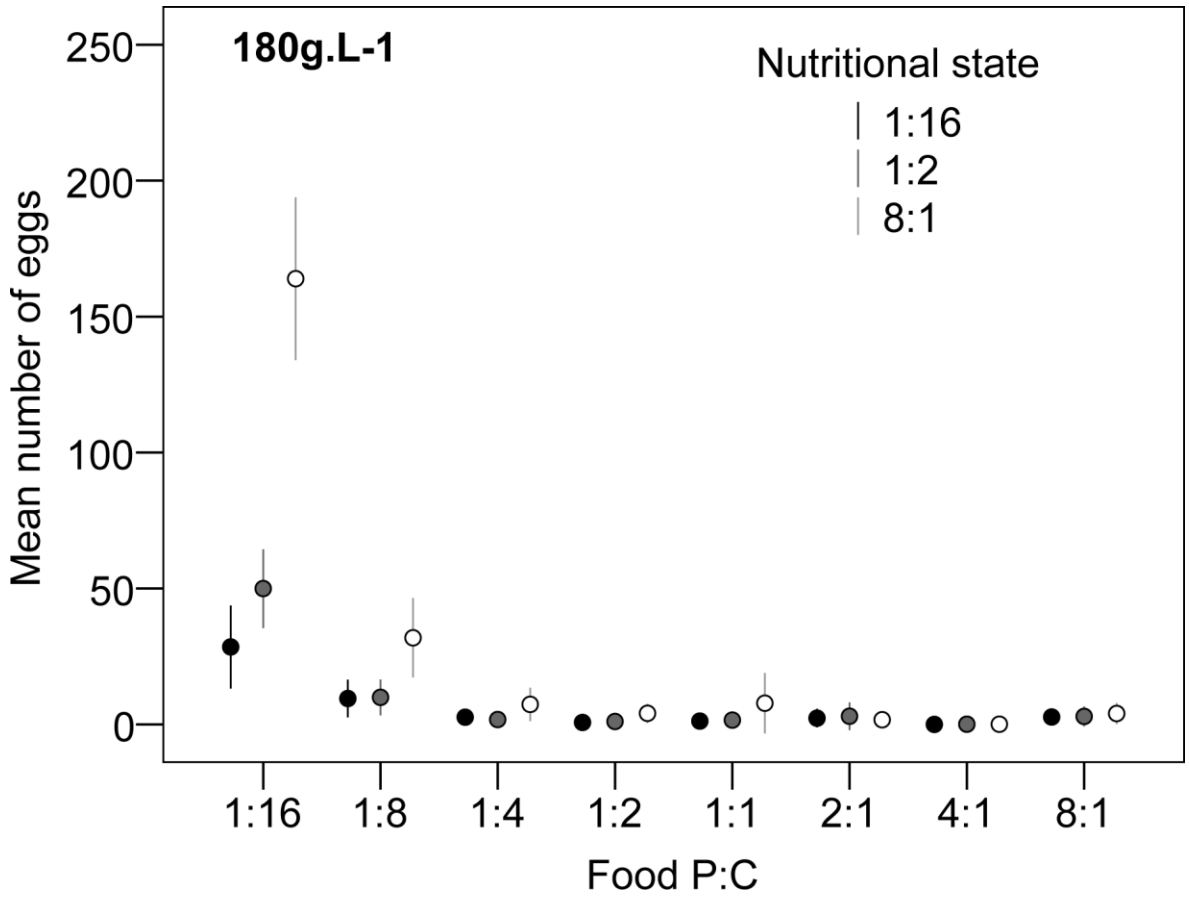

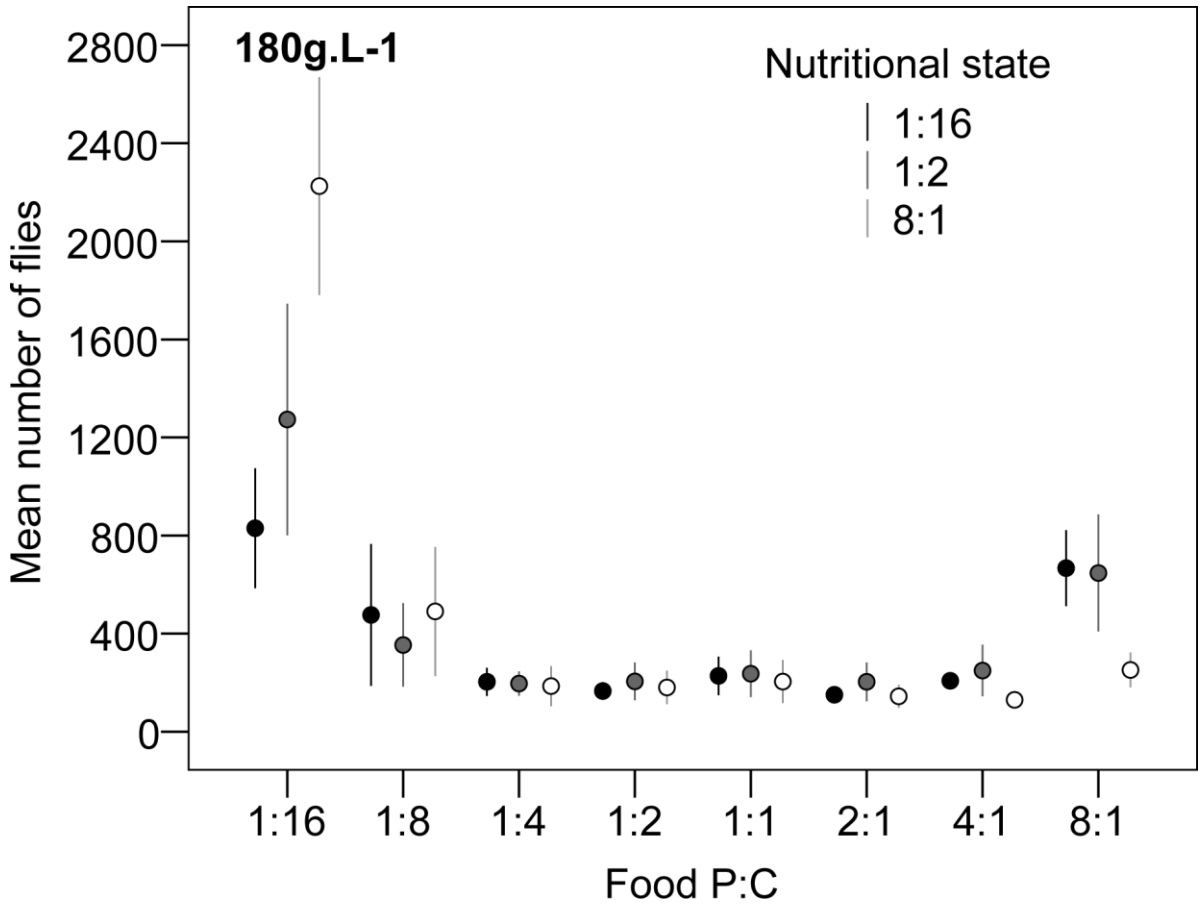

Fig. S1. Effect of nutritional state on the interaction between feeding and egg-laying in choice assays (experiment 5). Mean number of flies (A) and eggs (B) on each food according to the nutritional state of flies (N=18 groups for P:C 1:16, N=17 groups for P:C 1:2, N=19 groups for P:C 8:1). The P+C concentration was 180g.L^{-1} for food. Flies were tested in groups of 10**.** Error bars indicate ±95% CI.

