Seasonal changes in basking shark vertical space-use in the north-east Atlantic

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Supplementary materials

Table S1. Summary table of archival tags deployed between 2012 and 2014 contributing depth and temperature data (n = 32). Data type contribution from each tag shown (Histos = Summarised histograms at 4-hour intervals, Light geolocated = light geolocation methods applied to tags with long-term attachment (>165 days) providing daily minimum and maximum depths, and Time series = tags physically recovered for download providing depth and temperature data at 10 or 15 second intervals). Ordered by deployment year, tag type and tag number.

Year	Tag number	Tag model	Sex	Body length (m)	Duration (days)	Max. Depth (m)	Histos	Light geolocated	Timeseries
2012	119842	PAT-F280	Female	4 to 5	37	-	✓		
	119843	PAT-F280	Male	7 to 8	140	-	✓		
	119845	PAT-F280	Male	4 to 5	204	1000	✓	✓	✓
	119846	PAT-F280	Female	6 to 7	170	248	✓	✓	
	119848	PAT-F280	Unknown	5 to 6	20	-	✓		
	119850	PAT-F280	Female	8 to 9	19	-	✓		
	119851	PAT-F280	Unknown	5 to 6	45	227	✓		✓
	119852	PAT-F280	Female	6 to 7	111	-	✓		
	119853	PAT-F280	Male	6 to 7	280	1072	✓	✓	✓
2013	129431	SPLASH-F	Female	7 to 8	57	-	✓		
	129432	SPLASH-F	Unknown	5 to 6	34	-	✓		
	129433	SPLASH-F	Male	7 to 8	45	-	✓		
	129434	SPLASH-F	Unknown	5 to 6	45	178	✓		✓
	129442	MiniPAT-280	Unknown	4 to 5	292	375	✓	✓	
	129452	MiniPAT-280	Female	5 to 6	280	1192	✓	✓	
	129453	MiniPAT-365	Unknown	4 to 5	121	250	✓		✓
	129454	MiniPAT-280	Female	5 to 6	259	1500	✓	✓	✓
	129455	MiniPAT-280	Female	5 to 6	280	1280	✓	✓	
	129456	MiniPAT-280	Female	5 to 6	281	1500	✓	✓	✓
	129457	MiniPAT-365	Unknown	7 to 8	196	232	✓	✓	
	129458	MiniPAT-280	Unknown	4 to 5	280	875	✓	✓	
	129459	MiniPAT-280	Unknown	4 to 5	165	375	✓	✓	
	131890	MiniPAT-280	Unknown	5 to 6	64	259	✓		✓
2014	137645	SPLASH-F	Unknown	7 to 8	75	-	✓		
	137646	SPLASH-F	Male	6 to 7	10	82	✓		✓
	137648	SPLASH-F	Female	6 to 7	64	-	✓		
	137649	SPLASH-F	Unknown	6 to 7	136	165	✓		✓
	137650	SPLASH-F	Female	7 to 8	112	-	✓		
	137651	SPLASH-F	Female	5 to 6	248	-	✓		
	137652	SPLASH-F	Unknown	6 to 7	115	-	✓		
	137653	SPLASH-F	Male	7 to 8	47	208	✓		✓
	137654	SPLASH-F	Unknown	7 to 8	259	1232	✓	✓	✓

Table S2. Time-at-depth for basking sharks for each month of deployment. Time-at-depth represents mean percentage of time (summarised in 4-hour intervals) occupying eleven depth classes. Standard error (se) and (n)umber of sharks contributing to each month shown. Depth class with highest occupancy highlighted.

