

Supplementary Figures

Figure S1. Mean percentage (\pm standard deviation) of detections recorded as a function of the distance between the test tag and the acoustic receiver.

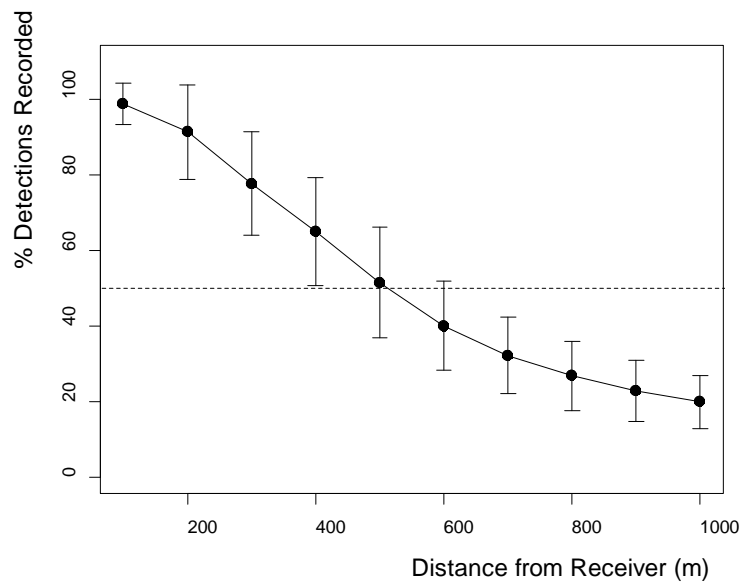
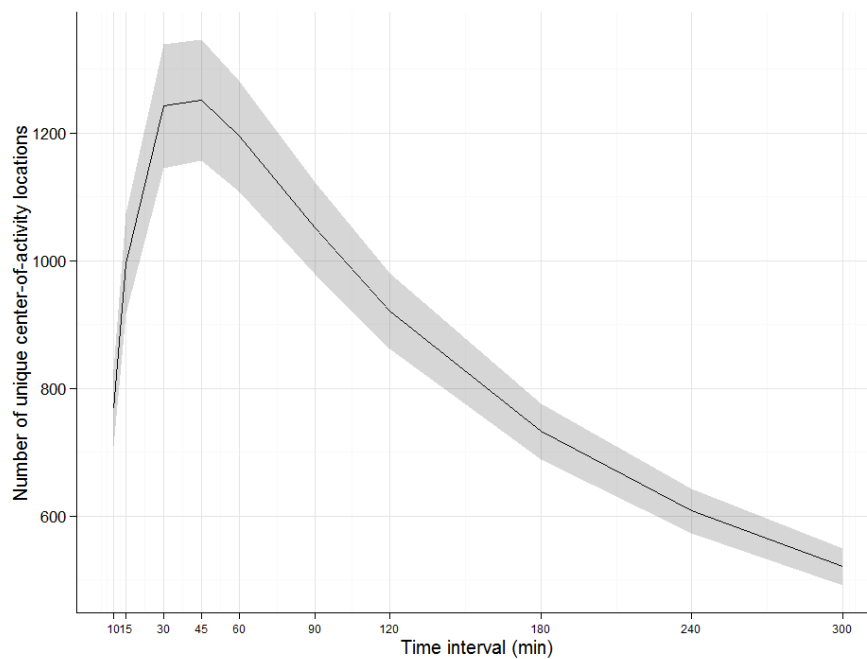


Figure S2. Mean number (\pm standard error) of unique center-of-activity locations as a function of the time interval used in the calculation.



Supplementary Tables

Table S1. Model selection for the summer average depth during the day, based on the Akaike's information criteria (AIC) and Akaike weights (w_i). The 95% confidence set of models (cumulative weights > 0.95) is presented in bold. AIC differences (Δ_i) and cumulative weights (cum w_i) are also shown.

