

Supplementary materials

Title: The influence of satellite-derived environmental and oceanographic parameters on marine turtle time-at-surface in the Gulf of Mexico

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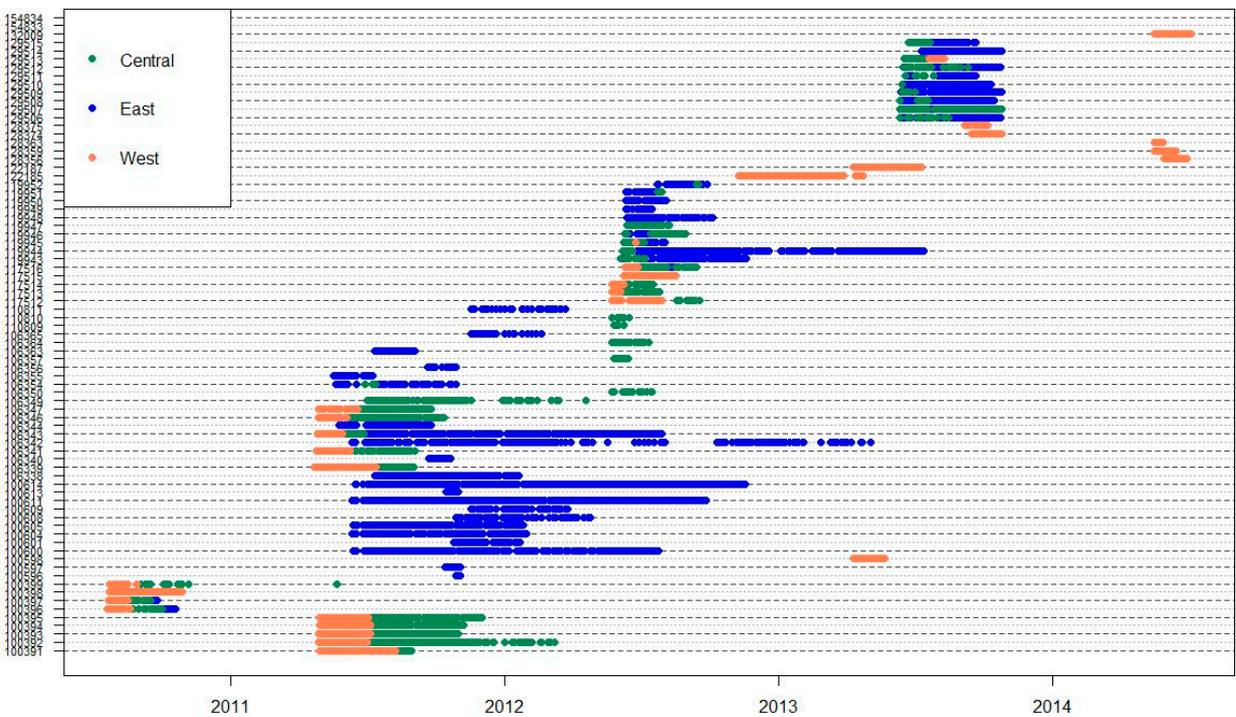


Figure S1. Tracking duration of all marine turtles included in the analysis from mid-2010 until January of 2016. Colors represent region of the Gulf of Mexico as defined by Bureau of Ocean Energy Management (BOEM).