Month	0-1 m		1-5 m		5-10 m		10-25 m		25-50 m		50-75 m		75-100 m		100-250 m		250-500 m		500-750 m		750-1000 m	
	Time at depth (%)	se	Time at depth (%)	se	Time at depth (%)	se	Time at depth (%)	se	Time at depth (%)	se	Time at depth (%)	se	Time at depth (%)	se	Time at depth (%)	se	Time at depth (%)	se	Time at depth (%)	se	Time at depth (%)	se
January (n = 12)	7.16	3.15	6.70	2.06	7.44	3.93	11.85	5.11	10.09	2.92	15.44	4.77	19.23	9.04	15.91	11.87	2.34	1.74	3.48	2.39	0.34	0.34
February (n = 11)	28.55	18.13	9.07	6.66	1.72	0.96	2.32	1.28	4.27	2.15	5.17	2.03	14.26	9.48	26.15	13.53	2.44	1.52	4.63	3.59	1.19	0.88
March (n = 8)	8.32	4.00	16.13	13.05	4.93	3.80	4.04	2.67	5.82	3.37	7.17	3.31	7.51	3.23	31.52	20.62	6.37	3.42	6.67	4.46	1.42	0.87
April (n = 8)	16.73	10.60	21.64	11.46	9.07	3.94	10.80	2.20	12.43	1.05	10.58	2.37	6.43	2.43	6.21	2.24	1.73	1.06	2.16	1.77	2.03	1.87
May (n = 4)	16.52	7.60	15.46	6.35	12.36	2.23	13.35	2.41	6.42	2.18	3.41	2.05	5.68	2.24	26.77	0.70	0.00	0.00	0.00	0.00	0.00	0.00
July (n = 30)	20.98	2.62	13.22	1.77	6.44	0.91	20.41	2.48	19.31	2.28	9.75	1.72	6.86	1.69	3.00	1.02	0.03	0.03	0.00	0.00	0.00	0.00
August (n = 32)	20.37	3.65	9.06	1.59	4.23	0.48	21.75	2.53	25.46	2.32	13.55	2.93	2.98	0.76	2.60	1.27	0.01	0.01	0.00	0.00	0.00	0.00
September (n = 25)	2.62	1.33	3.10	1.23	1.49	0.35	14.02	2.88	35.15	3.85	21.86	3.09	7.67	1.83	14.10	4.11	0.00	0.00	0.00	0.00	0.00	0.00
October (n = 21)	1.59	0.69	1.31	0.49	1.41	0.38	9.38	2.40	22.11	4.98	21.71	3.91	15.18	2.68	27.27	7.15	0.04	0.04	0.00	0.00	0.00	0.00
November (n = 18)	5.72	2.83	2.84	1.25	4.58	2.37	11.86	4.26	18.33	3.07	25.60	5.50	17.11	3.53	13.94	4.54	0.02	0.01	0.00	0.00	0.00	0.00
December (n = 13)	4.66	1.35	5.77	2.04	7.40	3.60	18.20	7.18	21.62	2.70	28.06	8.27	8.23	3.47	6.06	4.79	0.00	0.00	0.00	0.00	0.00	0.00

Table S3. Time-at-depth for basking sharks for each month of deployment split by time of day (night / day). Time at depth represents mean percentage of time (summarised in 4-hour intervals) occupying eleven depth classes. Standard error (se) and (n)umber of sharks contributing to each month shown. Depth class with highest occupancy highlighted.

