Figures and Supplementary Material

Main text figures

Figure 1:

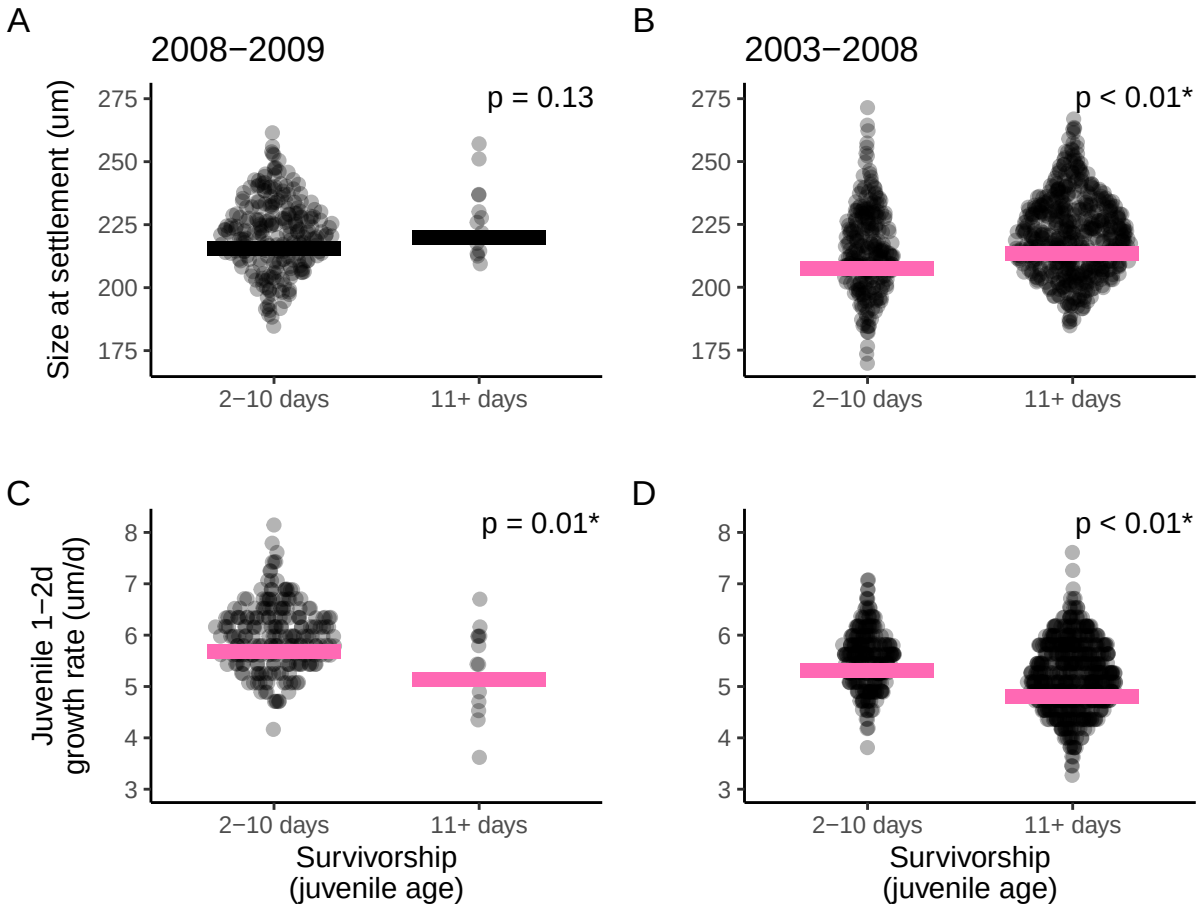


Figure 2:

