

Coexistence of two newt species in a transition zone of range overlap

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Supplementary material

FIGURE S1 Aerial photograph of the sand pit and study pond to be, on January 1, 1972, when it was notable for the first time (see arrow). The villages shown are Audresselles in the north and Ambleteuse in the south. The imagery is freely available at <https://remonterletemps.ign.fr>, courtesy of the Institute National de l'Information Géographique et Forestière'. The image from 2012 illustrates the increased forestation around the study pond and the expansion of local infrastructure and urbanization.

Year 1972



Year 2012



FIGURE S2 Field aspects of the study pond in 2003. The photo at the top shows that the pond, situated in the depression on the right, has become fully surrounded by tree vegetation. The photo to the bottom shows its current low water level and near-complete shading.

PHOTOGRAPHY A. ZUIDERWIJK

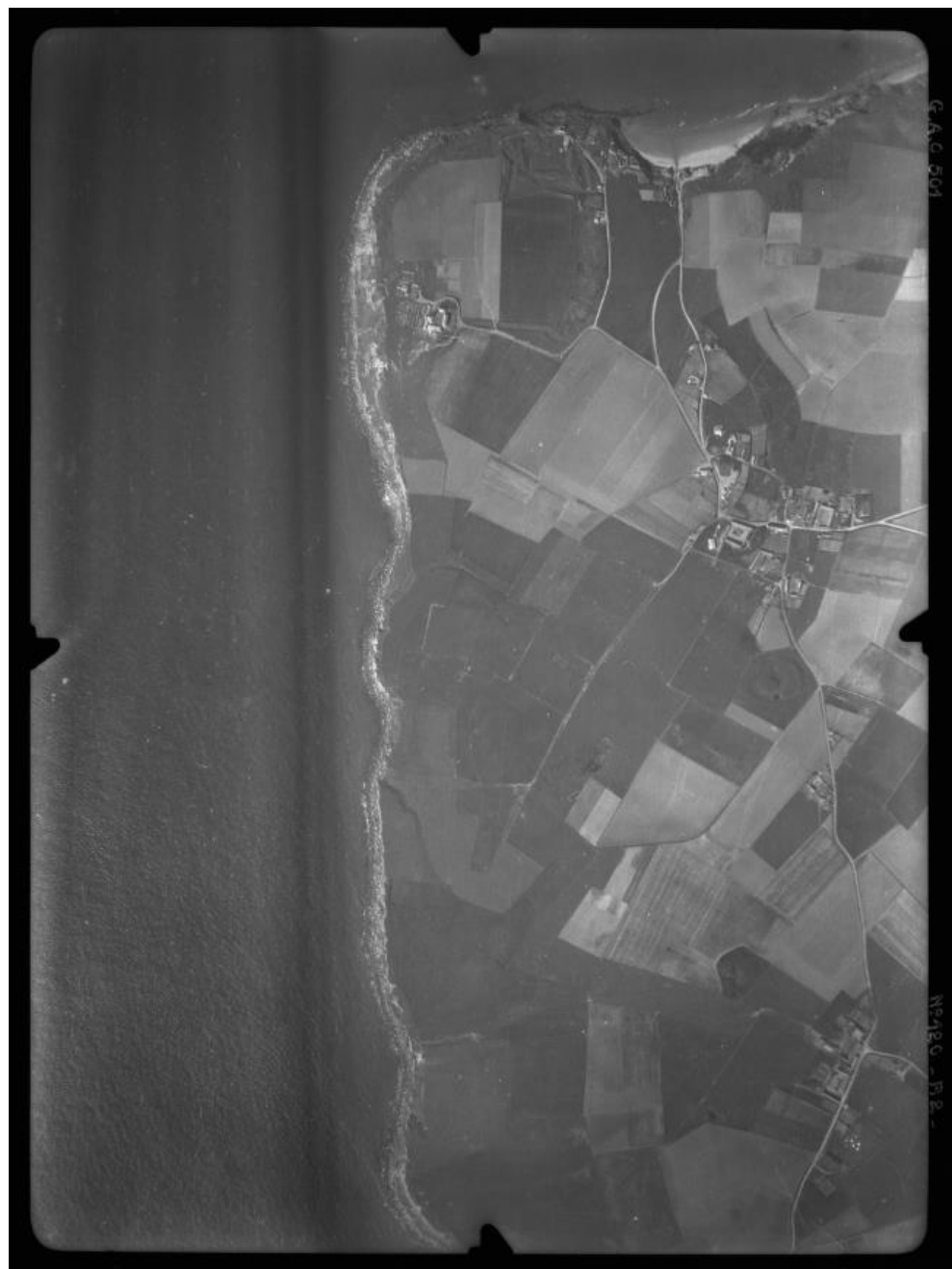


FIGURE S3 The ‘bomb crater area’ directly south of Cap Griz Nez highlighted by an ellipse. The aerial photographs are from 1975 and freely available at <https://remonterletemps.ign.fr>, courtesy of the ‘Institute National de l'Information Géographique et Forestière’. The images from 1939 and 1949 show the absence versus high density of bomb craters in the area, before and after the Second World War.

Year 1975



Year 1939



Year 1949



TABLE S1 Measurements on hardness of the water (Ca⁺) and salinity (Cl⁻) in ponds with *Lissotriton newts*. Pond numbers and coordinates are as in table 1, along with pond numbers as used in a previous study (Arntzen et al., 2017)

Pond numbe r	Coordinates		Pond details as in previous publications #			Chemical composition	
	Latitud e	Longitud e	Number	Easting	Northing	Ca+ (mg/l)	Cl- _mg/l
Focal	50.820	1.604	330	548.431	1346.941	32	57
