

Table S1: Mean size (\pm SE) and size range (95% CI), mean weight (\pm SE) and weight range (95% CI), body condition (\pm SE) and body condition range (95% CI), sex ratio (in %) of males (M), females (F) or unidentified (Un.) of 58 sardines sampled at capture in May.

Size (mm)	Weight (g)	Body condition (Kn)	Sex (n = 58)		
			Male	Female	Un.
105.6 \pm 0.9 [103.6 – 107.5]	7.9 \pm 0.2 [7.5 – 8.4]	0.96 \pm 0.01 [0.95– 0.97]	35%	62%	3%

Table S2: Mortality rate (%) for each tank throughout the experiment

Period	Feeding treatments	Tank	Mortality rate (%)
Summer	Rich	Tank 1	6
	Poor	Tank 2	9
Winter	Rich/Rich	Tank 1	0
		Tank 2	2
	Rich/Poor	Tank 1	4
		Tank 2	0
	Poor/Rich	Tank 1	4
		Tank 2	2
	Poor/Poor	Tank 1	5
		Tank 2	5

Table S3: Descriptive statistics (mean ± SE) for growth (mm/day) and condition rate during summer and winter as well as total length (mm), body condition (Le Cren index), and variance (SD) at the end of summer and at the end of winter for each treatment considered. Values with different letters are significantly different (LMM; P < 0.05 from post-hoc Tukey tests).

Treatment	Summer						Winter					
	Total length (mm)	Body condition	SD Total length (mm)	SD Body condition	Growth rate (mm/day)	Condition rate (day ⁻¹)	Total length (mm)	Body condition	SD Total length (mm)	SD Body condition	Growth rate (mm/day)	Condition rate (day ⁻¹)
Rich Summer/ Rich Winter	122.4 ± 0.3	1.24 ± 0.01	5.83	0.11	0.135 ± 0.002	24.8.10 ⁻⁴ ± 0.6.10 ⁻⁴	130.1 ± 0.4	1.33 ± 0.01	6.49	0.08	0.087 ± 0.002	7.4.10 ⁻⁴ ± 0.6.10 ⁻⁴
Rich Summer/ Poor Winter	a	a			a	a	a	127.8 ± 0.5			1.20 ± 0.01	0.056 ± 0.002
Poor Summer/ Rich Winter	113.7 ± 0.2	0.93 ± 0.01	4.35	0.11	0.065 ± 0.002	5.1.10 ⁻⁴ ± 0.6.10 ⁻⁴	117.6 ± 0.4	1.07 ± 0.01	5.63	0.10	0.043 ± 0.002	10.7.10 ⁻⁴ ± 0.6.10 ⁻⁴
Poor Summer/ Poor Winter	b	b			b	b	b	114.8 ± 0.3			0.98 ± 0.01	0.015 ± 0.002

Table S4: Results of the selected linear model of summer growth rate considering feeding treatment and initial size for all sardines. Estimations of the predictors were based on the estimations of treatment Poor Summer. For instance, the intercept of Rich Summer treatment was -0.135 (i.e. 0.296 – 0.431) and the slope was +0.002 (i.e.-0.002 + 0.004).

Predictors	Summer growth rate		
	Estimates	CI	p
(Intercept)	0.296	0.182 – 0.410	<0.001
Initial size summer	-0.002	-0.003 – -0.001	<0.001
Treatment summer [Rich Summer]	-0.431	-0.582 – -0.280	<0.001
Initial size summer* Treatment summer [Rich Summer]	0.004	0.003 – 0.006	<0.001
Observations	972		
R ² / R ² adjusted	0.345 / 0.343		

Table S5: Summary of the selected linear model of winter growth rate considering feeding treatment and initial size (size at the end of summer) for all sardines. Are represented for each treatment whether its slope is significantly different from zero (either positively or negatively).

<i>Treatment</i>	<i>Estimates slope</i>	Winter growth rate	
		<i>CI</i>	<i>p</i>
Poor Summer/Poor Winter	0.0004	-0.0005 – 0.0013	0.426
Poor Summer/Rich Winter	0.0011	0.0003 – 0.0020	0.010
Rich Summer/Poor Winter	0.0007	0.0001 – 0.0014	0.017
Rich Summer/Rich Winter	-0.0003	-0.0009 – 0.0003	0.360
Observations	972		
R ² / R ² adjusted	0.423 / 0.419		

Table S6: Results of the selected generalized mixed effect model (with a gamma link function, equation 6) for sardines in the Poor Summer/Poor Winter feeding treatment in winter.

<i>Predictors</i>	<i>Estimates</i>	Growth rate (t)	
		<i>CI</i>	<i>p</i>
(Intercept)	-0.99	-1.00 – -0.98	<0.001
Condition rate (t)	-0.07	-0.08 – -0.07	<0.001
Body condition (t-1)	0.06	0.05 – 0.06	<0.001
Condition rate (t) *			
Body condition (t-1)	-0.00	-0.01 – 0.00	0.081
Random Effects			
σ^2	0.01		
τ_{00} Tag	0.002		
N Tag	222		
Observations	873		
Marginal R ² / Conditional R ²	0.521 / 0.620		

Table S7: Results of the selected generalized mixed effect model (with a gamma link function, equation 6) for sardines in the Poor Summer/Rich Winter feeding treatment in winter.

<i>Predictors</i>	<i>Estimates</i>	Growth rate (t)	
		<i>CI</i>	<i>p</i>
(Intercept)	-0.92	-0.93 – -0.91	<0.001
Condition rate (t)	-0.05	-0.06 – -0.05	<0.001
Body condition (t-1)	0.04	0.03 – 0.05	<0.001
Condition rate (t) * Body condition (t-1)	-0.01	-0.02 – -0.00	0.001
Random Effects			
σ^2	0.01		
$\tau_{00 \text{ Tag}}$	0.002		
N_{Tag}	225		
Observations	890		
Marginal R^2 / Conditional R^2	0.330 / 0.452		

Table S8: Results of the selected generalized mixed effect model (with a gamma link function, equation 6) for sardines in the Rich Summer/Poor Winter feeding treatment in winter.

<i>Predictors</i>	<i>Estimates</i>	Growth rate (t)	
		<i>CI</i>	<i>p</i>
(Intercept)	-0.88	-0.89 – -0.87	<0.001
Condition rate (t)	-0.09	-0.10 – -0.09	<0.001
Body condition (t-1)	0.01	0.00 – 0.02	0.023
Condition rate (t) * Body condition (t-1)	0.00	-0.01 – 0.01	0.982
Random Effects			
σ^2	0.01		
$\tau_{00 \text{ Tag}}$	0.003		
N_{Tag}	262		
Observations	969		
Marginal R^2 / Conditional R^2	0.475 / 0.606		

Table S9: Results of the selected generalized mixed effect model (with a gamma link function, equation 6) for sardines in the Rich Summer/Rich Winter feeding treatment in winter.

