Supplementary figures

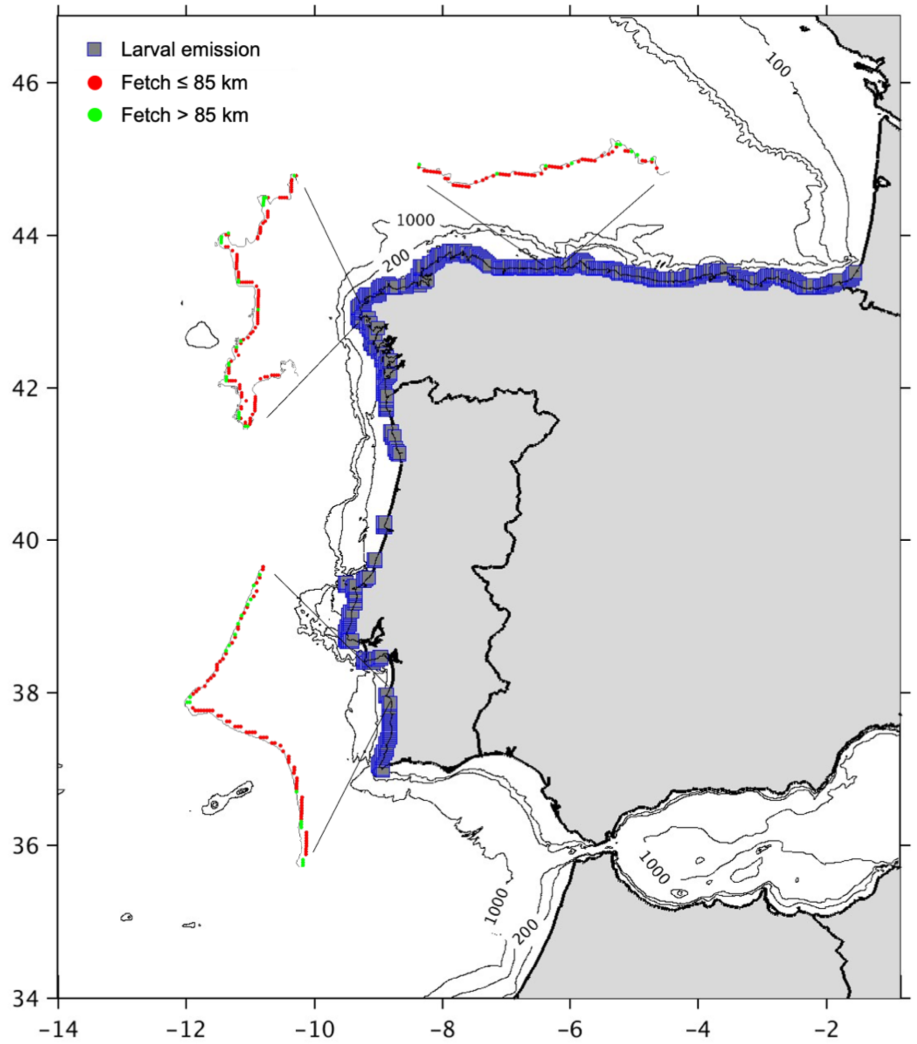

Figure S1. Distribution of rocky shore cells where spawning was simulated (blue squares along the coast), and spatial distribution of exposure, according to the wave fetch index developed by Burrows et al (2008), for selected segments of the coast (insets).

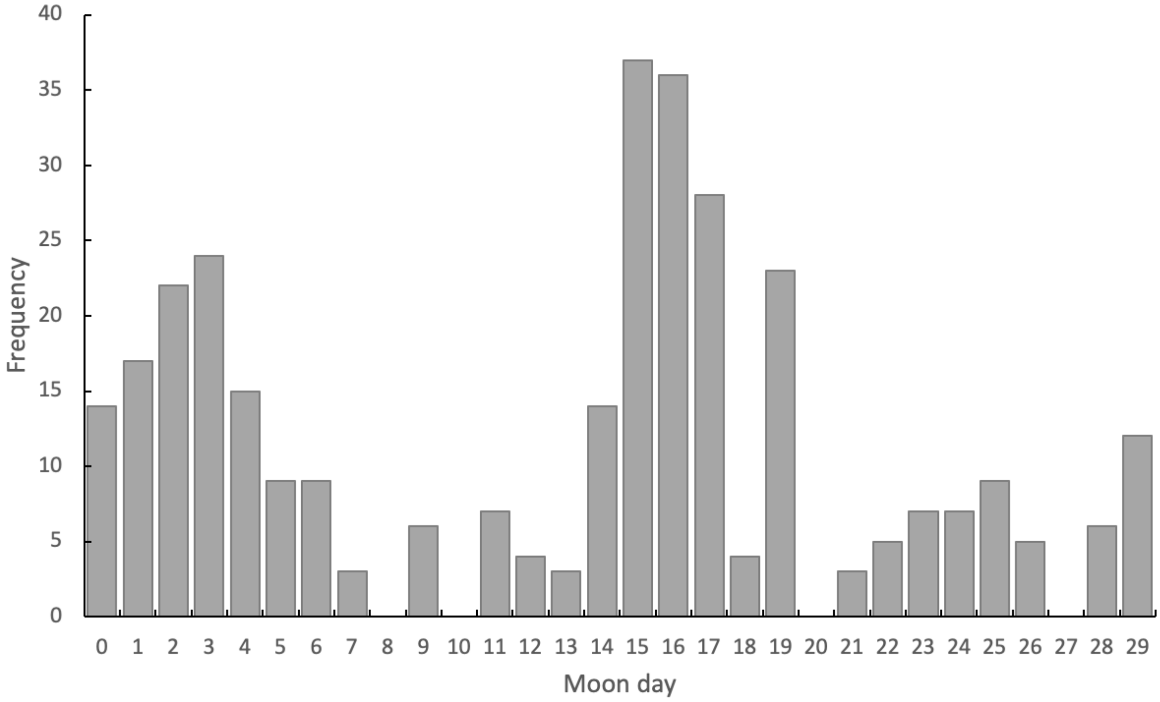

Figure S2. Frequency distribution of the Moon day in which the sampling for recruits took place. Moon day 15 is Full Moon.