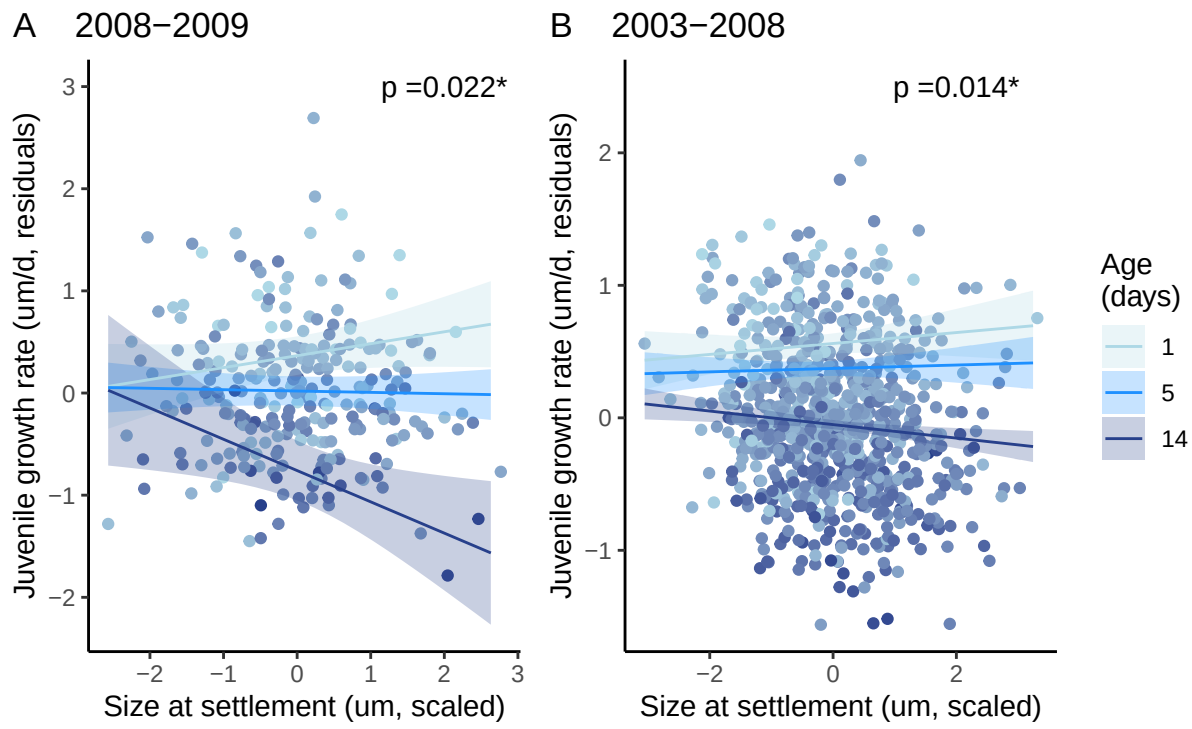

A 2008−2009
p =0.022*
Juvenile growth rate (um/d, residuals)
Size at settlement (um, scaled)
B 2003−2008
p =0.014*
Juvenile growth rate (um/d, residuals)
Size at settlement (um, scaled)
Age (days)
1
5
14

Figure 3:

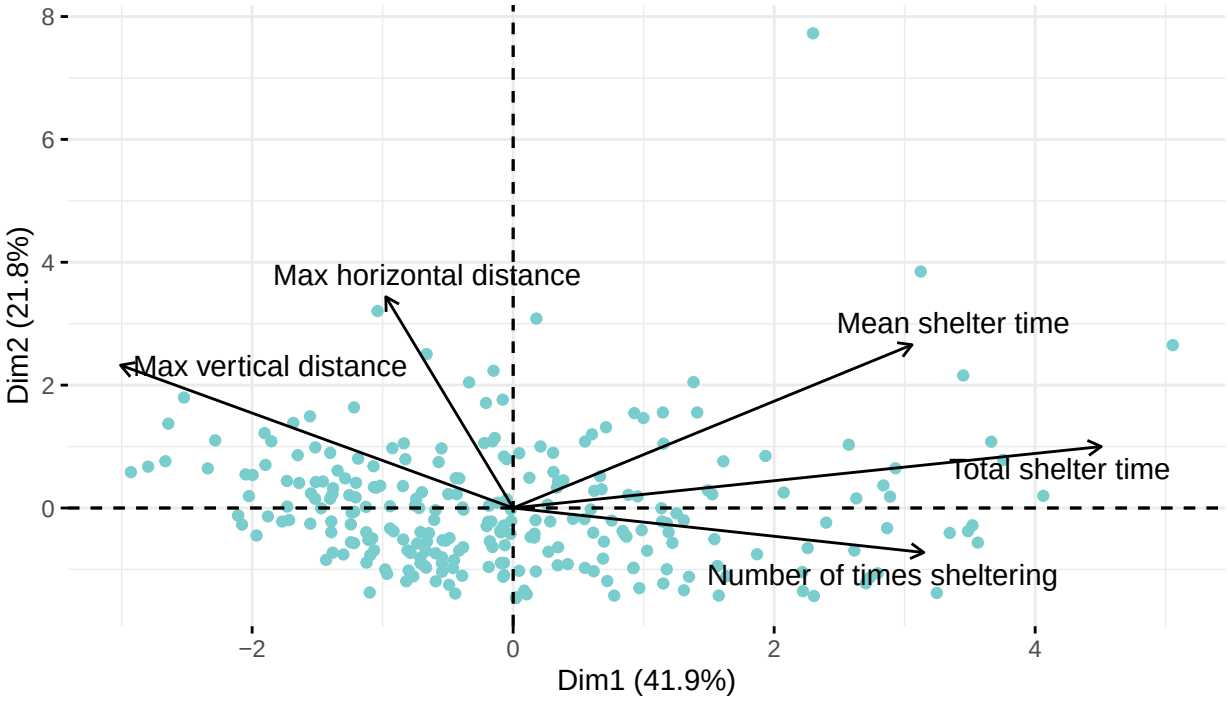

Max horizontal distance
Mean shelter time
Max vertical distance
Total shelter time
Number of times sheltering
Dim2 (21.8%)
Dim1 (41.9%)
8
6
4
2
0
−2
0
2
4

