** Tables S1–S2: model AIC values; Tables S3–S4: summary tables of community indices data; Tables S5–S6: summary tables of taxa biomass data; Tables S7–S10: summary tables of community indices data excluded from our analysis; Tables S11–S14: summary tables of taxa biomass data excluded from our analysis; Figs. S1–S3: examples using different proxies than d50 for sediment composition

Table S1. Average AICc value scored from the quantile regression models of community indices for different spline degrees.

Spline degree	2		3		4		5	
Basin	Oosterschelde	Westerschelde	Oosterschelde	Westerschelde	Oosterschelde	Westerschelde	Oosterschelde	Westerschelde
Total biomass	11144	12867	11084	12851	11489	12853	11086	13250
Total density	9588	11905	9509	11868	9916	12654	9891	12638
Number of species	6358	7252	6342	7597	6332	7604	6329	7980
Margalef diversity	3952	3251	3935	3579	3925	3579	3524	3970

Table S2. Average AICc value scored from the quantile regression models of single taxa for different spline degrees.

Spline degree	2	3	4	5
Basin	Oosterschelde	Westerschelde	Oosterschelde	Westerschelde
<i>Scoloplos armiger</i>	9474	11201	9739	11217
Oligochaeta	8419	6781	8434	6441
<i>Heteromastus filiformis</i>	8639	10790	8516	10983
<i>Nephtys hombergii</i>	10179	11163	10347	11070
Phoxocephaloidea	8683	10298	8574	10393
<i>Aphelochaeta marioni</i>	8285	8600	8151	8420
<i>Pygospio elegans</i>	7670	8916	7681	8912
<i>Streblospio shrubsolii</i>	7641	4399	7736	3883
<i>Hydrobia ulvae</i>	10498	9535	10283	9422
<i>Capitella capitata</i>	8408	8421	8412	8258
<i>Macoma balthica</i>	10090	11179	9842	11196
<i>Nephtys cirrosa</i>	8853	10946	8828	10959
<i>Spiophanes bombyx</i>	8594	9515	8684	9395
<i>Eteone</i>	8203	8907	8079	8826
<i>Lanice conchilega</i>	10745	9737	10819	9415
<i>Crangon</i>	9365	8905	9225	8653
<i>Cerastoderma edule</i>	11135	11274	10894	11169
<i>Hediste diversicolor</i>	10333	9446	10067	9106
<i>Arenicola marina</i>	10562	11601	10250	11339
<i>Abra alba</i>	9645	7370	9681	7339
<i>Ensis</i>	11614	12333	11603	11994
<i>Spio</i>	7148	8196	7150	8025
<i>Notomastus latericeus</i>	10474	NA	10516	NA
Anaitides	9059	9245	9028	9167
<i>Corophium arenarium</i>	8913	9845	8911	9587

Table S3. Summary Westerschelde dataset (community indices, 1964 observations), % in columns refer to the quantiles of the biomass, (mg m<sup>-2</sup>), density (ind. m<sup>-2</sup>) species richness and Shannon-Wiener diversity distributions

Index	25%	50%	Mean	75%	80%	90%	95%	Max
Total biomass	46	435	6785	2146	3160	10820	24122	1125016
Abundance	67	267	2409	1533	2333	7200	12886	87267
Number of species	1	2	4	5	6	9	11	22
Shannon-Wiener diversity	0	1	1	1	1	2	2	2

Table S4. Summary Oosterschelde dataset (community indices, 1753 observations), % in columns refer to the quantiles of the biomass, (mg m<sup>-2</sup>), density (ind. m<sup>-2</sup>) species richness and Shannon-Wiener diversity distributions

Index	25%	50%	Mean	75%	80%	90%	95%	Max
Total biomass	894	3832	29972	18057	26680	72857	146226	1175517
Abundance	733	2000	5050	4867	5800	11400	19693	127200
Number of species	5	7	8	11	12	15	19	32
Shannon-Wiener diversity	1	1	1	2	2	2	2	3

Table S5. Summary Westerschelde dataset (taxa, 1964 observations), % in columns refer to the quantiles of the biomass ( $\text{mg m}^{-2}$ ) distributions