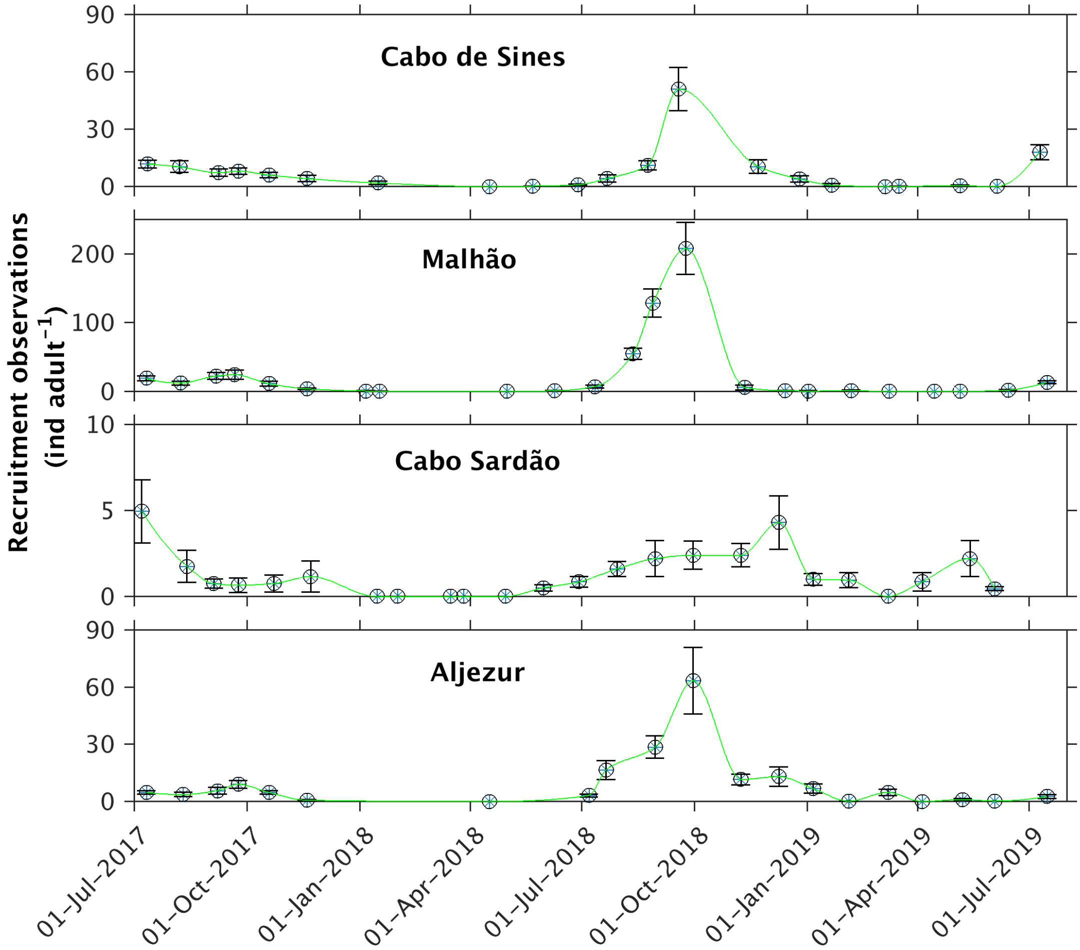

Figure S3. Cubic polynomial fit to the recruitment observations in SW Portugal. Dots and whiskers represent the average and standard error of the number of recruits per adult *Pollicipes pollicipes*. Application of the cubic polynomial to the recruitment time series of the other regions and to the time series of estimated larval supply produced similar fits.

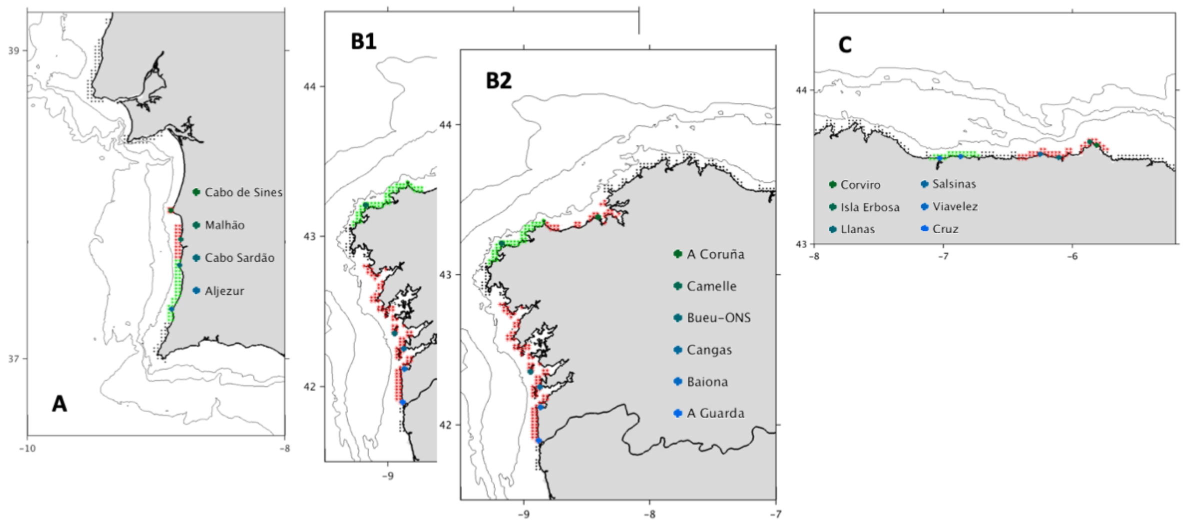

Figure S4. Subregions in SW Portugal (A), Galicia (B1 with 2 sub-regions, B2 with 3 sub-regions) and Asturias (C) used in the analyses.

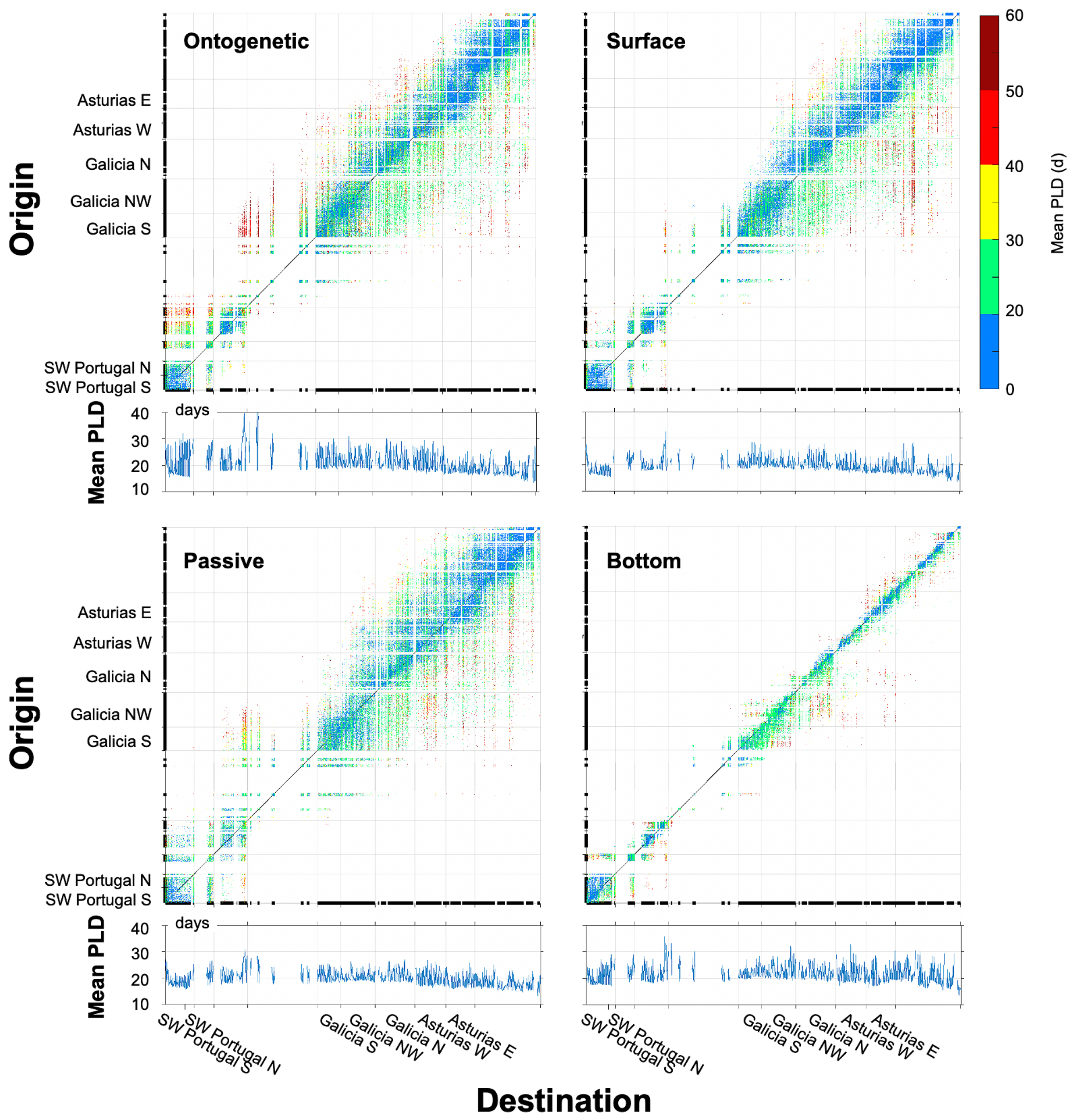

Figure S5. Matrices of mean pelagic development duration (PLD) as predicted by the model during the period of the observations (July 2017 to July 2019), using the ontogenetic, surface, passive and bottom larval behaviour scenarios. Each element of the matrix corresponds to one coastal cell of the model and represents the number of larvae produced by cell *i* that settle at cell *j*. Thick lines on the Origin and Destination axes indicate segments of coastline dominated by rocky shores, empty spaces indicate sandy shores without *Pollicipes pollicipes*, tick marks delimit regions and/or sub-regions of the study, and unlabelled thick lines show rocky shores outside the regions of the study. The bottom graph in each panel shows the mean PLD of the larvae that recruit to each cell.