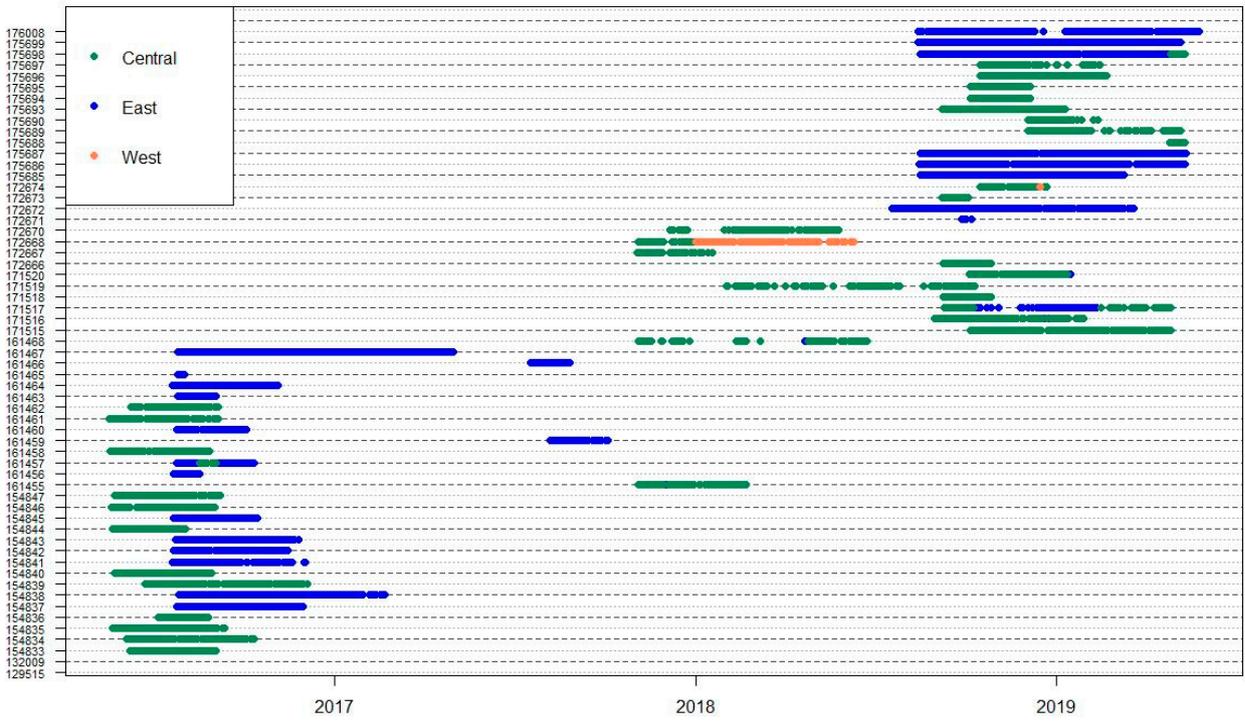


Figure S2. Tracking duration of all marine turtles included in the analysis from January 2016 until mid-2019. Colors represent region of the Gulf of Mexico as defined by Bureau of Ocean Energy Management (BOEM).

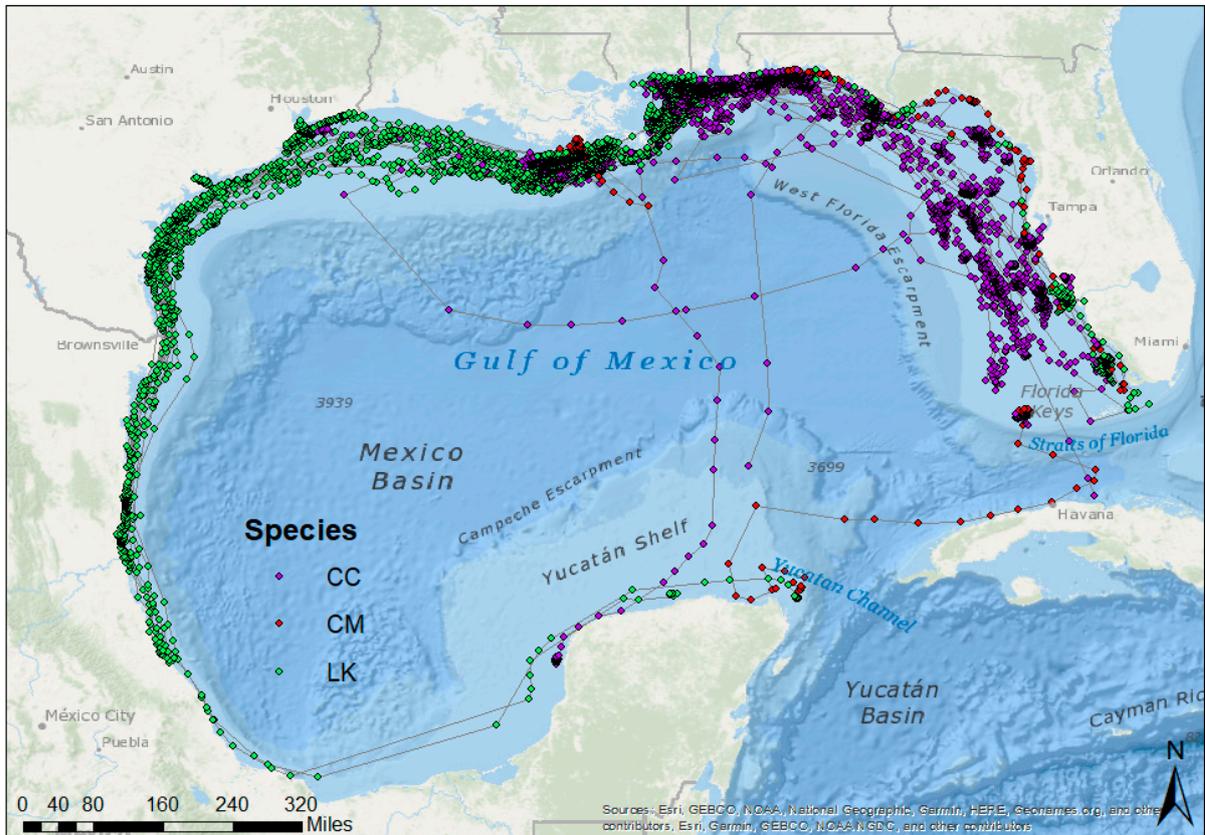


Figure S3. Resulting tracks from state space model for all marine turtles included in the analysis separated by species.