Model selection for	Method	Fixed effects	Random effects	Temporal autocorrelation term	AIC	Δ_i	w_i	Cum w_i
T1m vs T19m	ML	T1m	Fish	None	80,914	0		
		T19m	Fish	None	81,238	323		
Random structure	REML	T1m + Up + Prec + Len + T1mxLen + UpxT1m	T1m Year/Fish	corAR1(form=~Jul Year/Fish)	70,609	0		
		"	T1m Year/Fish	None	77,661	7,053		
		"	Year/Fish	None	79,693	9,084		
		"	Fish	None	80,819	10,210		
		"	None	None	87,975	17,366		
Fixed structure	ML	Up + T1m + Len + T1mxLen + UpxT1m	T1m Year/Fish	corAR1(form=~Jul Year/Fish)	70,572	0	1.00	1.00
		Up + T1m + Len + Up * T1m	"	"	70,586	13	0.00	1.00
		Up + T1m + Len + T1m * Len	"	"	70,656	84	0.00	1.00
		Up + T1m + Len	"	"	70,670	98	0.00	1.00
		Up + T1m	"	"	70,671	98	0.00	1.00
		Up + T1m + Len + Prec	"	"	70,671	99	0.00	1.00
		Up + T1m + Prec	"	"	70,671	99	0.00	1.00
		Up + Prec	"	"	70,687	115	0.00	1.00
		Up	"	"	70,687	115	0.00	1.00
		Up + Len	"	"	70,687	115	0.00	1.00
		T1m	"	"	70,720	148	0.00	1.00
		Prec	"	"	70,735	163	0.00	1.00
		Len	"	"	70,736	163	0.00	1.00

Abbreviations: T1m, temperature at 1 m depth, i.e. surface temperature ($^{\circ}\text{C}$); T19m, temperature at 19 m depth, i.e. bottom temperature ($^{\circ}\text{C}$); DifT, difference between surface and bottom temperatures ($^{\circ}\text{C}$); Up, upwelling (2 categories: 1=presence, 2=absence); Prec, precipitation (mm), Len, fish body size (cm); jul, julian day, starting in January 1st of the tagging year; year, year (4 levels: 2008, 2009, 2011, 2012); dnc, did not converge. Random effects and temporal autocorrelation terms follow the R-function *lme* (library *nlme*) syntax.

Table S2. Model selection for summer average depth at night. See Table S1 for abbreviations.

Model selection for	Method	Fixed effects	Random effects	Temporal autocorrelation term	AIC	Δ_i	w_i	Cum w_i
T1m vs T19m	ML	T1m	Fish	None	80,965	0		
		T19m	Fish	None	81,342	378		
Random structure	REML	T1m + Up + Prec + Len + T1mxLen + UpxT1m	T1m Year/Fish	corAR1(form=~Jul Year/Fish)	69,921	0		
		"	T1m Year/Fish	None	77,816	7,895		
		"	Year/Fish	None	79,517	9,596		
		"	Fish	None	80,839	10,918		
Fixed structure	ML	Len + T1m + Up + Prec + T1mxLen + UpxT1m	T1m Year/Fish	corAR1(form=~Jul Year/Fish)	69,883	0	1.00	1.00
		Len + T1m + Up + Prec + Up * T1m	"	"	69,900	17	0.00	1.00
		Len + T1m + Up + Prec + T1m * Len	"	"	69,969	85	0.00	1.00
		Len + T1m + Up + Prec	"	"	69,986	102	0.00	1.00
		Len + T1m + Prec	"	"	69,986	103	0.00	1.00
		Len + T1m + Up	"	"	69,988	104	0.00	1.00
		Len + T1m	"	"	69,988	105	0.00	1.00
		Len + Prec	"	"	69,996	113	0.00	1.00
		Len + Up	"	"	69,998	115	0.00	1.00
		Len	"	"	69,998	115	0.00	1.00
		T1m	"	"	69,999	115	0.00	1.00
		Prec	"	"	70,007	124	0.00	1.00
		Up	"	"	70,009	125	0.00	1.00

Table S3. Model selection for summer diel vertical migration. See Table S1 for abbreviations.