<i>Predictors</i>	<i>Estimates</i>	Growth rate (t)	
		<i>CI</i>	<i>p</i>
(Intercept)	-0.82	-0.83 – -0.81	<0.001
Condition rate (t)	-0.10	-0.10 – -0.09	<0.001
Body condition (t-1)	-0.00	-0.01 – 0.01	0.984
Condition rate (t) * Body condition (t-1)	-0.01	-0.01 – -0.00	0.010
Random Effects			
σ^2	0.01		
τ_{00} Tag	0.002		
N Tag	263		
Observations	964		
Marginal R ² / Conditional R ²	0.463 / 0.573		

Table S10: Results of the generalized linear model (with a gamma link function, equation 7) for sardines in the Poor Summer/Poor Winter feeding treatment

<i>Predictors</i>	<i>Estimates</i>	GSI	
		<i>CI</i>	<i>p</i>
(Intercept)	-1.25	-2.14 – -0.24	0.018
Total growth rate	26.45	0.14 – 52.80	0.042
Condition rate (without gonad)	-166.80	-1190.29 – 612.80	0.732
Sex [M]	0.86	0.12 – 1.59	0.014
Total <u>growth rate</u> * Condition rate (<u>without gonad</u>)	521.29	-30226.58 – 33226.02	0.975
Observations	26		
R ² Nagelkerke	0.556		

Table S11: Results of the generalized linear model model (with a gamma link function, equation 7) for sardines in the Poor Summer/Rich Winter feeding treatment

<i>Predictors</i>	<i>Estimates</i>	GSI	
		<i>CI</i>	<i>p</i>
(Intercept)	0.58	-0.08 – 1.37	0.113
Total growth rate	1.12	-8.76 – 10.09	0.813
Condition rate (without gonad)	-87.96	-1307.52 – 1243.81	0.887
Sex [M]	0.98	0.49 – 1.46	<0.001
Total <u>growth rate</u> * Condition rate (<u>without gonad</u>)	-8169.20	-31134.90 – 13643.28	0.446
Observations	30		
R ² Nagelkerke	0.529		

Table S12: Results of the generalized linear model model (with a gamma link function, equation 7) for sardines in the Rich Summer/Poor Winter feeding treatment

<i>Predictors</i>	<i>Estimates</i>	GSI	
		<i>CI</i>	<i>p</i>
(Intercept)	0.79	-0.28 – 1.85	0.113
Total growth rate	3.41	-8.18 – 15.66	0.550
Condition rate (without gonad)	585.42	-748.67 – 2015.02	0.379
Sex [M]	0.59	0.07 – 1.14	0.019
Total <u>growth rate</u> * Condition rate (<u>without gonad</u>)	-5558.50	-19340.20 – 6962.11	0.395
Observations	29		
R ² <u>Nagelkerke</u>	0.278		

Table S13: Results of the generalized linear model model (with a gamma link function, equation 7) for sardines in the Rich Summer/Rich Winter feeding treatment

<i>Predictors</i>	<i>Estimates</i>	GSI	
		<i>CI</i>	<i>p</i>
(Intercept)	1.60	0.92 – 2.27	<0.001
Total growth rate	0.51	-5.43 – 6.60	0.866
Condition rate (without gonad)	-754.97	-1451.45 – -26.65	0.030
Sex [M]	0.59	0.25 – 0.91	<0.001
Total <u>growth rate</u> *	4737.19	-1242.08 –	0.098
Condition rate (<u>without gonad</u>)		10265.51	
Observations	30		
R ² Nagelkerke	0.315		

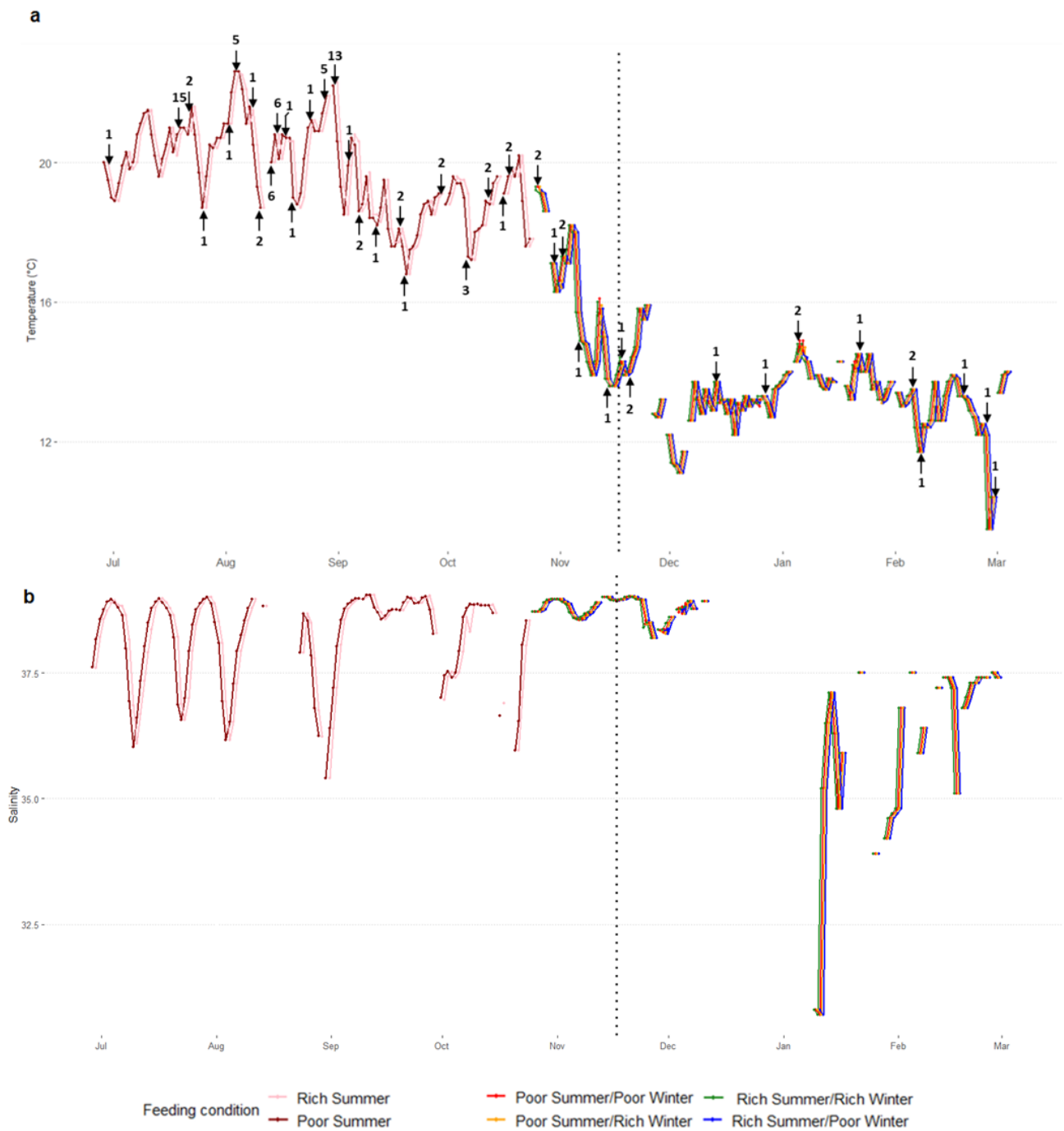


Figure S1: Temperature (a) and Salinity (b) recordings in each tank ($n = 2$ in summer and $n = 8$ in winter). The dashed vertical line highlights the beginning of the winter period (breeding season for Mediterranean sardines). Arrows indicate mortality events throughout the experiment. Number of dead individuals is indicated above each arrow.

