

**Table S1.** Thickness characteristics of different shell layers of *M. galloprovincialis* B1 and C and *M. edulis* in  $\mu\text{m}$ . Shell thickness was measured before and after transplantation. N.d. = no data; n.p. = not present.

	<i>Mytilus galloprovincialis</i> from site C pH <sub>T</sub> 8.07 in $\mu\text{m}$	<i>Mytilus edulis</i> from Wadden Sea pH ~8.2 in $\mu\text{m}$	<i>Mytilus galloprovincialis</i> from site B1 pH <sub>T</sub> 7.25 in $\mu\text{m}$
Calcit layer	130 - 500	120 - 830	215 - 820
- commissure	200 - 250	830	215 - 230
- near commissure (after transplantation [C and B1])	200 - 250	n.d.	340 - 430
- transition from harbour site to experimental site	n.d.	n.d.	620
- near commissure (before transplantation [C and B1])	500	n.d.	760 - 820
- near hinge	130	120	430 - 520
Nacre layer	5 - 440	10 - 1520	10 - 150
- commissure	5 - 10	10 - 35	n.p.
- near commissure (after transplantation [C and B1])	5 - 10	n.d.	n.p.
- transition from the harbour site to experimental site	n.d.	n.d.	n.p.
- near commissure (before transplantation [C and B1])	40	n.d.	10 - 150
- near hinge	440	1520	10 - 100
Total shell (calcite and nacre layer)	135 - 570	130 - 1640	225 - 970
- commissure	205 - 260	840 - 865	215 - 230
- near commissure (after transplantation [C and B1])	205 - 260	n.d.	340 - 430
- transition from the harbour site to experimental site	n.d.	n.d.	620
- near commissure (before transplantation [C and B1])	540	n.d.	770 - 970
- near hinge	570	1640	440 - 620

**Table S2.** Results of microprobe analysis maps (total area) in weight percent (wt %). See Fig(s). 6 and 7 for location of element maps.

<b>Map 1</b>	<b>Minimum (wt%)</b>	<b>Maximum (wt%)</b>	<b>Mean (wt%)</b>	<b>(Std. Dev.)</b>	<b>Maximum in ppm</b>
<b>Ba</b>	0.1	0.264	0.030	0.045	2640
<b>Ca</b>	30.867	39.102	37.345	0.700	391020
<b>Cl</b>	0	0.167	0.035	0.035	1670
<b>Fe</b>	0.1	0.237	0.026	0.038	2370
<b>Mg</b>	0.1	0.123	0.029	0.027	1230
<b>Mn</b>	0	0.241	0.025	0.037	2410
<b>Na</b>	0	0.445	0.227	0.066	4450
<b>P</b>	0	0.428	0.026	0.031	4280
<b>Si</b>	0	0.170	0.041	0.035	1700
<b>Sr</b>	0	0.280	0.101	0.062	2800

  

<b>Map 2</b>	<b>Minimum (wt%)</b>	<b>Maximum (wt%)</b>	<b>Mean (wt%)</b>	<b>(Std. Dev.)</b>	<b>Maximum in ppm</b>
<b>Ba</b>	0.1	0.288	0.031	0.046	2880
<b>Ca</b>	1.294	38.972	36.810	1.078	389720
<b>Cl</b>	0	0.255	0.041	0.039	2550
<b>Fe</b>	0.1	0.263	0.029	0.041	2630
<b>Mg</b>	0.1	1.411	0.168	0.105	14110
<b>Mn</b>	0	0.769	0.026	0.038	7690
<b>Na</b>	0	0.428	0.161	0.062	4280
<b>P</b>	0	0.468	0.029	0.032	4680
<b>Si</b>	0	0.717	0.086	0.061	7170
<b>Sr</b>	0	0.391	0.107	0.067	3910

  