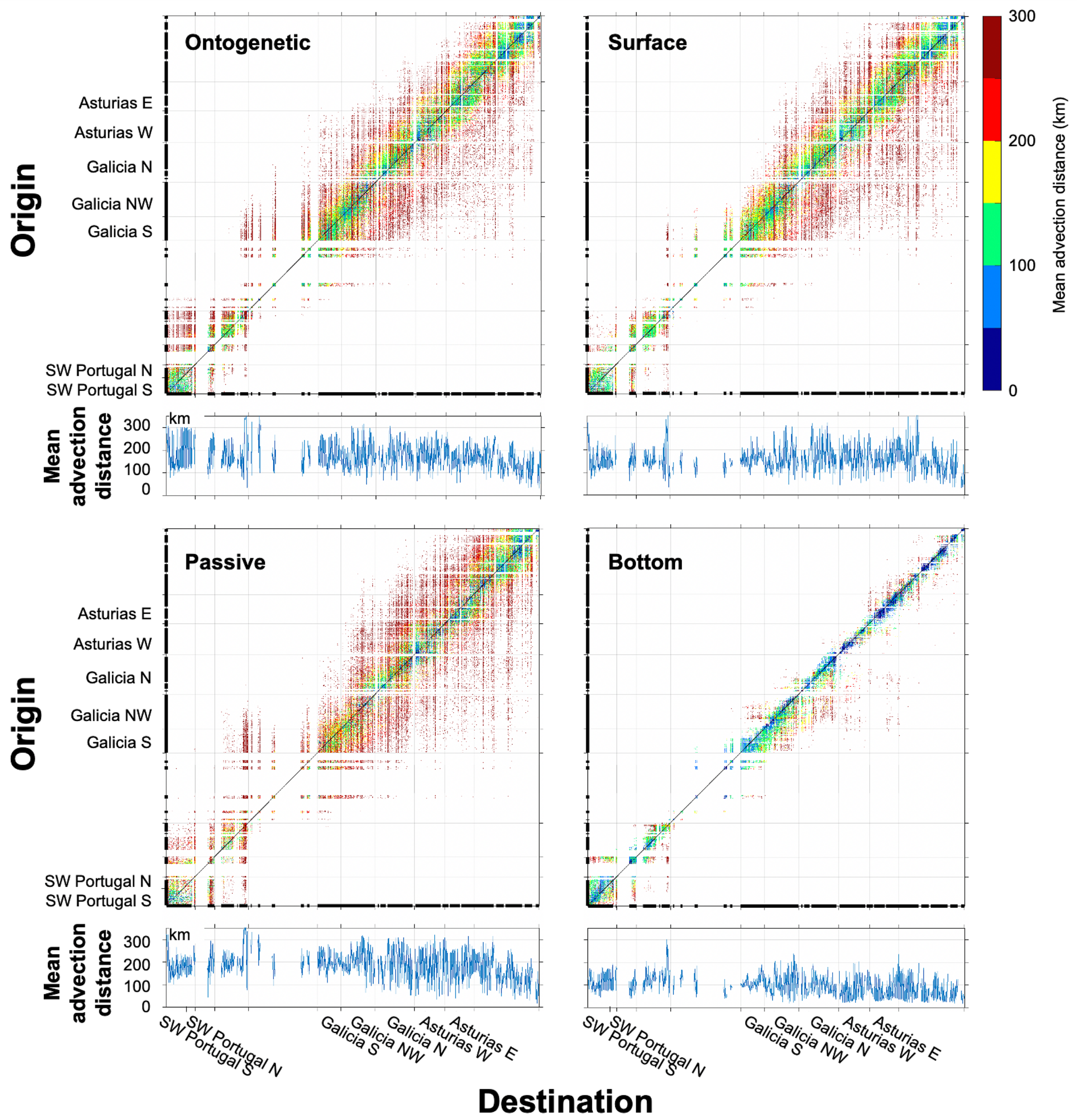

Figure S6. Matrices of mean advection distance of the larvae as predicted by the model during the period of the observations (July 2017 to July 2019), using the ontogenetic, surface, passive and bottom larval behaviour scenarios. Each element of the matrix corresponds to one coastal cell of the model and represents the number of larvae produced by cell *i* that settle at cell *j*. Thick lines on the Origin and Destination axes indicate segments of coastline dominated by rocky shores, empty spaces indicate sandy shores without *Pollicipes pollicipes*, tick marks delimit regions and/or sub-regions of the study, and unlabelled thick lines show rocky shores outside the regions of the study. The bottom graph in each panel shows the mean advection distance of the larvae that recruit to each cell. Advection distance is the actual distance travelled by the surviving larvae during pelagic development.

Supplementary tables

Table S1. Spawning intensity index of *Pollicipes pollicipes* according to region and month.

Region	J	F	M	A	M	J	J	A	S	O	N	D
Asturias	0	0	0	0	2	4	4	4	3	2	1	0
Galicia	0	0	1	2	3	3	4	3	3	2	1	0
Portugal	0	0	1	2	2	4	3	4	3	1	0	0

Table S2. Pearson cross-correlation coefficients between the observations on *Pollicipes pollicipes* recruitment and modelled supply according to time lag, larval behaviour scenario and site. Only significant positive correlations at time lags of -3 to +3 months were considered ecologically and oceanographically meaningful. Significance of the correlation is given between brackets. Cells in bold indicate significance at the 5% level.

	Time lag (months)						
Ontogenetic scenario							
Site	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**
Corviro	**0.61 (0.00)**	-0.01 (0.96)	-0.01 (0.95)	0.19 (0.40)	**0.48 (0.02)**	**0.47 (0.03)**	-0.04 (0.87)
Isla Erbosa	0.14 (0.54)	0.06 (0.79)	0.13 (0.55)	0.34 (0.11)	**0.56 (0.01)**	0.38 (0.09)	0.17 (0.47)
Llanas	0.01 (0.97)	0.17 (0.45)	-0.19 (0.40)	-0.20 (0.36)	**0.46 (0.03)**	0.27 (0.23)	0.17 (0.47)
Salsinas	-0.24 (0.32)	-0.40 (0.07)	0.40 (0.06)	**0.53 (0.01)**	-0.05 (0.83)	-0.08 (0.73)	0.19 (0.43)
Viavelez	-0.25 (0.29)	0.03 (0.91)	0.25 (0.26)	-0.03 (0.90)	0.09 (0.69)	0.38 (0.09)	0.17 (0.47)
Cruz	0.05 (0.84)	0.41 (0.07)	0.16 (0.48)	0.01 (0.97)	0.26 (0.23)	0.05 (0.84)	-0.09 (0.72)
Carino	0.03 (0.95)	0.39 (0.39)	0.66 (0.08)	0.21 (0.58)	-0.46 (0.25)	-0.35 (0.44)	0.54 (0.26)
A Coruña	0.17 (0.48)	-0.06 (0.81)	-0.09 (0.69)	0.31 (0.15)	0.18 (0.43)	0.28 (0.21)	0.16 (0.50)
Camelle	0.17 (0.52)	-0.07 (0.77)	0.07 (0.77)	0.32 (0.17)	0.25 (0.29)	0.18 (0.48)	0.23 (0.37)
Bueu-ONS	-0.14 (0.56)	0.16 (0.49)	0.01 (0.96)	-0.31 (0.16)	-0.12 (0.59)	**0.51 (0.02)**	**0.65 (0.00)**
Cangas	0.34 (0.15)	0.28 (0.22)	-0.26 (0.24)	0.15 (0.50)	0.32 (0.15)	0.20 (0.38)	0.09 (0.70)
Baiona	-0.09 (0.70)	0.22 (0.34)	0.30 (0.17)	0.03 (0.89)	**0.40 (0.06)**	0.16 (0.50)	-0.22 (0.35)
A Guarda	0.03 (0.92)	0.15 (0.53)	-0.12 (0.63)	-0.17 (0.47)	-0.05 (0.83)	0.26 (0.29)	0.28 (0.26)
Cabo de Sines	-0.14 (0.55)	-0.09 (0.69)	0.01 (0.98)	0.02 (0.94)	-0.11 (0.61)	**0.51 (0.01)**	**0.62 (0.00)**
Malhão	-0.21 (0.37)	-0.27 (0.22)	0.25 (0.26)	**0.47 (0.02)**	-0.04 (0.87)	0.18 (0.43)	0.23 (0.32)
Cabo Sardão	-0.07 (0.77)	-0.01 (0.96)	-0.10 (0.65)	0.04 (0.85)	-0.02 (0.94)	**0.49 (0.02)**	0.18 (0.45)
Azenha do Mar	0.11 (0.62)	0.32 (0.14)	**0.73 (0.00)**	0.24 (0.27)	-0.74 (0.00)	-0.62 (0.00)	0.29 (0.20)
Aljezur	-0.29 (0.20)	-0.17 (0.45)	-0.00 (0.99)	**0.64 (0.00)**	-0.26 (0.22)	0.11 (0.62)	0.36 (0.11)

