

SUPPLEMENTARY MATERIAL: RESULTS

Table S1. AIC, Δ AIC, weight values and degrees of freedom comparing zero inflated negative binomial (GLMMZINB) models, with 35 different combinations of covariate models for predicting penguin presence and abundance. Explanatory variables: Sea surface temperature (SST) and bottom temperature (BT), both in °C; sea surface salinity (SSS) and bottom salinity (BS); depth (m); distance from the shoreline (dist_coast); difference between surface and bottom temperature (Δ T); difference between surface and bottom salinity (Δ S); anchovy density (t.nm²). Surveys were added as random variable. The best model, i.e. lowest AIC value, is highlighted in bold.

<i>ZINB -Penguin</i>							
<i>n</i>	<i>MODEL</i>	<i>count part</i>	<i>binomial part (presence/absence)</i>	<i>AIC</i>	Δ <i>AIC</i>	<i>weight</i>	<i>df</i>
1	M1	Δ T+anchovy density+SST+SSS+ Δ S	Δ T+anchovy density+SST+SSS+ Δ S	502.5685	14.0821	<0.001	19
2	M2	Δ T+anchovy density+SST+BS	Δ T+anchovy density+SST+BS	502.6494	14.1630	<0.001	17
3	M3	Δ T+anchovy density+SST+SSS+depth	Δ T+anchovy density+SST+SSS+depth	503.2474	14.7610	<0.001	19
4	M4	Δ T+anchovy density+SST+SSS+dist_coast	Δ T+anchovy density+SST+SSS+dist_coast	502.0054	13.5190	<0.001	19
5	M5	Δ T+anchovy density+BT+SSS+ Δ S	Δ T+anchovy density+BT+SSS+ Δ S	491.6538	3.1674	0.1688	19
6	M6	ΔT+anchovy density+BT+BS	ΔT+anchovy density+BT+BS	488.4864	0.0000	0.8225	17
7	M7	Δ T+anchovy density+BT+SSS+depth	Δ T+anchovy density+BT+SSS+depth	499.7617	11.2753	0.0029	19
8	M8	Δ T+anchovy density+BT+SSS+dist_coast	Δ T+anchovy density+BT+SSS+dist_coast	499.8078	11.3214	0.0029	19
<i>drop from M6</i>							
	M6	Δ T+anchovy density+BT+BS	Δ T+anchovy density+BT+BS	488.4864	1.8573	0.0984	17
9	M6.a	anchovy density+BT+BS	Δ T+anchovy density+BT+BS	487.7257	1.0966	0.1440	16
10	M6.b	Δ T+BT+BS	Δ T+anchovy density+BT+BS	496.8247	10.1956	0.0015	16
11	M6.c	Δ T+anchovy density+BS	Δ T+anchovy density+BT+BS	489.3217	2.6926	0.1069	16
12	M6.d	ΔT+anchovy density+BT	ΔT+anchovy density+BT+BS	486.6291	0.0000	0.2491	16
13	M6.e	ΔT+anchovy density+BT+BS	anchovy density+BT+BS	486.6483	0.0192	0.2468	16
14	M6f	Δ T+anchovy density+BT+BS	Δ T+BT+BS	488.6166	1.9875	0.1521	16
15	M6.g	Δ T+anchovy density+BT+BS	Δ T+anchovy density+BS	510.1602	23.5311	<0.001	16
16	M6.h	Δ T+anchovy density+BT+BS	Δ T+anchovy density+BT	497.3174	10.6883	0.0012	16