Model selection for	Method	Fixed effects	Random effects	Temporal autocorrelation term	AIC	Δ_i	w_i	Cum w_i	
T1m vs T19m	ML	T19m	Fish	None	75,478	0			
		T1m	Fish	None	76,156	678			
Random structure	REML	T19m + DifT + Prec + Len	T19m Year/Fish *	corAR1(form=~Jul Year/Fish)	72,556	0			
		"	Year/Fish	corAR1(form=~Jul Year/Fish)	72,899	343			
		"	T19m Year/Fish	None	73,955	1,399			
		"	Year/Fish	None	75,047	2,491			
		"	"	Fish	None	75,468	2,912		
		"	"	None	None	81,963	9,407		
Fixed structure	ML	T19m + Len + DifT	Year/Fish	corAR1(form=~Jul Year/Fish)	72,869	0	0.55	0.55	
		T19m + Len + DifT + Prec	"	"	72,869	0	0.45	1.00	
		T19m + Len	"	"	72,887	18	0.00	1.00	
		T19m + Len + Prec	"	"	72,888	19	0.00	1.00	
		T19m + DifT	"	"	72,899	30	0.00	1.00	
		T19m	"	"	72,917	48	0.00	1.00	
		T19m + Prec	"	"	72,918	49	0.00	1.00	
		DifT	"	"	72,955	86	0.00	1.00	
		Len	"	"	74,094	1,225	0.00	1.00	
		Prec	"	"	74,124	1,256	0.00	1.00	

* This model did not converge during model selection of fixed effects. The next best random structure was therefore used.

Table S4. Model selection for summer activity level. See Table S1 for abbreviations.

Model selection for	Method	Fixed effects	Random effects	Temporal autocorrelation term	AIC	Δ_i	w_i	Cum w_i	
T1m vs T19m	ML	T19m	Fish	None	-2,928	0			
		T1m	Fish	None	-2,912	16			
Up vs DifT	ML	Up	Fish	None	-2,931	0			
		DifT	Fish	None	-2,896	35			
Random structure	REML	T19m + DifT + Prec + Len	T19m Year/Fish *	corAR1(form=~Jul Year/Fish)	-5,270	0			
		"	Year/Fish	corAR1(form=~Jul Year/Fish)	-4,951	319			
		"	T19m Year/Fish	None	-4,030	1,240			
		"	Year/Fish	None	-3,106	2,164			
		"	"	Fish	None	-2,875	2,395		
		"	"	None	None	468	5,738		
Fixed structure	ML	Len + Prec	Year/Fish	corAR1(form=~Jul Year/Fish)	-5,087	0	0.33	0.33	
		Len	"	"	-5,087	0	0.30	0.63	
		Len + Prec + Up	"	"	-5,086	1	0.18	0.80	
		Len + Up	"	"	-5,086	1	0.17	0.97	
		Prec	"	"	-5,082	6	0.02	0.99	
		Up	"	"	-5,080	7	0.01	1.00	
		Len + Prec + T19m + Up	"	"	-5,023	64	0.00	1.00	
		Len + T19m	"	"	-5,008	79	0.00	1.00	
		Len + Prec + T19m	"	"	-5,006	81	0.00	1.00	
		T19m	"	"	-5,003	85	0.00	1.00	

* This model did not converge during model selection of fixed effects. The next best random structure was therefore used.

Table S5. Model selection for average distance moved in summer. See Table S1 for abbreviations.

Model selection for	Method	Fixed effects	Random effects	Temporal autocorrelation term	AIC	Δ_i	w_i	Cum w_i
T1m vs T19m	ML	T19m	Fish	None	68,421	0		
		T1m	Fish	None	68,859	438		
Up vs DifT	ML	DifT	Fish	None	68,724	0		
		Up	Fish	None	69,827	1,103		
Random structure	REML	T19m + DifT + Prec + Len	T19m Year/Fish *	corAR1(form=~Jul Year/Fish)	65,000	0		
		"	Year/Fish	corAR1(form=~Jul Year/Fish)	65,160	160		
		"	T19m Year/Fish	None	67,566	2,566		
		"	Year/Fish	None	68,406	3,406		
		"	Fish	None	68,611	3,611		
Fixed structure	ML	T19m + DifT + Len + Prec	Year/Fish	corAR1(form=~Jul Fish)	65,123	0	0.57	0.57
		T19m + DifT + Len	"	"	65,124	1	0.32	0.89
		T19m + DifT + Prec	"	"	65,127	4	0.07	0.96
		T19m + DifT	"	"	65,129	5	0.04	1.00
		T19m + Len	"	"	65,164	41	0.00	1.00
		T19m + Prec	"	"	65,168	45	0.00	1.00
		T19m	"	"	65,168	45	0.00	1.00
		DifT	"	"	65,169	45	0.00	1.00
		Len	"	"	66,220	1,097	0.00	1.00
		Prec	"	"	66,222	1,099	0.00	1.00

* This model did not converge during model selection of fixed effects. The next best random structure was therefore used.