Taxon	25%	50%	Mean	75%	80%	90%	95%	Max
<i>Scoloplos armiger</i>	0	0	83	0	0	44	396	5133
<i>Oligochaeta</i>	0	0	15	0	0	4	26	2614
<i>Heteromastus filiformis</i>	0	0	457	171	300	1038	2361	23997
<i>Nephtys hombergii</i>	0	0	99	0	0	0	167	11053
Phoxocephaloidea	0	0	58	0	17	98	363	3052
<i>Aphelochaeta marioni</i>	0	0	35	0	0	13	116	3170
<i>Pygospio elegans</i>	0	0	36	0	0	39	155	3210
<i>Streblospio shrubsolii</i>	0	0	1	0	0	0	0	225
<i>Hydrobia ulvae</i>	0	0	32	0	0	15	98	8150
<i>Capitella capitata</i>	0	0	2	0	0	0	0	408
<i>Macoma balthica</i>	0	0	636	23	200	1796	3694	90141
<i>Nephtys cirrosa</i>	0	0	95	0	0	155	589	6017
<i>Spiophanes bombyx</i>	0	0	3	0	0	0	0	1310
<i>Eteone</i>	0	0	11	0	0	14	57	619
<i>Lanice conchilega</i>	0	0	62	0	0	0	0	69011
<i>Crangon</i>	0	0	12	0	0	0	41	2427
<i>Cerastoderma edule</i>	0	0	836	0	0	0	15	200325
<i>Hediste diversicolor</i>	0	0	201	0	0	28	962	22407
<i>Arenicola marina</i>	0	0	707	0	0	0	181	1089963
<i>Abra alba</i>	0	0	3	0	0	0	0	1780
<i>Ensis</i>	0	0	1585	0	0	0	0	329600
<i>Spio</i>	0	0	1	0	0	0	0	172
<i>Notomastus latericeus</i>	0	0	2	0	0	0	0	3175
Anaitides	0	0	5	0	0	0	0	1451
<i>Corophium arenarium</i>	0	0	14	0	0	0	17	3962

Table S6. Summary Oosterschelde dataset (taxa, 1753 observations), % in columns refer to the quantiles of the biomass ( $\text{mg m}^{-2}$ ) distributions

Taxon	25%	50%	Mean	75%	80%	90%	95%	Max
<i>Scoloplos armiger</i>	0	20	308	358	540	975	1473	5519
<i>Oligochaeta</i>	0	0	45	9	13	44	174	18605
<i>Heteromastus filiformis</i>	0	0	7	0	0	0	10	2030
<i>Nephtys hombergii</i>	0	0	427	514	688	1259	2145	9997
Phoxocephaloidea	0	0	28	0	0	58	160	1154
<i>Aphelochaeta marioni</i>	0	0	18	3	6	23	63	2651
<i>Pygospio elegans</i>	0	0	6	0	0	9	33	772
<i>Streblospio shrubsolii</i>	0	0	17	5	10	31	71	1502
<i>Hydrobia ulvae</i>	0	0	829	4	25	874	6096	52986
<i>Capitella capitata</i>	0	0	45	4	8	28	75	16616
<i>Macoma balthica</i>	0	0	71	0	0	0	25	6007
<i>Nephtys cirrosa</i>	0	0	64	0	11	219	402	2248
<i>Spiophanes bombyx</i>	0	0	36	17	37	120	207	1694
<i>Eteone</i>	0	0	7	0	0	3	20	5703
<i>Lanice conchilega</i>	0	0	1014	0	55	2327	6235	41356
<i>Crangon</i>	0	0	34	0	0	5	80	8596
<i>Cerastoderma edule</i>	0	0	2386	0	0	67	10406	281958
<i>Hediste diversicolor</i>	0	0	54	0	0	0	0	7240
<i>Arenicola marina</i>	0	0	477	0	0	0	1839	172263
<i>Abra alba</i>	0	0	83	0	0	26	228	16767
<i>Ensis</i>	0	0	6817	0	0	14	35844	482987
<i>Spio</i>	0	0	2	0	0	0	11	274
<i>Notomastus latericeus</i>	0	0	254	0	0	290	1685	24450
Anaitides	0	0	20	0	0	7	59	4350
<i>Corophium arenarium</i>	0	0	13	0	0	0	37	1461