<i>drop from M6.d</i>							
	M6.d	ΔT +anchovy density+BT	ΔT +anchovy density+BT+BS	486.6291	1.8299	0.0659	16
17	M6.d.1	anchovy density+BT	ΔT +anchovy density+BT+BS	485.7284	0.9292	0.1034	15
18	M6.d.2	ΔT +BT	ΔT +anchovy density+BT+BS	494.8273	10.0281	0.0011	15
19	M6.d.3	ΔT +anchovy density	ΔT +anchovy density+BT+BS	486.3219	1.5227	0.0769	15
20	M6.d.4	ΔT+anchovy density+BT	anchovy density+BT+BS	484.7992	0.0000	0.1646	15
21	M6.d.5	ΔT +anchovy density+BT	ΔT +BT+BS	486.7596	1.9604	0.1018	15
22	M6.d.6	ΔT +anchovy density+BT	ΔT +anchovy density+BS	508.3147	23.5155	<0.001	15
23	M6.d.7	ΔT +anchovy density+BT	ΔT +anchovy density+BT	491.8275	7.0283	<0.001	15
<i>drop from M6.e</i>							
	M6.e	ΔT +anchovy density+BT+BS	anchovy density+BT+BS	485.9669	1.1677	0.0781	16
24	M6.e.1	anchovy density+BT+BS	anchovy density+BT+BS	486.6483	1.8491	0.1098	15
25	M6.e.2	ΔT +BT+BS	anchovy density+BT+BS	495.0256	10.2264	<0.001	15
26	M6.e.3	ΔT +anchovy density+BS	anchovy density+BT+BS	486.5129	1.7137	0.0836	15
27	M6.e.4	ΔT +anchovy density+BT+BS	BT+BS	486.9013	2.1021	0.1135	15
28	M6.e.5	ΔT +anchovy density+BT+BS	anchovy density+BS	508.2268	23.4276	<0.001	15
29	M6.e.6	ΔT +anchovy density+BT+BS	anchovy density+BT	496.623	11.8238	<0.001	15
<i>drop from M6.d.4</i>							
	M6.d.4	ΔT +anchovy density+BT	anchovy density+BT+BS	485.7992	485.7992	0.1952	15
30	M6.d.4.1	anchovy density+BT	anchovy density+BT+BS	483.9703	483.9703	0.2954	14
31	M6.d.4.2	ΔT +BT	anchovy density+BT+BS	485.6995	485.6995	<0.001	14
32	M6.d.4.3	ΔT +anchovy density	anchovy density+BT+BS	485.5135	485.5135	0.2251	14
33	M6.d.4.4	ΔT +anchovy density+BT	BT+BS	485.0554	485.0554	0.2831	14
34	M6.d.4.5	ΔT +anchovy density+BT	anchovy density+BS	506.5104	506.5104	<0.001	14
35	M6.d.4.6	ΔT +anchovy density+BT	anchovy density+BT	494.9498	494.9498	0.0012	14
	Final Model	anchovy density+BT	anchovy density+BT+BS	483.9703			

Table S2. AIC, Δ AIC, weight values and degrees of freedom comparing zero-altered negative binomial (GLMMZANB) models, with 37 different combinations of covariate models for predicting flying seabirds presence and abundance. Explanatory variables: Sea surface temperature (SST); bottom temperature (BT), both in °C; sea surface salinity (SSS) and bottom salinity (BS); depth (m); distance from the shoreline (dist_coast); difference between surface and bottom temperature (Δ T); difference between surface and bottom salinity (Δ S); anchovy density (t.nm²). Surveys were added as random variable. The best model, i.e. lowest AIC value, is highlighted in bold

<i>ZANB-Flying birds</i>							
<i>n</i>	<i>MODEL</i>	<i>cout part</i>	<i>binomial part (presence/absence)</i>	<i>AIC</i>	<i>ΔAIC</i>	<i>weight</i>	<i>df</i>
1	M1	ΔT+anchovy density+SST+SSS+ΔS	ΔT+anchovy density+SST+SSS+ΔS	1066.5180	0.0000	0.5300	19
2	M2	Δ T+anchovy density+SST+BS	Δ T+anchovy density+SST+BS	1069.2767	2.7587	0.2218	17
3	M3	Δ T+anchovy density+SST+SSS+depth	Δ T+anchovy density+SST+SSS+depth	1080.5160	13.9980	<0.001	19
4	M4	Δ T+anchovy density+SST+SSS+dist_coast	Δ T+anchovy density+SST+SSS+dist_coast	1078.1265	11.6085	0.0013	19
5	M5	Δ T+anchovy density+BT+SSS+ Δ S	Δ T+anchovy density+BT+SSS+ Δ S	1073.2120	6.6940	0.0200	19
6	M6	Δ T+anchovy density+BT+BS	Δ T+anchovy density+BT+BS	1068.7300	2.2120	0.4700	17
7	M7	Δ T+anchovy density+BT+SSS+depth	Δ T+anchovy density+BT+SSS+depth	1084.3730	17.8550	<0.001	19
8	M8	Δ T+anchovy density+BT+SSS+dist_coast	Δ T+anchovy density+BT+SSS+dist_coast	1083.6220	17.1040	<0.001	19
<i>drop from M1</i>							
	M1	Δ T+anchovy density+SST+SSS+ Δ S	Δ T+anchovy density+SST+SSS+ Δ S	1066.5180	1.7880	0.0854	19
9	M1 .a	anchovy density+SST+SSS+ Δ S	Δ T+anchovy density+SST+SSS+ Δ S	1069.4740	4.7440	0.0217	18
10	M1 .b	ΔT+SST+SSS+ΔS	ΔT+anchovy density+SST+SSS+ΔS	1064.7300	0.0000	0.2322	18
11	M1 .c	Δ T+anchovy density+SSS+ Δ S	Δ T+anchovy density+SST+SSS+ Δ S	1066.4290	1.6990	0.0993	18
12	M1 .d	Δ T+anchovy density+SST+ Δ S	Δ T+anchovy density+SST+SSS+ Δ S	1064.8580	0.1280	0.2178	18
13	M1 .e	Δ T+anchovy density+SST+SSS	Δ T+anchovy density+SST+SSS+ Δ S	1072.3210	7.5910	0.0052	18
14	M1 .f	Δ T+anchovy density+SST+SSS+ Δ S	anchovy density+SST+SSS+ Δ S	1067.6740	2.9440	0.0533	18
15	M1 .g	Δ T+anchovy density+SST+SSS+ Δ S	Δ T+SST+SSS+ Δ S	1065.0020	0.2720	0.2027	18
16	M1 .h	Δ T+anchovy density+SST+SSS+ Δ S	Δ T+anchovy density+SSS+ Δ S	1070.1680	5.4380	0.0153	18
17	M1 .i	Δ T+anchovy density+SST+SSS+ Δ S	Δ T+anchovy density+SST+ Δ S	1067.2100	2.4800	0.0672	18
18	M1 .j	Δ T+anchovy density+SST+SSS+ Δ S	Δ T+anchovy density+SST+SSS	1071.1241	6.3941	0.0410	18
<i>drop M1.b</i>							