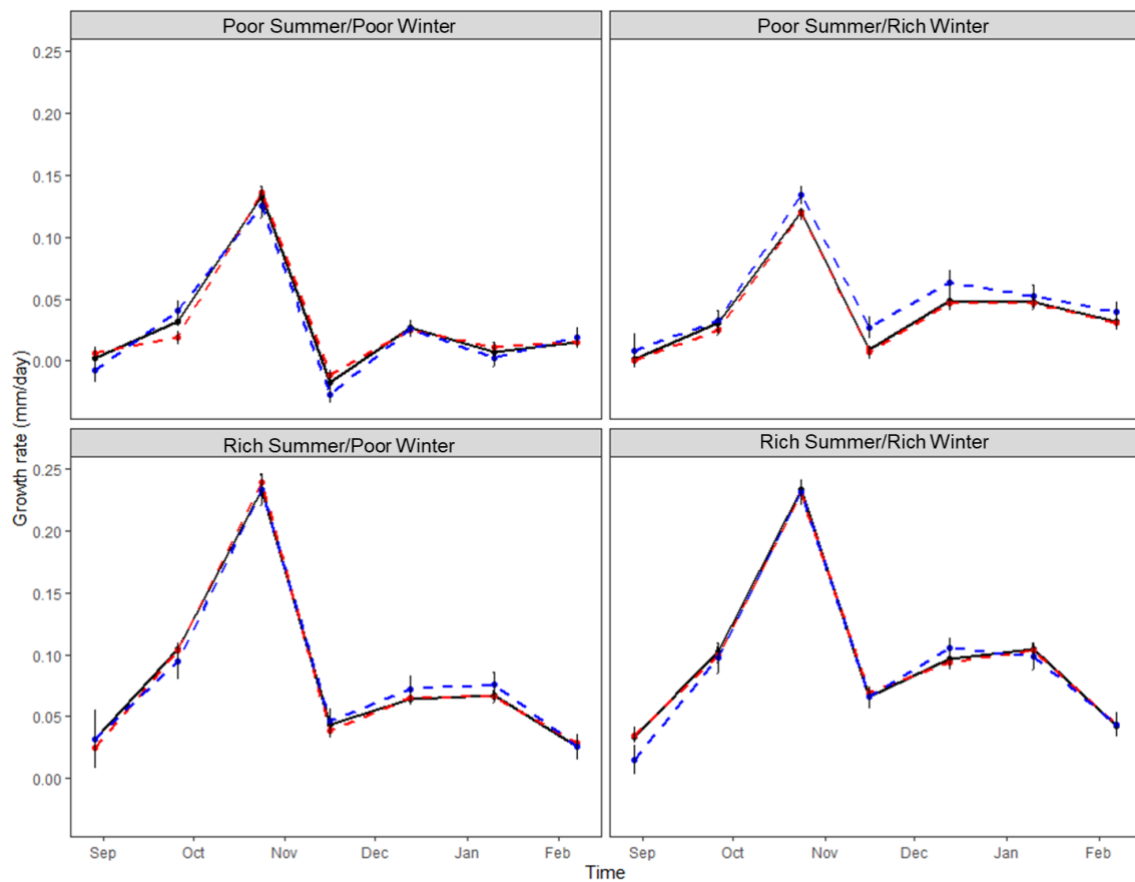


Figure S2: Time series of mean growth rates (\pm SE) per treatment considering all individuals (solid black line $N = 603$ in September and then $N = 1000$ for the rest of experiment), for only the individuals followed since the beginning (the 60% that did not lose their tag) of the experiment (segmented red line $N = 603$) and for the 120 individuals sacrificed for physiological conditions analysis (segmented blue line).

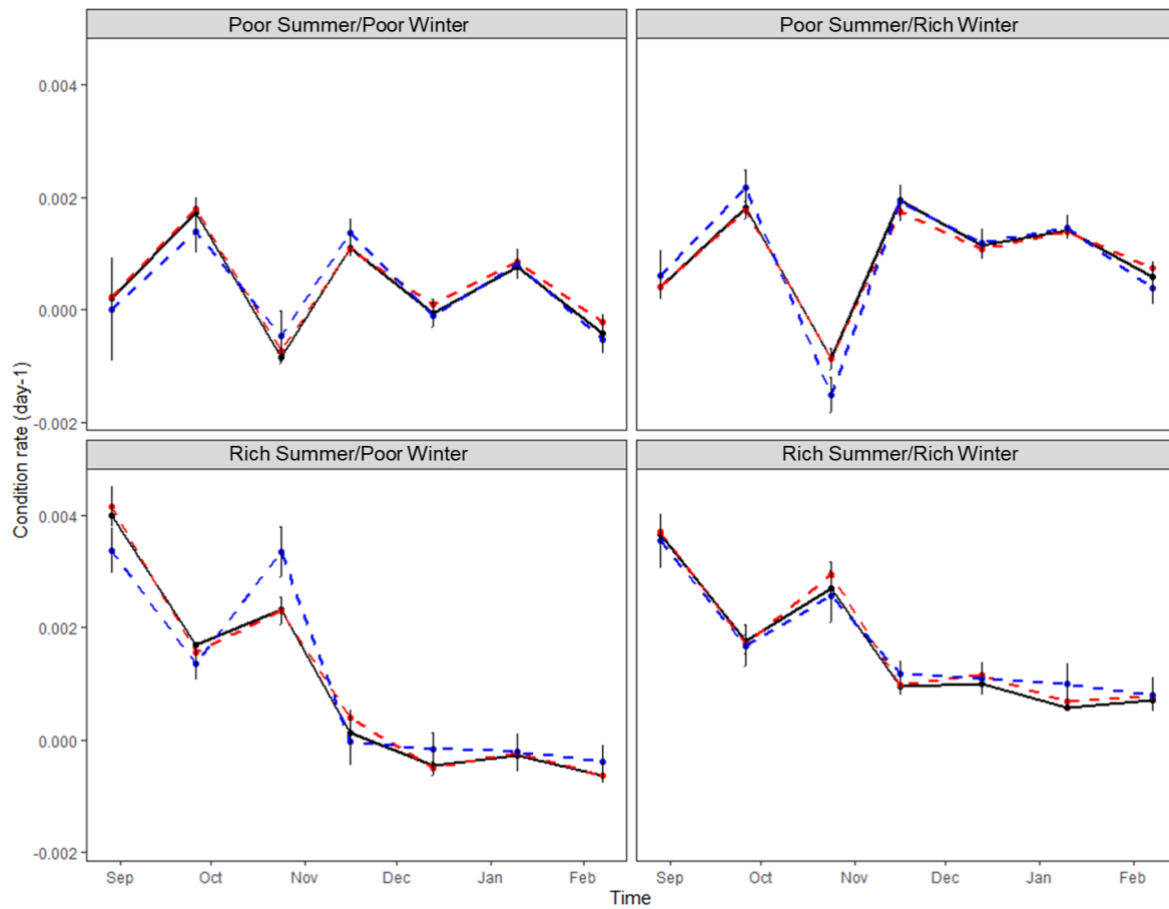


Figure S3: Time series of mean condition rates (\pm SE) per treatment considering all individuals (solid black line $N = 603$ in September and then $N = 1000$ for the rest of experiment), for only the individuals followed since the beginning (the 60% that did not lose their tag) of the experiment (segmented red line $N = 603$) and for the 120 individuals sacrificed for physiological conditions analysis (segmented blue line).