Table S7. Summary of fine d50 outliers ( $\leq 42 \mu\text{m}$ , 19 observations) in the Westerschelde dataset (community indices), % in columns refer to the quantiles of the biomass, ( $\text{mg m}^{-2}$ ), density ( $\text{ind. m}^{-2}$ ) species richness and Shannon-Wiener diversity distributions

Index	25%	50%	Mean	75%	80%	90%	95%	Max
Total biomass	179	1893	15894	7442	13682	46141	65225	151345
Abundance	533	1533	1765	2867	3093	3507	3933	6333
Number of species	3	6	6	8	9	9	10	12
Shannon-Wiener diversity	1	1	1	2	2	2	2	2

Table S8. Summary of coarse d50 outliers ( $\geq 358 \mu\text{m}$ , 154 observations) in the Westerschelde dataset (community indices), % in columns refer to the quantiles of the biomass, ( $\text{mg m}^{-2}$ ), density ( $\text{ind. m}^{-2}$ ) species richness and Shannon-Wiener diversity distributions

Index	25%	50%	Mean	75%	80%	90%	95%	Max
Total biomass	0	28	468	284	485	1286	2435	12302
Abundance	67	133	236	200	267	580	957	2533
Number of species	1	1	2	2	2	3	4	12
Shannon-Wiener diversity	0	0	0	1	1	1	1	2

Table S9. Summary of fine d50 outliers ( $\leq 42 \mu\text{m}$ , 18 observations) in the Oosterschelde dataset (community indices), % in columns refer to the quantiles of the biomass, ( $\text{mg m}^{-2}$ ), density ( $\text{ind. m}^{-2}$ ) species richness and Shannon-Wiener diversity distributions

Index	25%	50%	Mean	75%	80%	90%	95%	Max
Total biomass	42	429	55575	4192	5390	152212	474130	498939
Abundance	67	2433	3030	3000	4147	6440	8837	16600
Number of species	0	3	4	6	7	8	10	15
Shannon-Wiener diversity	0	1	1	1	1	2	2	2

Table S10. Summary of coarse d50 outliers ( $\geq 358 \mu\text{m}$ , 18 observations) in the Oosterschelde dataset (community indices), % in columns refer to the quantiles of the biomass, ( $\text{mg m}^{-2}$ ), density ( $\text{ind. m}^{-2}$ ) species richness and Shannon-Wiener diversity distributions

Index	25%	50%	Mean	75%	80%	90%	95%	Max
Total biomass	1921	3308	10581	5141	7931	19340	49092	92953
Abundance	883	1767	1930	2300	2613	3760	4860	6333
Number of species	7	12	11	14	15	18	20	20
Shannon-Wiener diversity	2	2	2	2	2	2	2	3

Table S11. Summary of fine d50 outliers ( $\leq 42 \mu\text{m}$ , 19 observations) in the Westerschelde dataset (taxa), % in columns refer to the quantiles of the biomass ( $\text{mg m}^{-2}$ ) distributions