<b>Map 3</b>	<b>Minimum (wt%)</b>	<b>Maximum (wt%)</b>	<b>Mean (wt%)</b>	<b>(Std. Dev.)</b>	<b>Maximum in ppm</b>
<b>Ba</b>	0.1	0.442	0.031	0.046	4420
<b>Ca</b>	17.434	40.687	36.876	0.785	406870
<b>Cl</b>	0	0.393	0.040	0.036	3930
<b>Fe</b>	0.1	0.689	0.030	0.042	6890
<b>Mg</b>	0.1	0.388	0.110	0.050	3880
<b>Mn</b>	0	0.706	0.025	0.037	7060
<b>Na</b>	0	0.462	0.175	0.062	4620
<b>P</b>	0	0.528	0.024	0.028	5280
<b>Si</b>	0	0.272	0.046	0.033	2720
<b>Sr</b>	0	0.587	0.090	0.061	5870

  

<b>Map 4</b>	<b>Minimum (wt%)</b>	<b>Maximum (wt%)</b>	<b>Mean (wt%)</b>	<b>(Std. Dev.)</b>	<b>Maximum in ppm</b>
<b>Ba</b>	0.1	0.268	0.035	0.048	2680
<b>Ca</b>	29.587	38.297	34.999	1.639	382970
<b>Cl</b>	0	0.199	0.032	0.032	1990
<b>Fe</b>	0.1	0.199	0.031	0.041	1990
<b>Mg</b>	0.1	0.226	0.063	0.041	2260
<b>Mn</b>	0	0.278	0.025	0.035	2780
<b>Na</b>	0	0.497	0.209	0.065	4970
<b>P</b>	0	0.151	0.023	0.027	1510
<b>Si</b>	0	0.117	0.032	0.023	1170
<b>Sr</b>	0	0.280	0.079	0.056	2800

<b>Map 5</b>	<b>Minimum (wt%)</b>	<b>Maximum (wt%)</b>	<b>Mean (wt%)</b>	<b>(Std. Dev.)</b>	<b>Maximum in ppm</b>
<b>Ba</b>	0.1	0.251	0.031	0.046	2510
<b>Ca</b>	1.169	39.037	36.558	1.564	390370
<b>Cl</b>	0	0.243	0.034	0.033	2430
<b>Fe</b>	0.1	0.677	0.028	0.041	6770
<b>Mg</b>	0.1	0.981	0.194	0.132	9810
<b>Mn</b>	0	0.706	0.024	0.037	7060
<b>Na</b>	0	0.468	0.144	0.064	4680
<b>P</b>	0	0.171	0.026	0.029	1710
<b>Si</b>	0	0.190	0.030	0.024	1900
<b>Sr</b>	0	0.325	0.090	0.059	3250

<b>Map 6</b>	<b>Minimum wt%</b>	<b>Maximum wt%</b>	<b>Mean wt%</b>	<b>(Std. Dev.)</b>	<b>Maximum in ppm</b>
<b>Ba</b>	0.1	0.766	0.032	0.049	7660
<b>Ca</b>	0.000	37.853	34.142	7.519	378530
<b>Cl</b>	0	1.371	0.102	0.176	13710
<b>Fe</b>	0.1	0.649	0.030	0.042	6490
<b>Mg</b>	0.1	0.276	0.006	0.023	2760
<b>Mn</b>	0	0.182	0.024	0.034	1820
<b>Na</b>	0	0.932	0.531	0.159	9320
<b>P</b>	0	0.160	0.018	0.024	1600
<b>Si</b>	0	0.325	0.050	0.028	3250
<b>Sr</b>	0	0.344	0.091	0.064	3440

<b>Map 7</b>	<b>Minimum wt%</b>	<b>Maximum wt%</b>	<b>Mean wt%</b>	<b>(Std. Dev.)</b>	<b>Maximum in ppm</b>
<b>Ba</b>	0.1	0.355	0.032	0.047	3550
<b>Ca</b>	0.375	38.579	35.813	2.360	385790
<b>Cl</b>	0	0.856	0.082	0.067	8560
<b>Fe</b>	0.1	0.312	0.030	0.041	3120
<b>Mg</b>	0.1	0.241	0.002	0.009	2410
<b>Mn</b>	0	0.248	0.025	0.035	2480
<b>Na</b>	0	1.060	0.577	0.110	10600
<b>P</b>	0	0.386	0.023	0.027	3860
<b>Si</b>	0	0.832	0.060	0.029	8320
<b>Sr</b>	0	0.373	0.103	0.062	3730

**Table S3.** Results of isotope analysis from shells of *M. galloprovincialis* <sub>B1 and C</sub> and *M. edulis*. d = double measurement;  $\sigma$  = standard deviation. Distance from commissure indicates position of sampling point.