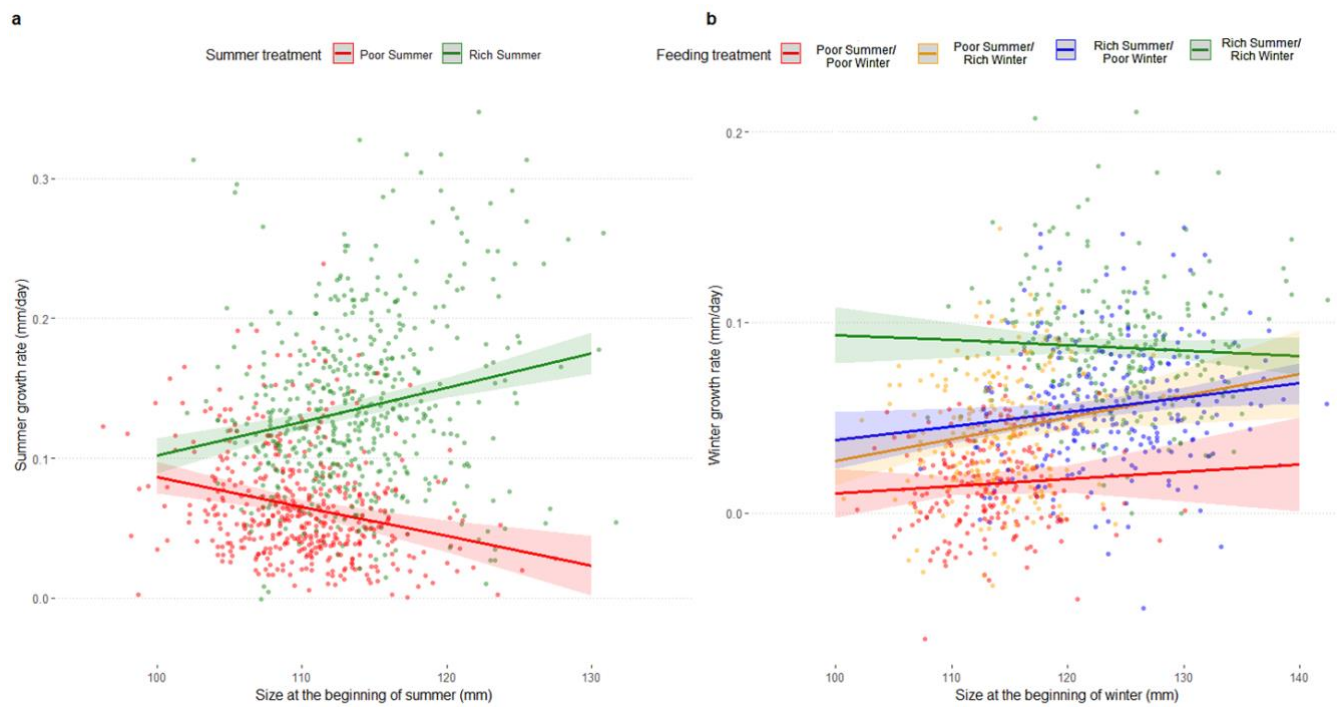


Figure S4: Relationship between growth and size at the beginning of summer (a) and winter (b) for each feeding treatment for N = 972 individuals (Poor and Rich in summer and Poor/Poor, Poor/Rich, Rich/Poor and Rich/Rich in winter). Initial size in summer was the first size recorded after the individual tagging (August 2017). In winter, size had a significant effect of growth only for individuals from the two intermediate treatments (Poor/Rich and Rich/Poor).

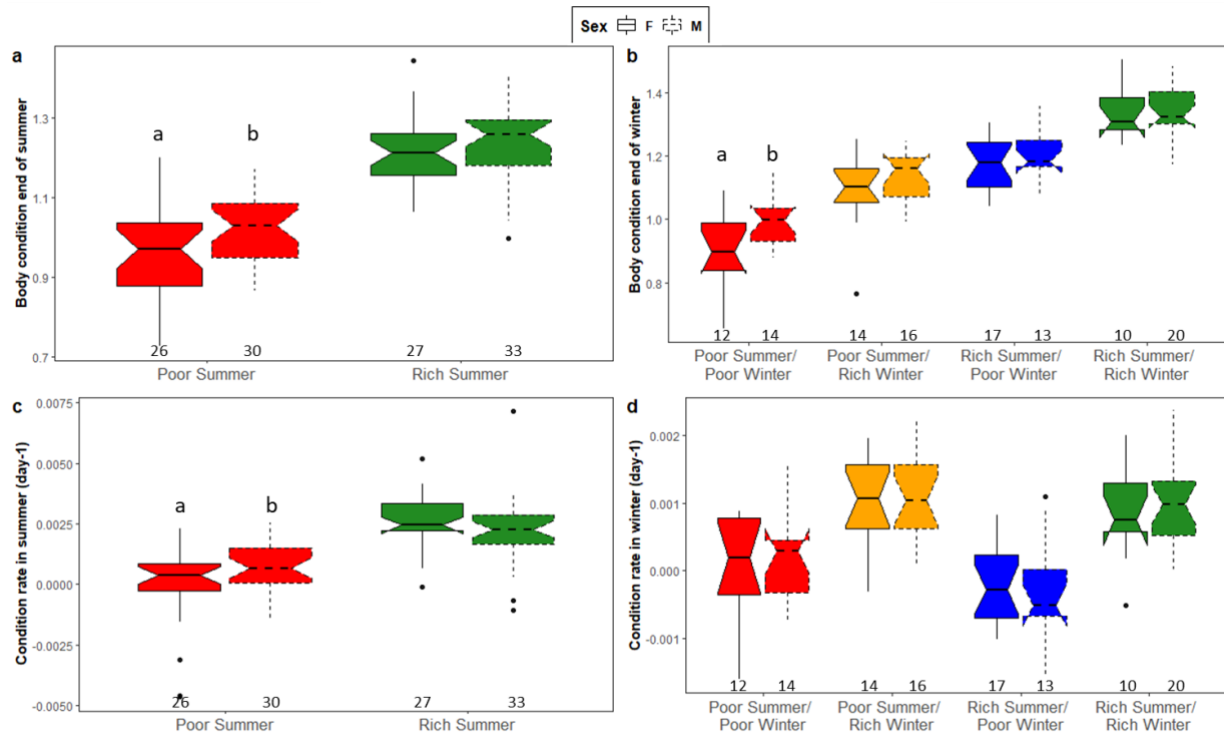


Figure S5: Boxplots of body condition at the end of summer (a) and at the end of winter (b) and of summer growth rate (c) and winter growth rate (d) for both sexes in each feeding treatment. Sample size of male and female for each treatment is given below the boxes. Boxplot with different superscript letters displayed significant differences between males and females of the same feeding treatment ($P < 0.05$). The outliers are represented by black dots.

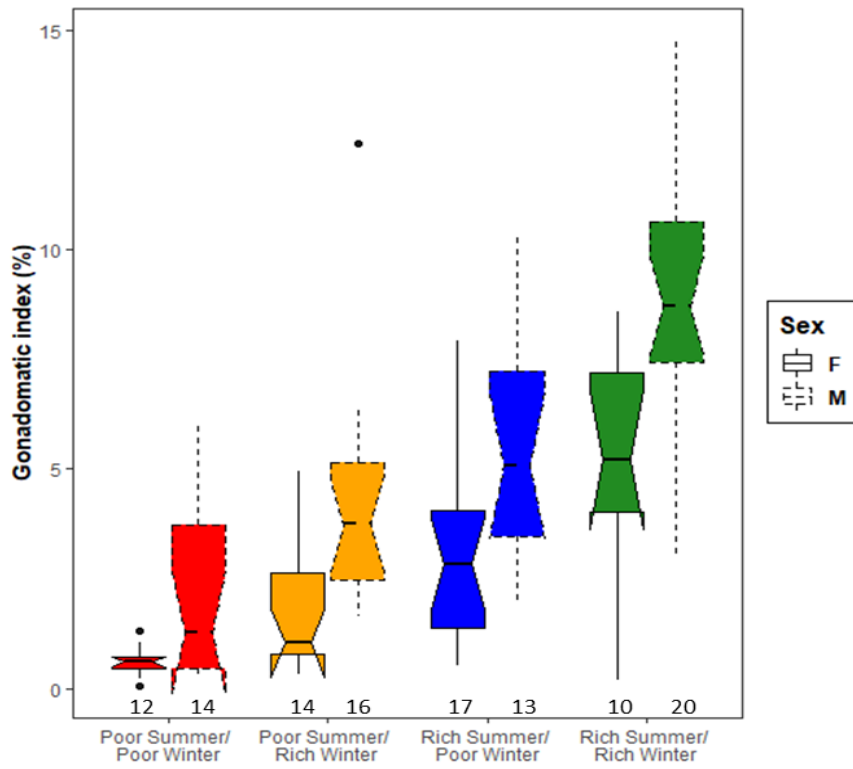


Figure S6: Gonadosomatic indices for both sexes in each treatment. The sample size is indicated under each boxplot. Outliers are represented by black dots.