Surface scenario

Site	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**
Corviro	-0.22 (0.35)	**0.48 (0.03)**	0.08 (0.71)	0.21 (0.33)	0.32 (0.15)	**0.52 (0.02)**	-0.10 (0.68)
Isla Erbosa	0.11 (0.65)	0.31 (0.17)	-0.04 (0.87)	0.05 (0.82)	0.04 (0.86)	0.35 (0.11)	0.10 (0.69)
Llanas	-0.06 (0.80)	0.28 (0.22)	0.01 (0.97)	-0.35 (0.10)	0.26 (0.25)	0.29 (0.20)	0.17 (0.48)
Salsinas	-0.22 (0.34)	-0.35 (0.12)	0.14 (0.54)	**0.46 (0.03)**	0.04 (0.85)	-0.03 (0.89)	0.13 (0.57)
Viavelez	-0.13 (0.59)	0.10 (0.67)	0.11 (0.63)	0.13 (0.54)	**0.47 (0.03)**	0.31 (0.17)	-0.08 (0.74)
Cruz	-0.25 (0.29)	**0.44 (0.05)**	0.07 (0.77)	-0.10 (0.66)	0.38 (0.08)	0.05 (0.83)	-0.16 (0.51)
Carino	-0.09 (0.86)	0.48 (0.28)	0.67 (0.07)	0.04 (0.92)	-0.65 (0.08)	-0.26 (0.57)	0.56 (0.25)
A Coruña	0.23 (0.33)	0.07 (0.77)	-0.14 (0.54)	0.15 (0.48)	0.14 (0.53)	0.19 (0.40)	0.12 (0.61)
Camelle	0.35 (0.17)	-0.14 (0.57)	0.09 (0.71)	0.18 (0.45)	0.06 (0.80)	0.17 (0.50)	0.10 (0.70)
Bueu-ONS	0.33 (0.16)	0.09 (0.70)	-0.25 (0.27)	-0.25 (0.27)	0.13 (0.58)	**0.45 (0.05)**	0.39 (0.10)
Cangas	0.31 (0.19)	**0.43 (0.05)**	-0.14 (0.54)	-0.00 (0.99)	0.20 (0.38)	0.13 (0.57)	0.04 (0.87)
Baiona	-0.08 (0.73)	0.18 (0.43)	0.28 (0.20)	0.08 (0.71)	**0.46 (0.03)**	0.14 (0.54)	-0.27 (0.25)
A Guarda	0.13 (0.60)	-0.02 (0.93)	0.03 (0.91)	-0.17 (0.46)	0.01 (0.96)	0.16 (0.51)	0.17 (0.49)
Cabo de Sines	-0.06 (0.81)	-0.03 (0.90)	0.09 (0.67)	0.13 (0.53)	-0.05 (0.81)	-0.02 (0.93)	0.00 (0.99)
Malhão	-0.18 (0.42)	-0.18 (0.42)	0.26 (0.23)	**0.50 (0.01)**	-0.03 (0.90)	-0.29 (0.20)	-0.04 (0.87)
Cabo Sardão	-0.03 (0.89)	0.01 (0.98)	-0.14 (0.53)	-0.01 (0.97)	-0.02 (0.95)	0.37 (0.10)	0.29 (0.22)
Azenha do Mar	0.18 (0.43)	**0.45 (0.03)**	**0.70 (0.00)**	0.11 (0.60)	-0.84 (0.00)	-0.65 (0.00)	0.33 (0.14)
Aljezur	-0.22 (0.34)	-0.15 (0.50)	0.12 (0.58)	**0.80 (0.00)**	-0.22 (0.32)	-0.19 (0.41)	0.02 (0.94)

Passive scenario

Site	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**
Corviro	0.31 (0.18)	0.04 (0.86)	0.12 (0.59)	0.36 (0.09)	**0.49 (0.02)**	**0.56 (0.01)**	0.03 (0.89)
Isla Erbosa	0.29 (0.22)	0.16 (0.49)	0.20 (0.38)	0.31 (0.15)	0.41 (0.06)	**0.53 (0.01)**	0.16 (0.50)
Llanas	-0.11 (0.64)	0.08 (0.73)	-0.15 (0.50)	-0.08 (0.71)	**0.53 (0.01)**	0.28 (0.22)	0.03 (0.88)

Salsinas	0.05 (0.82)	-0.15 (0.51)	-0.05 (0.84)	0.31 (0.15)	0.19 (0.39)	0.10 (0.68)	0.02 (0.94)
Viavelez	-0.14 (0.57)	0.04 (0.85)	0.17 (0.45)	0.40 (0.06)	0.41 (0.06)	0.17 (0.47)	-0.10 (0.66)
Cruz	-0.33 (0.16)	0.27 (0.24)	0.17 (0.44)	0.02 (0.92)	**0.63 (0.00)**	0.08 (0.71)	-0.20 (0.41)
Carino	0.08 (0.88)	0.46 (0.30)	0.61 (0.11)	0.01 (0.97)	-0.50 (0.21)	-0.24 (0.60)	0.54 (0.27)
A Coruña	0.27 (0.25)	0.03 (0.91)	-0.07 (0.76)	0.10 (0.65)	-0.23 (0.31)	0.23 (0.31)	0.29 (0.21)
Camelle	0.47 (0.06)	-0.10 (0.68)	0.14 (0.56)	0.03 (0.91)	0.02 (0.92)	0.07 (0.78)	0.17 (0.51)
Bueu-ONS	-0.20 (0.40)	0.11 (0.64)	-0.13 (0.56)	-0.12 (0.60)	0.29 (0.21)	0.26 (0.27)	0.06 (0.82)
Cangas	0.31 (0.18)	0.22 (0.34)	-0.41 (0.06)	-0.24 (0.26)	0.15 (0.50)	**0.51 (0.02)**	0.41 (0.07)
Baiona	0.17 (0.47)	-0.02 (0.92)	-0.26 (0.25)	-0.42 (0.04)	**0.51 (0.01)**	**0.70 (0.00)**	0.04 (0.86)
A Guarda	0.37 (0.13)	0.13 (0.59)	-0.03 (0.89)	-0.20 (0.40)	-0.18 (0.45)	0.15 (0.53)	0.32 (0.20)
Cabo de Sines	-0.14 (0.55)	-0.07 (0.75)	0.13 (0.57)	0.29 (0.17)	0.00 (0.99)	-0.10 (0.66)	-0.18 (0.43)
Malhão	-0.20 (0.38)	-0.03 (0.91)	0.38 (0.08)	0.30 (0.16)	-0.20 (0.37)	-0.43 (0.05)	-0.19 (0.40)
Cabo Sardão	-0.05 (0.82)	-0.06 (0.78)	-0.18 (0.43)	0.04 (0.85)	0.08 (0.71)	0.38 (0.09)	0.01 (0.97)
Azenha do Mar	0.38 (0.09)	**0.78 (0.00)**	-0.04 (0.84)	-0.61 (0.00)	-0.47 (0.02)	0.11 (0.62)	**0.63 (0.00)**
Aljezur	-0.29 (0.20)	-0.18 (0.43)	0.25 (0.25)	**0.68 (0.00)**	-0.11 (0.63)	-0.32 (0.15)	-0.23 (0.31)