Table S6. Model selection for winter average depth at day. See Table S1 for abbreviations.

Model selection for	Method	Fixed effects	Random effects	Temporal autocorrelation term	AIC	Δ_i	w_i	Cum w_i
T1m vs T19m	ML	T1m	Fish	None	29414.79	0		
		T19m	Fish	None	30793.36	1,379		
Random structure	REML	T1m + Up + Prec + Len	T1m Year/Fish *	corAR1(form=~Jul Year/Fish)	25949	0		
		"	Year/Fish	corAR1(form=~Jul Year/Fish)	26014.4	65		
		"	T1m Year/Fish	None	28446.27	2,497		
		"	Year/Fish	None	29429.81	3,481		
		"	Fish	None	30577.29	4,628		
Fixed structure	ML	T1m + Len + Prec + Up	Year/Fish	corAR1(form=~Jul Year/Fish)	25985.33	0	0.90	0.90
		T1m + Len	"	"	25991.23	6	0.05	0.94
		T1m + Len + Prec	"	"	25992.21	7	0.03	0.97
		T1m + Len + Up	"	"	25993.08	8	0.02	0.99
		T1m	"	"	25995.92	11	0.00	1.00
		T1m + Prec	"	"	25996.9	12	0.00	1.00
		T1m + Up	"	"	25997.79	12	0.00	1.00
		Len	"	"	27465.42	1,480	0.00	1.00
		Prec	"	"	27471.22	1,486	0.00	1.00
		Up	"	"	27472.3	1,487	0.00	1.00

* This model did not converge during model selection of fixed effects. The next best random structure was therefore used.

Table S7. Model selection for winter average depth at night. See Table S1 for abbreviations.

Model selection for	Method	Fixed effects	Random effects	Temporal autocorrelation term	AIC	Δ_i	w_i	Cum w_i
T1m vs T19m	ML	T19m	Fish	None	27852.52	-53,112		
		T1m	Fish	None	29647.29	-51,317		
Random structure	REML	T1m + Up + Prec + Len	Year/Fish	corAR1(form="Jul Year/Fish)	22922.58		0	
		"	T1m Year/Fish	corAR1(form="Jul Year/Fish)	dnc			
		"	Year/Fish	None	27869.67	4,947		
		"	Fish	None	29648.6	6,726		
		"	None	None	31893.63	8,971		
		"	T1m Year/Fish	None	dnc			
Fixed structure	ML	T1m + Up	"	"	22898.24	0	0.24	0.24
		T1m	"	"	22898.46	0	0.21	0.45
		T1m + Prec	"	"	22898.99	1	0.16	0.62
		T1m + Up + Prec	"	"	22899.08	1	0.16	0.78
		T1m + Up + Len	"	"	22900.24	2	0.09	0.86
		T1m + Len	"	"	22900.46	2	0.08	0.94
		T1m + Up + Prec + Len	"	"	22901.08	3	0.06	1.00
		Up	"	"	24404.14	1,506	0.00	1.00
		Prec	"	"	24410.63	1,512	0.00	1.00
		Len	"	"	24411.56	1,513	0.00	1.00

Table S8. Model selection for winter diel vertical migration. See Table S1 for abbreviations.

Model selection for	Method	Fixed effects	Random effects	Temporal autocorrelation term	AIC	Δ_i	w_i	Cum w_i
T1m vs T19m	ML	T19m	Fish	None	27623.24		0	
		T1m	Fish	None	28806.78	1,184		
Random structure	REML	T19m + Dift + Prec + Len	T1m Year/Fish *	corAR1(form="Jul Year/Fish)	26053.41		0	
		"	Year/Fish	corAR1(form="Jul Year/Fish)	26472.4	419		
		"	T1m Year/Fish	None	27260.92	1,208		
		"	Year/Fish	None	27612.22	1,559		
		"	Fish	None	27938.25	1,885		
		"	None	None	29819.23	3,766		
Fixed structure	ML	T1m + Dift + Len	Year/Fish	corAR1(form="Jul Year/Fish)	26048.75	0	0.72	0.72
		T1m + Dift + Len + Prec	"	"	26050.68	2	0.28	1.00
		T1m + Dift	"	"	26064.27	16	0.00	1.00
		T1m + Dift + Prec	"	"	26066.2	17	0.00	1.00
		T1m + Len	"	"	26066.87	18	0.00	1.00
		T1m	"	"	26082.33	34	0.00	1.00
		T1m + Prec	"	"	26084.28	36	0.00	1.00
		Dift	"	"	26089.43	41	0.00	1.00
		Prec	"	"	27670.2	1,621	0.00	1.00
		Len	"	"	27686.8	1,638	0.00	1.00