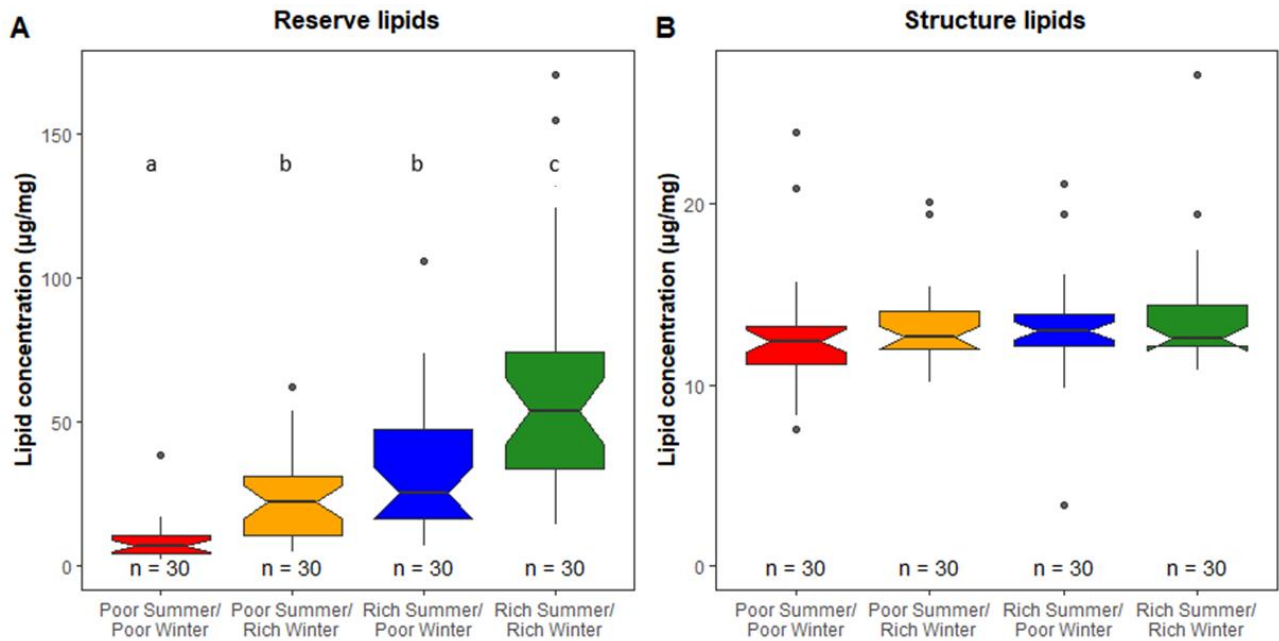


Figure S7: Muscle reserve lipid (A) and structure lipid content (B) for each treatment. The sample size is under each boxplot indicated by n. The outliers are represented by black dots. Boxplots with different letters are significantly different ($P < 0.05$).

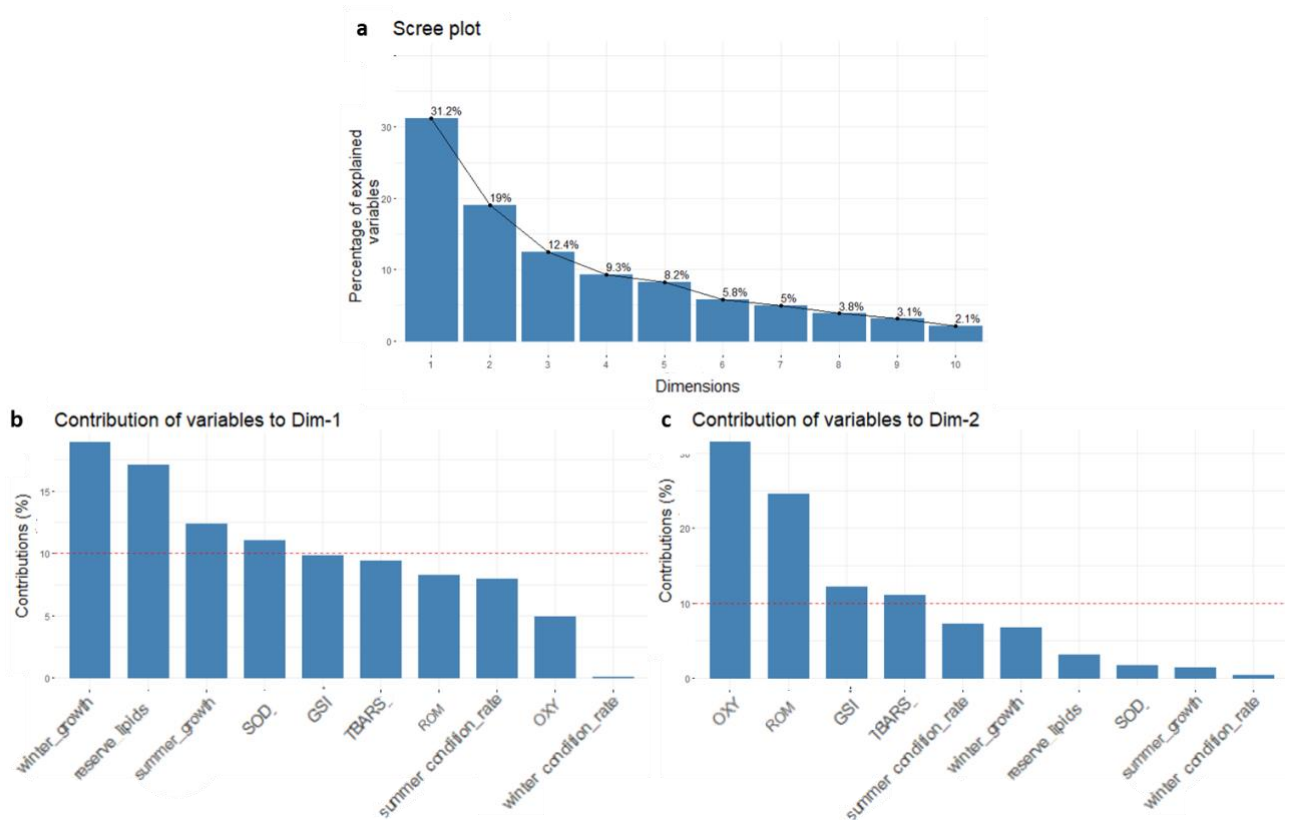


Figure S8: Scree plot (a) and contribution of each variable to the first two principal components (b and c).

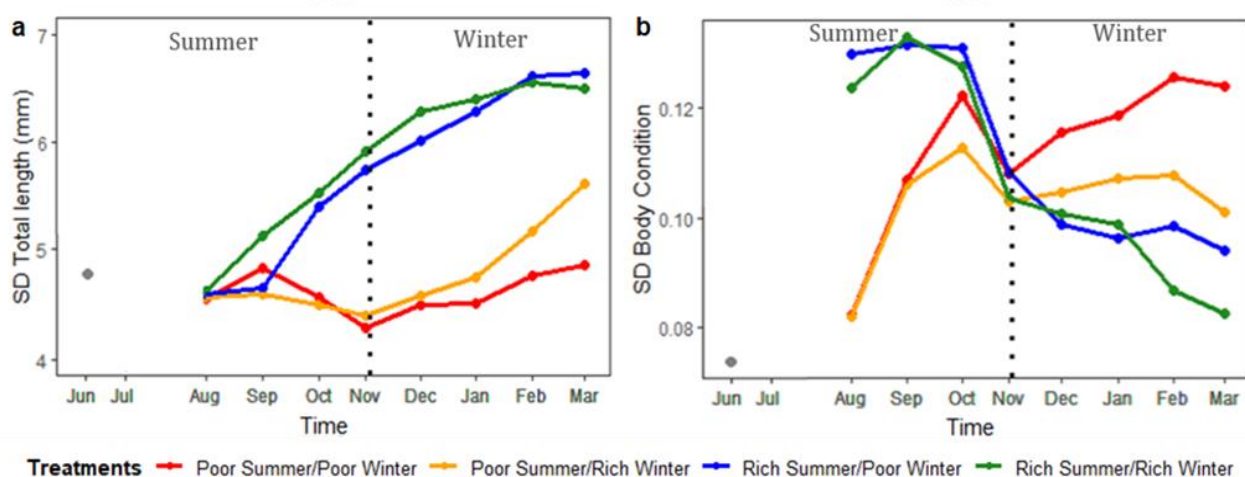


Figure S9: Time series of SD of total length (a) and of body condition (b) of all sardines in each feeding treatment. Time series of SD of body condition do not start from the same point for the 4 feeding treatments. In fact the experiment started two months (June 27th) before the individual monitoring (August 29th). Body condition being a fast adjusting variable, it results in groups of fish in the rich diet displayed greater variance (SD) than groups facing poor ones at the beginning of summer. SD values at each time step were only represented when there were at least 50 individuals, this is why there are no values in July. Values in June are in grey, individual monitoring starting from August 29th, 2017.