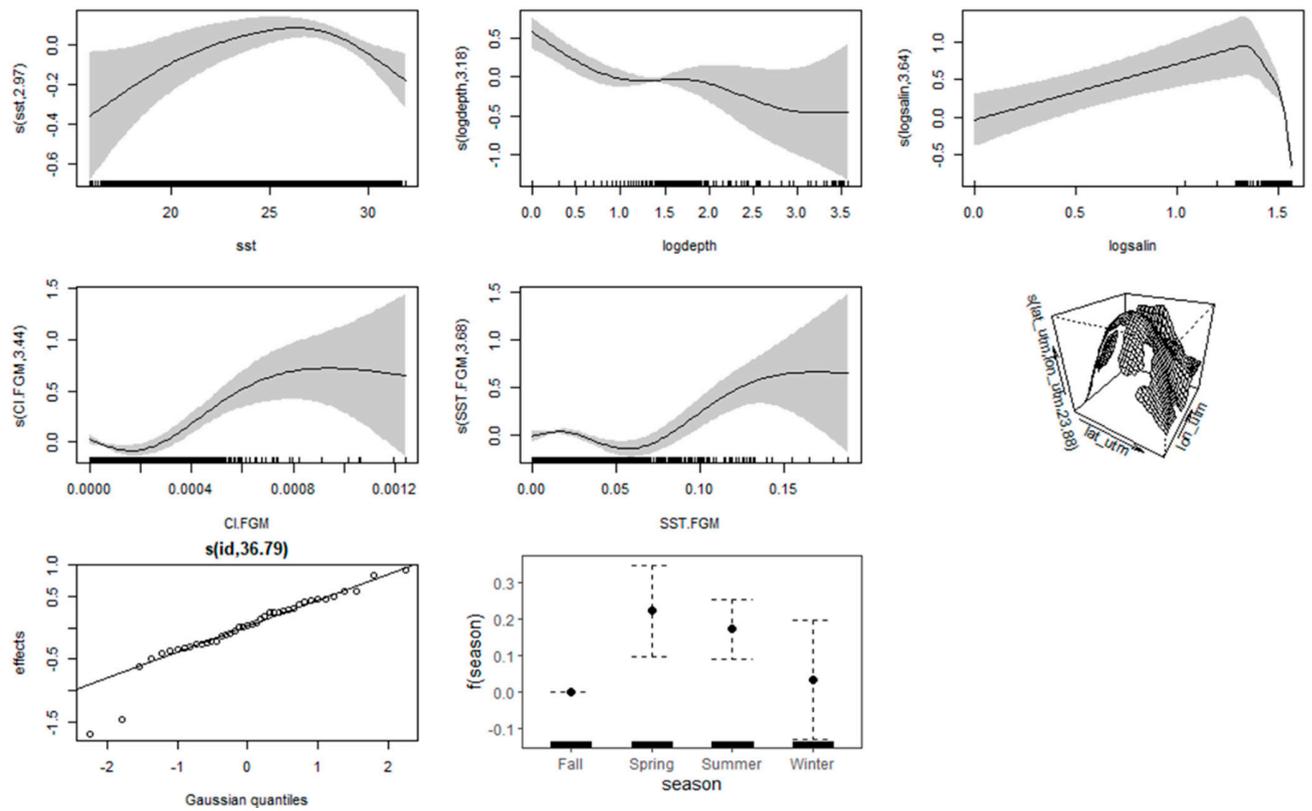


Figure S4. Generalized additive model (GAM) plots of loggerhead turtle (*Caretta caretta*) time-at-surface (scaled between 0 and 1) in the Gulf of Mexico relative to environmental and factor variables. Shaded areas for environmental variable plots represent standard error.