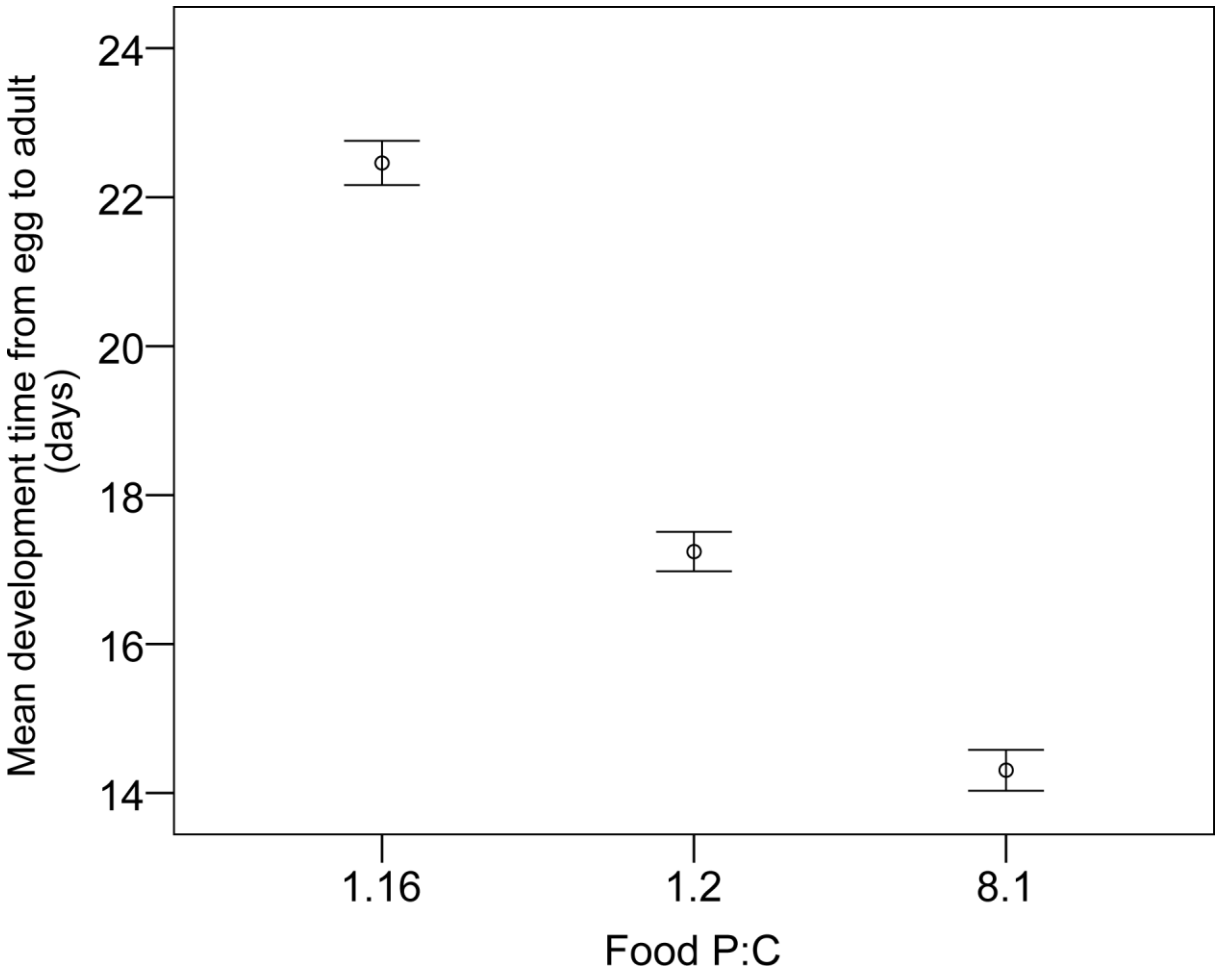

Fig. S2. Effect of breeding diet on the development time from egg to adult (experiment 6). Three protein to carbohydrate ratios (P:C) were tested. Flies were tested in groups of 5 (N=15 groups per food, N=1518 egg in total)**.** Error bars indicate ±95% CI.