Bottom scenario							
Site	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**
Corviro	0.38 (0.10)	-0.01 (0.96)	-0.03 (0.89)	0.02 (0.94)	**0.69 (0.00)**	0.32 (0.16)	-0.28 (0.23)
Isla Erbosa	-0.06 (0.80)	-0.23 (0.31)	0.29 (0.18)	**0.67 (0.00)**	**0.45 (0.03)**	**0.44 (0.05)**	-0.22 (0.36)
Llanas	-0.11 (0.65)	0.24 (0.30)	0.06 (0.78)	-0.25 (0.25)	0.15 (0.51)	**0.45 (0.04)**	0.22 (0.36)
Salsinas	-0.54 (0.01)	-0.16 (0.50)	0.18 (0.43)	0.38 (0.08)	0.30 (0.17)	-0.09 (0.70)	-0.23 (0.34)
Viavelez	-0.23 (0.33)	0.13 (0.57)	0.37 (0.09)	**0.56 (0.01)**	0.11 (0.62)	-0.31 (0.18)	-0.16 (0.50)
Cruz	-0.40 (0.08)	0.23 (0.33)	**0.74 (0.00)**	0.36 (0.09)	0.07 (0.75)	-0.17 (0.47)	-0.17 (0.48)
Carino	0.68 (0.14)	0.26 (0.58)	0.01 (0.99)	0.01 (0.97)	**0.78 (0.02)**	**0.81 (0.03)**	-0.19 (0.73)
A Coruña	0.06 (0.82)	**0.53 (0.01)**	0.16 (0.49)	0.00 (0.98)	-0.33 (0.14)	0.03 (0.89)	0.18 (0.45)

Camelle	0.24 (0.36)	**0.75 (0.00)**	-0.02 (0.95)	0.09 (0.71)	-0.16 (0.51)	-0.13 (0.60)	0.17 (0.52)
Bueu-ONS	-0.21 (0.38)	**0.55 (0.01)**	0.37 (0.10)	-0.43 (0.04)	-0.16 (0.50)	0.20 (0.39)	0.36 (0.13)
Cangas	0.24 (0.30)	**0.46 (0.04)**	-0.07 (0.76)	0.01 (0.96)	0.07 (0.76)	0.04 (0.86)	-0.01 (0.96)
Baiona	-0.10 (0.67)	-0.30 (0.18)	-0.01 (0.97)	**0.60 (0.00)**	**0.59 (0.00)**	-0.04 (0.87)	-0.42 (0.07)
A Guarda	0.02 (0.93)	-0.01 (0.97)	-0.16 (0.51)	-0.06 (0.78)	0.03 (0.91)	0.15 (0.53)	0.20 (0.43)
Cabo de Sines	-0.14 (0.54)	-0.10 (0.64)	0.09 (0.70)	0.15 (0.48)	-0.17 (0.44)	0.07 (0.75)	-0.11 (0.64)
Malhão	-0.13 (0.59)	-0.12 (0.58)	0.18 (0.41)	0.23 (0.27)	-0.14 (0.52)	-0.12 (0.60)	-0.23 (0.33)
Cabo Sardão	0.06 (0.81)	-0.12 (0.59)	-0.10 (0.67)	0.10 (0.65)	-0.27 (0.23)	**0.66 (0.00)**	0.01 (0.96)
Azenha do Mar	-0.08 (0.74)	0.11 (0.61)	0.29 (0.18)	0.23 (0.28)	-0.43 (0.04)	-0.32 (0.15)	0.21 (0.37)
Aljezur	-0.28 (0.22)	-0.02 (0.94)	-0.02 (0.93)	0.25 (0.24)	0.12 (0.58)	-0.05 (0.84)	-0.09 (0.70)

Table S3. Pearson cross-correlation coefficients between the observations on *Pollicipes pollicipes* recruitment and modelled supply according to time lag, larval behaviour scenario and sub-region, with 2 sub-regions in Galicia. Only significant positive correlations at time lags of -3 to +3 months were considered ecologically and oceanographically meaningful. Significance of the correlation is given between brackets. Cells in bold indicate significance at the 5% level.

	Time lag (months)						
Ontogenetic scenario							
Sub-region	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**
Asturias East	0.30 (0.21)	0.13 (0.57)	-0.08 (0.71)	-0.23 (0.30)	**0.44 (0.04)**	**0.58 (0.01)**	0.22 (0.34)
Asturias West	-0.10 (0.69)	0.22 (0.35)	-0.03 (0.89)	-0.03 (0.90)	0.27 (0.22)	0.12 (0.61)	0.04 (0.88)
Galiza North	0.19 (0.43)	0.18 (0.44)	-0.16 (0.48)	0.27 (0.22)	-0.01 (0.95)	**0.49 (0.03)**	0.08 (0.73)
Galiza South	0.07 (0.77)	-0.01 (0.96)	-0.04 (0.86)	-0.13 (0.57)	0.39 (0.08)	0.14 (0.55)	0.05 (0.84)
SW Portugal North	-0.24 (0.30)	-0.24 (0.28)	0.36 (0.09)	**0.46 (0.02)**	-0.24 (0.27)	0.13 (0.56)	0.27 (0.23)
SW Portugal South	-0.17 (0.47)	-0.19 (0.39)	0.01 (0.95)	0.21 (0.32)	**0.57 (0.00)**	-0.41 (0.06)	0.11 (0.63)
Surface scenario							
Sub-region	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**
Asturias East	-0.09 (0.70)	0.17 (0.47)	-0.17 (0.45)	0.14 (0.51)	0.37 (0.09)	0.41 (0.06)	-0.01 (0.98)
Asturias West	-0.21 (0.37)	0.32 (0.16)	-0.15 (0.49)	0.14 (0.52)	**0.43 (0.05)**	-0.10 (0.66)	0.03 (0.89)
Galiza North	**0.46 (0.04)**	0.06 (0.79)	-0.15 (0.51)	0.09 (0.70)	0.16 (0.46)	0.28 (0.21)	-0.01 (0.96)
Galiza South	0.10 (0.69)	-0.03 (0.89)	0.01 (0.97)	-0.13 (0.54)	0.38 (0.08)	0.12 (0.59)	0.01 (0.96)
SW Portugal North	-0.15 (0.52)	-0.28 (0.21)	0.37 (0.08)	**0.55 (0.01)**	-0.24 (0.27)	-0.20 (0.36)	0.00 (1.00)
SW Portugal South	-0.14 (0.55)	-0.16 (0.47)	0.05 (0.81)	0.18 (0.41)	0.58 (0.00)	-0.50 (0.02)	0.08 (0.72)

Passive scenario							
Sub-region	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**
Asturias East	0.10 (0.67)	0.06 (0.78)	0.10 (0.65)	-0.08 (0.71)	0.32 (0.14)	0.35 (0.12)	0.02 (0.93)
Asturias West	-0.16 (0.49)	0.19 (0.41)	0.01 (0.97)	0.19 (0.39)	**0.64 (0.00)**	-0.13 (0.58)	-0.08 (0.74)
Galiza North	0.40 (0.08)	0.05 (0.82)	-0.11 (0.63)	0.20 (0.37)	-0.37 (0.09)	**0.59 (0.00)**	-0.12 (0.63)
Galiza South	0.41 (0.08)	-0.08 (0.74)	-0.19 (0.40)	-0.23 (0.29)	0.31 (0.16)	0.21 (0.36)	0.00 (0.99)
SW Portugal North	-0.18 (0.43)	-0.13 (0.56)	0.40 (0.06)	0.33 (0.11)	-0.25 (0.26)	-0.19 (0.39)	-0.08 (0.74)
SW Portugal South	-0.18 (0.43)	-0.09 (0.70)	0.19 (0.39)	**0.45 (0.03)**	-0.10 (0.65)	-0.24 (0.29)	-0.06 (0.78)