	DAY			NIGHT				DAY			NIGHT		
	Depth classes (m)	Time at depth (%)	se	Depth classes (m)	Time at depth (%)	se		Depth classes (m)	Time at depth (%)	se	Depth classes (m)	Time at depth (%)	se
January (n = 12)	<1	9.96	4.76	<1	4.37	1.54	August (n = 32)	<1	26.78	4.93	<1	13.96	2.38
	<5	6.73	2.16	<5	6.66	1.97		<5	9.30	1.46	<5	8.82	1.72
	<10	9.31	5.23	<10	5.58	2.63		<10	4.20	0.53	<10	4.26	0.43
	<25	15.54	7.07	<25	8.16	3.15		<25	18.70	2.59	<25	24.79	2.46
	<50	10.03	3.82	<50	10.15	2.03		<50	22.98	2.80	<50	27.93	1.84
	<75	6.78	4.51	<75	24.10	5.04		<75	12.23	3.07	<75	14.87	2.79
	<100	14.58	13.03	<100	23.89	5.05		<100	3.40	0.85	<100	2.57	0.68
	<250	18.35	17.51	<250	13.47	6.23		<250	2.40	0.93	<250	2.80	1.60
	<500	3.01	2.45	<500	1.67	1.03		<500	0.01	0.01	<500	0.00	0.00
	<750	5.12	3.76	<750	1.84	1.02		<750	0.00	0.00	<750	0.00	0.00
	<1000	0.59	0.59	<1000	0.10	0.10		<1000	0.00	0.00	<1000	0.00	0.00
February (n = 11)	<1	25.45	24.82	<1	31.65	11.44	September (n = 25)	<1	3.80	2.16	<1	1.45	0.49
	<5	10.85	10.30	<5	7.30	3.02		<5	3.59	1.47	<5	2.61	0.98
	<10	2.01	1.41	<10	1.42	0.52		<10	1.52	0.43	<10	1.46	0.27
	<25	2.07	1.70	<25	2.57	0.87		<25	13.33	3.60	<25	14.70	2.16
	<50	2.34	2.02	<50	6.19	2.28		<50	33.15	4.21	<50	37.14	3.50
	<75	1.61	1.24	<75	8.73	2.82		<75	21.70	3.49	<75	22.02	2.70
	<100	14.99	13.29	<100	13.53	5.67		<100	8.12	2.19	<100	7.21	1.48
	<250	33.75	22.47	<250	18.56	4.58		<250	14.80	4.97	<250	13.40	3.26
	<500	0.42	0.42	<500	4.46	2.61		<500	0.00	0.00	<500	0.00	0.00
	<750	5.18	5.18	<750	4.08	2.00		<750	0.00	0.00	<750	0.00	0.00
	<1000	1.01	1.01	<1000	1.38	0.76		<1000	0.00	0.00	<1000	0.00	0.00
March (n = 8)	<1	4.40	4.40	<1	12.23	3.60	October (n = 21)	<1	2.23	0.85	<1	0.96	0.53
	<5	23.66	23.28	<5	8.59	2.83		<5	1.60	0.69	<5	1.03	0.30
	<10	7.69	7.07	<10	2.18	0.52		<10	1.53	0.47	<10	1.29	0.29
	<25	5.31	4.66	<25	2.76	0.67		<25	8.54	2.53	<25	10.22	2.28
	<50	5.08	4.28	<50	6.56	2.46		<50	23.64	6.23	<50	20.58	3.72
	<75	4.23	3.51	<75	10.10	3.12		<75	24.06	5.83	<75	19.35	1.99
	<100	4.20	2.91	<100	10.81	3.55		<100	14.10	3.15	<100	16.27	2.21