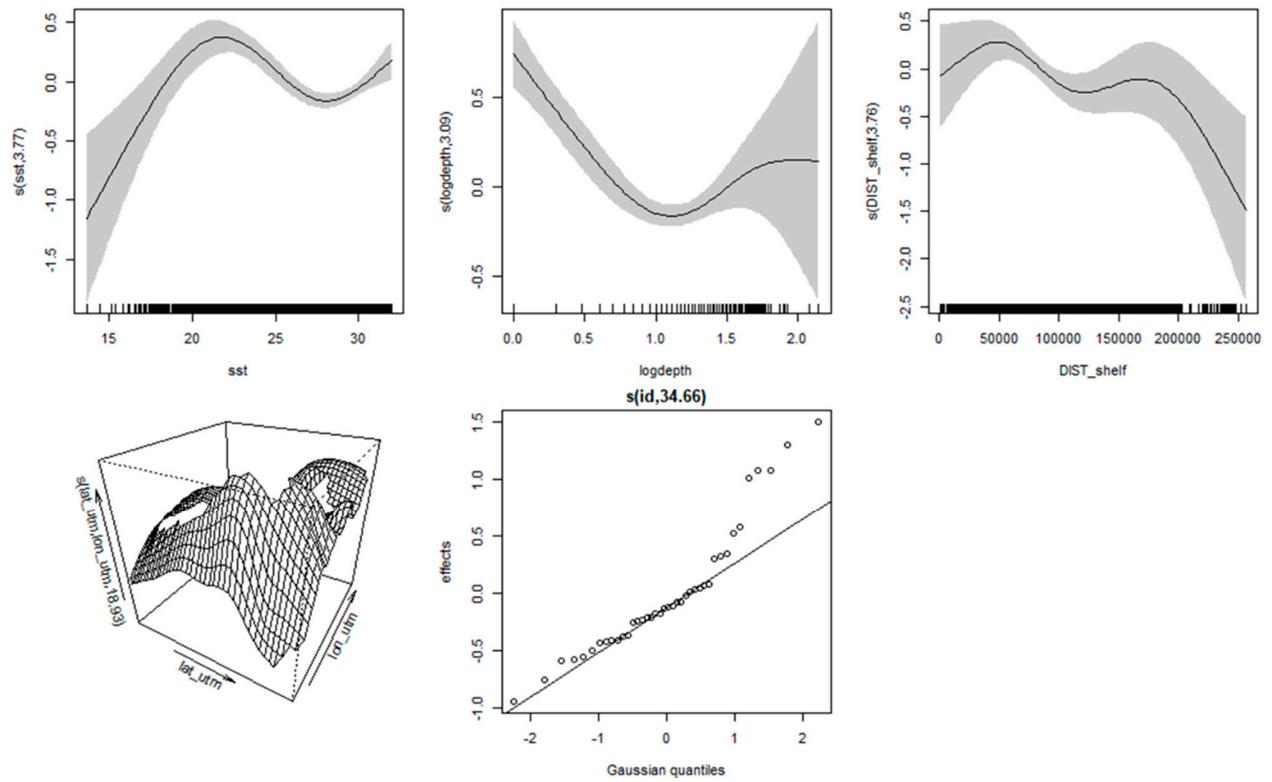


Figure S5. Generalized additive model (GAM) plots of Kemp's ridley turtle (*Lepidochelys kempii*) time-at-surface (scaled between 0 and 1) in the Gulf of Mexico relative to environmental and factor variables. Shaded areas for environmental variable plots represent standard error.

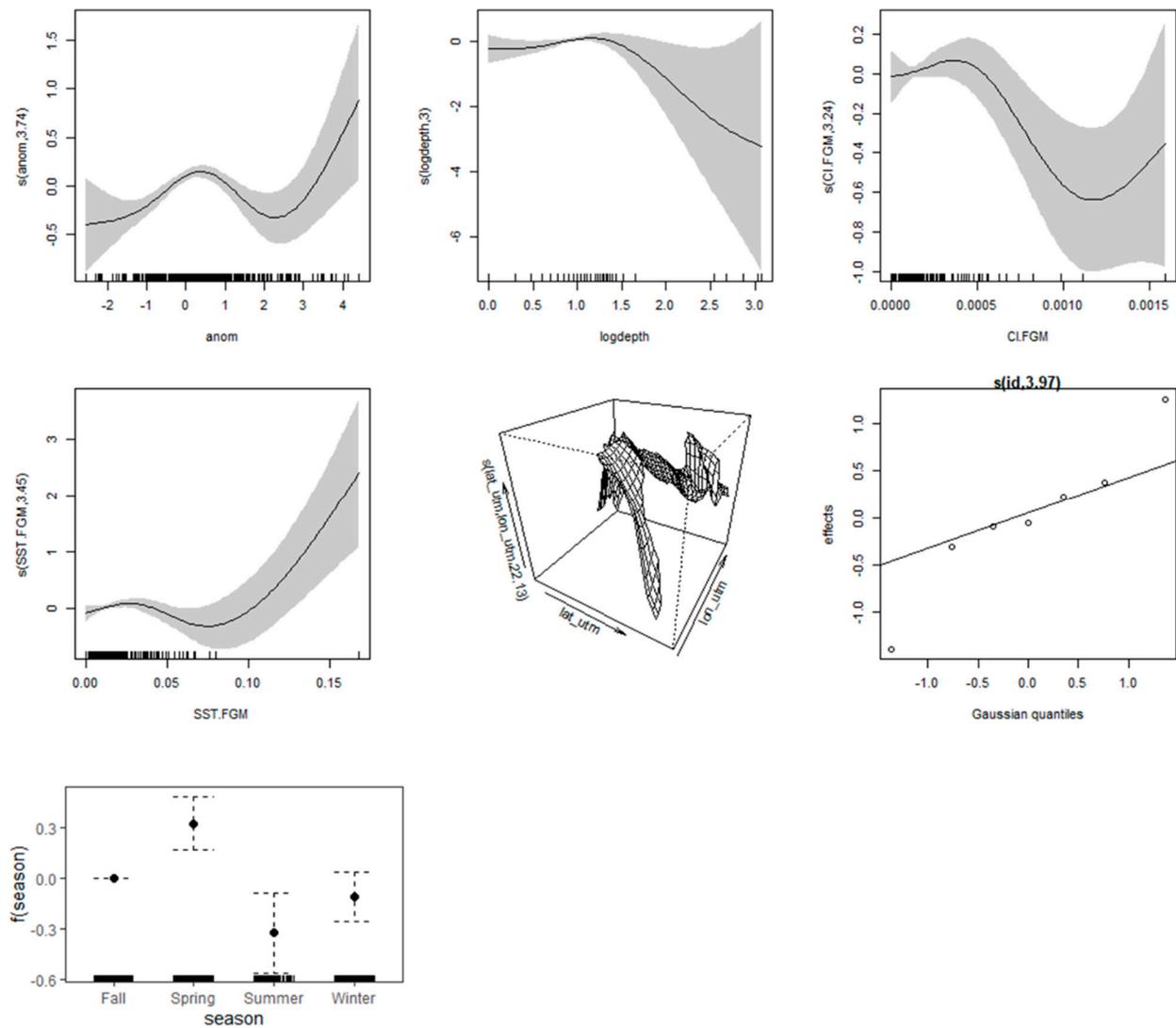


Figure S6. Generalized additive model (GAM) plots of green turtle (*Chelonia mydas*) time-at-surface (scaled between 0 and 1) in the Gulf of Mexico relative to environmental and factor variables. Shaded areas for environmental variable plots represent standard error.