Bottom scenario							
Sub-region	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**
Asturias East	0.09 (0.70)	-0.02 (0.92)	0.27 (0.23)	-0.10 (0.66)	0.31 (0.16)	0.33 (0.14)	-0.06 (0.80)
Asturias West	-0.42 (0.07)	0.22 (0.33)	0.24 (0.27)	0.34 (0.12)	**0.41 (0.06)**	-0.30 (0.18)	-0.19 (0.42)
Galiza North	-0.00 (1.00)	**0.67 (0.00)**	-0.30 (0.17)	0.20 (0.36)	-0.26 (0.24)	0.30 (0.19)	-0.03 (0.89)
Galiza South	0.27 (0.26)	-0.01 (0.95)	-0.17 (0.44)	-0.14 (0.52)	0.31 (0.16)	0.34 (0.13)	-0.08 (0.73)
SW Portugal North	-0.16 (0.50)	-0.26 (0.25)	**0.48 (0.02)**	**0.41 (0.05)**	-0.37 (0.08)	-0.08 (0.74)	-0.20 (0.39)
SW Portugal South	-0.29 (0.20)	-0.08 (0.72)	-0.02 (0.93)	0.19 (0.37)	0.22 (0.30)	-0.20 (0.37)	0.25 (0.28)

Table S4. Pearson cross-correlation coefficients between the observations on *Pollicipes pollicipes* recruitment and modelled supply according to time lag, larval behaviour scenario and sub-region, with 3 sub-regions in Galicia. Only significant positive correlations at time lags of -3 to +3 months were considered ecologically and oceanographically meaningful. Significance of the correlation is given between brackets. Cells in bold indicate significance at the 5% level.

	Time lag (months)						
Ontogenetic scenario							
Sub-region	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**
Asturias East	0.30 (0.21)	0.13 (0.57)	-0.08 (0.71)	-0.23 (0.30)	**0.44 (0.04)**	**0.58 (0.01)**	0.22 (0.34)
Asturias West	-0.10 (0.69)	0.22 (0.35)	-0.03 (0.89)	-0.03 (0.90)	0.27 (0.22)	0.12 (0.61)	0.04 (0.88)
Galiza North	0.08 (0.74)	0.16 (0.49)	-0.26 (0.23)	0.38 (0.08)	0.00 (0.98)	0.15 (0.51)	0.12 (0.60)
Galiza Center	0.17 (0.51)	-0.09 (0.73)	0.08 (0.76)	0.13 (0.58)	0.03 (0.91)	**0.60 (0.01)**	-0.03 (0.90)
Galiza South	0.07 (0.77)	-0.01 (0.96)	-0.04 (0.86)	-0.13 (0.57)	0.39 (0.08)	0.14 (0.55)	0.05 (0.84)
SW Portugal North	-0.24 (0.30)	-0.24 (0.28)	0.36 (0.09)	**0.46 (0.02)**	-0.24 (0.27)	0.13 (0.56)	0.27 (0.23)
SW Portugal South	-0.17 (0.47)	-0.19 (0.39)	0.01 (0.95)	0.21 (0.32)	**0.57 (0.00)**	-0.41 (0.06)	0.11 (0.63)
Surface scenario							
Sub-region	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**
Asturias East	-0.09 (0.70)	0.17 (0.47)	-0.17 (0.45)	0.14 (0.51)	0.37 (0.09)	0.41 (0.06)	-0.01 (0.98)
Asturias West	-0.21 (0.37)	0.32 (0.16)	-0.15 (0.49)	0.14 (0.52)	**0.43 (0.05)**	-0.10 (0.66)	0.03 (0.89)
Galiza North	0.29 (0.22)	0.00 (0.98)	-0.18 (0.42)	0.21 (0.33)	0.08 (0.72)	0.19 (0.41)	0.09 (0.71)
Galiza Center	**0.49 (0.05)**	-0.27 (0.28)	0.06 (0.81)	0.19 (0.42)	0.05 (0.84)	0.21 (0.41)	0.05 (0.85)
Galiza South	0.10 (0.69)	-0.03 (0.89)	0.01 (0.97)	-0.13 (0.54)	0.38 (0.08)	0.12 (0.59)	0.01 (0.96)
SW Portugal North	-0.15 (0.52)	-0.28 (0.21)	0.37 (0.08)	**0.55 (0.01)**	-0.24 (0.27)	-0.20 (0.36)	0.00 (1.00)
SW Portugal South	-0.14 (0.55)	-0.16 (0.47)	0.05 (0.81)	0.18 (0.41)	0.58 (0.00)	**-0.50 (0.02)**	0.08 (0.72)

Passive scenario							
Sub-region	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**
Asturias East	0.10 (0.67)	0.06 (0.78)	0.10 (0.65)	-0.08 (0.71)	0.32 (0.14)	0.35 (0.12)	0.02 (0.93)
Asturias West	-0.16 (0.49)	0.19 (0.41)	0.01 (0.97)	0.19 (0.39)	**0.64 (0.00)**	-0.13 (0.58)	-0.08 (0.74)
Galiza North	0.34 (0.14)	-0.02 (0.94)	-0.27 (0.23)	0.40 (0.06)	-0.39 (0.07)	**0.45 (0.04)**	-0.01 (0.96)
Galiza Center	0.25 (0.33)	-0.11 (0.67)	0.24 (0.33)	-0.17 (0.47)	0.00 (0.99)	0.44 (0.07)	-0.23 (0.38)
Galiza South	0.41 (0.08)	-0.08 (0.74)	-0.19 (0.40)	-0.23 (0.29)	0.31 (0.16)	0.21 (0.36)	0.00 (0.99)
SW Portugal North	-0.18 (0.43)	-0.13 (0.56)	0.40 (0.06)	0.33 (0.11)	-0.25 (0.26)	-0.19 (0.39)	-0.08 (0.74)
SW Portugal South	-0.18 (0.43)	-0.09 (0.70)	0.19 (0.39)	**0.45 (0.03)**	-0.10 (0.65)	-0.24 (0.29)	-0.06 (0.78)

Bottom scenario							
Sub-region	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**
Asturias East	0.09 (0.70)	-0.02 (0.92)	0.27 (0.23)	-0.10 (0.66)	0.31 (0.16)	0.33 (0.14)	-0.06 (0.80)
Asturias West	-0.42 (0.07)	0.22 (0.33)	0.24 (0.27)	0.34 (0.12)	**0.41 (0.06)**	-0.30 (0.18)	-0.19 (0.42)
Galiza North	-0.27 (0.25)	0.39 (0.08)	-0.21 (0.34)	0.20 (0.36)	-0.24 (0.28)	0.32 (0.16)	-0.01 (0.98)
Galiza Center	0.38 (0.13)	0.38 (0.12)	-0.35 (0.14)	0.43 (0.06)	-0.34 (0.16)	0.20 (0.42)	0.05 (0.86)
Galiza South	0.27 (0.26)	-0.01 (0.95)	-0.17 (0.44)	-0.14 (0.52)	0.31 (0.16)	0.34 (0.13)	-0.08 (0.73)
SW Portugal North	-0.16 (0.50)	-0.26 (0.25)	**0.48 (0.02)**	**0.41 (0.05)**	-0.37 (0.08)	-0.08 (0.74)	-0.20 (0.39)
SW Portugal South	-0.29 (0.20)	-0.08 (0.72)	-0.02 (0.93)	0.19 (0.37)	0.22 (0.30)	-0.20 (0.37)	0.25 (0.28)

Text S1. Temperature-dependent larval mortality and growth rates

Temperature dependence of naupliar mortality

We estimated nauplii mortality from data on the variation of total survival to cypris (*tS*, percent) and median development to cypris (MDT, days) with temperature (T, °C) as reported in Table 1 of Franco et al. 2017. We have assumed the exponential model

$N_t = N_0 e^{-mt}$ equation A1

where N_0 is the initial population size, N_t is the population size after time *t* and *m* is the mortality rate. We have applied data in Franco et al. (2017) to equation 1 by setting *t=MDT*, N_0=100 and N_t=*tS*, thus

$tS = 100e^{-mMDT}$ equation A2

which, solving for *m*, becomes

$m = ln\left(\frac{100}{tS}\right)/MDT$ equation A3

We used equation A.3 to calculate *m* for each combination of *tS* and *MTD* in Franco et al. (2017), and examined its variation with *T*, which can be appreciated in figure A.1. Following common practice, we fitted these data to an exponential model (Fig. A1) which can be used to predict nauplii mortality from environmental temperature:

$m=0,034e^{0.067T}$ equation A4

This equation explains only a moderate portion of the variance (R^2=0.42, Fig. A1) and, given the small sample size (n=5), it is only marginally significant (p=0.161). However, it is consistent with mortality patterns in pelagic nauplii of other crustacean species, including barnacles (Fig. A2).