Taxon	25%	50%	Mean	75%	80%	90%	95%	Max
<i>Scoloplos armiger</i>	0	0	4	0	2	5	15	66
<i>Oligochaeta</i>	0	0	14	13	21	26	52	161
<i>Heteromastus filiformis</i>	0	0	0	0	0	0	0	0
<i>Nephtys hombergii</i>	0	0	186	200	360	496	662	1576
Phoxocephaloidea	0	0	0	0	0	0	0	0
<i>Aphelochaeta marioni</i>	0	0	1	0	0	2	3	4
<i>Pygospio elegans</i>	0	0	0	0	0	0	0	0
<i>Streblospio shrubsolii</i>	0	1	52	7	12	94	313	626
<i>Hydrobia ulvae</i>	0	0	19	0	0	58	90	229
<i>Capitella capitata</i>	0	0	2	0	0	2	11	35
<i>Macoma balthica</i>	0	0	0	0	0	0	0	0
<i>Nephtys cirrosa</i>	0	0	0	0	0	0	0	0
<i>Spiophanes bombyx</i>	0	0	0	0	0	0	0	0
<i>Eteone</i>	0	0	3	0	0	0	8	51
<i>Lanice conchilega</i>	0	0	0	0	0	0	0	0
<i>Crangon</i>	0	0	1	0	0	2	6	10
<i>Cerastoderma edule</i>	0	0	0	0	0	0	0	0
<i>Hediste diversicolor</i>	0	0	0	0	0	0	0	0
<i>Arenicola marina</i>	0	0	0	0	0	0	0	0
<i>Abra alba</i>	0	0	2	0	0	0	6	38
<i>Ensis</i>	0	0	0	0	0	0	0	0
<i>Spio</i>	0	0	0	0	0	0	0	2
<i>Notomastus latericeus</i>	0	0	0	0	0	0	0	0
Anaitides	0	0	0	0	0	0	0	0
<i>Corophium arenarium</i>	0	0	0	0	0	0	0	0

Table S12. Summary of coarse d50 outliers ( $\geq 358 \mu\text{m}$ , 154 observations) in the Westerschelde dataset (taxa), % in columns refer to the quantiles of the biomass ( $\text{mg m}^{-2}$ ) distributions

Taxon	25%	50%	Mean	75%	80%	90%	95%	Max
<i>Scoloplos armiger</i>	0	0	3	0	0	0	3	162
<i>Oligochaeta</i>	0	0	1	0	0	3	5	13
<i>Heteromastus filiformis</i>	0	0	51	0	6	52	141	2502
<i>Nephtys hombergii</i>	0	0	31	0	0	0	0	4682
Phoxocephaloidea	0	0	4	0	0	0	13	280
<i>Aphelochaeta marioni</i>	0	0	1	0	0	0	0	91
<i>Pygospio elegans</i>	0	0	0	0	0	0	0	0
<i>Streblospio shrubsolii</i>	0	0	0	0	0	0	0	0
<i>Hydrobia ulvae</i>	0	0	0	0	0	0	0	15
<i>Capitella capitata</i>	0	0	1	0	0	0	0	77
<i>Macoma balthica</i>	0	0	93	0	0	0	0	8841
<i>Nephtys cirrosa</i>	0	0	135	0	0	55	706	5160
<i>Spiophanes bombyx</i>	0	0	0	0	0	0	0	0
<i>Eteone</i>	0	0	2	0	0	0	0	144
<i>Lanice conchilega</i>	0	0	2	0	0	0	0	149
<i>Crangon</i>	0	0	0	0	0	0	0	19
<i>Cerastoderma edule</i>	0	0	0	0	0	0	0	4
<i>Hediste diversicolor</i>	0	0	0	0	0	0	0	20
<i>Arenicola marina</i>	0	0	11	0	0	0	0	1649
<i>Abra alba</i>	0	0	0	0	0	0	0	69
<i>Ensis</i>	0	0	0	0	0	0	0	0
<i>Spio</i>	0	0	0	0	0	0	0	0
<i>Notomastus latericeus</i>	0	0	0	0	0	0	0	13
Anaitides	0	0	0	0	0	0	0	31
<i>Corophium arenarium</i>	0	0	0	0	0	0	0	0

Table S13. Summary of fine d50 outliers ( $\leq 42 \mu\text{m}$ , 18 observations) in the Oosterschelde dataset (taxa), % in columns refer to the quantiles of the biomass ( $\text{mg m}^{-2}$ ) distributions