Bivalve	Sample type	Corrected values				Distance from commissure (in cm)
		$\delta^{13}\text{C}_{\text{PDB}}$ (‰)	$\pm \sigma$	$\delta^{18}\text{O}_{\text{PDB-carbonate}}$ (‰)	$\pm \sigma$	
<i>M. galloprovincialis</i> <sub>B1 - 4.5cm</sub>	bulk measurement	2.2	0.02	1.0	0.02	0.50
	bulk measurement	0.7	0.02	-0.2	0.03	1.70
	bulk measurement	0.3	0.02	-0.1	0.02	2.40
	bulk measurement	2.1	0.02	0.7	0.02	0.50
	bulk measurement	-0.6	0.02	-0.6	0.01	1.10
	bulk measurement	-1.0	0.01	0.0	0.03	1.70
	bulk measurement	-0.8	0.02	0.8	0.01	2.40
	bulk measurement	-0.8	0.02	1.1	0.02	3.00
	bulk measurement	-0.2	0.01	1.3	0.02	3.60
	bulk measurement (d)	-0.1	0.02	1.4	0.02	3.60
<i>M. galloprovincialis</i> <sub>B1 - 5.1cm</sub>	bulk measurement	1.3	0.01	0.0	0.01	0.20
	bulk measurement	1.3	0.01	0.0	0.02	1.70
	bulk measurement	1.2	0.02	-0.2	0.03	2.40
	bulk measurement	-0.2	0.01	-0.5	0.02	1.10
	bulk measurement	-0.1	0.02	0.7	0.01	1.70
	bulk measurement	-0.1	0.02	0.8	0.02	2.40
	bulk measurement	0.2	0.02	1.2	0.03	3.20
	bulk measurement	0.4	0.02	0.0	0.02	3.90
<i>M. edulis</i> <sub>Sylt - 4.6cm</sub>	bulk measurement	-1.2	0.02	-0.7	0.02	0.20
	bulk measurement	-0.2	0.02	-0.2	0.02	1.50
	bulk measurement	0.0	0.02	-0.7	0.03	2.10
	bulk measurement	-0.9	0.02	-0.6	0.02	0.20
	bulk measurement	-0.8	0.02	-0.5	0.02	1.00
	bulk measurement	-0.4	0.01	-0.6	0.02	1.50
	bulk measurement	-0.9	0.02	-0.8	0.03	2.10
	bulk measurement	-0.8	0.02	-1.0	0.02	2.70
	bulk measurement (d)	-0.9	0.02	-1.1	0.03	2.70
	bulk measurement	-1.4	0.02	-1.2	0.02	3.30
	bulk measurement (d)	-1.4	0.01	-1.2	0.02	3.30
<i>M. edulis</i> <sub>Sylt - 5.1cm</sub>	bulk measurement	-0.5	0.01	-0.4	0.03	0.30
	bulk measurement	0.4	0.02	-0.4	0.02	1.70
	bulk measurement	0.8	0.02	-0.2	0.03	2.40
	bulk measurement	-0.8	0.02	-0.4	0.02	0.30
	bulk measurement	-0.2	0.02	0.1	0.02	1.00
	bulk measurement	-0.2	0.02	-0.3	0.02	1.70
	bulk measurement	0.0	0.01	1.1	0.02	2.40

