

Heterochrony in a complex world: disentangling environmental processes of facultative paedomorphosis in an amphibian

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Table S1. Models (with support ≥ 0.001) explaining spatial variation for the proportion of paedomorphs in palmate newt populations. Models are ranked following increasing qAIC values; for each model, coefficients of included variables are reported. K: number of parameters in the model.

Rank	Water availability	Predator	Terrestrial habitat suitability	Aquatic breathing	Anti-predator refuge	Dispersal limitation	K	qAIC	Weight	R^2_D
1	0.32	-3.42	1.16	1.74	-0.64	2.91	7	143.5	0.592	0.42
2	0.32	-2.89	1.38	1.95		2.65	6	145.6	0.200	0.40
3	0.31		1.26	1.81	-0.51	2.32	6	147	0.100	0.40
4	0.31		1.42	1.98		2.20	5	147.8	0.067	0.38
5	0.30	-3.85		1.56	-0.87	3.38	6	149.1	0.035	0.39
6	0.28			1.62	-0.74	2.74	5	154.2	0.001	0.35
Variable importance	>0.999	0.856	0.956	>0.999	0.754	0.999				
Model averaged parameters	0.318	-3.32	1.22	1.79	-0.63	2.79				

Table S2. Models (with support ≥ 0.001) explaining spatial variation for the proportion of pedomorphs in palmate newt populations. Analysis performed using qAIC corrected for small sample size (QAICc). Models are ranked following increasing qAICc values for each model, coefficients of included variables are reported. K: number of parameters in the model.

Rank	Water availability	Predator	Terrestrial habitat suitability	Aquatic breathing	Anti-predator refuge	Dispersal limitation	K	qAICc	Weight	R^2_D
1	0.32	-3.42	1.16	1.74	-0.64	2.91	7	144.5	0.560	0.42
2	0.32	-2.89	1.38	1.95		2.65	6	146.4	0.212	0.40
3	0.31		1.26	1.81	-0.51	2.32	6	147.8	0.106	0.40
4	0.31		1.42	1.98		2.20	5	148.4	0.079	0.38
5	0.30	-3.85		1.56	-0.87	3.38	6	149.9	0.037	0.39
6	0.28			1.62	-0.74	2.74	5	154.8	0.003	0.35
7	0.29	-3.12		1.86		3.12	5	156.2	0.002	0.35
Variable importance	>0.999	0.840	0.953	>0.999	0.731	0.999				
Model averaged parameters	0.317	-3.31	1.23	1.80	-0.63	2.77				

Table S3. Models (with support ≥ 0.001) explaining spatial variation for the proportion of pedomorphs in palmate newt populations. Analysis including in all models also the average date of surveys and its quadratic term. Models are ranked following increasing qAIC values; if a variable is included in the model, the sign of the relationship (+ or -) is reported. K: number of parameters in the model.

Rank	Water availability	Predator	Terrestrial habitat suitability	Aquatic breathing	Anti-predator refuge	Dispersal limitation	K	qAIC	Weight	R^2_D
1	0.33	-3.55	1.20	1.74	-0.74	2.80	7	146.2	0.650	0.43
2	0.33	-3.04	1.43	1.89		2.60	6	148.8	0.171	0.41
3	0.32		1.29	1.82	-0.61	2.25	6	150.1	0.093	0.40
4	0.32		1.46	1.94		2.16	5	151.4	0.048	0.38
5	0.30	-3.93		1.59	-1.00	3.31	6	152.1	0.034	0.39
6	0.28			1.66	-0.86	2.68	5	157.4	0.002	0.36
7	0.29	-3.18		1.81		3.14	5	159.4	0.001	0.35
Variable importance	>0.999	0.880	0.959	>0.999	0.802	0.999				
Model averaged parameters	0.33	-3.47	1.26	1.77	-0.74	2.72				

Table S4. Two step models: a) first step. Models (with support ≥ 0.001) explaining spatial variation for the presence / absence of paedomorphs in palmate newt populations. b) Models explaining spatial variation for the proportion of paedomorphs in palmate newts, considering populations with paedomorphs only. For each model, coefficients of included variables are reported. Models are ranked following increasing AIC / qAIC values. K: number of parameters in the model.