Taxon	25%	50%	Mean	75%	80%	90%	95%	Max
<i>Scoloplos armiger</i>	0	0	4	0	2	5	15	66
<i>Oligochaeta</i>	0	0	14	13	21	26	52	161
<i>Heteromastus filiformis</i>	0	0	0	0	0	0	0	0
<i>Nephtys hombergii</i>	0	0	186	200	360	496	662	1576
Phoxocephaloidea	0	0	0	0	0	0	0	0
<i>Aphelochaeta marioni</i>	0	0	1	0	0	2	3	4
<i>Pygospio elegans</i>	0	0	0	0	0	0	0	0
<i>Streblospio shrubsolii</i>	0	1	52	7	12	94	313	626
<i>Hydrobia ulvae</i>	0	0	19	0	0	58	90	229
<i>Capitella capitata</i>	0	0	2	0	0	2	11	35
<i>Macoma balthica</i>	0	0	0	0	0	0	0	0
<i>Nephtys cirrosa</i>	0	0	0	0	0	0	0	0
<i>Spiophanes bombyx</i>	0	0	0	0	0	0	0	0
<i>Eteone</i>	0	0	3	0	0	0	8	51
<i>Lanice conchilega</i>	0	0	0	0	0	0	0	0
<i>Crangon</i>	0	0	1	0	0	2	6	10
<i>Cerastoderma edule</i>	0	0	0	0	0	0	0	0
<i>Hediste diversicolor</i>	0	0	0	0	0	0	0	0
<i>Arenicola marina</i>	0	0	0	0	0	0	0	0
<i>Abra alba</i>	0	0	2	0	0	0	6	38
<i>Ensis</i>	0	0	0	0	0	0	0	0
<i>Spio</i>	0	0	0	0	0	0	0	2
<i>Notomastus latericeus</i>	0	0	0	0	0	0	0	0
<i>Anaitides</i>	0	0	0	0	0	0	0	0
<i>Corophium arenarium</i>	0	0	0	0	0	0	0	0

Table S14. Summary of coarse d50 outliers ( $\geq 358 \mu\text{m}$ , 18 observations) in the Oosterschelde dataset (taxa), % in columns refer to the quantiles of the biomass ( $\text{mg m}^{-2}$ ) distributions

Taxon	25%	50%	Mean	75%	80%	90%	95%	Max
<i>Scoloplos armiger</i>	134	394	452	588	693	950	1204	1509
<i>Oligochaeta</i>	0	0	5	6	8	15	21	36
<i>Heteromastus filiformis</i>	0	0	1	0	0	0	2	15
<i>Nephtys hombergii</i>	0	125	1002	889	1769	2746	3600	7455
Phoxocephaloidea	0	0	3	0	0	0	8	51
<i>Aphelochaeta marioni</i>	0	1	6	8	8	12	20	63
<i>Pygospio elegans</i>	0	0	0	0	0	0	0	2
<i>Streblospio shrubsolii</i>	0	0	1	0	1	3	3	4
<i>Hydrobia ulvae</i>	0	0	15	0	6	16	48	226
<i>Capitella capitata</i>	0	0	7	0	0	4	21	109
<i>Macoma balthica</i>	0	0	0	0	0	0	0	0
<i>Nephtys cirrosa</i>	0	0	74	54	78	174	391	743
<i>Spiophanes bombyx</i>	0	10	28	35	41	105	109	120
<i>Eteone</i>	0	0	6	0	0	18	37	59
<i>Lanice conchilega</i>	0	0	1256	39	123	1031	5272	19321
<i>Crangon</i>	0	0	9	0	0	0	25	165
<i>Cerastoderma edule</i>	0	0	0	0	0	0	0	0
<i>Hediste diversicolor</i>	0	0	166	0	0	336	1232	1876
<i>Arenicola marina</i>	0	0	0	0	0	0	0	0
<i>Abra alba</i>	0	0	19	0	1	6	54	330
<i>Ensis</i>	0	0	6134	0	0	12340	45356	69287
<i>Spio</i>	0	0	7	0	0	16	48	81
<i>Notomastus latericeus</i>	0	0	133	0	0	56	470	2214
<i>Anaitides</i>	0	0	6	0	0	14	42	64
<i>Corophium arenarium</i>	0	0	1	0	0	0	3	22