	bulk measurement	0.9	0.01	-0.4	0.02	3.10
	bulk measurement	-0.3	0.02	0.0	0.03	3.70
	bulk measurement	0.0	0.02	0.6	0.03	0.30
	bulk measurement	-1.5	0.03	-1.0	0.02	1.00
	bulk measurement	-0.8	0.02	-0.6	0.03	1.70
	bulk measurement	-0.6	0.03	0.1	0.02	2.40
	bulk measurement (d)	-0.5	0.01	-0.2	0.02	2.40
	bulk measurement	-0.2	0.02	0.0	0.03	3.70
<i>M. galloprovincialis</i> C - 5.4cm	bulk measurement	-0.2	0.02	0.5	0.02	0.30
	bulk measurement	-1.2	0.02	-0.9	0.02	1.00
	bulk measurement (d)	-1.3	0.03	-1.0	0.02	1.00
	bulk measurement	-1.2	0.02	-0.3	0.02	1.70
	bulk measurement	-0.6	0.01	0.5	0.02	2.40
	bulk measurement	-0.7	0.02	0.6	0.03	3.10
	bulk measurement	-0.6	0.02	0.9	0.02	3.70
	bulk measurement	0.4	0.02	0.3	0.02	0.20
	bulk measurement	0.2	0.02	0.5	0.02	1.60
	bulk measurement	0.4	0.02	-0.1	0.03	2.20
	bulk measurement	0.3	0.02	0.5	0.02	0.20
	bulk measurement	-0.7	0.03	-0.7	0.04	0.80
<i>M. galloprovincialis</i> C - 4.1cm	bulk measurement (d)	-0.8	0.02	-0.7	0.02	0.80
	bulk measurement	-0.4	0.03	0.6	0.02	1.60
	bulk measurement	-0.4	0.02	-0.4	0.02	2.20
	bulk measurement	-0.2	0.01	-0.7	0.03	3.00
	bulk measurement (d)	-0.1	0.02	-0.6	0.03	3.00
	bulk measurement	0.1	0.02	0.0	0.03	3.60
	with periostracum	2.4	0.02	0.8	0.01	0.20
	with periostracum	-0.2	0.02	0.6	0.02	1.00
<i>M. galloprovincialis</i> B1 - 3.9cm	with periostracum (d)	-0.2	0.01	0.4	0.04	1.00
	with periostracum	-1.6	0.02	-0.5	0.03	1.90
	with periostracum	-1.0	0.02	-0.4	0.02	2.70
	(+/-) without periostracum	2.0	0.02	0.6	0.02	0.20
	(+/-) without periostracum	-0.4	0.01	0.6	0.02	1.00
<i>M. galloprovincialis</i> B1 - 3.9cm	(+/-) without periostracum	-1.3	0.02	-0.3	0.02	1.90
	(+/-) without periostracum	-0.3	0.02	0.0	0.03	2.79
	(+/-) without periostracum (d)	-0.3	0.01	0.0	0.02	2.00
	periostracum + calcite	-0.8	0.02	0.0	0.03	1.30
<i>M. galloprovincialis</i> B1 - 5.0cm	calcite	-1.1	0.02	0.1	0.03	1.30
	calcite + nacre	-1.1	0.01	0.0	0.03	1.30
	nacre	-0.8	0.03	-0.6	0.02	1.30
	periostracum + calcite	-1.0	0.02	0.7	0.02	1.80
	calcite	-1.2	0.02	0.6	0.03	1.80
	calcite + nacre	-1.1	0.02	0.6	0.03	1.80
	nacre	0.0	0.02	-0.6	0.02	1.80

