

## SUPPLEMENTARY MATERIALS

### A. Number of samples taken during the experiments (Table S1)

**Table S1.** Number of samples taken during the experiments. Phytoplankton (PHYT): one sample per raceway was taken. Microphytobenthos (MPB) and sediment characteristics (SED): three enclosures per raceway. At the start of the experiment ( $t_0$ ), samples for microphytobenthos and sediment characteristics were taken from all enclosures (9 per raceway). For Experiment 1, in total 772 living cockles were sampled from the enclosures, which was almost 27% of the maximum number if all cockles in this experiment had survived during the experiment (being  $72 \times 40 = 2880$  individuals). For Experiment 2, 1091 living cockles were sampled from the enclosures, which is almost 38% of the maximum number if all cockles in this experiment had survived during the experiment.

Date	Day nr	Environmental conditions			Cockle performance indices			
		PHYT sampled	MPB sampled	SED sampled	Experiment 1		Experiment 2	
					seeded	sampled	seeded	sampled
2018-12-12	0		72	72	72			
2019-01-16	35		24	24		24		
2019-01-22	41	8						
2019-02-05	55	8						
2019-02-06	56						24	
2019-02-19	69	8						
2019-03-05	86	8						
2019-03-19	100	8						
2019-04-02	113	8						
2019-04-16	127	8						
2019-04-24	133		24	24		24	24	
2019-04-30	139	8						
2019-05-14	153	8						
2019-05-28	167	8						
2019-06-11	181	8						
2019-06-25	195	8						
2019-07-03	203		24	24		24	24	
2019-07-09	209	8						
2019-07-23	223	8						
2019-08-06	238	8						
2019-08-13	245		72	72				72
<b>SUM</b>		<b>120</b>	<b>216</b>	<b>216</b>	<b>72</b>	<b>72</b>	<b>72</b>	<b>72</b>

## B. RESULTS STATISTICAL ANALYSES

**Table S2.** The estimates, estimated degrees of freedom and approximate significance for intercepts and smoothers of the best statistical model for **(a)** phytoplankton (mg CHLa m<sup>-3</sup>), **(b)** microphytobenthos (µg CHLa g<sup>-1</sup>), **(c)** median grain size (µm) and **(d)** silt fraction (%) (see [Table 1](#) for description of models). Significance codes: '\*\*\*' < 0.001, '\*\*' < 0.01, '\*' < 0.05 and '.' < 0.1.

### a. Phytoplankton

Formula:

CHLa ~ s(Tid, RW)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	6.729	0.224	30.04	<2e-16 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(Tid,RW)	26.04	28.42	8.841	<2e-16 ***

R-sq.(adj) = 0.668    Deviance explained = 74%  
 GCV = 7.7724    Scale est. = 6.021    n = 120

### b. Microphytobenthos

Formula:

CHLa ~ factor(SamplingDate) + factor(RefVol)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	-0.4789	0.5400	-0.887	0.3761
factor(SamplingDate)2019-01-16	1.4155	0.7637	1.854	0.0652 .
factor(SamplingDate)2019-04-24	7.8177	0.7637	10.237	< 2e-16 ***
factor(SamplingDate)2019-07-03	7.5824	0.7637	9.929	< 2e-16 ***
factor(SamplingDate)2019-08-13	4.7042	0.5400	8.712	9.41e-16 ***
factor(RefVol)250	0.1069	0.6235	0.171	0.8640
factor(RefVol)450	3.0515	0.6235	4.894	1.98e-06 ***
factor(RefVol)600	5.7532	0.6235	9.227	< 2e-16 ***

R-sq.(adj) = 0.577    Deviance explained = 59.1%  
 GCV = 10.901    Scale est. = 10.497    n = 216

### c. Median grain size

Formula:

MedGS ~ factor(SamplingDate) + factor(RefVol)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	225.288	3.415	65.961	< 2e-16 ***
factor(SamplingDate)2019-01-16	-9.571	4.830	-1.981	0.0489 *
factor(SamplingDate)2019-04-24	-31.859	4.830	-6.596	3.44e-10 ***
factor(SamplingDate)2019-07-03	-30.717	4.830	-6.359	1.26e-09 ***
factor(SamplingDate)2019-08-13	-19.176	3.415	-5.615	6.26e-08 ***
factor(RefVol)250	1.665	3.944	0.422	0.6734
factor(RefVol)450	7.159	3.944	1.815	0.0709 .
factor(RefVol)600	-17.476	3.944	-4.431	1.51e-05 ***

R-sq.(adj) = 0.339    Deviance explained = 36%  
 GCV = 436.11    Scale est. = 419.96    n = 216

**d. Silt fraction (%)**

Formula:

Vol63 ~ factor(SamplingDate) + factor(RefVol) + factor(RWrank)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	-0.2402	1.1354	-0.212	0.83268	
factor(SamplingDate)2019-01-16	6.7972	1.4866	4.572	8.30e-06	***
factor(SamplingDate)2019-04-24	14.6397	1.4866	9.848	< 2e-16	***
factor(SamplingDate)2019-07-03	13.4206	1.4866	9.028	< 2e-16	***
factor(SamplingDate)2019-08-13	9.2647	1.0512	8.813	4.98e-16	***
factor(RefVol)250	3.5013	1.2138	2.885	0.00433	**
factor(RefVol)450	7.5726	1.2138	6.239	2.45e-09	***
factor(RefVol)600	13.2517	1.2138	10.917	< 2e-16	***
factor(RWrank)Upstream	1.7348	0.8583	2.021	0.04454	*

R-sq. (adj) = 0.571    Deviance explained = 58.7%

GCV = 41.51    Scale est. = 39.781    n = 216

**Table S3.** The estimates, their standard error and the significance for intercepts and factors of the best statistical models for **(a)** cockle density (number per enclosure), **(b)** shell length (mm), **(c)** shell volume (mm<sup>3</sup>), **(d)** meat content (mg ADW mm<sup>-3</sup>) and **(e)** total cockle biomass (mg ADW per enclosure) of Experiment 1 (see [Table 1](#) for descriptions of the models). Significance codes: '\*\*\*' < 0.001, '\*\*' < 0.01, '\*' < 0.05 and '.' < 0.1.

**a. Density**

Formula:

Tn ~ factor(SamplingDate) + factor(RW)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	14.5972	1.7002	8.586	3.84e-12	***
factor(SamplingDate)2019-04-24	-10.1250	1.3170	-7.688	1.38e-10	***
factor(SamplingDate)2019-07-03	-13.6667	1.3170	-10.377	3.50e-15	***
factor(RW)3	4.5556	2.1506	2.118	0.038169	*
factor(RW)5	7.6667	2.1506	3.565	0.000708	***
factor(RW)7	8.7778	2.1506	4.082	0.000130	***
factor(RW)9	3.3333	2.1506	1.550	0.126245	
factor(RW)11	0.5556	2.1506	0.258	0.797013	
factor(RW)13	5.8889	2.1506	2.738	0.008052	**
factor(RW)15	2.1111	2.1506	0.982	0.330097	

R-sq. (adj) = 0.66 Deviance explained = 70.4%  
 GCV = 24.17 Scale est. = 20.813 n = 72

**b. Shell length**

Formula:

Tl ~ factor(SamplingDate) + factor(RW)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	12.3886	0.3524	35.156	<2e-16	***
factor(SamplingDate)2019-04-24	4.9406	0.2503	19.741	<2e-16	***
factor(SamplingDate)2019-07-03	11.5448	0.2682	43.046	<2e-16	***
factor(RW)3	-0.1766	0.4494	-0.393	0.6959	
factor(RW)5	0.6013	0.4392	1.369	0.1764	
factor(RW)7	0.4968	0.4392	1.131	0.2627	
factor(RW)9	0.3874	0.4392	0.882	0.3815	
factor(RW)11	0.3257	0.4494	0.725	0.4716	
factor(RW)13	0.6745	0.4392	1.536	0.1302	
factor(RW)15	0.8549	0.4494	1.902	0.0622	.