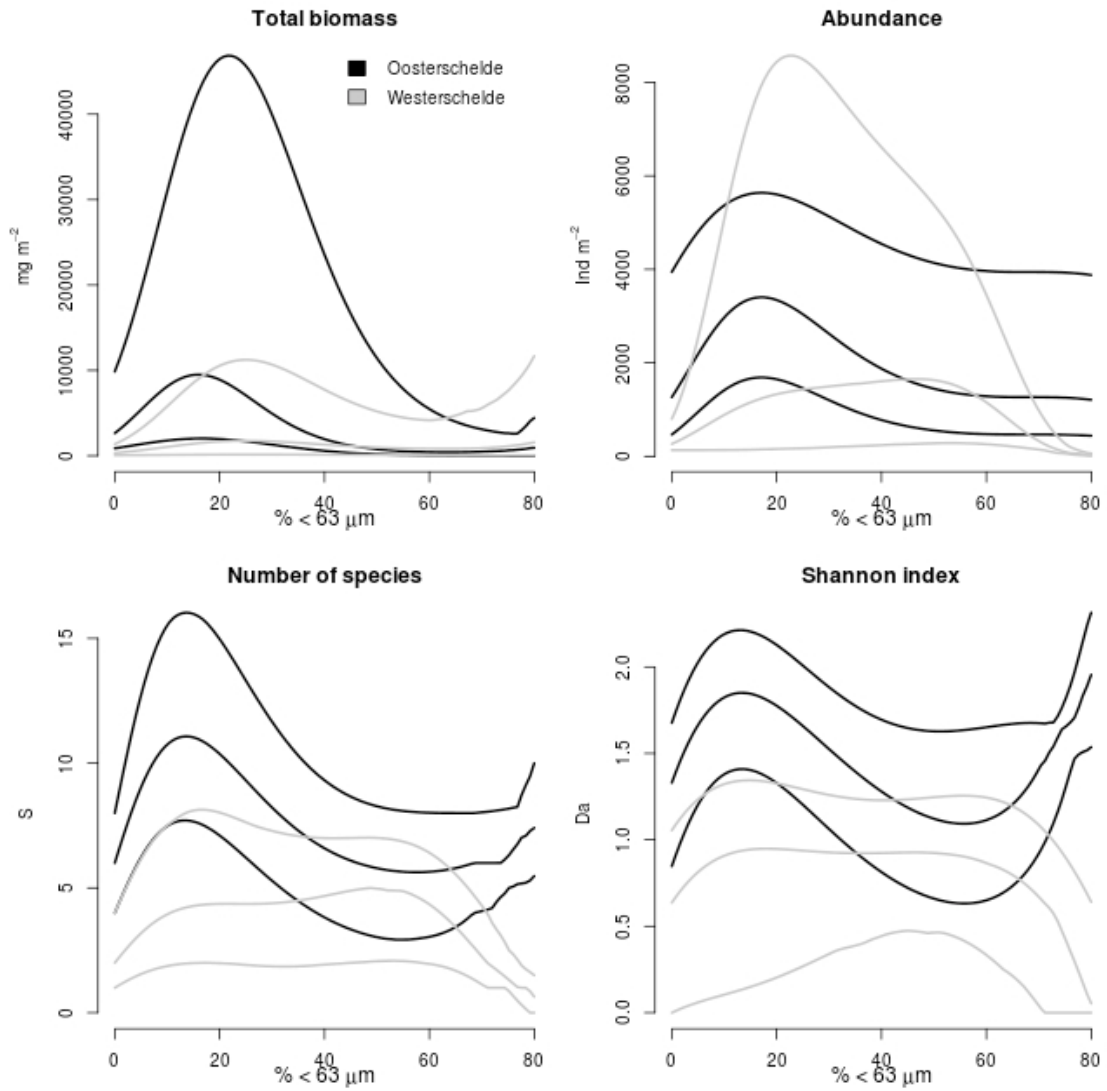


Fig. S1. Distribution of species richness, total biomass and ecological diversity along the % of mud gradient. The expected distributions are sketched using the 0.25, 0.5 and 0.75 quantiles.