Figure 4:

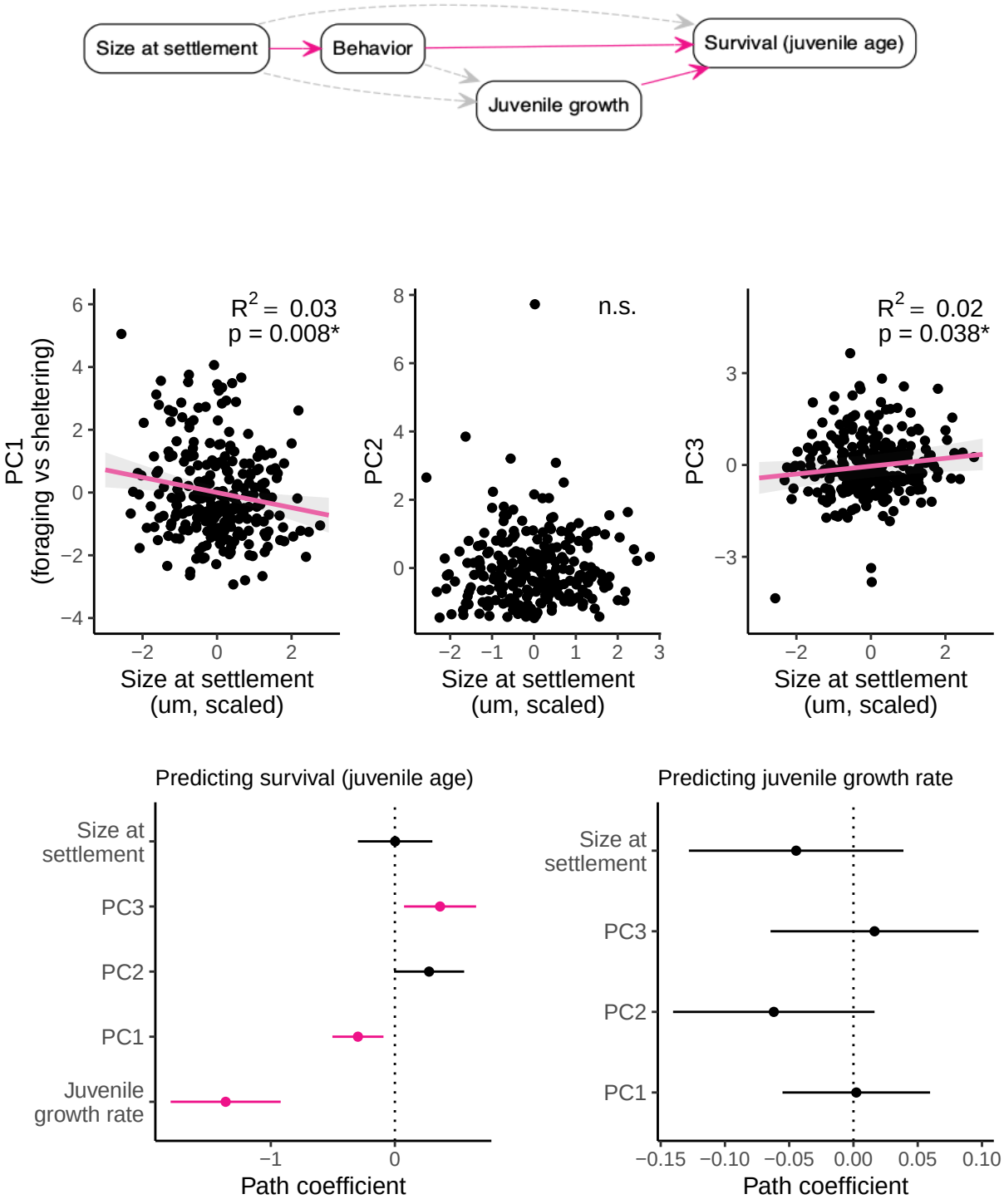
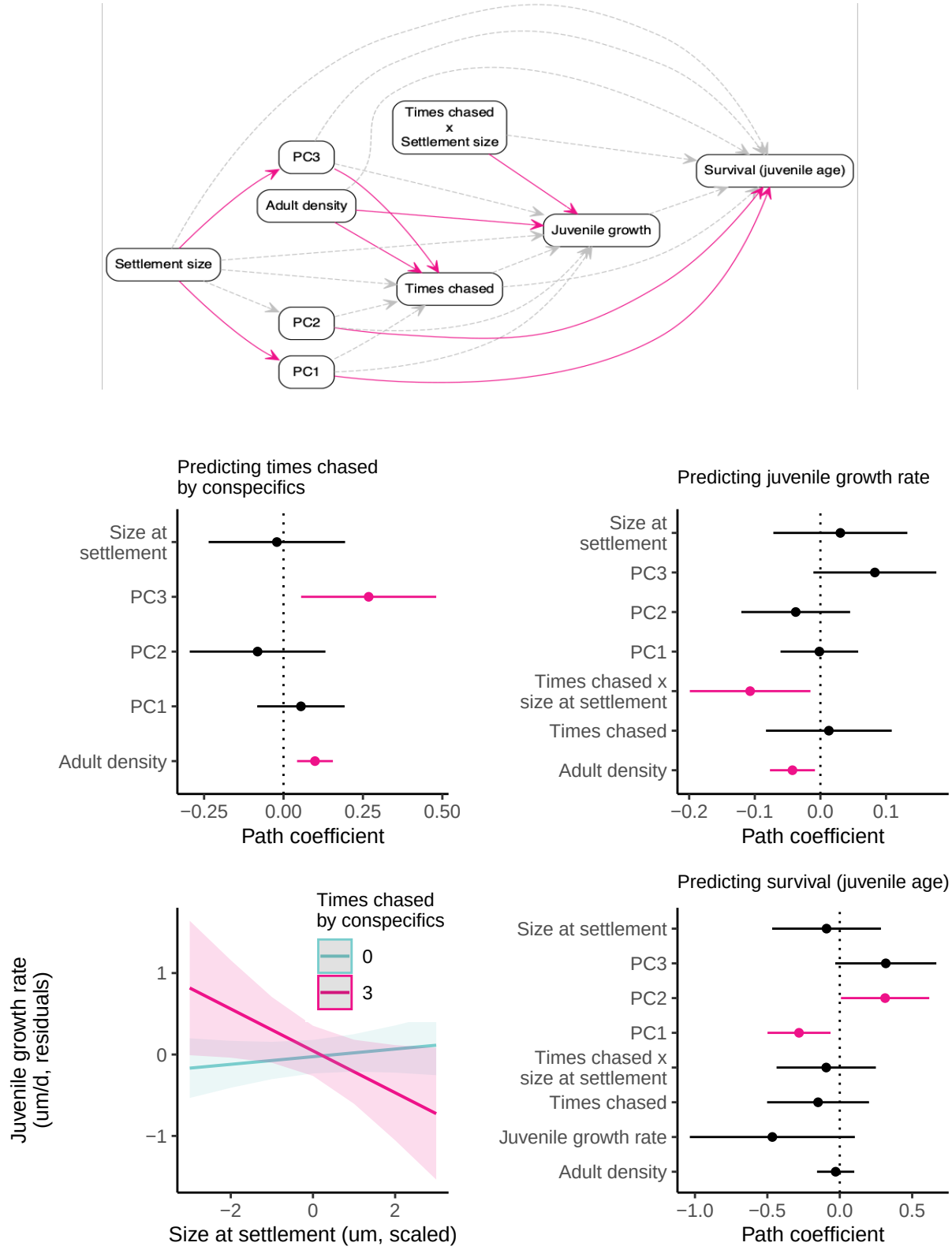