R-sq. (adj) = 0.966 Deviance explained = 97.1%  
 GCV = 0.88348 Scale est. = 0.75162 n = 67

**c. Shell volume**

Formula:

Tv ~ factor(SamplingDate) + factor(Vol)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	935.3	330.2	2.833	0.006111	**
factor(SamplingDate)2019-04-24	1180.7	330.2	3.576	0.000658	***
factor(SamplingDate)2019-07-03	2996.0	330.2	9.075	3.21e-13	***
factor(Vol)250	-146.9	381.2	-0.385	0.701172	
factor(Vol)450	139.7	381.2	0.366	0.715292	
factor(Vol)600	-864.6	381.2	-2.268	0.026613	*

R-sq. (adj) = 0.55 Deviance explained = 58.2%  
 GCV = 1.4269e+06 Scale est. = 1.308e+06 n = 72

#### d. Meat content

Formula:

Tb ~ factor(SamplingDate) + factor(Vol)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	0.022354	0.001087	20.574	< 2e-16	***
factor(SamplingDate)2019-04-24	0.016728	0.001106	15.119	< 2e-16	***
factor(SamplingDate)2019-07-03	0.023909	0.001182	20.227	< 2e-16	***
factor(Vol)250	-0.003328	0.001451	-2.294	0.02621	*
factor(Vol)450	-0.003589	0.001258	-2.853	0.00637	**
factor(Vol)600	-0.002693	0.001362	-1.977	0.05382	.

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.9 Deviance explained = 91%  
GCV = 1.3294e-05 Scale est. = 1.1817e-05 n = 54

#### e. Total biomass

Formula:

Tw ~ factor(SamplingDate) + factor(RW)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	-0.07951	0.20029	-0.397	0.69276	
factor(SamplingDate)2019-04-24	0.26705	0.15515	1.721	0.09019	.
factor(SamplingDate)2019-07-03	0.69844	0.15515	4.502	3.03e-05	***
factor(RW)3	0.29886	0.25335	1.180	0.24266	
factor(RW)5	0.72743	0.25335	2.871	0.00559	**
factor(RW)7	0.67567	0.25335	2.667	0.00975	**
factor(RW)9	0.38385	0.25335	1.515	0.13483	
factor(RW)11	-0.16786	0.25335	-0.663	0.51007	
factor(RW)13	0.63163	0.25335	2.493	0.01535	*
factor(RW)15	0.15551	0.25335	0.614	0.54158	

R-sq.(adj) = 0.332 Deviance explained = 41.7%  
GCV = 0.33544 Scale est. = 0.28885 n = 72

**Table S4.** The estimates, their standard error and the significance for intercepts and factors of the best statistical models for **(a)** cockle density (number per enclosure), **(b)** shell length (mm), **(c)** shell volume (mm<sup>3</sup>), **(d)** meat content (mg ADW mm<sup>-3</sup>) and **(e)** total cockle biomass (mg ADW per enclosure) of [Experiment 2](#) (see [Table 1](#) for descriptions of the models). Significance codes: '\*\*\*' < 0.001, '\*\*' < 0.01, '\*' < 0.05 and '.' < 0.1.

**a. Density**

Formula:

Tn ~ factor(SeedingDate) + factor(RW)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	1.264	2.757	0.458	0.648265	
factor(SeedingDate)2019-04-24	9.583	2.136	4.487	3.19e-05	***
factor(SeedingDate)2019-07-03	5.625	2.136	2.634	0.010647	*
factor(RW)3	6.889	3.488	1.975	0.052692	.
factor(RW)5	4.889	3.488	1.402	0.165958	
factor(RW)7	12.556	3.488	3.600	0.000633	***
factor(RW)9	8.111	3.488	2.326	0.023319	*
factor(RW)11	6.556	3.488	1.880	0.064849	.
factor(RW)13	21.667	3.488	6.213	4.85e-08	***
factor(RW)15	9.889	3.488	2.835	0.006171	**