	periostracum + calcite	-1.1	0.02	1.2	0.02	2.50
	calcite	-1.2	0.02	1.2	0.03	2.50
	calcite (d)	-1.2	0.02	1.1	0.02	2.50
	calcite + nacre	-0.6	0.02	0.8	0.02	2.50
	nacre	-0.2	0.02	-0.8	0.02	2.50
	periostracum + calcite	-0.5	0.02	-0.4	0.02	0.70
	calcite	-0.3	0.01	-0.2	0.02	0.70
	calcite + nacre	-0.9	0.01	-0.5	0.02	0.70
	nacre	0.0	0.02	-0.4	0.03	0.70
	periostracum + calcite	-0.7	0.01	0.2	0.03	1.20
	calcite	-0.8	0.02	0.3	0.03	1.20
<i>M. galloprovincialis</i> B1 - 4.7cm	calcite + nacre	-0.5	0.02	0.1	0.03	1.20
	nacre	0.7	0.02	-0.4	0.02	1.20
	nacre (d)	0.5	0.02	-0.3	0.02	1.20
	periostracum + calcite	-0.8	0.02	0.6	0.04	1.80
	calcite	-0.6	0.02	0.7	0.02	1.80
	calcite + nacre	-0.3	0.01	0.6	0.02	1.80
	nacre	0.32	0.02	-0.3	0.03	1.80
	periostracum + calcite	-0.2	0.02	-0.7	0.02	0.90
	calcite	-0.4	0.02	-0.7	0.02	0.90
	calcite + nacre	-0.6	0.01	-0.9	0.03	0.90
	nacre	-0.2	0.01	-0.7	0.02	0.90
	periostracum + calcite	-0.9	0.02	0.3	0.02	1.50
	calcite	-0.9	0.03	0.0	0.03	1.50
<i>M. galloprovincialis</i> C - 4.0cm(2)	calcite (d)	-0.9	0.02	0.0	0.02	1.50
	calcite + nacre	-0.4	0.02	-0.2	0.03	1.50
	nacre	0.0	0.02	-0.8	0.02	1.50
	periostracum + calcite	-0.6	0.01	0.8	0.02	2.20
	calcite	-0.6	0.01	0.8	0.03	2.20
	calcite + nacre	-0.2	0.02	0.5	0.02	2.20
	nacre	0.2	0.02	-0.7	0.02	2.20
	periostracum + calcite	-0.7	0.02	-0.6	0.04	0.80
	calcite	-0.8	0.03	-0.7	0.01	0.80
	calcite + nacre	-1.0	0.02	-0.8	0.02	0.80
	nacre	-0.5	0.02	-0.5	0.03	0.80
	nacre (d)	-0.6	0.02	-0.5	0.02	0.80
	periostracum + calcite	-1.2	0.01	0.2	0.04	1.30
	calcite	-1.2	0.01	0.1	0.02	1.30
<i>M. galloprovincialis</i> C - 4.7cm	calcite + nacre	-0.9	0.02	-0.2	0.03	1.30
	nacre	-0.1	0.02	-0.8	0.03	1.30
	periostracum + calcite	-1.3	0.02	0.7	0.02	1.90
	calcite	-1.1	0.02	0.82	0.03	1.90
	calcite + nacre	-0.2	0.02	0.24	0.01	1.90
	nacre	-0.1	0.02	-0.91	0.03	1.90

	(periostracum) + calcite	-0.7	0.02	-1.1	0.02	0.80	
	calcite	-0.8	0.02	-1.3	0.03	0.80	
	calcite (d)	-0.9	0.02	-1.1	0.02	0.80	
	calcite + nacre	-0.1	0.02	0.3	0.03	0.80	
	nacre	0.9	0.02	0.0	0.03	0.80	
	(periostracum) + calcite	-1.6	0.02	-0.8	0.02	1.20	
<i>M. edulis</i> Sylt - 4.1cm	calcite	-1.5	0.01	-1.0	0.04	1.20	
	calcite + nacre	-0.2	0.02	-0.9	0.02	1.20	
	nacre	0.8	0.01	-0.2	0.04	1.20	
	(periostracum) + calcite	-1.3	0.02	0.3	0.02	1.80	
	calcite	-1.5	0.02	0.3	0.03	1.80	
	calcite + nacre	0.0	0.01	-0.7	0.02	1.80	
	nacre	1.0	0.02	-0.1	0.02	1.80	
	nacre (d)	1.1	0.01	-0.2	0.02	1.80	
		detailed measurement - A	2.3	0.02	0.2	0.04	0.25
		detailed measurement - B	2.4	0.02	0.2	0.03	0.31
		detailed measurement - C	2.2	0.01	0.2	0.03	0.36
		detailed measurement - D	0.0	0.02	-0.5	0.02	0.52
		detailed measurement - E	-2.4	0.01	-1.2	0.03	0.60
		detailed measurement - F	-2.1	0.01	-1.3	0.02	0.65
	detailed measurement - G	-1.7	0.02	-1.1	0.02	0.75	
	detailed measurement - H	-1.3	0.02	-0.9	0.02	0.80	
	detailed measurement - I	-1.0	0.01	-0.5	0.02	0.88	
<i>M. galloprovincialis</i> B1 - 5.0cm	detailed measurement - J	-1.1	0.03	-0.5	0.02	0.95	
	detailed measurement - K	-1.1	0.01	-1.0	0.04	1.00	
	detailed measurement - L	-1.2	0.01	-1.1	0.03	1.10	
	detailed measurement - M	-1.2	0.01	-0.5	0.03	1.20	
	detailed measurement - N	-1.3	0.02	-0.4	0.02	1.25	
	detailed measurement - O	-1.2	0.02	-0.2	0.03	1.35	
	detailed measurement - P	-1.1	0.02	-0.3	0.04	1.40	
	detailed measurement - Q	-1.0	0.02	-0.2	0.02	1.50	
	detailed measurement - R	-0.8	0.02	-0.2	0.03	1.55	
	detailed measurement - S	-0.8	0.03	-0.6	0.03	1.60	
	detailed measurement - T	-0.6	0.03	0.1	0.02	1.70	
		detailed measurement - A	2.0	0.02	0.5	0.03	0.40
	<i>M. galloprovincialis</i> B1 - 4.5cm	detailed measurement - B	1.9	0.02	0.4	0.02	0.45
		detailed measurement - C	1.9	0.01	0.3	0.04	0.50
detailed measurement - D		2.0	0.02	0.2	0.04	0.55	
detailed measurement - E		2.0	0.01	-0.1	0.02	0.60	
detailed measurement - F		1.2	0.02	-0.3	0.03	0.65	
detailed measurement - G		0.3	0.02	-0.8	0.04	0.70	
detailed measurement - H		-1.0	0.02	-1.2	0.02	0.75	
detailed measurement - I		-1.2	0.01	-1.1	0.02	0.80	
detailed measurement - J		-1.2	0.02	-1.2	0.01	0.85	
detailed measurement - K		-1.3	0.02	-1.4	0.03	0.90	