a) Spatial variation for presence / absence of paedomorphs										
Rank	Water availability	Predator	Terrestrial habitat suitability	Aquatic breathing	Anti-predator refuge	Dispersal limitation	K	AIC	Weight	R^2_D
1	0.89	-4.43		1.03		1.28	5	334.4	0.276	0.45
2	0.89	-4.40	0.56	1.09		1.19	6	335.4	0.169	0.45
3	0.88	-4.44		1.03	-0.29	1.22	6	335.8	0.141	0.45
4	0.89	-4.04		1.04			4	336.3	0.110	0.45
5	0.88	-4.41	0.59	1.10	-0.31	1.12	7	336.7	0.090	0.46
6	0.89	-4.01	0.70	1.11			5	336.7	0.089	0.45
7	0.88	-4.05		1.04	-0.34		5	337.3	0.065	0.45
8	0.88	-4.03	0.73	1.11	-0.37		6	337.6	0.057	0.46
9	0.89	-4.24				1.19	4	345.3	0.001	0.44
Variable importance	>0.999	>0.999	0.406	0.996	0.354	0.678				
Averaged parameters	0.89	-4.30	0.62	1.06	-0.32	1.22				
b) Spatial variation for the proportion of paedomorphs										
Rank	Water availability	Predator	Terrestrial habitat suitability	Aquatic breathing	Anti-predator refuge	Dispersal limitation	K	qAIC	Weight	R^2_D
1	0.16			2.03	1.26	1.95	5	82	0.221	0.31
2				2.13	1.11	1.46	4	83.6	0.099	0.27
3	0.17		-0.21	1.94	1.20	2.05	6	83.7	0.093	0.31
4	0.16	-0.43		2.03	1.26	1.97	6	84	0.083	0.31
5				1.89	1.33		3	84.7	0.059	0.23
6	0.10			1.77	1.47		4	84.9	0.051	0.25
7	0.13			1.94		2.37	4	85.5	0.039	0.25
8			-0.08	2.10	1.09	1.49	5	85.6	0.037	0.27
9		0.13		2.13	1.11	1.45	5	85.6	0.036	0.27
10	0.17	-0.64	-0.21	1.94	1.19	2.08	7	85.7	0.035	0.31
11				2.02		1.93	3	85.9	0.031	0.22
12	0.15		-0.44	1.76		2.55	5	86.3	0.026	0.26
13		1.36		1.89	1.33		4	86.6	0.023	0.23
14			0.06	1.91	1.35		4	86.6	0.022	0.23
15	0.10	1.28		1.78	1.46		5	86.9	0.02	0.25
16	0.10		0.01	1.78	1.47		5	86.9	0.019	0.25
17			-0.30	1.91		2.01	4	87.3	0.015	0.22
18	0.13	-0.54		1.94		2.40	5	87.4	0.015	0.25
19		0.05	-0.08	2.10	1.09	1.49	6	87.6	0.014	0.27
20		-0.08		2.02		1.93	4	87.9	0.011	0.22
21	0.15	-0.97	-0.45	1.76		2.59	6	88.2	0.01	0.26
22		1.40	0.07	1.92	1.35		5	88.5	0.008	0.23
23	0.10	1.29	0.02	1.79	1.47		6	88.9	0.007	0.25
24				1.68			2	89.3	0.006	0.15
25		-0.34	-0.30	1.91		2.02	5	89.3	0.006	0.22
26	0.06			1.63			3	90.7	0.003	0.16
27			-0.19	1.61			3	91	0.002	0.16
28		1.63		1.69			3	91.1	0.002	0.16
29	0.07		-0.24	1.52			4	92.3	0.001	0.17
30	0.06	1.60		1.64			4	92.5	0.001	0.16
Variable importance	0.623	0.273	0.828	0.998	0.299	0.773				
Averaged parameters	0.15	0.04	1.25	1.97	-0.18	1.91				

Table S5. Models (with support ≥ 0.001) explaining temporal variation for the proportion of paedomorphs in palmate newt populations. Models are ranked following increasing AIC values; if a variable is included in the model, the sign of the relationship (+ or -) is reported. K: number of parameters in the model.

Rank	Water availability	Aquatic breathing	Anti-predator refuge	K	AIC	Weight
1	0.20	0.25	-0.54	4	799.2	0.819
2		0.22		2	803.3	0.105
3				1	805.5	0.035
4	0.22			2	805.7	0.032
5	0.41		-0.76	3	808.4	0.008
Variable importance	0.859	0.924	0.827			
Model averaged parameters	0.21	0.25	-0.55			

Table S6. Models (with support ≥ 0.001) explaining temporal variation for the proportion of paedomorphs in palmate newt populations. Analyses are performed using alternative approaches. In A, all models also include the date of surveys and its quadratic term; in B, models are selected using AICc instead than AIC. Models are ranked following increasing AIC/AICc values; if a variable is included in the model, the sign of the relationship (+ or -) is reported. K: number of parameters in the model.

a) Models also including date of survey

Rank	Water availability	Aquatic breathing	Anti-predator refuge	K	AIC	Weight
1	0.19	0.38	-0.95	6	798.6	0.988
2	0.21	0.38		5	807.5	0.012
Variable importance	>0.999	>0.999	0.988			
Model averaged parameters	0.19	0.38	-0.95			

b) model selection performed using AICc

Rank	Water availability	Aquatic breathing	Anti-predator refuge	K	AICc	Weight
1	0.20	0.25	-0.54	4	799.6	0.805
2		0.22		2	803.5	0.113
3				1	805.6	0.039
4	0.22			2	805.8	0.035
5	0.41		-0.76	3	808.7	0.009
Variable importance	0.848	0.918	0.813			
Model averaged parameters	0.21	0.25	-0.55			