Size at settlement
Behavior
Survival (juvenile age)
Juvenile growth
PC1 (foraging vs sheltering)
R2 = 0.03
p = 0.008*
Size at settlement (um, scaled)
PC2
n.s.
Size at settlement (um, scaled)
PC3
R2 = 0.02
p = 0.038*
Size at settlement (um, scaled)
Predicting survival (juvenile age)
Size at settlement
PC3
PC2
PC1
Juvenile growth rate
Path coefficient
Predicting juvenile growth rate
Size at settlement
PC3
PC2
PC1
Path coefficient

Figure 5:


Times chased
x
Settlement size
PC3
Survival (juvenile age)
Adult density
Juvenile growth
Settlement size
Times chased
PC2
PC1
Predicting times chased
by conspecifics
Size at
settlement
PC3
PC2
PC1
Adult density
−0.25
0.00
0.25
0.50
Path coefficient
Predicting juvenile growth rate
Size at
settlement
PC3
PC2
PC1
Times chased x
size at settlement
Times chased
Adult density
−0.2
−0.1
0.0
0.1
Path coefficient
Juvenile growth rate
(um/d, residuals)
Times chased
by conspecifics
0
3
1
0
−1
−2
0
2
Size at settlement (um, scaled)
Predicting survival (juvenile age)
Size at settlement
PC3
PC2
PC1
Times chased x
size at settlement
Times chased
Juvenile growth rate
Adult density
−1.0
−0.5
0.0
0.5
Path coefficient

Supplementary Figures

Figure S1:

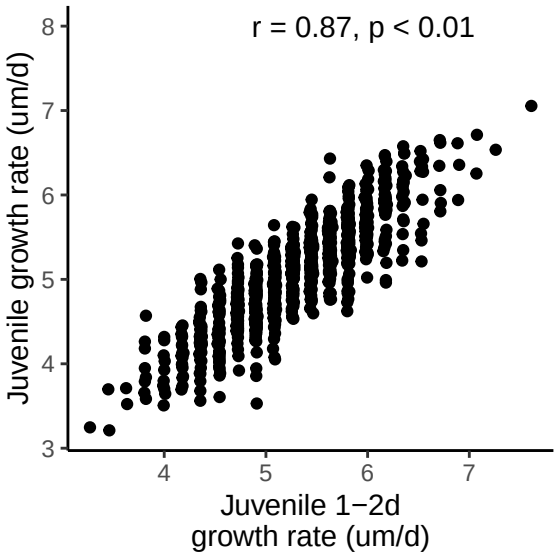


Figure S2:

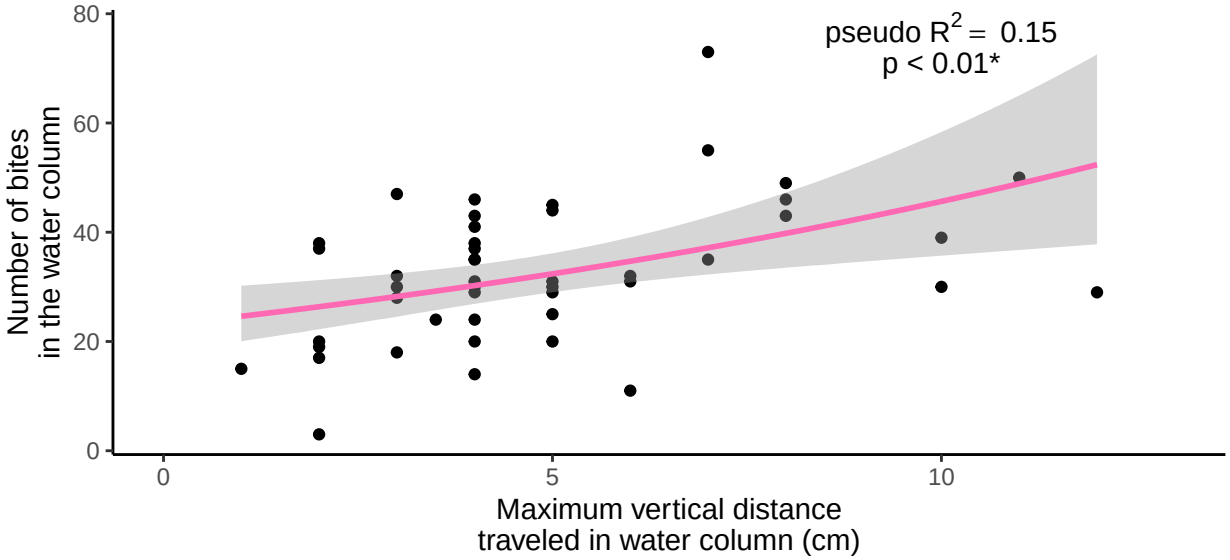

pseudo R^2 = 0.15
p < 0.01*
Number of bites in the water column
0
20
40
60
80
0
5
10
Maximum vertical distance traveled in water column (cm)

Figure S3:

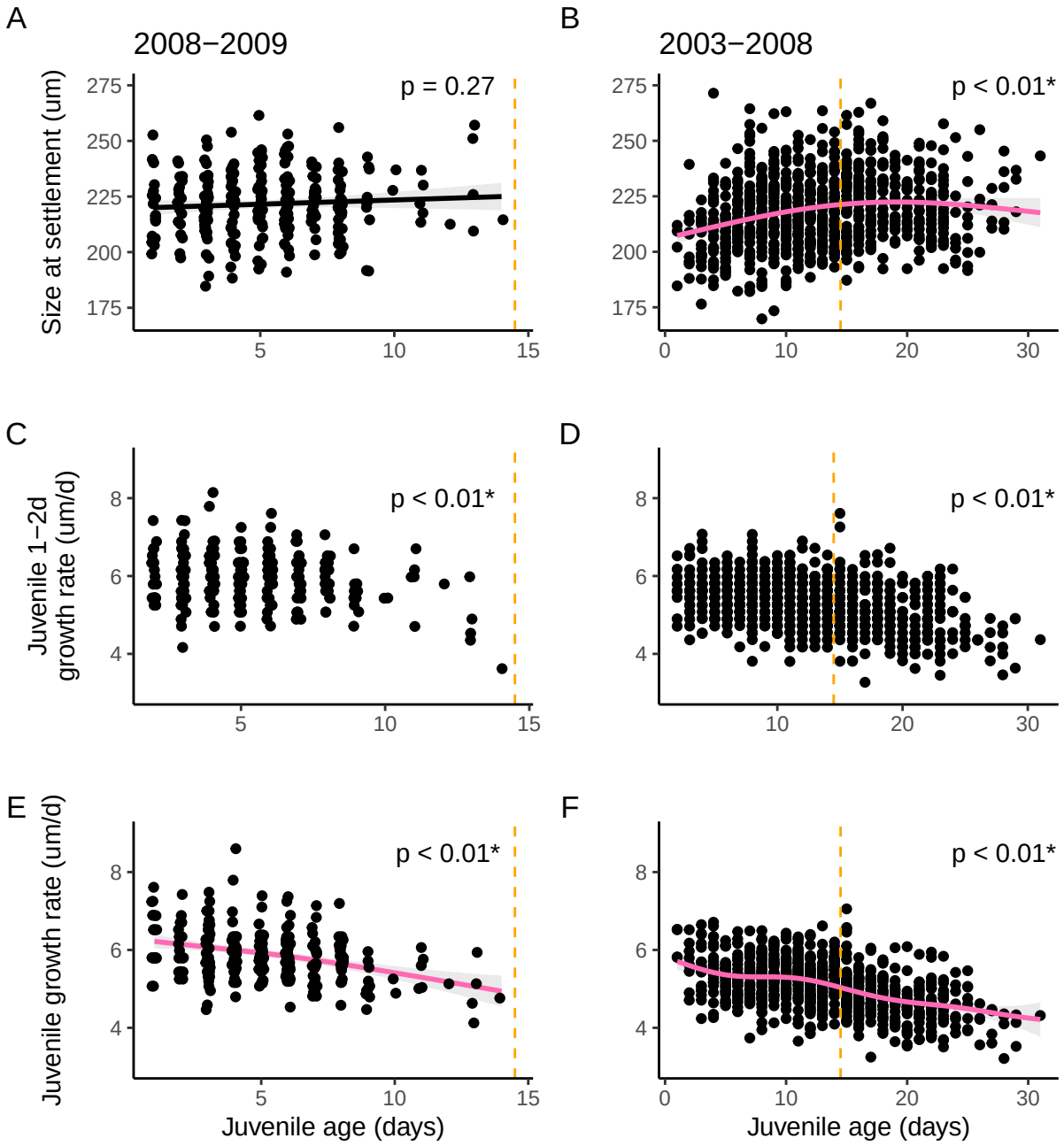

A
2008−2009
p = 0.27
Size at settlement (um)
B
2003−2008
p < 0.01*
C
p < 0.01*
Juvenile 1−2d growth rate (um/d)
D
p < 0.01*
E
p < 0.01*
Juvenile growth rate (um/d)
Juvenile age (days)
F
p < 0.01*
Juvenile age (days)

Figure S4:

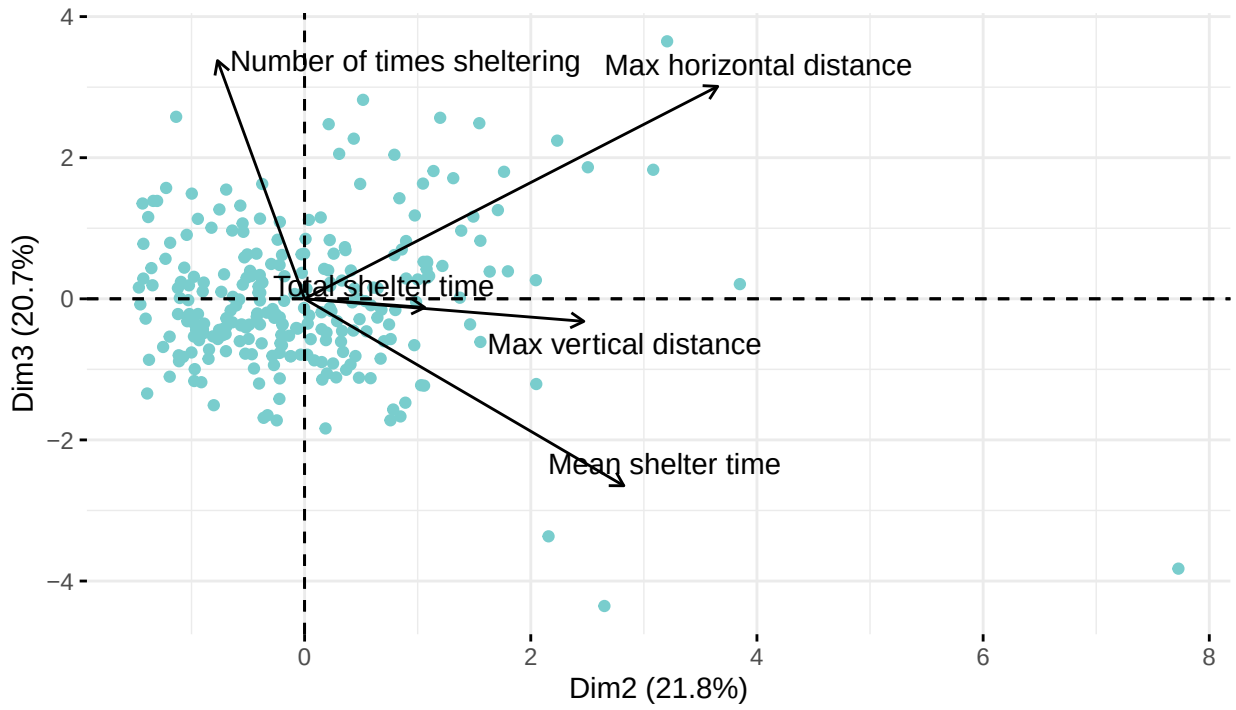
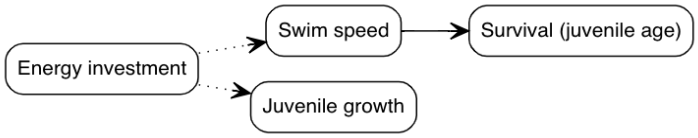
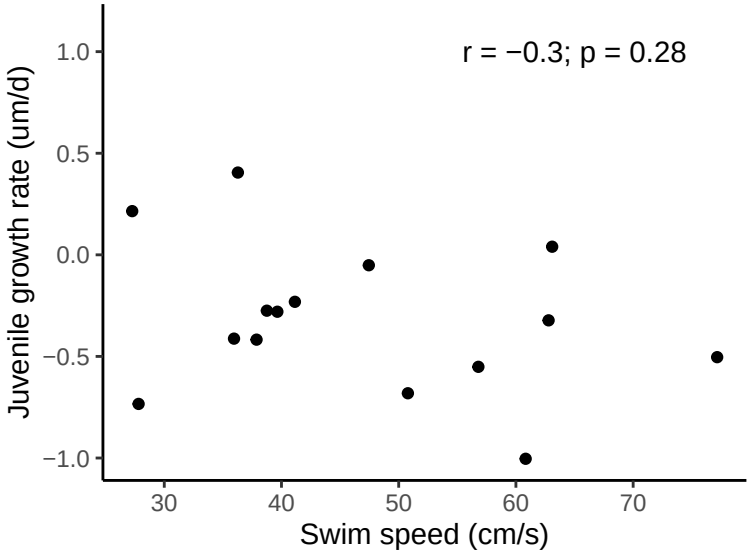