GAM Summaries

Loggerhead turtles:

Family: Beta regression(6.69)

Link function: logit

Formula:

```
ptop2T ~ season + s(sst, k = 5) + s(logdepth, k = 5) + s(logsalin,
  k = 5) + s(CI.FGM, k = 5) + s(SST.FGM, k = 5) + s(lat_utm,
  lon_utm) + s(id, bs = "re")
```

Parametric coefficients:

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	-1.88475	0.08981	-20.985	< 2 × 10 ⁻¹⁶ ***
seasonSpring	0.22250	0.06392	3.481	0.0005 ***
seasonSummer	0.17210	0.04108	4.190	2.79 × 10 ⁻⁵ ***
seasonWinter	0.03343	0.08296	0.403	0.6870

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

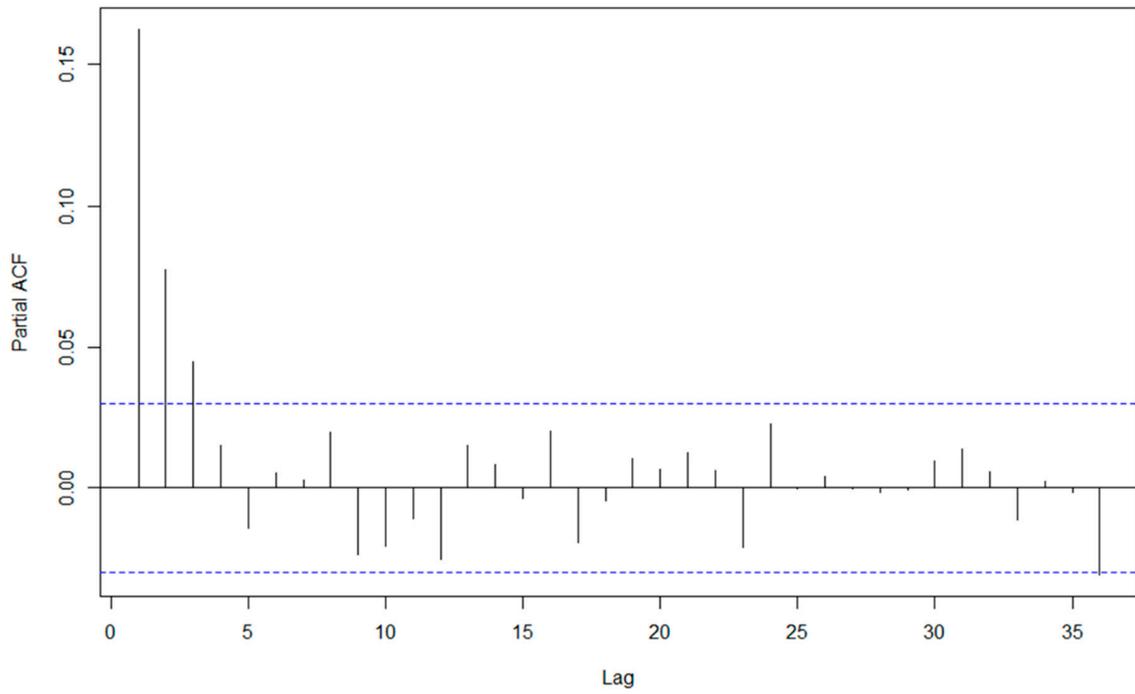
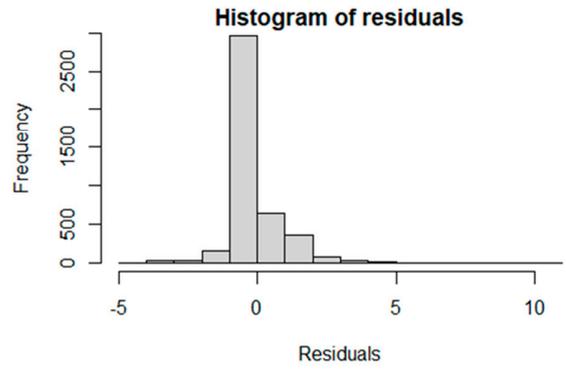
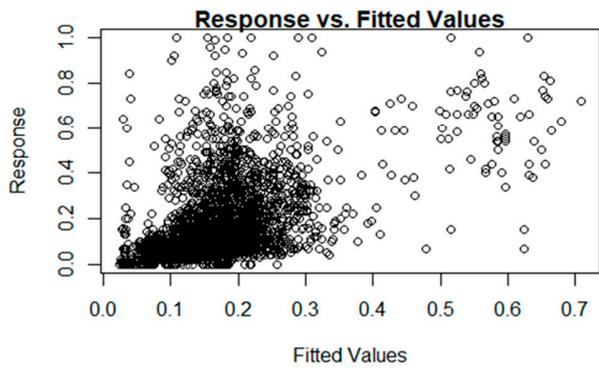
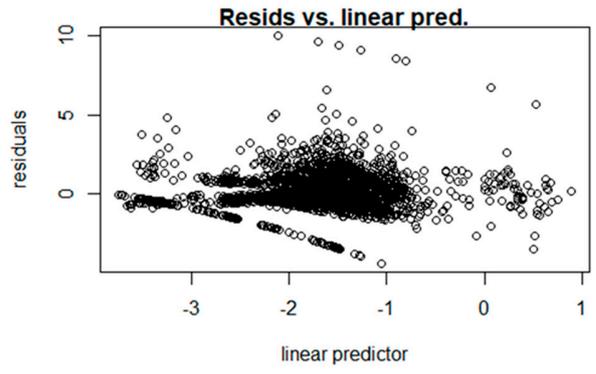
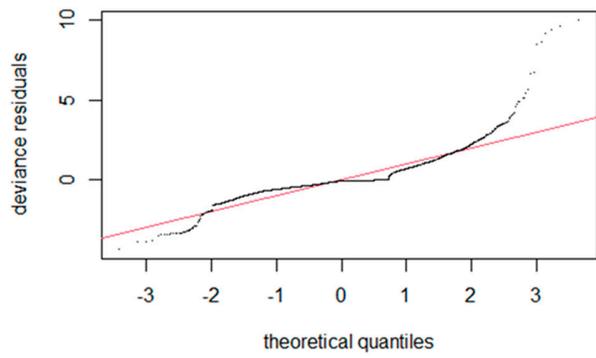
Approximate significance of smooth terms:

	edf	Ref.df	Chi.sq	p-value
s(sst)	2.967	3.485	17.00	0.00119 **
s(logdepth)	3.179	3.605	30.89	1.70 × 10 ⁻⁶ ***
s(logsalin)	3.641	3.901	65.75	< 2 × 10 ⁻¹⁶ ***
s(CI.FGM)	3.442	3.828	45.24	< 2 × 10 ⁻¹⁶ ***
s(SST.FGM)	3.679	3.940	37.75	7.44 × 10 ⁻⁷ ***
s(lat_utm,lon_utm)	23.881	27.141	256.79	< 2 × 10 ⁻¹⁶ ***
s(id)	36.793	40.000	548.61	< 2 × 10 ⁻¹⁶ ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.271 Deviance explained = 37.8%

-REML = -4433.9 Scale est. = 1 n = 4279



Kemp's ridley turtles:

Family: Beta regression(3.365)

Link function: logit

Formula:

$\text{ptop2T} \sim \text{s}(\text{sst}, k = 5) + \text{s}(\text{logdepth}, k = 5) + \text{s}(\text{DIST_shelf}, k = 5) + \text{s}(\text{lat_utm}, \text{lon_utm}) + \text{s}(\text{id}, \text{bs} = \text{"re"})$

Parametric coefficients:

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	-1.1572	0.1008	-11.48	$< 2 \times 10^{-16}$ ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