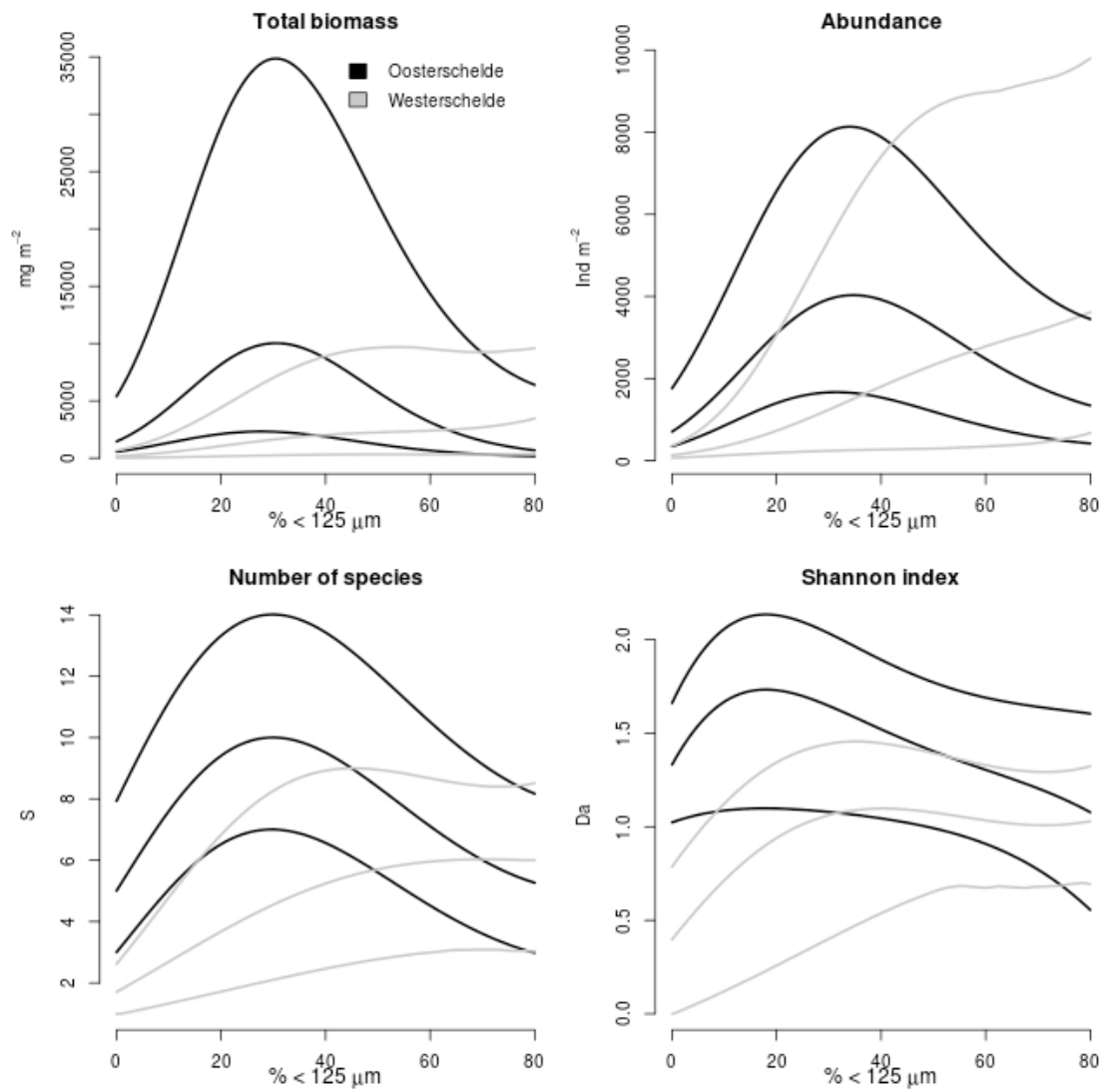


Fig. S2. Distribution of species richness, total biomass and ecological diversity along the % of fine sand gradient. The expected distributions are sketched using the 0.25, 0.5 and 0.75 quantiles.