	<250	36.32	32.21	<250	26.71	9.03		<250	24.28	9.09	<250	30.25	5.22
	<500	2.63	2.63	<500	10.11	4.20		<500	0.02	0.02	<500	0.05	0.05
	<750	5.30	5.30	<750	8.03	3.62		<750	0.00	0.00	<750	0.00	0.00
	<1000	1.15	1.15	<1000	1.69	0.60		<1000	0.00	0.00	<1000	0.00	0.00
April (n = 8)	<1	16.30	16.30	<1	17.16	4.89	November (n = 18)	<1	7.83	4.14	<1	3.62	1.52
	<5	26.02	18.84	<5	17.27	4.07		<5	2.56	1.21	<5	3.11	1.28
	<10	9.93	6.27	<10	8.21	1.61		<10	4.92	2.91	<10	4.25	1.84
	<25	10.09	2.90	<25	11.52	1.50		<25	12.76	5.92	<25	10.95	2.60
	<50	13.30	0.39	<50	11.55	1.71		<50	15.20	4.01	<50	21.46	2.12
	<75	9.60	1.30	<75	11.57	3.45		<75	28.61	7.93	<75	22.59	3.07
	<100	5.37	2.03	<100	7.48	2.82		<100	17.85	4.65	<100	16.37	2.41
	<250	3.26	1.86	<250	9.16	2.61		<250	10.26	5.80	<250	17.63	3.29
	<500	0.33	0.33	<500	3.13	1.78		<500	0.02	0.02	<500	0.02	0.01
	<750	2.77	2.77	<750	1.55	0.77		<750	0.00	0.00	<750	0.00	0.00
	<1000	3.01	3.01	<1000	1.06	0.73		<1000	0.00	0.00	<1000	0.00	0.00
May (n = 4)	<1	12.03	0.00	<1	21.01	15.21	December (n = 13)	<1	5.46	1.69	<1	3.86	1.01
	<5	5.00	0.00	<5	25.92	12.70		<5	5.54	2.11	<5	5.99	1.97
	<10	11.88	0.00	<10	12.85	4.45		<10	8.48	4.82	<10	6.32	2.39
	<25	8.28	0.00	<25	18.42	4.83		<25	19.88	10.67	<25	16.51	3.69
	<50	3.55	0.00	<50	9.30	4.36		<50	15.09	1.42	<50	28.14	3.98
	<75	1.78	0.00	<75	5.05	4.11		<75	28.20	11.75	<75	27.91	4.80
	<100	6.05	0.00	<100	5.31	4.47		<100	10.29	5.62	<100	6.17	1.32
	<250	51.40	0.00	<250	2.13	1.41		<250	7.05	6.58	<250	5.07	2.99
	<500	0.00	0.00	<500	0.00	0.00		<500	0.00	0.00	<500	0.00	0.00
	<750	0.00	0.00	<750	0.00	0.00		<750	0.00	0.00	<750	0.00	0.00
	<1000	0.00	0.00	<1000	0.00	0.00		<1000	0.00	0.00	<1000	0.00	0.00
July (n = 30)	<1	25.44	2.60	<1	16.53	2.64							
	<5	15.39	1.93	<5	11.05	1.60							
	<10	6.55	1.01	<10	6.34	0.82							
	<25	18.30	2.32	<25	22.52	2.64							
	<50	17.89	2.70	<50	20.73	1.87							
	<75	7.41	1.39	<75	12.08	2.04							
	<100	6.09	1.50	<100	7.64	1.88							
	<250	2.90	0.88	<250	3.10	1.16							
	<500	0.05	0.04	<500	0.01	0.01							
	<750	0.00	0.00	<750	0.00	0.00							
	<1000	0.00	0.00	<1000	0.00	0.00							