R-sq. (adj) = 0.449    Deviance explained = 51.9%  
 GCV = 63.561    Scale est. = 54.733    n = 72

**b. Shell length**

Formula:

Tl ~ factor(SeedingDate) + factor(RW)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	22.6518	1.0775	21.022	< 2e-16	***
factor(SeedingDate)2019-04-24	4.1252	0.7350	5.612	5.88e-07	***
factor(SeedingDate)2019-07-03	-0.7950	0.7441	-1.068	0.28974	
factor(RW)3	1.3271	1.2375	1.072	0.28799	
factor(RW)5	1.4879	1.2375	1.202	0.23410	
factor(RW)7	2.1539	1.2375	1.741	0.08707	.
factor(RW)9	0.5183	1.2375	0.419	0.67687	
factor(RW)11	1.5489	1.2743	1.215	0.22912	
factor(RW)13	2.0021	1.2375	1.618	0.11112	
factor(RW)15	3.4139	1.2664	2.696	0.00918	**

R-sq. (adj) = 0.452    Deviance explained = 52.6%  
 GCV = 6.9992    Scale est. = 5.9699    n = 68

### c. Shell volume

Formula:

Tv ~ factor(SeedingDate) + factor(RW)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	3025.6	554.9	5.453	9.15e-07	***
factor(SeedingDate) 2019-04-24	2890.6	429.8	6.725	6.41e-09	***
factor(SeedingDate) 2019-07-03	-320.5	429.8	-0.746	0.45868	.
factor(RW) 3	1321.7	701.9	1.883	0.06438	.
factor(RW) 5	1469.7	701.9	2.094	0.04036	*
factor(RW) 7	1855.0	701.9	2.643	0.01039	*
factor(RW) 9	1363.3	701.9	1.942	0.05664	.
factor(RW) 11	1237.5	701.9	1.763	0.08280	.
factor(RW) 13	1746.0	701.9	2.488	0.01556	*
factor(RW) 15	2216.6	701.9	3.158	0.00245	**

R-sq. (adj) = 0.5 Deviance explained = 56.3%  
GCV = 2.5744e+06 Scale est. = 2.2168e+06 n = 72

### d. Meat content

Formula:

Tb ~ factor(SeedingDate) + factor(RW)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	0.043994	0.001795	24.507	< 2e-16	***
factor(SeedingDate) 2019-04-24	-0.001236	0.001216	-1.016	0.3141	.
factor(SeedingDate) 2019-07-03	-0.002836	0.001217	-2.330	0.0237	*
factor(RW) 3	0.005294	0.002073	2.554	0.0136	*
factor(RW) 5	0.003275	0.002126	1.540	0.1296	.
factor(RW) 7	0.001053	0.002021	0.521	0.6045	.
factor(RW) 9	-0.004292	0.002065	-2.079	0.0426	*
factor(RW) 11	0.003848	0.002157	1.783	0.0803	.
factor(RW) 13	0.005252	0.002021	2.599	0.0122	*
factor(RW) 15	0.011430	0.002065	5.536	1.03e-06	***

R-sq. (adj) = 0.562 Deviance explained = 62.7%  
GCV = 1.7356e-05 Scale est. = 1.4557e-05 n = 62

### e. Total biomass

Formula:

Tw ~ factor(SeedingDate) + factor(Vol)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
(Intercept)	5.76472	0.79307	7.269	8.70e-10	***
factor(SeedingDate) 2019-04-24	4.31670	0.81607	5.290	1.81e-06	***
factor(SeedingDate) 2019-07-03	-0.09126	0.81607	-0.112	0.911336	.
factor(Vol) 250	-3.29836	0.94623	-3.486	0.000924	***
factor(Vol) 450	-3.51878	0.94623	-3.719	0.000443	***
factor(Vol) 600	-4.78567	0.90220	-5.304	1.72e-06	***

R-sq. (adj) = 0.495 Deviance explained = 53.3%  
GCV = 8.0582 Scale est. = 7.3256 n = 66

**Table S5.** Scores of the PCA of Experiment 1 and Experiment 2. The more the value of the variable deviates from 0, the stronger the correlation with that principal component.