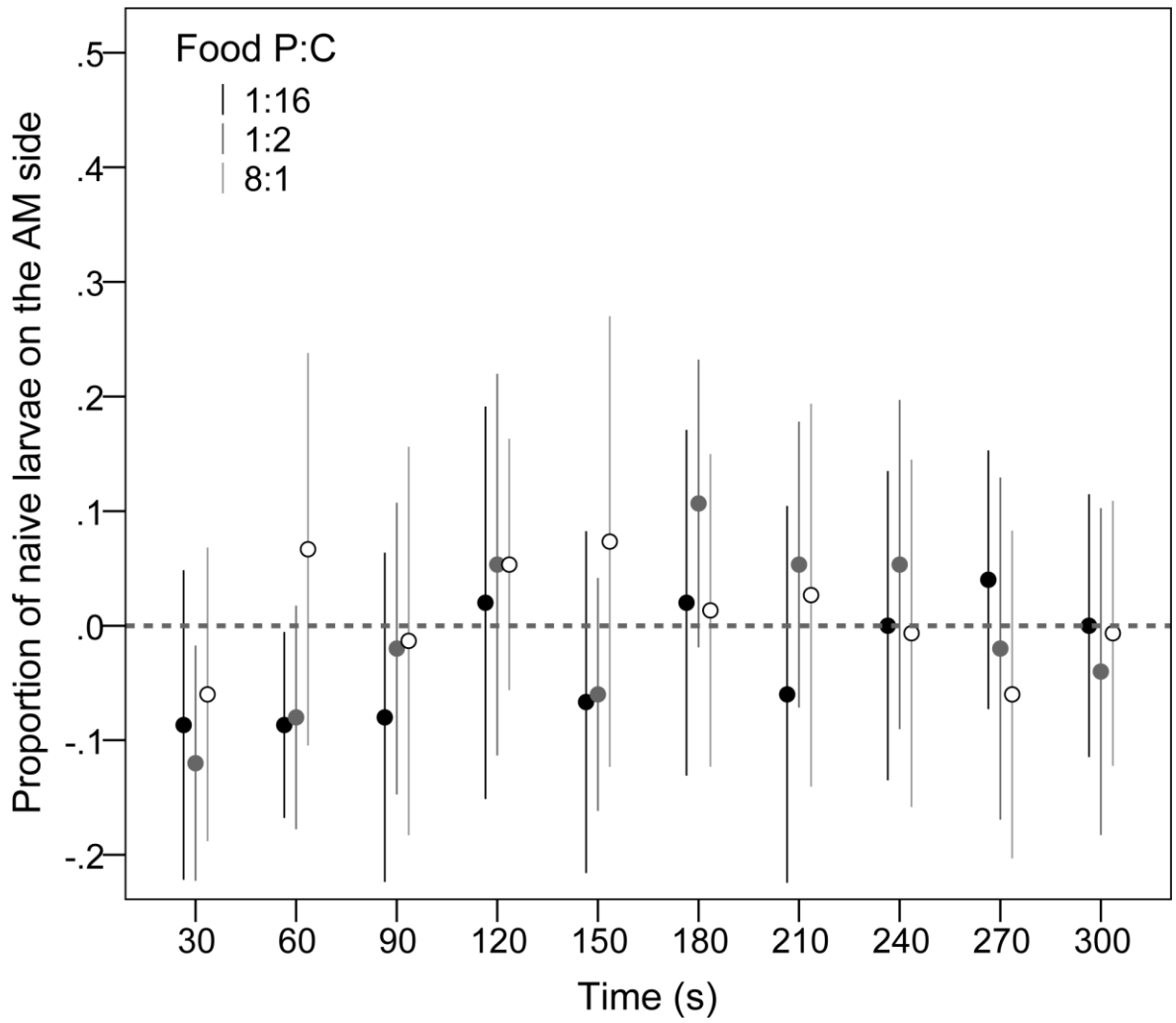

Fig. S3. Effect of nutritional state on larval odour preference (experiment 7). Proportion of larvae observed on the AM side after 3 minutes according to the nutritional state of flies (N=10 groups of 30 larvae for each nutritional state). Error bars indicate ±95% CI.

Table S1. Details of the experimental designs. P:C is the protein to carbohydrate balance in diets. P+C is the total concentration of protein and carbohydrate ($g.L^{-1}$). N is the number of replicates.