Number of times sheltering
Max horizontal distance
Total shelter time
Max vertical distance
Mean shelter time
Dim3 (20.7%)
Dim2 (21.8%)
4
2
0
−2
−4
0
2
4
6
8

Figure S5:


Swim speed
Survival (juvenile age)
Energy investment
Juvenile growth


r = −0.3; p = 0.28
Juvenile growth rate (um/d)
1.0
0.5
0.0
−0.5
−1.0
30
40
50
60
70
Swim speed (cm/s)

Supplementary Tables

Table 1: Generalized linear model (GLM) with a negative binomial error structure predicting number of times fish take bites in the water column.

	Estimate	Std. Error	z value	p value
(Intercept)	3.13	0.12	25.28	<0.001
Max vertical distance	**0.07**	**0.02**	**3.08**	**0.002**

Table 2: Linear mixed effects model (LMM) predicting juvenile growth rate (um/d, residuals) in the 2008-2009 dataset, with random intercepts for collection site.

	Estimate	Std. Error	df	t value	p value
(Intercept)	0.45	0.11	4.50	4.26	0.010
Settlement size	0.15	0.09	249.51	1.75	0.081
Juvenile age	**-0.09**	**0.01**	**251.60**	**-5.84**	**<0.001**
Settlement size x juvenile age	**-0.03**	**0.01**	**251.47**	**-2.30**	**0.022**

Table 3: LMM predicting juvenile growth rate (um/d, residuals) in the 2003-2008 dataset, with random intercepts for collection site.

	Estimate	Std. Error	z value	p value
(Intercept)	0.61	0.04	14.67	<0.001
Settlement size	0.05	0.04	1.22	0.223
Juvenile age	**-0.05**	**0.00**	**-16.05**	**<0.001**
Settlement size x juvenile age	**-0.01**	**0.00**	**-2.47**	**0.014**

Table 4: Path coefficients for the DAG in Figure 4A. The model is well fit to the data (C-statistic = 1.33, df = 6, p-value = 0.97). A p-value < 0.05 would indicate that the hypothesized structure in the DAG is not supported by the data. Estimates correspond to partial regression coefficients and can be interpreted as the expected change in the response given a unit change in the predictor. Standardized estimates are calculated by scaling these estimates by the ratio of the standard deviation of the predictor over the standard deviation of the response.