**a. Experiment 1** (one common seeding date, three different sampling dates)

	PC1	PC2
cockle.density	0.1984594	-0.47849586
cockle.length	0.4438226	0.08402952
cockle.volume	0.4124381	-0.25762515
cockle.condition	0.1375601	0.45623348
cockle.biomass	0.2191078	-0.44994878
phytoplankton	0.2366963	0.45542436
microphytobenthos	-0.3790822	-0.15973812
median.grain.size	0.4014566	-0.12232774
siltfraction	-0.4070667	-0.19777625

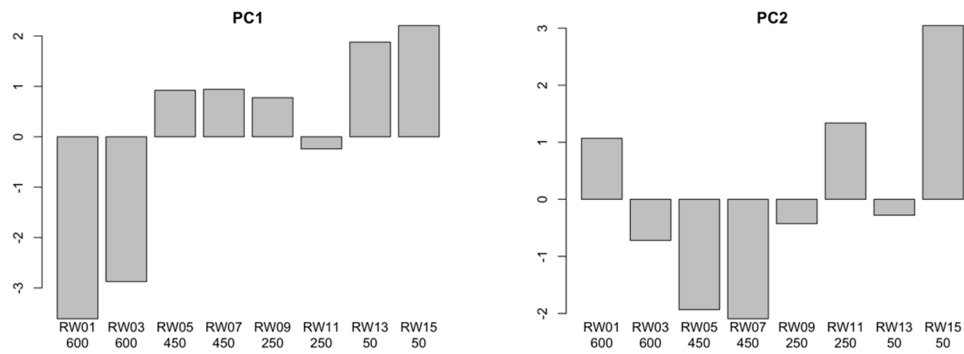
**b. Experiment 2** (three different seeding dates, one common sampling date)

	PC1	PC2
cockle.density	-0.3115103	0.19967980
cockle.length	-0.3730005	-0.25665329
cockle.volume	-0.3722640	0.06883643
cockle.condition	-0.2608368	-0.60574895
cockle.biomass	-0.3857685	-0.06545885
phytoplankton	-0.3020928	-0.37053833
microphytobenthos	0.3343078	-0.36314764
median.grain.size	-0.2349643	0.46208897
siltfraction	0.3875155	-0.18868195

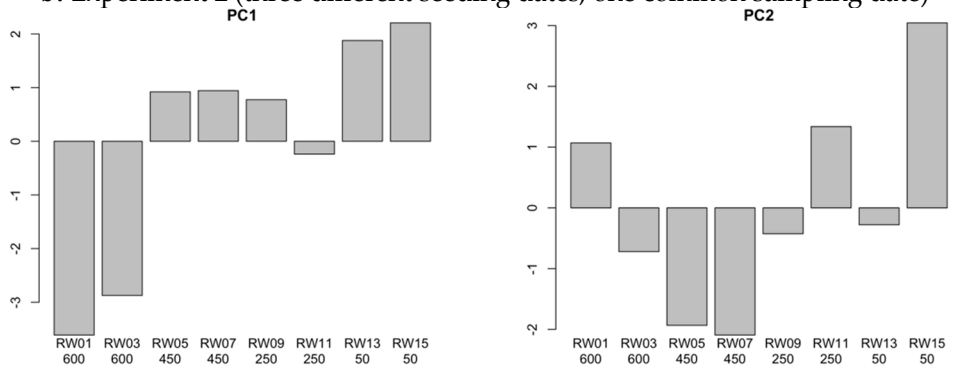


C. Loadings of PCA (Figure S1)

a. Experiment 1 (one common seeding date, three different sampling dates).



b. Experiment 2 (three different seeding dates, one common sampling date)



**Figure S1.** Loadings of 1<sup>st</sup> and 2<sup>nd</sup> axis of principal component analyses of the raceway coefficients on environmental conditions and cockle performance indices as derived from models M2 (see [Table 1](#)) on (a) Experiment 1 and (b) Experiment 2.