detailed measurement - L	-0.7	0.01	-1.0	0.01	0.95
detailed measurement - M	-0.7	0.01	-0.9	0.03	1.00
detailed measurement - N	-0.6	0.02	-0.9	0.03	1.05
detailed measurement - O	-0.6	0.02	-0.7	0.03	1.10
detailed measurement - P	-0.7	0.02	-0.6	0.03	1.15
detailed measurement - Q	-0.7	0.02	-0.8	0.03	1.20
detailed measurement - R	-0.7	0.02	-0.8	0.04	1.25
detailed measurement - S	-0.7	0.02	-0.7	0.04	1.30
detailed measurement - T	-0.7	0.02	-0.7	0.02	1.35

detailed measurement - A	-0.1	0.03	0.2	0.03	0.15
detailed measurement - B	-0.2	0.02	0.4	0.02	0.20
detailed measurement - C	-0.2	0.02	0.4	0.03	0.25
detailed measurement - D	-0.2	0.01	0.4	0.02	0.30
detailed measurement - E	-0.2	0.02	0.2	0.04	0.35
detailed measurement - F	-0.3	0.02	0.1	0.05	0.40
detailed measurement - G	-0.4	0.02	0.1	0.02	0.45
detailed measurement - H	-0.6	0.01	0.1	0.04	0.50
detailed measurement - I	-0.7	0.01	0.1	0.03	0.55
detailed measurement - J	-1.2	0.01	-0.2	0.02	0.60
detailed measurement - K	-2.0	0.02	-0.8	0.02	0.65
detailed measurement - L	-2.2	0.03	-1.3	0.03	0.70
detailed measurement - M	-2.1	0.01	-1.4	0.02	0.75
detailed measurement - N	-2.0	0.02	-1.4	0.04	0.80
detailed measurement - O	-1.5	0.03	-0.9	0.02	0.85
detailed measurement - P	-1.4	0.01	-0.9	0.03	0.90
detailed measurement - Q	-1.1	0.02	-0.7	0.03	0.95
detailed measurement - R	-0.9	0.02	-0.7	0.03	1.00
detailed measurement - S	-0.9	0.02	-0.7	0.03	1.05
detailed measurement - T	-1.0	0.02	-0.8	0.02	1.10
detailed measurement - U	-1.1	0.02	-0.8	0.03	1.15
detailed measurement - V	-1.3	0.02	-0.8	0.04	1.20
detailed measurement - W	-1.3	0.02	-0.7	0.03	1.25
detailed measurement - X	-1.2	0.02	-0.7	0.02	1.30
detailed measurement - Y	-1.3	0.02	-1.0	0.02	1.35
detailed measurement - Z	-1.3	0.03	-0.9	0.04	1.40

*M. galloprovincialis* C - 4.5cm