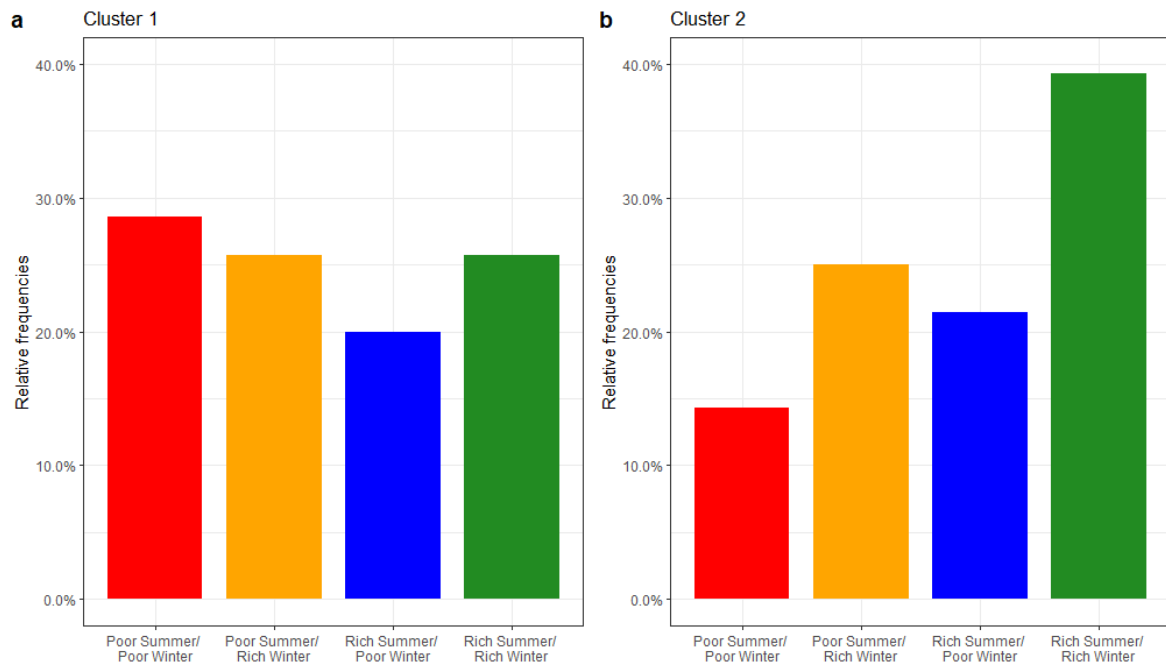


Figure S10: Relative frequencies of each feeding treatment for cluster 1 (a) and cluster 2 (b) for males.

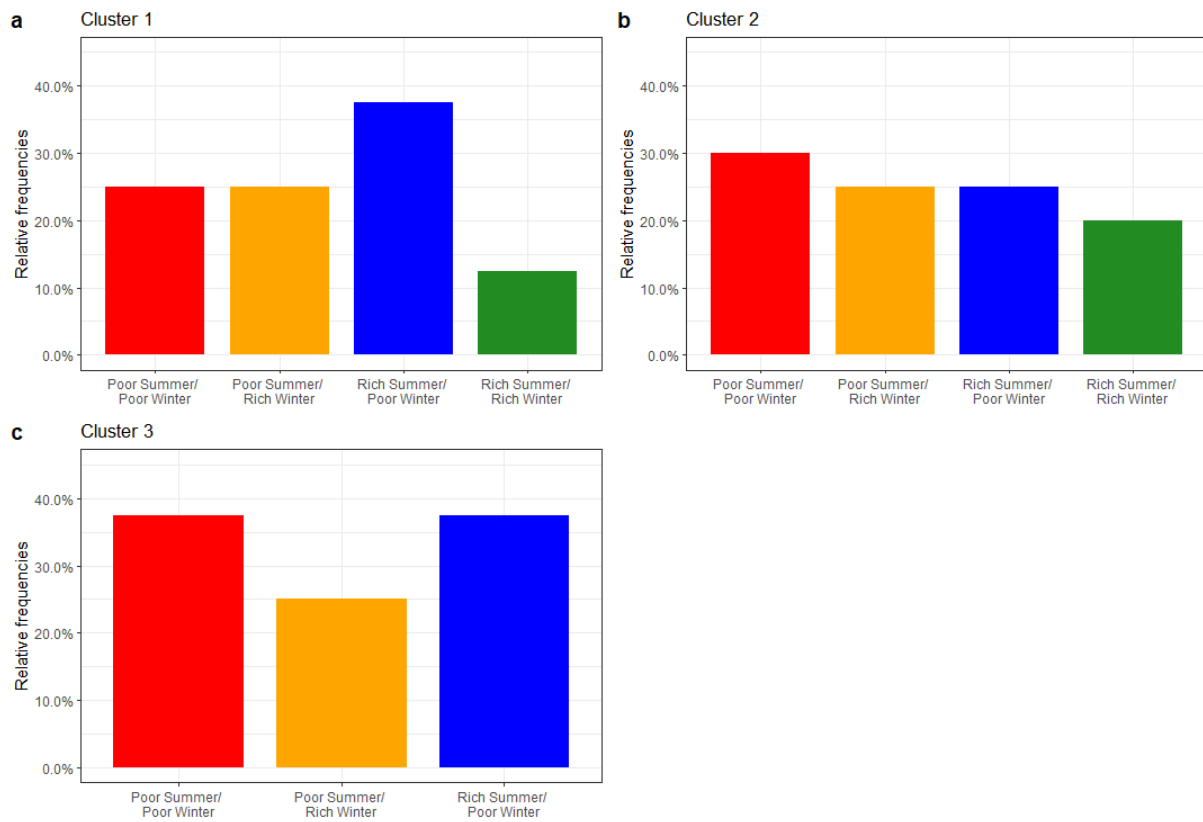


Figure S11: Relative frequencies of each feeding treatment for cluster 1 (a), cluster 2 (b) and cluster 3 (c) for females.