Table S4. Summary results of General Additive Model (GAM) to test for effect of latitude (per month) or month on the maximum daily depth occupied by basking sharks tracked for extended durations (>165 days; n = 12). Top ranked models and adjusted weights (Adj. Weight) after selection for ΔAIC ≤ 6 (Harrison et al. 2018) highlighted in bold.

Model (GAM)	Response	Fixed effects	Intercept	d.f	logLik	AIC	ΔAIC	Weight	Adj. Weight	Adj. R^2
Gaussian	*log daily maximum depth (m)*	**~ Month + s(Latitude by month)**	**4.74**	**19**	**-1640.43**	**3318.87**	**0.00**	**1.00**	**1.00**	**0.35**
		~ 1	4.72	11	-2024.12	4070.23	751.36	0.00	-	-

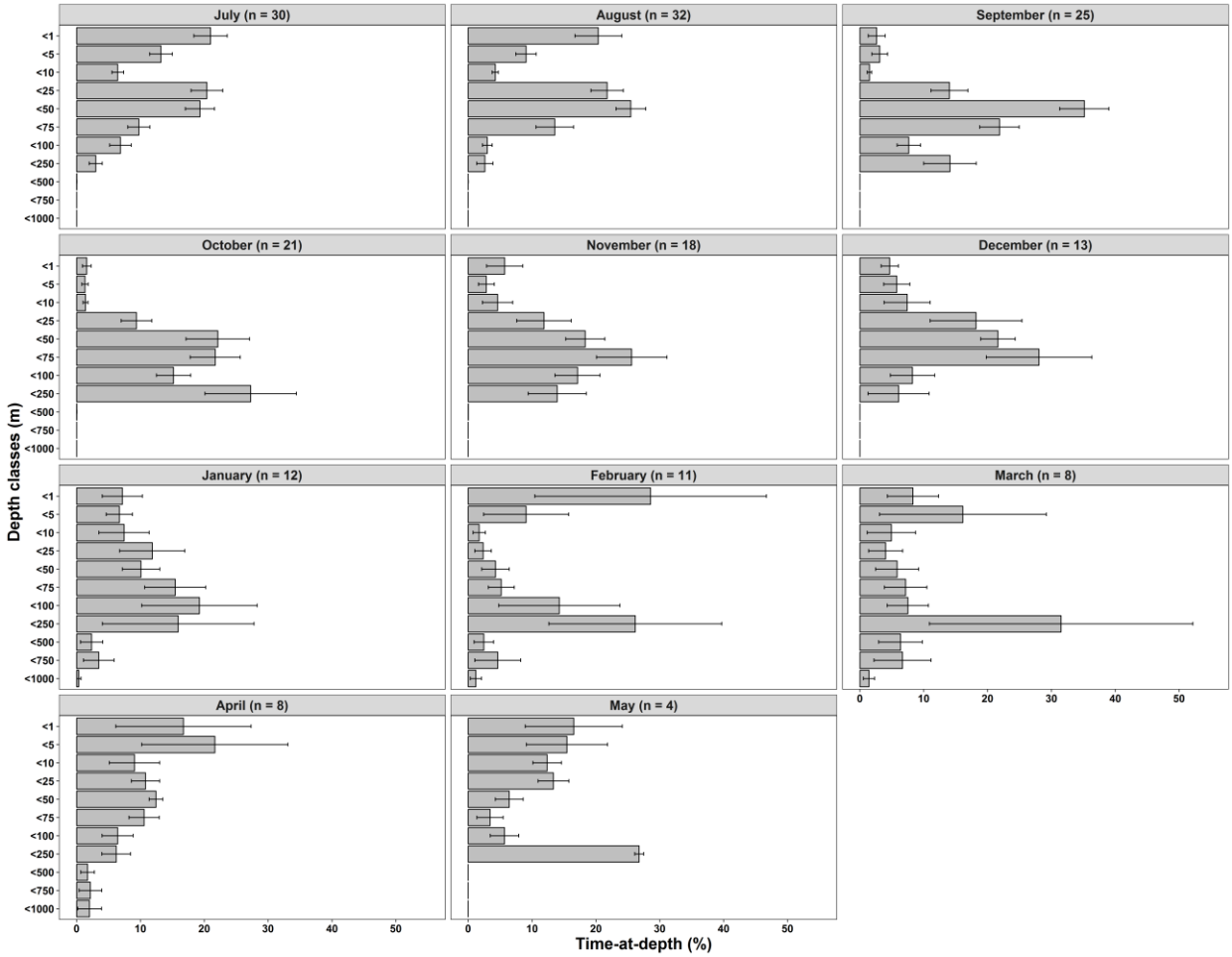

Figure S1. Monthly time-at-depth. Mean time-at-depth for basking sharks (n = 32) for each month of tag attachment. Bars represent mean percentage of time (summarised in 4-hour intervals) occupying eleven depth-ranges ± standard error (se). (N)umber of sharks contributing to each monthly plot shown.