	M1 .b	$\Delta T + SST + SSS + \Delta S$	$\Delta T + \text{anchovy density} + SST + SSS + \Delta S$	1064.8580	1.9990	0.1281	18
19	M1 .b1	$SST + SSS + \Delta S$	$\Delta T + \text{anchovy density} + SST + SSS + \Delta S$	1067.6340	4.7750	0.0320	17
20	M1 .b2	$\Delta T + SSS + \Delta S$	$\Delta T + \text{anchovy density} + SST + SSS + \Delta S$	1064.4540	1.5950	0.1568	17
21	M1 .b3	$\Delta T + SST + \Delta S$	$\Delta T + \text{anchovy density} + SST + SSS + \Delta S$	1062.8590	0.0000	0.3481	17
22	M1 .b4	$\Delta T + SST + SSS$	$\Delta T + \text{anchovy density} + SST + SSS + \Delta S$	1070.3290	7.4700	0.0083	17
23	M1 .b5	$\Delta T + SST + SSS + \Delta S$	$\text{anchovy density} + SST + SSS + \Delta S$	1065.6500	2.7910	0.1416	17
24	M1 .b6	$\Delta T + SST + SSS + \Delta S$	$\Delta T + SST + SSS + \Delta S$	1063.1300	0.2710	0.3038	17
25	M1 .b7	$\Delta T + SST + SSS + \Delta S$	$\Delta T + \text{anchovy density} + SSS + \Delta S$	1068.2960	5.4370	0.0230	17
26	M1 .b8	$\Delta T + SST + SSS + \Delta S$	$\Delta T + \text{anchovy density} + SST + \Delta S$	1065.0700	2.2110	0.1427	17
27	M1 .b9	$\Delta T + SST + SSS + \Delta S$	$\Delta T + \text{anchovy density} + SST + SSS$	1066.0310	3.1720	0.1123	17
<i>Only variables significant ($\Delta AIC > 2$ if excluded)</i>							
28	MOD1	$\Delta T + \Delta S$	$\Delta T + SST + \Delta S$	1062.0541	0.8801	0.3282	14
29	MOD2	ΔS	$\Delta T + SST + \Delta S$	1066.5220	5.3480	0.0386	13
30	MOD3	ΔT	$\Delta T + SST + \Delta S$	1072.5900	11.4160	0.0011	13
31	MOD4	$\Delta T + \Delta S$	$SST + \Delta S$	1061.1740	0.0000	0.5593	13
32	MOD5	$\Delta T + \Delta S$	$\Delta T + \Delta S$	1066.0040	4.8300	0.0500	13
33	MOD6	$\Delta T + \Delta S$	$\Delta T + SST$	1062.1060	0.9320	0.3510	13
<i>drop MOD4</i>							
	MOD4	$\Delta T + \Delta S$	$SST + \Delta S$	1061.1740	0.2850	0.5593	13
34	MOD4.1	ΔS	$SST + \Delta S$	1066.1810	5.2920	0.0600	12
35	MOD4.2	ΔT	$SST + \Delta S$	1073.2490	12.3600	0.0018	12
36	MOD4.3	$\Delta T + \Delta S$	ΔS	1065.3000	4.4110	0.0932	12
37	MOD4.4	$\Delta T + \Delta S$	SST	1060.8890	0.0000	0.8451	12
	Final Model	$\Delta T + \Delta S$	SST	1060.8890			