Response	Predictor	Estimate	Std.Estimate	Std.Error	DF	Crit.Value	P.Value
PC1	**Settlement size**	**-0.24**	**-0.17**	**0.09**	**254**	**-2.69**	**0.008**
PC2	Settlement size	0.04	0.03	0.07	254	0.54	0.591
PC3	**Settlement size**	**0.13**	**0.13**	**0.06**	**256**	**2.08**	**0.038**
Juvenile age	**Juv. growth rate**	**-1.36**	**-0.35**	**0.23**	**250**	**-6.03**	**<0.001**
Juvenile age	Settlement size	0.00	0.00	0.15	250	0.01	0.989
Juvenile age	**PC1**	**-0.30**	**-0.16**	**0.10**	**250**	**-2.84**	**0.005**
Juvenile age	PC2	0.28	0.11	0.14	250	1.91	0.057
Juvenile age	**PC3**	**0.36**	**0.14**	**0.15**	**250**	**2.46**	**0.015**
Juv. growth rate	PC1	0.00	0.00	0.03	251	0.08	0.939
Juv. growth rate	PC2	-0.06	-0.10	0.04	251	-1.55	0.123
Juv. growth rate	PC3	0.02	0.03	0.04	251	0.40	0.691
Juv. growth rate	Settlement size	-0.04	-0.07	0.04	251	-1.05	0.297

Table 5: R-squared values for component models for the DAG in Figure 4A.

Response	Family	Link	Mixed model	Marginal R2	Conditional R2
PC1	Gaussian	identity	No	0.03	NA
PC2	Gaussian	identity	No	0.00	NA
PC3	Gaussian	identity	Yes	0.02	0.08
Juvenile age	Gaussian	identity	No	0.19	NA
Juvenile growth rate	Gaussian	identity	No	0.01	NA

Table 6: Path coefficients for the DAG in Figure 5A. The model is well fit to the data (C-statistic = 13.55, df = 12, p-value = 0.33). A p-value < 0.05 would indicate that the hypothesized structure in the DAG is not supported by the data. Estimates correspond to partial regression coefficients and can be interpreted as the expected change in the response given a unit change in the predictor. Standardized estimates are calculated by scaling these estimates by the ratio of the standard deviation of the predictor over the standard deviation of the response.

Response	Predictor	Estimate	Std.Estimate	Std.Error	DF	Crit.Value	P.Value
Times chased	**Adult density**	**0.10**	**0.13**	**0.03**	**162**	**3.44**	**0.001**
Times chased	Settlement size	-0.02	-0.01	0.11	162	-0.19	0.848
Times chased	PC1	0.05	0.04	0.07	162	0.78	0.435
Times chased	PC2	-0.08	-0.04	0.11	162	-0.75	0.454
Times chased	**PC3**	**0.27**	**0.14**	**0.11**	**162**	**2.47**	**0.014**
Juv. growth rate	**Adult density**	**-0.04**	**-0.19**	**0.02**	**159**	**-2.43**	**0.016**
Juv. growth rate	Times chased	0.01	0.02	0.05	159	0.26	0.792
Juv. growth rate	Settlement size	0.03	0.05	0.05	160	0.58	0.560
Juv. growth rate	PC3	0.08	0.14	0.05	145	1.74	0.084
Juv. growth rate	PC1	0.00	0.00	0.03	160	-0.05	0.959
Juv. growth rate	PC2	-0.04	-0.07	0.04	159	-0.89	0.375
Juv. growth rate	**Chased:Settlmt size**	**-0.11**	**-0.19**	**0.05**	**159**	**-2.29**	**0.024**
Juvenile age	Juv. growth rate	-0.47	-0.13	0.29	159	-1.60	0.111
Juvenile age	Times chased	-0.15	-0.06	0.18	158	-0.84	0.404
Juvenile age	Settlement size	-0.09	-0.04	0.19	159	-0.48	0.634
Juvenile age	PC3	0.32	0.14	0.18	157	1.78	0.076
Juvenile age	**PC2**	**0.31**	**0.15**	**0.16**	**158**	**2.01**	**0.046**
Juvenile age	**PC1**	**-0.28**	**-0.20**	**0.11**	**159**	**-2.54**	**0.012**
Juvenile age	Adult density	-0.03	-0.03	0.07	158	-0.43	0.665
Juvenile age	Chased:Settlmt size	-0.09	-0.04	0.17	158	-0.54	0.593
PC1	**Settlement size**	**-0.26**	**-0.16**	**0.12**	**166**	**-2.11**	**0.036**
PC2	Settlement size	-0.01	-0.01	0.09	166	-0.08	0.936
PC3	**Settlement size**	**0.21**	**0.20**	**0.08**	**168**	**2.68**	**0.007**

Table 7: R-squared values for component models for the DAG in Figure 5A.

Response	Family	Link	Mixed model	Marginal R2	Conditional R2
Times chased	Poisson	log	No	0.13	NA
Juvenile growth rate	Gaussian	identity	Yes	0.08	0.10
Juvenile age	Gaussian	identity	Yes	0.09	0.13
PC1	Gaussian	identity	No	0.03	NA
PC2	Gaussian	identity	No	0.00	NA
PC3	Gaussian	identity	Yes	0.04	0.10