1	50.770	1.772	026	560.178	1341.373		
2	50.871	1.617	110	549.314	1352.794		
3	50.902	1.679	131	553.743	1356.112	80	
4	50.901	1.678	132	553.684	1356.027	72	
5	50.870	1.606	133	548.593	1352.597	129	104
6	50.902	1.680	135	553.806	1356.19	58	
7	50.869	1.608	136	548.678	1352.537		
8	50.869	1.609	137	548.75	1352.497		
9	50.875	1.656	201	552.118	1353.132	58	
10	50.855	1.666	205	552.748	1350.947		
11	50.854	1.664	206	552.665	1350.874		
12	50.839	1.672	207	553.184	1349.182		
13	50.837	1.675	208	553.396	1348.891	62	
14	50.820	1.631	209	550.255	1347.102	58	
15	50.858	1.630	212	550.247	1351.269	71	
16	50.861	1.610	213	548.857	1351.602		
17	50.860	1.606	216	548.535	1351.492		
18	50.849	1.597	217	547.898	1350.346		

19	50.853	1.595	232	547.802	1350.769		
20	50.866	1.608	233	548.723	1352.234	62	
21	50.844	1.590	234	547.423	1349.761	64	76
22	50.844	1.598	235	547.996	1349.758		
23	50.844	1.599	236	548.015	1349.772	70	95
24	50.845	1.599	237	548.031	1349.888	96	85
25	50.845	1.599	239	548.057	1349.865	98	63
26	50.845	1.599	240	548.033	1349.839	99	88
27	50.845	1.599	242	548.085	1349.811	86	176
28	50.845	1.600	243	548.1	1349.821	92	101
29	50.845	1.600	244	548.114	1349.86	81	132
30	50.845	1.600	245	548.088	1349.854	114	110
31	50.845	1.601	246	548.212	1349.899	90	82
32	50.846	1.600	247	548.101	1349.95	46	104
33	50.845	1.600	248	548.109	1349.897	80	60
34	50.846	1.603	250	548.304	1349.952	62	
35	50.849	1.598	251	548.008	1350.293		
36	50.861	1.591	258	547.503	1351.647		
37	50.860	1.586	263	547.165	1351.594	27	
38	50.860	1.583	264	546.907	1351.548	93	
39	50.857	1.664	265	552.651	1351.127	34	
40	50.864	1.616	267	549.238	1351.942		
41	50.865	1.602	268	548.3	1352.057		
42	50.855	1.664	269	552.607	1350.984		
43	50.832	1.626	271	549.963	1348.406		
44	50.844	1.593	276	547.627	1349.757		
45	50.850	1.582	299	546.833	1350.449		
46	50.819	1.611	304	548.85	1346.94		