* This model did not converge during model selection of fixed effects. The next best random structure was therefore used.

Table S9. Model selection for winter activity level. See Table S1 for abbreviations.

Model selection for	Method	Fixed effects	Random effects	Temporal autocorrelation term	AIC	Δ_i	w_i	Cum w_i
T1m vs T19m	ML	T19m	Fish	None	-2096.373	0		
		T1m	Fish	None	-2086.629	10		
Up vs DifT	ML	DifT	Fish	None	-2109.239	0		
		Up	Fish	None	-2035.789	73		
Random structure	REML	T19m + DifT + Prec + Len	T1m Year/Fish *	corAR1(form=~Jul Year/Fish)	-3709.222	0		
		"	Year/Fish	corAR1(form=~Jul Year/Fish)	-3642.269	67		
		"	T1m Year/Fish	None	-2786.246	923		
		"	Fish	None	-2057.82	1,651		
		"	None	None	-1016.686	2,693		
Fixed structure	ML	Len + Prec	Year/Fish	corAR1(form=~Jul Year/Fish)	-3767.546	0	0.45	0.45
		Len + Prec + Up	"	"	-3766.332	1	0.25	0.70
		Len	"	"	-3765.327	2	0.15	0.85
		Len + T1m	"	"	-3764.145	3	0.08	0.93
		Prec	"	"	-3762.865	5	0.04	0.97
		Len + Prec + DifT	"	"	-3759.975	8	0.01	0.98
		T1m	"	"	-3759.405	8	0.01	1.00
		Len + Prec + Up + DifT	"	"	-3758.406	9	0.00	1.00
		Len + DifT	"	"	-3757.507	10	0.00	1.00
		DifT	"	"	-3752.746	15	0.00	1.00

* This model did not converge during model selection of fixed effects. The next best random structure was therefore used.

Table S10. Model selection for average distance moved in winter. See Table S1 for abbreviations.

Model selection for	Method	Fixed effects	Random effects	Temporal autocorrelation term	AIC	Δ_i	w_i	Cum w_i
T1m vs T19m	ML	T1m	Fish	None	26356.82	0		
		T19m	Fish	None	27588.15	1,231		
Up vs DifT	ML	DifT	Fish	None	26396.79	0		
		Up	Fish	None	28346.27	1,949		
Random structure	REML	T1m + DifT + Prec + Len	T1m Year/Fish *	corAR1(form=~Jul Year/Fish)	24834.26	0		
		"	Year/Fish	corAR1(form=~Jul Year/Fish)	24888.02	54		
		"	T1m Year/Fish	None	25857.15	1,023		
		"	Year/Fish	None	26154	1,320		
		"	Fish	None	26355.4	1,521		
Fixed structure	ML	DifT + T1m + Len	Year/Fish	corAR1(form=~Jul Fish)	24859.36	0	0.45	0.45
		DifT + T1m	"	"	24860.64	1	0.24	0.69
		DifT + T1m + Len + Prec	"	"	24860.96	2	0.20	0.89
		DifT + T1m + Prec	"	"	24862.23	3	0.11	1.00
		DifT + Len	"	"	24873.79	14	0.00	1.00
		DifT	"	"	24875.82	16	0.00	1.00
		DifT + Prec	"	"	24877.67	18	0.00	1.00
		T1m	"	"	24880.32	21	0.00	1.00
		Len	"	"	26542.55	1,683	0.00	1.00
		Prec	"	"	26545.43	1,686	0.00	1.00

* This model did not converge during model selection of fixed effects. The next best random structure was therefore used.