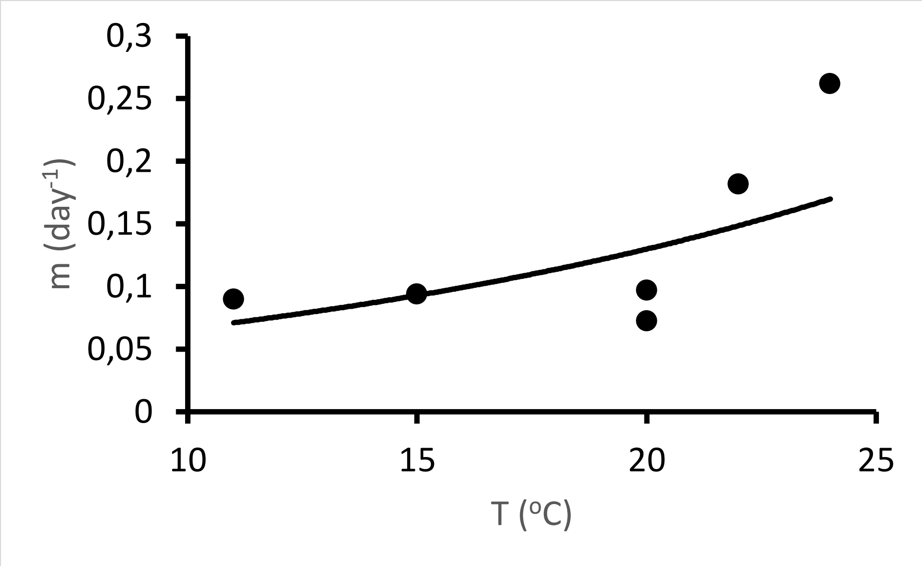

Figure A1. Plot of mortality *vs* temperature for nauplii of *Pollicipes pollicipes*, based on data in Franco et al. (2017). The line corresponds to the least squares fit to an exponential model, which takes the form log(m)=(0.067±0.039)T-(3.38±0.75), with n=5, R^2=0.42, $F_{1,4}$=2.945, P=0.161.

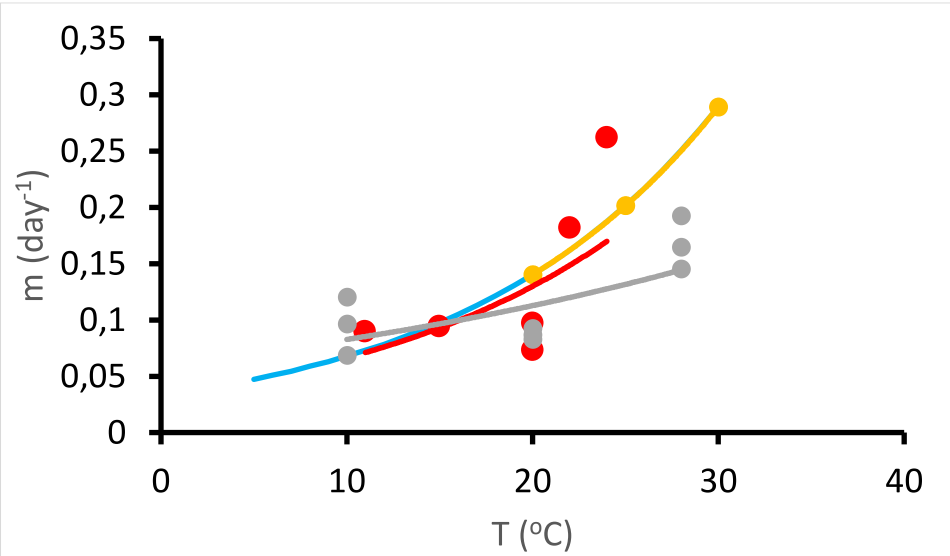

Figure A2. Comparison of mortality vs temperature data for the barnacles *Pollicipes pollicipes* (red dots, calculated from Franco et al. (2016), *Balanus improvisus* (grey dots, from Nasrolahi et al. 2016), *Balanus eburneus* (yellow dots, from Scheltema & Williams 1982). Colored lines indicate least squares fits to exponential models. The blue line indicates the best fit for a compilation of data from copepods by Hirst & Kiørboe (2002; in this case the individual data are not plotted).

Temperature dependence of the development time to cypris

Temperature has a marked effect on the development time of nauplii to cypris (operationally defined as median development time [MDT] in Franco et al. (2017). We originally planned to use an exponential model (i.e. O'Connor et al. 2007). However, it is overly complex for the kind of data that we have. It is also difficult to fragment in time units for IBM modeling, which usually proceeds in discrete time steps.

Thus, we have chosen to apply the concept of degree-days (as defined in Trudgill et al. 2005), which is classical, simple, widely accepted and its cumulative nature makes it ideal for use in IBM models. This method is based on a regression between the inverse of MDT and T (Figure A3), which takes the form:

1/MDT=0.00386T-0.00530 equation A5

The basal temperature Tb (°C) is defined as the intercept on the X-axis, which for equation A5 is Tb=1.373 °C. The degree days (DD, °C day^{-1}) is the inverse of the slope, which for equation A5 is DD=259.06. According to this, the nauplius stage should finish when

$$\sum_i \Delta t_i * (T_i - T_b) = \sum_{\boldsymbol{i}} \Delta \boldsymbol{t_i} * (\boldsymbol{Ti} - \mathbf{1,37}) \geq DD = \mathbf{259}$$ equation A6

where *i* corresponds to each of the simulation intervals, Δt_i is the duration of each simulation interval *i*, T_i is the environmental temperature during time interval *i*, T_b is the basal temperature (1,37 °C) and *DD* is the thermal constant (259 °C day). When $T_i < T_b$, term ($T_i - T_b$) is set to 0.

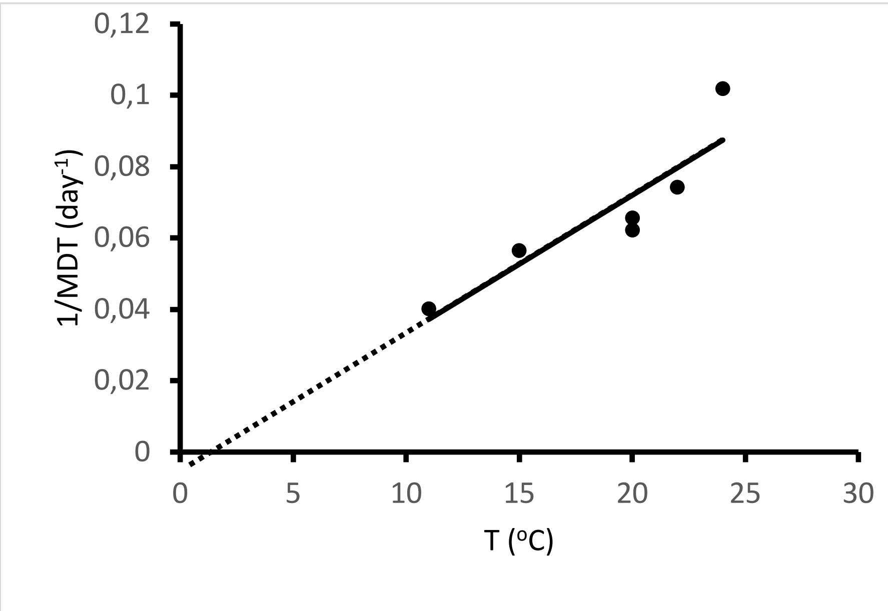

Figure A3. Plot of the inverse of the median development time of nauplii *vs* environmental temperature for *Pollicipes pollicipes*, according to data in Franco et al. (2017). The least-squares fit to these data takes the form 1/MDT=(0.00386±0.00093)T-(0.00530±0.01781), with n=6, R^2=0.81, $F_{1,5}$=17.31 and P=0.014.