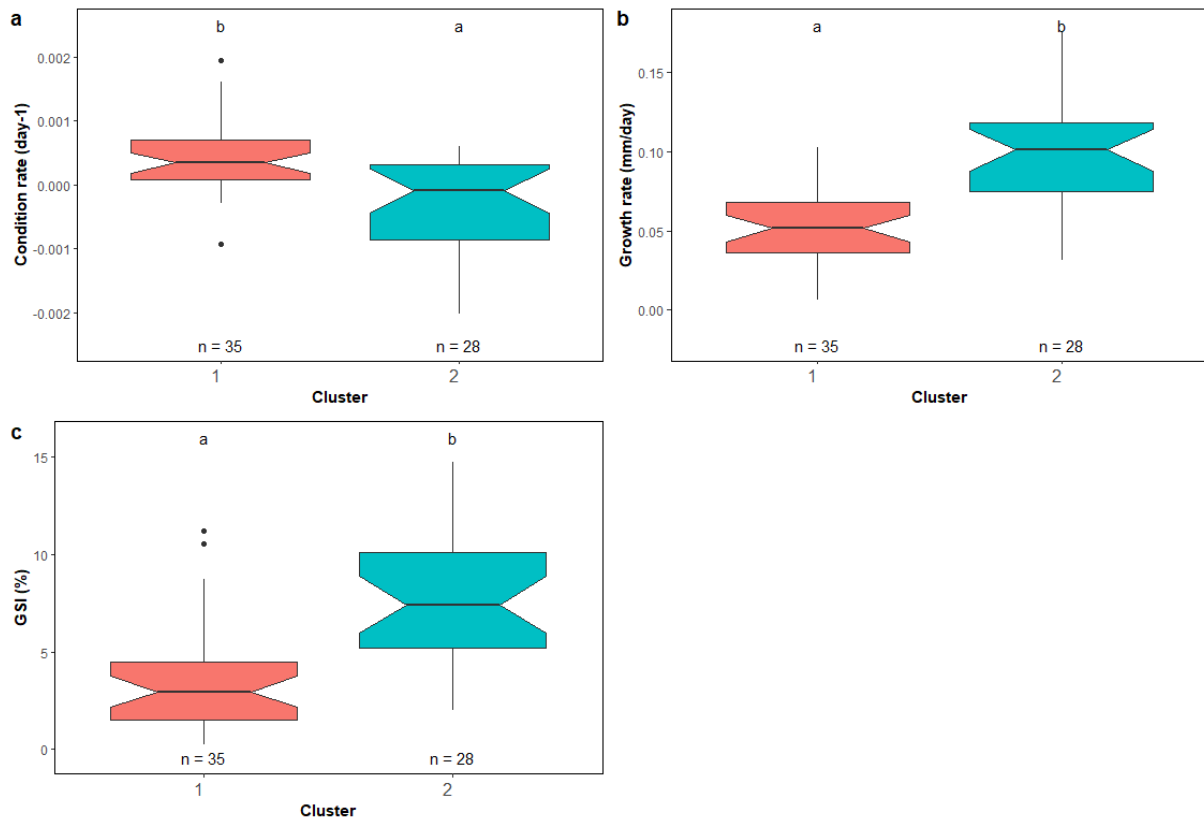


Figure S12: Boxplot of body condition rate (a), growth rate (b) and GSI (c) for each cluster for males. The number of individuals is indicated under each boxplot. The outliers are represented by black dots. Clusters with different letters are significantly different ($P < 0.05$).

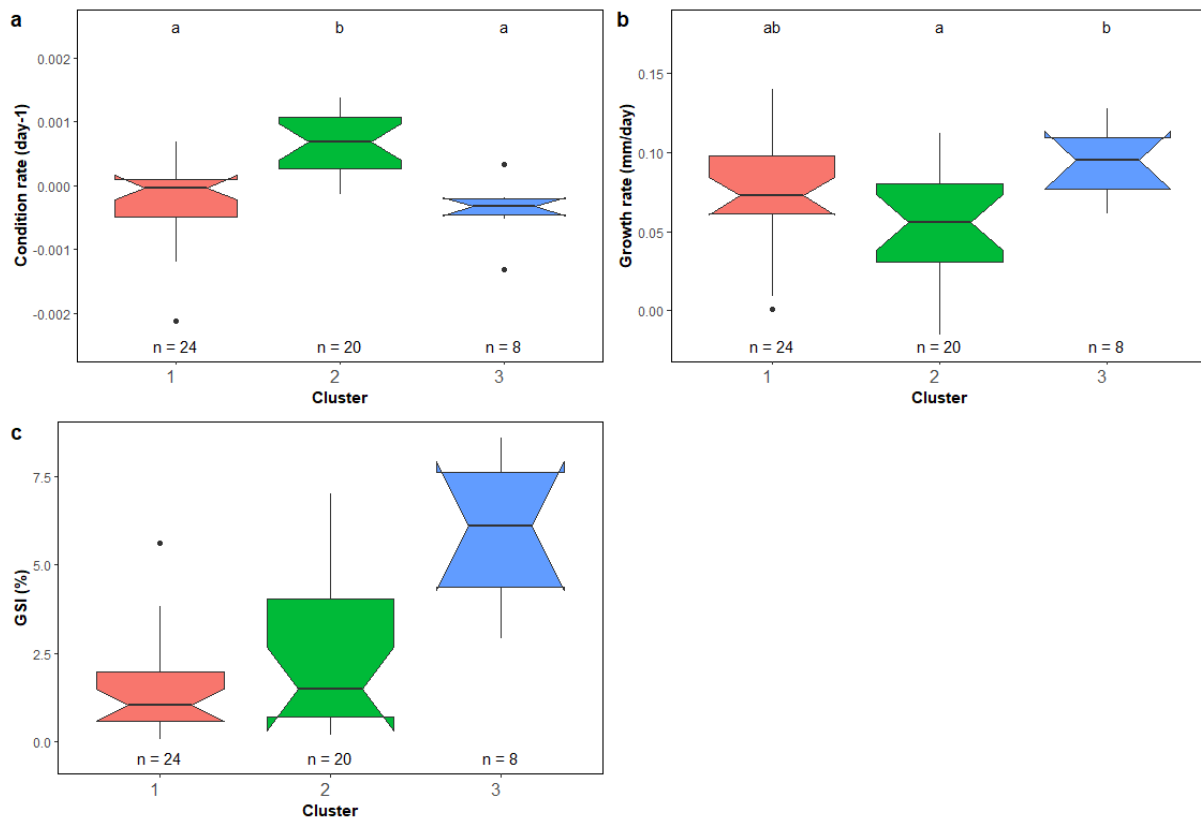


Figure S13: Boxplot of body condition rate (a), growth rate (b) and GSI (c) for each cluster for females. The number of individuals is indicated under each boxplot. The outliers are represented by black dots. Clusters with different letters are significantly different ($P < 0.05$).