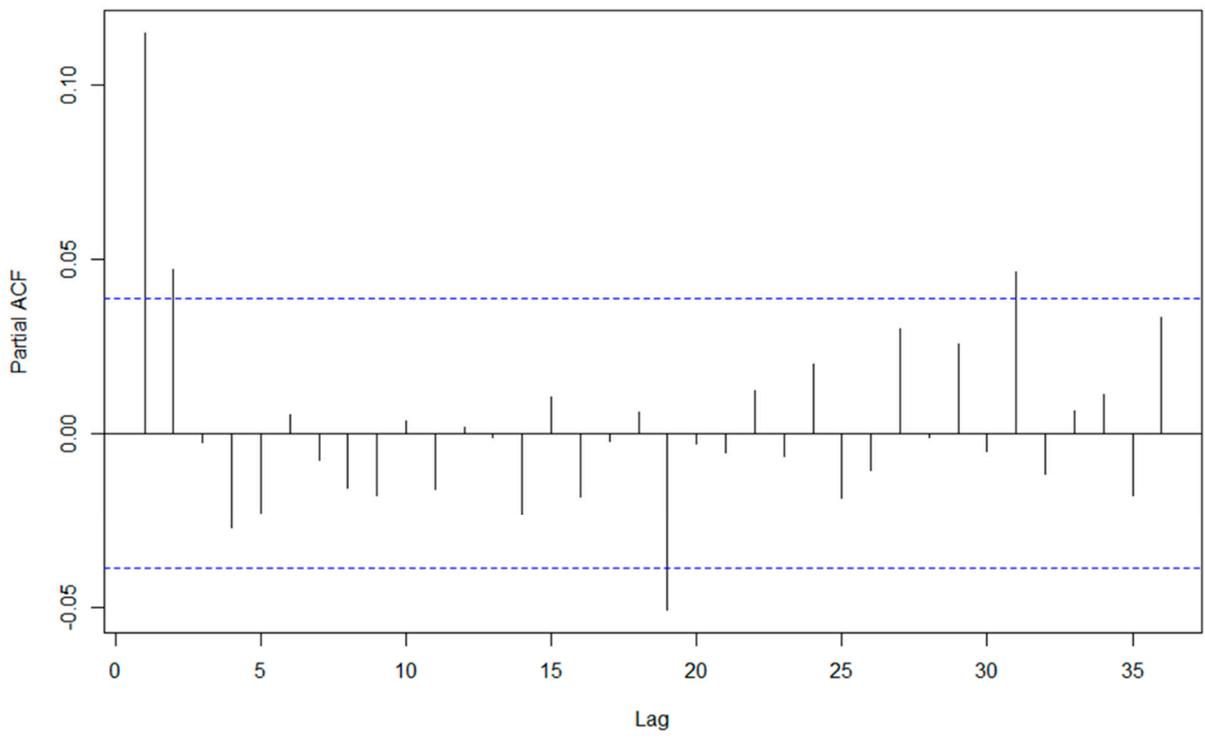
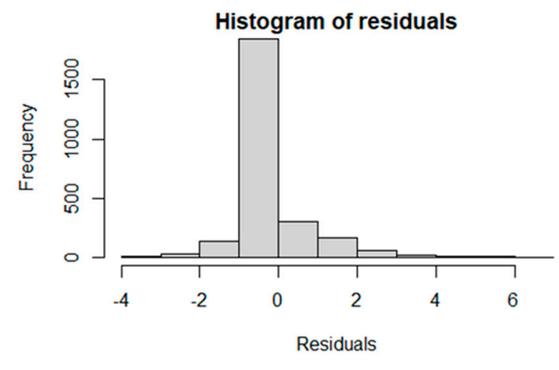
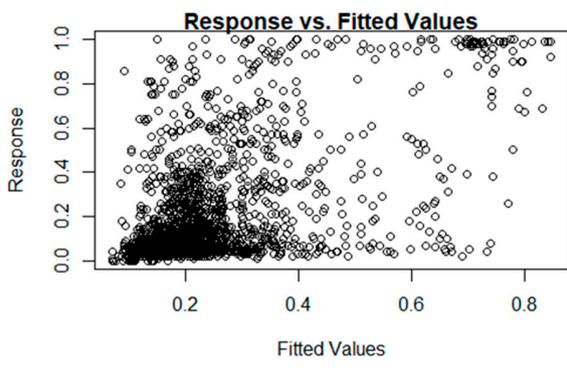
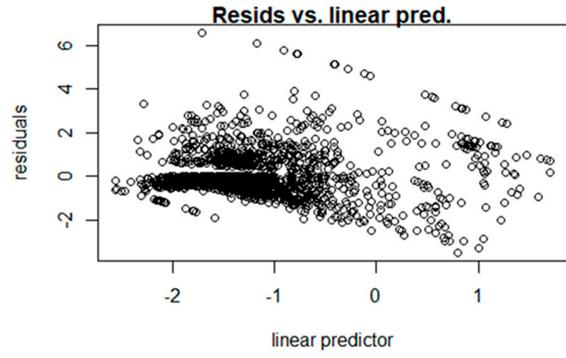
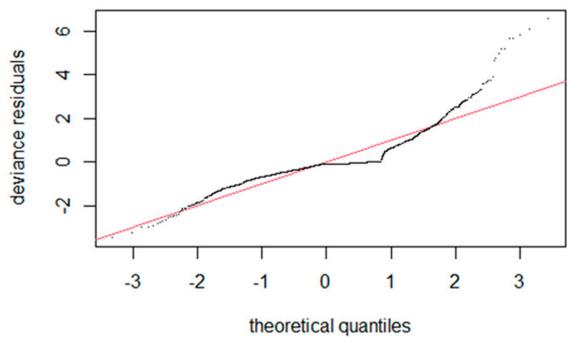
Approximate significance of smooth terms:

	edf	Ref.df	Chi.sq	p-value
s(sst)	3.769	3.963	52.14	$< 2 \times 10^{-16}$ ***
s(logdepth)	3.094	3.514	76.76	$< 2 \times 10^{-16}$ ***
s(DIST_shelf)	3.759	3.924	19.54	0.000373 ***
s(lat_utm,lon_utm)	18.934	22.938	71.61	5.62×10^{-8} ***
s(id)	34.665	39.000	516.05	$< 2 \times 10^{-16}$ ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.318 Deviance explained = 39.4%

-REML = -1706.9 Scale est. = 1 n = 2562



Green turtles:

Family: Beta regression(8.53)

Link function: logit

Formula:

ptop2T ~ season + s(anom, k = 5) + s(logdepth, k = 5) + s(CI.FGM,
k = 5) + s(SST.FGM, k = 5) + s(lat_utm, lon_utm) + s(id,
bs = "re")

Parametric coefficients:

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	-0.934669	0.459167	-2.036	0.041793 *
seasonSpring	0.309743	0.085656	3.616	0.000299 ***
seasonSummer	-0.346015	0.123136	-2.810	0.004954 **
seasonWinter	-0.008118	0.074733	-0.109	0.913495