Temperature dependence of cypris mortality

The only data to assess the mortality of cypris are those in Franco et al. (2016). They report on a experiment where they keep several batches of cyprids at 20ºC in the absence of any substratum to attach, and determine the percentage of cyprids surviving (S) at 2-day intervals until the end of the experiment in day 20, when nearly 50% of the cyprids are still alive. We have digitized the means in their Figure 5 and used those data to investigate mortality patterns. Cyprids exhibit a convex survivorship curve (Fig. A4; in a whole life cycle this would be called a "Type I" curve). This means that mortalities are not constant, but rather increase through time (as in Pansch et al. 2012 for *Amphibalanus improvisus*). Based on equation A1, I have calculated the mortality rate for every 2-day interval (Fig. A5). The increase in mortality with time in the cypris is best described by an exponential model, which makes sense since these organisms rely on a limited lipid reserve which decays through time. In spite of this pattern, mortalities are in general much lower in the cyprids (0.008 to 0.08 day^{-1}, Fig. A5) than in the nauplii (0.08 to 0.26 day^{-1} for the different temperatures, Fig. A1). The average mortality rate of the cyprids during the 0-20 day period is 0.034 day^{-1}.

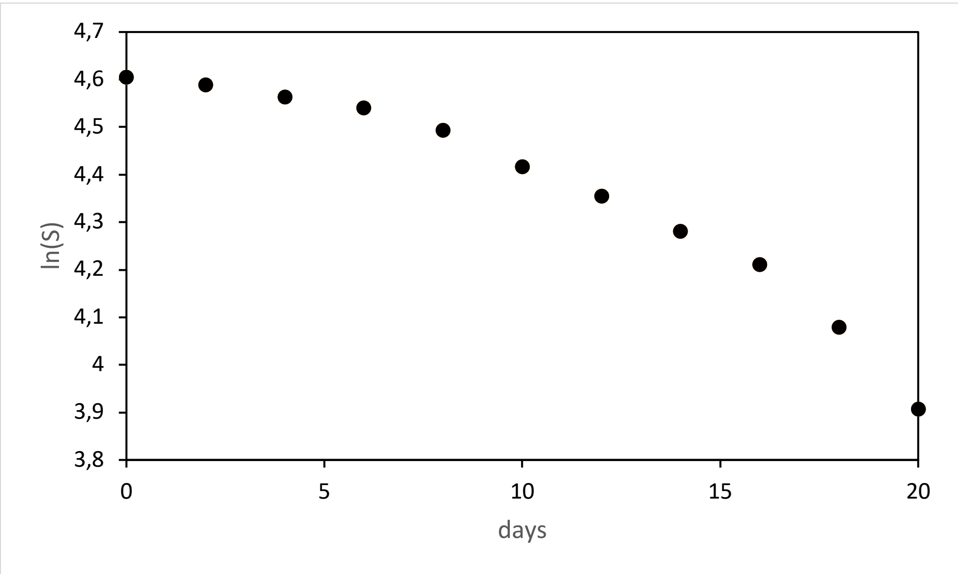

Figure A4. Plot of the natural logarithm of percent cypris survival *vs* time. In this kind of plot, departure from linearity indicates that mortalities are not constant through time, and increase when the curve is convex.

To our knowledge, there is no data to estimate the temperature sensitivity of cyprid mortality. In nauplii, mortality can be estimated from ambient temperature as $m=0,034e^{0.067T}$ (Eq. A4). If we assume the same temperature sensitivity, cyprid mortality should vary as $m=Xe^{0.067T}$, where X is an unknown scaling parameter. However, we know that the bulk mortality of cyprids at 20ºC during the first 20 days is 0.034 day^{-1}. Thus, if we assume that cyprid survival is as sensitive to temperature as nauplii survival, the above equation can be rewritten as 0.034=$Xe^{0.067*20}$, which can be solved to yield X=0.034/$e^{0.067*20}$ =0.0089. In other words, mortality for the cyprids could be roughly estimated as

m=$0.0089e^{0.067*T}$ equation A7

Note that equation 7 relies on two very important assumptions. First, that the mortality is constant trough the cypris stage, and equal to the bulk mortality during the 0 to 20 day age period. We know that this is not true (Fig. A5), and that mortalities should probably increase if a longer average was calculated. Second, we are assuming that cyprid mortality has the same temperature dependence as in nauplii.

Last, we have no reasonable grounds to propose a value for the maximum duration of a cypris, other than a rough estimate of 30 days as provided by Franco et al. (2016). This figure is probably reasonable given the exponential nature of the mortality term, which should nearly deplete the population by day 30 at 20ºC (Fig. A5). If we assume that cyprids have the same basal temperature as nauplii, then we can set $\Delta t_i = 30$ and T=20 in inequality A6, which can then be rewritten as 30*(20-1.37)≥DD which, once solved, leads to DD=559. Thus, if we assume the same basal temperature as for the nauplii, a cyprid larvae should die when the following condition is fulfilled:

$\sum_i \Delta t_i * (T_i - T_b) = \sum_i \boldsymbol{\Delta t_i} * (\boldsymbol{T} - \mathbf{1,37}) \geq DD = 559$ Equation A8

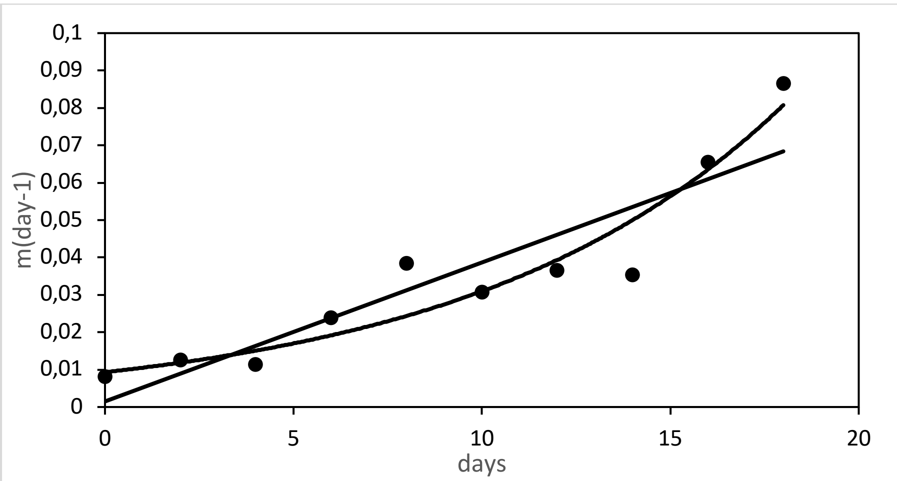

Figure A5. Plot of the instantaneous mortality rate of *Pollicipes pollicipes* cypris against time, at a temperature of 20° C, based on data in Franco et al. (2016). Lines indicate least-squares fits to linear (m=[0.00372±0.00060]d+[0.00149±0.00644], n=10, R^2=0.83, $F_{1,9}$=37.93, P<0.001) and exponential (ln(m)=[0.120±0.013]d-[4.674±0.145], n=10, R^2=0.91, $F_{1,9}$=77.8, P<0.001) models.

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