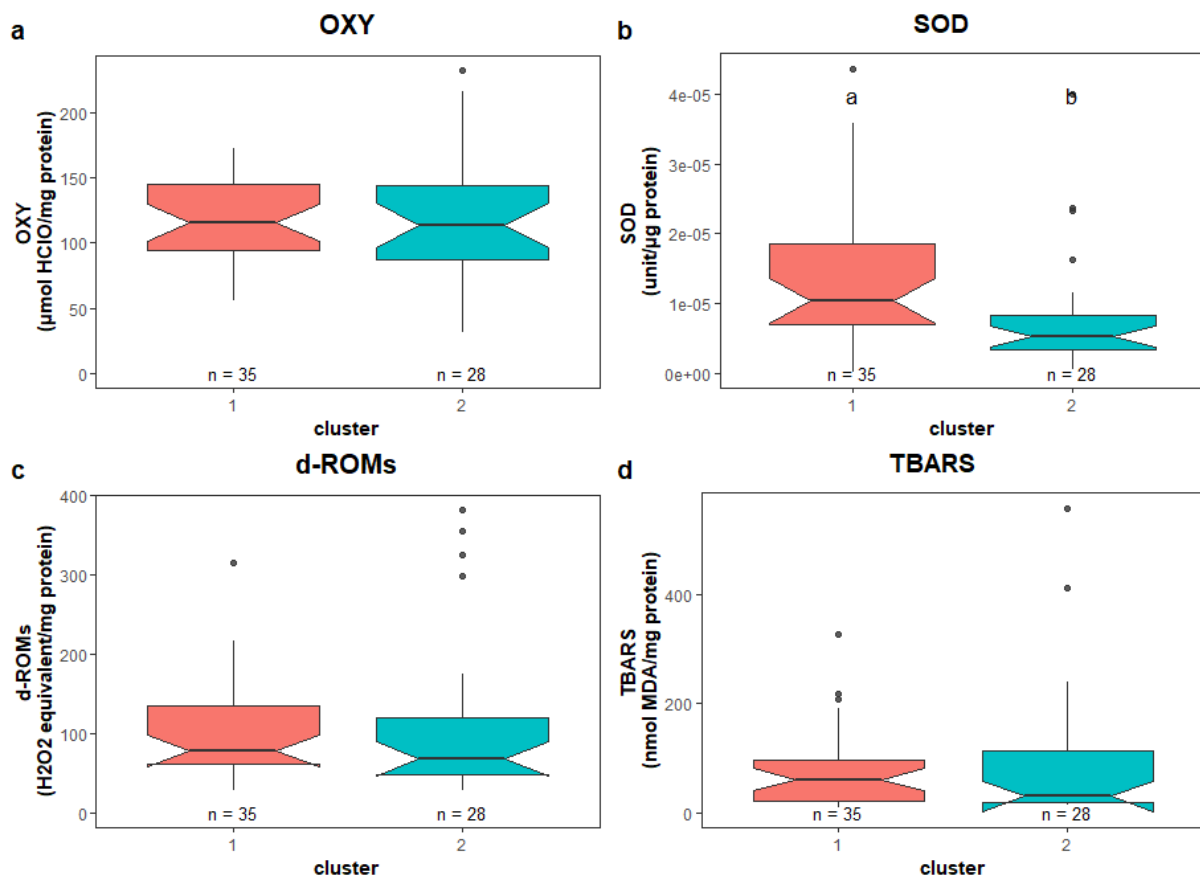


Figure S14: Boxplot of plasma concentrations of OXY (a), SOD (b), d-ROMs (c), and TBARS (d) in each cluster for males at the end of the experiment. The number of individuals is indicated under each boxplot. The outliers are represented by black dots. Clusters with different letters are significantly different ($P < 0.05$).

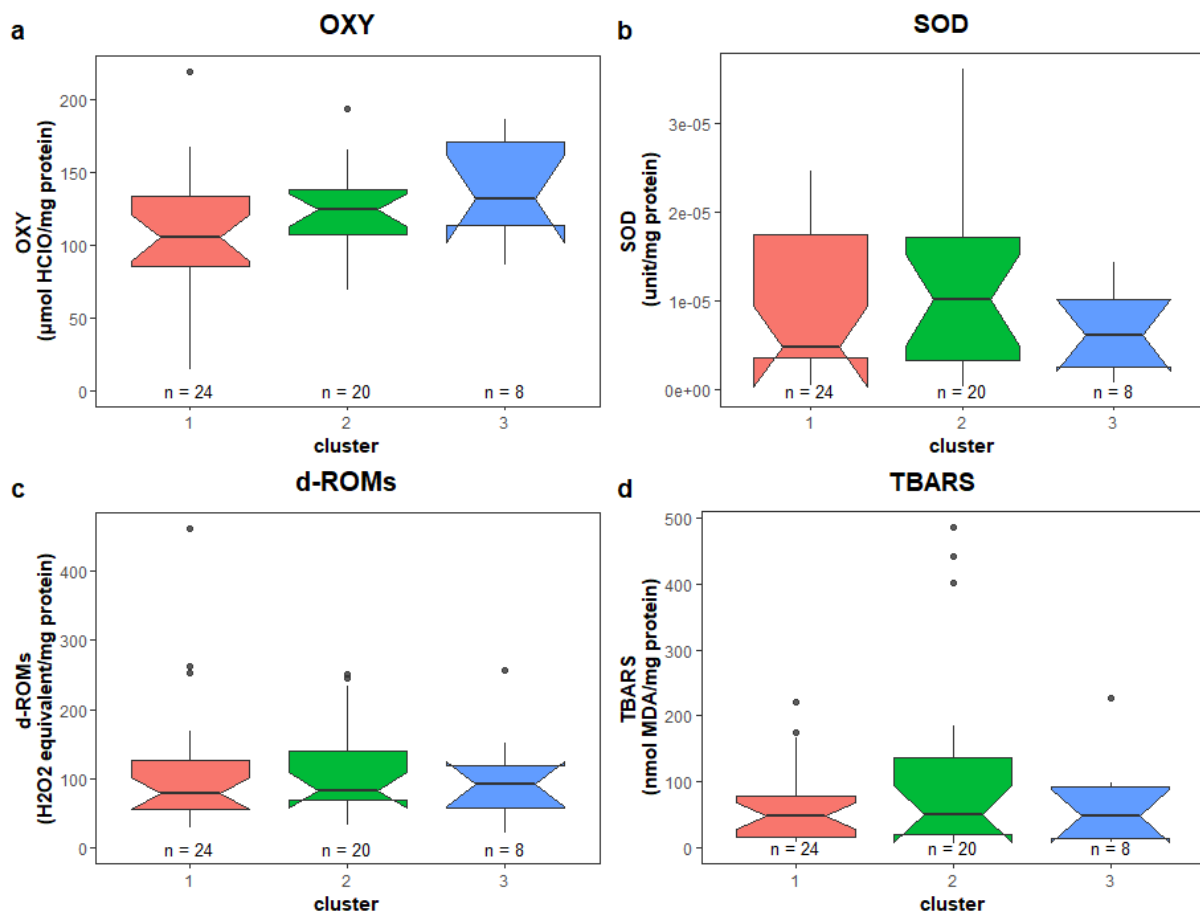


Figure S15: Boxplot of plasma concentrations of OXY (a), SOD (b), d-ROMs (c), and TBARS (d) in each cluster for females at the end of the experiment. The number of individuals is indicated under each boxplot. The outliers are represented by black dots.

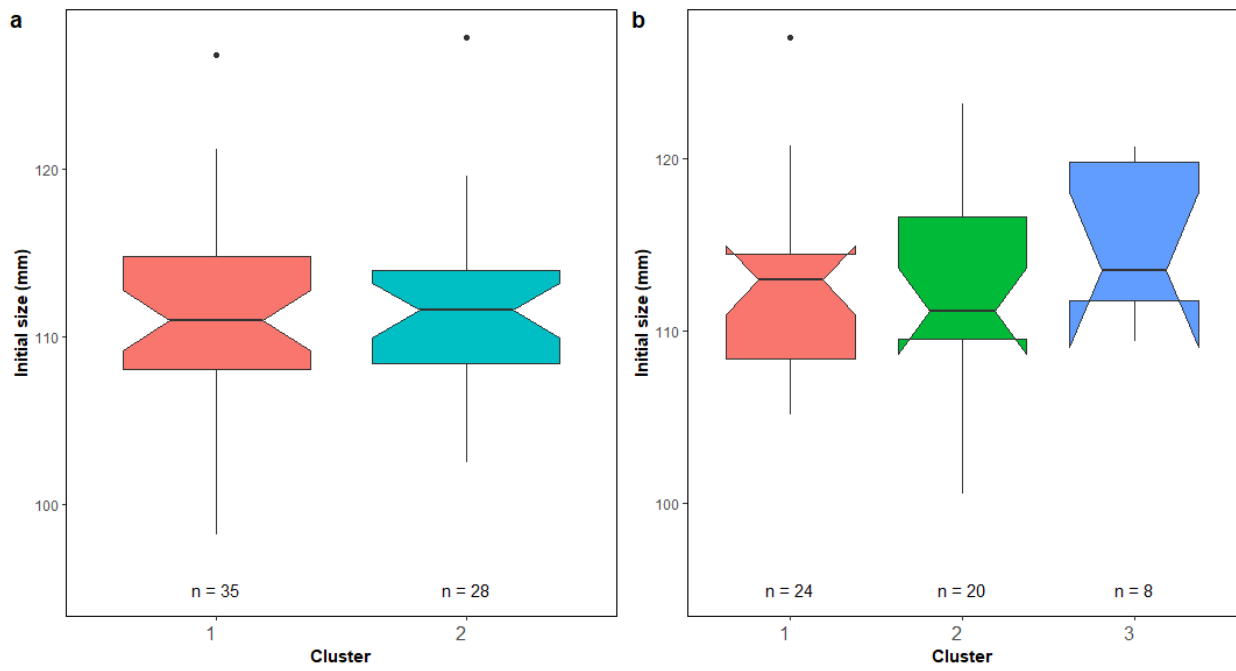


Figure S16: Boxplot of individual's initial size in each cluster for males (a) and females (b). Initial size was the first size recorded after the individual tagging (August 2017). The number of individuals in each cluster is indicated under each boxplot. The outliers are represented by black dots.