47	50.818	1.608	305	548.661	1346.873	62	82
48	50.822	1.600	328	548.105	1347.31	95	170
49	50.823	1.602	329	548.251	1347.431	89	151
50	50.821	1.619	338	549.424	1347.177	40	76
51	50.823	1.623	339	549.729	1347.456		
52	50.819	1.617	351	549.279	1346.982	106	141
53	50.820	1.598	352	547.945	1347.123	77	106
54	50.821	1.599	353	548.037	1347.177	43	92
55	50.797	1.626	402	549.901	1344.483	49	
56	50.795	1.627	403	549.961	1344.264	31	
57	50.800	1.623	405	549.673	1344.795	56	
58	50.799	1.622	407	549.63	1344.706	38	
59	50.784	1.617	409	549.288	1343.084		
60	50.797	1.619	430	549.403	1344.465	72	
61	50.797	1.621	431	549.535	1344.503	52	
62	50.798	1.613	433	548.989	1344.638	50	
63	50.791	1.621	435	549.563	1343.872	10	
64	50.799	1.615	440	549.149	1344.72	29	
65	50.797	1.616	442	549.194	1344.528	49	38
66	50.799	1.618	443	549.343	1344.774	71	60
67	50.797	1.624	445	549.787	1344.505		
68	50.799	1.628	448	550.019	1344.743	80	
69	50.793	1.625	454	549.825	1344.024		
70	50.791	1.624	455	549.782	1343.794		
71	50.808	1.667	506	552.796	1345.666		
72	50.826	1.668	541	552.874	1347.669		
73	50.851	1.723	605	556.761	1350.509		
74	50.855	1.700	606	555.148	1350.901		

75	50.863	1.692	607	554.606	1351.758		
76	50.823	1.722	609	556.67	1347.384	40	
77	50.822	1.722	610	556.664	1347.258	44	
78	50.822	1.721	611	556.608	1347.177	61	
79	50.851	1.759	627	559.298	1350.398		
80	50.850	1.758	628	559.251	1350.349		
81	50.854	1.701	630	555.245	1350.796		
82	50.819	1.718	632	556.378	1346.936		
83	50.805	1.699	710	555.078	1345.309	80	120
84	50.805	1.700	711	555.128	1345.401		
85	50.831	1.821	801	563.672	1348.189		
86	50.844	1.783	806	561.001	1349.697	33	41
87	50.833	1.775	810	560.45	1348.465	40	
88	50.833	1.778	811	560.619	1348.382	24	
89	50.832	1.776	812	560.485	1348.263	35	
90	50.832	1.774	826	560.395	1348.3		
91	50.832	1.776	827	560.497	1348.348		
92	50.830	1.775	828	560.467	1348.053		
93	50.831	1.773	829	560.271	1348.15		
94	50.837	1.800	832	562.202	1348.903		
95	50.800	1.689	902	554.352	1344.8		
96	50.789	1.691	904	554.468	1343.617	78	173
97	50.778	1.679	906	553.611	1342.406		
98	50.779	1.659	909	552.234	1342.531		
99	50.771	1.666	929	552.667	1341.548	58	24
100	50.774	1.673	931	553.171	1341.937	52	41
101	50.779	1.606	934	548.472	1342.51	46	
102	50.807	1.690	935	554.458	1345.538	72	

103	50.797	1.688	936	554.284	1344.517
104	50.801	1.690	937	554.402	1344.95
105	50.789	1.690	938	554.382	1343.561

= coordinates in the Lambert I system.

TABLE S2 Correlation of *Lissotriton* species composition (F_v) and the average distance to the 1-10 nearest ponds (Ponddist1 – Ponddist10) over 106 newt localities in dept. Pas de Calais, France. Distances were calculated from the Lambert I coordinates in Supplementary material S4. For species composition see table 1

Ponddist	Spearman's correlation coefficient	95% Confidence		P
		interval		
		Lower	Upper	
1	-0.029	-0.224	0.170	NS
2	-0.189	-0.373	0.008	NS
3	-0.289	-0.460	-0.098	**
4	-0.360	-0.520	-0.175	***
5	-0.380	-0.537	-0.198	***
6	-0.403	-0.556	-0.223	***
7	-0.448	-0.593	-0.275	***
8	-0.470	-0.611	-0.301	***
9	-0.484	-0.621	-0.316	***
10	-0.490	-0.627	-0.324	***

NS - not significant, ** - $P < 0.01$, *** $P < 0.001$