Experiment	Breeding diet	Number of flies	Type of choice	Characteristics of food patches		N	Variable Recorded
				P+C	P:C		
Exp. 1	Standard	1	no choice	45	8:1	20	Number of eggs
	Standard	1	no choice	45	4:1	20	
	Standard	1	no choice	45	1:1	20	
	Standard	1	no choice	45	1:2	20	
	Standard	1	no choice	45	1:4	20	
	Standard	1	no choice	45	1:6	20	
	Standard	1	no choice	45	1:8	20	
	Standard	1	no choice	90	8:1	20	
	Standard	1	no choice	90	4:1	20	
	Standard	1	no choice	90	2:1	20	
	Standard	1	no choice	90	1:1	20	
	Standard	1	no choice	90	1:2	20	
	Standard	1	no choice	90	1:4	20	
	Standard	1	no choice	90	1:8	20	
	Standard	1	no choice	90	1:16	20	
	Standard	1	no choice	180	8:1	28	
	Standard	1	no choice	180	4:1	37	
	Standard	1	no choice	180	2:1	37	
	Standard	1	no choice	180	1:1	37	
	Standard	1	no choice	180	1:2	37	
	Standard	1	no choice	180	1:4	37	
	Standard	1	no choice	180	1:8	37	
	Standard	1	no choice	180	1:16	37	
	Standard	1	no choice	180	1:32	20	
	Standard	1	no choice	270	8:1	20	
	Standard	1	no choice	270	4:1	20	
	Standard	1	no choice	270	2:1	20	
	Standard	1	no choice	270	1:1	20	
	Standard	1	no choice	270	1:2	20	
	Standard	1	no choice	270	1:4	20	
	Standard	1	no choice	270	1:8	20	
	Standard	1	no choice	270	1:16	20	
	Standard	1	no choice	270	1:32	20	
	Standard	1	no choice	270	1:56	20	
Exp. 2	standard	1	choice	180	8:1, 4:1, 2:1, 1:1, 1:2, 1:4, 1:8, 1:16	40	Number of eggs
	standard	10	choice	180		24	
Exp. 3	Standard	10	choice	180	8:1, 4:1, 2:1, 1:1, 1:2, 1:4, 1:8, 1:16	21	Number of eggs & Number of flies
Exp. 4	8:1	1	no choice	180	Standard diet	40	Number of eggs
	1:2	1	no choice	180		40	
	1:16	1	no choice	180		40	
	8:1	10	choice	45	8:1, 4:1, 2:1, 1:1, 1:2, 1:4, 1:6, 1:8	20	Number of eggs
	8:1	10	choice	90	8:1, 4:1, 2:1, 1:1, 1:2, 1:4, 1:8, 1:16	20	
	8:1	10	choice	180	4:1, 2:1, 1:1, 1:2, 1:4, 1:8, 1:16, 1:32	20	
	8:1	10	choice	270	2:1, 1:1, 1:2, 1:4, 1:8, 1:16, 1:32, 1:56	17	
	1:2	10	choice	45	8:1, 4:1, 2:1, 1:1, 1:2, 1:4, 1:6, 1:8	20	
	1:2	10	choice	90	8:1, 4:1, 2:1, 1:1, 1:2, 1:4, 1:8, 1:16	20	
	1:2	10	choice	180	4:1, 2:1, 1:1, 1:2, 1:4, 1:8, 1:16, 1:32	19	
	1:2	10	choice	270	2:1, 1:1, 1:2, 1:4, 1:8, 1:16, 1:32, 1:56	20	
	1:16	10	choice	45	8:1, 4:1, 2:1, 1:1, 1:2, 1:4, 1:6, 1:8	20	
	1:16	10	choice	90	8:1, 4:1, 2:1, 1:1, 1:2, 1:4, 1:8, 1:16	19	
	1:16	10	choice	180	4:1, 2:1, 1:1, 1:2, 1:4, 1:8, 1:16, 1:32	20	
	1:16	10	choice	270	2:1, 1:1, 1:2, 1:4, 1:8, 1:16, 1:32, 1:56	20	
Exp. 5	8:1	10	choice	180	8:1, 4:1, 2:1, 1:1, 1:2, 1:4, 1:8, 1:16	19	Number of eggs & Number of flies
	1:2	10	choice	180		17	
	1:16	10	choice	180		18	
Exp. 6	standard	5	no choice	180	8:1	15	Number of eggs & Larval development
	standard	5	no choice	180	1:2	15	
	standard	5	no choice	180	1:16	15	

Table S2. Univariate response surface regression analyses testing the relationship between the nutrient concentration (protein and carbohydrate) and the number of eggs laid (experiment 1). We used Lande–Arnold regressions to estimate parametric nonlinear response surfaces. These comprise linear and quadratic components for protein and carbohydrate intake and the cross-product of P and C. **A.** Tests of significance for the whole model. **B.** Estimated standardized coefficients. Significance: *, P < 0.05; **, P < 0.01; ***, P< 0.001.

A

	R^2	$F_{5,806}$	P
Number of eggs	0.19	38.17	<0.001

B

	Linear β (b)	Quadratic β (b)	Correlational β P × C (b)
Protein	0.454 (0.098) **	-0.368 (-0.0004) **	-0.418 (-0.0012) ***
Carbohydrate	1.800 (0.314) ***	-1.508 (-0.0010) ***	