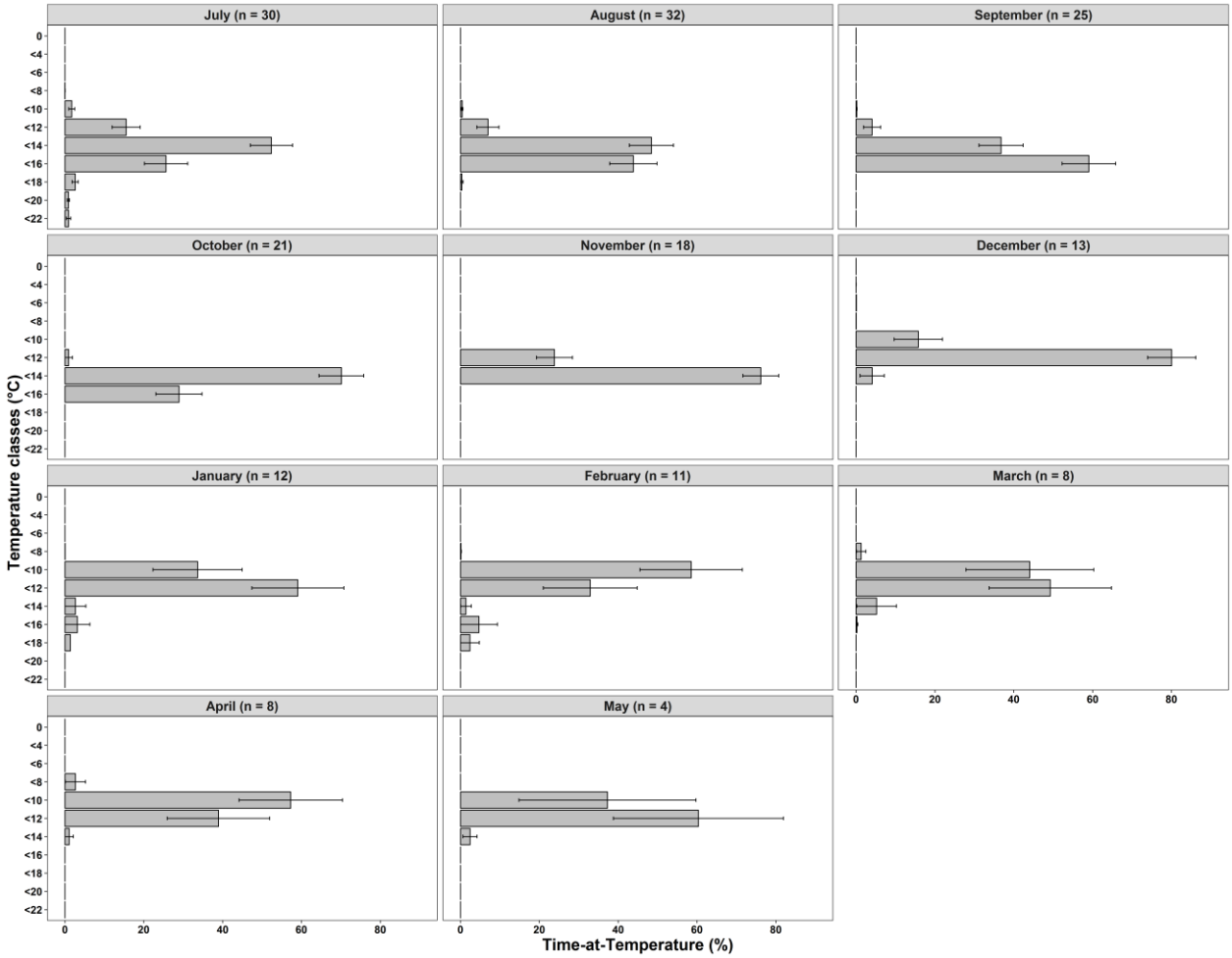

Figure S2. Monthly time-at-temperature. Mean time-at-temperature for basking sharks (n = 32) for each month of tag attachment. Bars represent mean percentage of time (summarised in 4-hour intervals) occupying eleven temperature-ranges ± standard error (se). (N)umber of sharks contributing to each monthly plot shown.