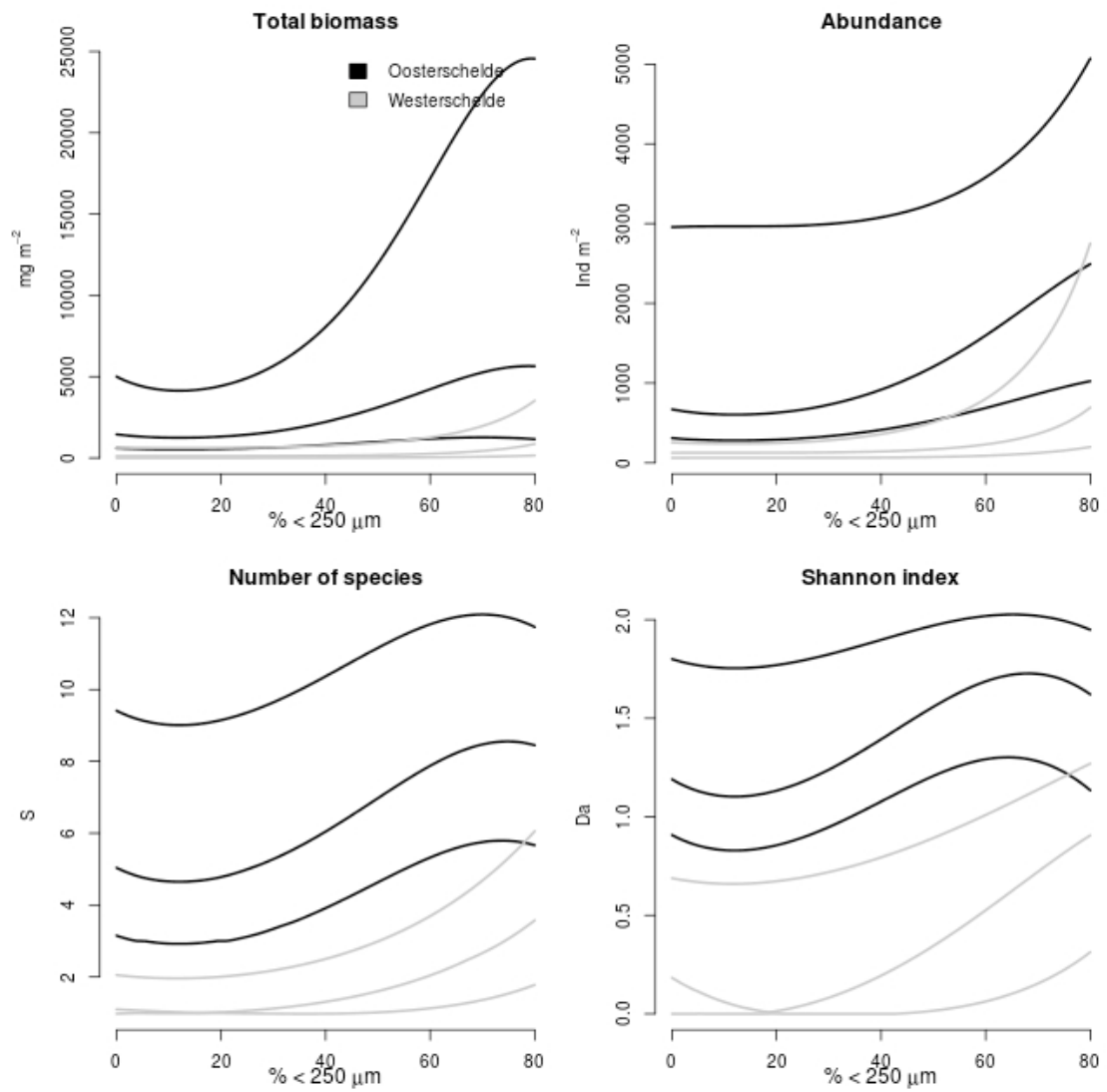


Fig. S3. Distribution of species richness, total biomass and ecological diversity along the % of medium sand gradient. The expected distributions are sketched using the 0.25, 0.5 and 0.75 quantiles.