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

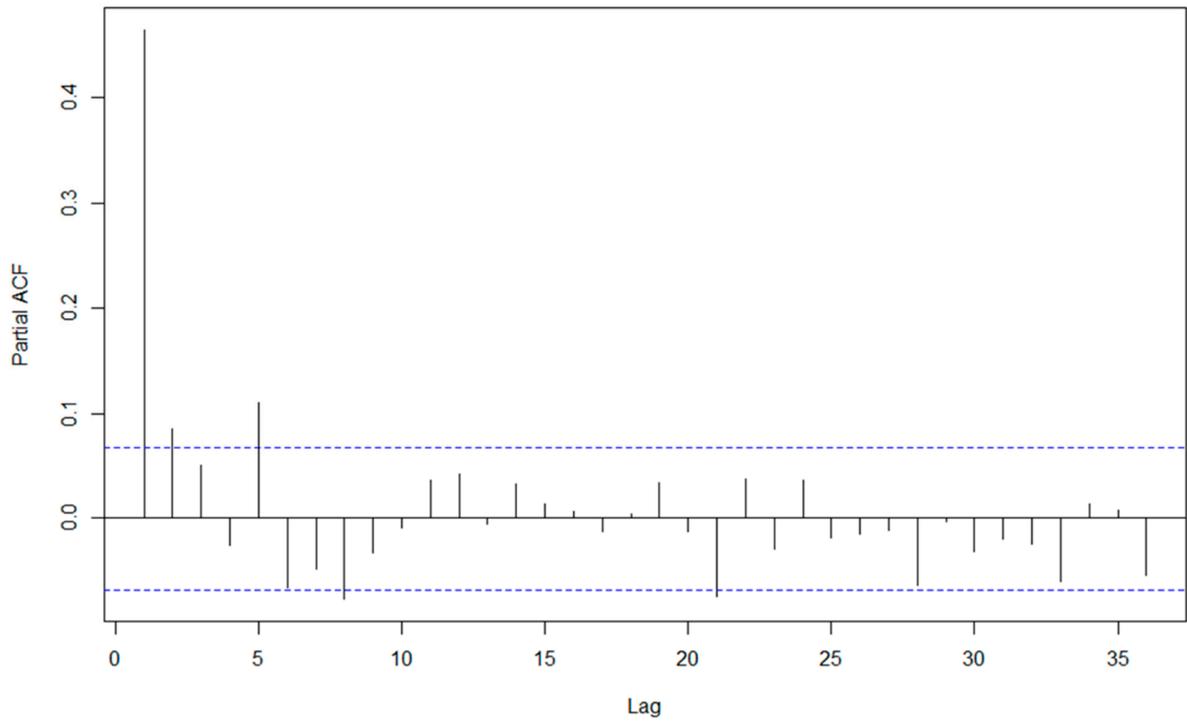
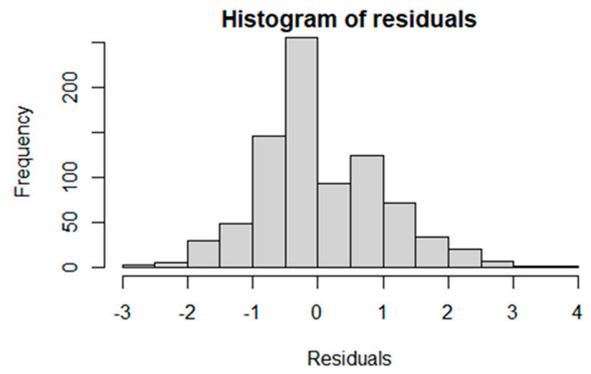
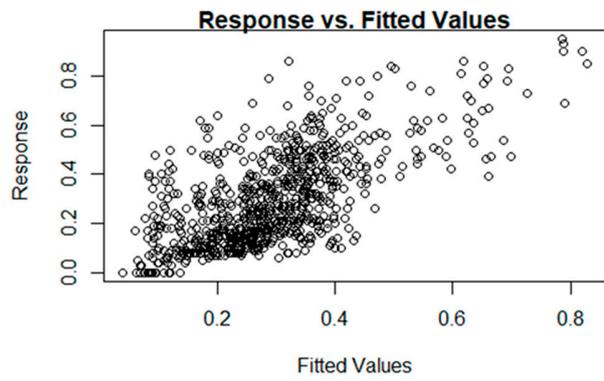
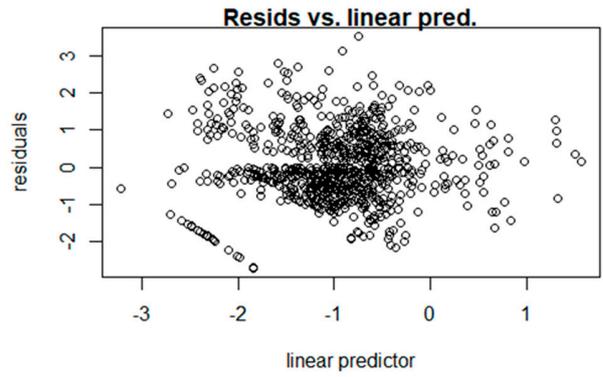
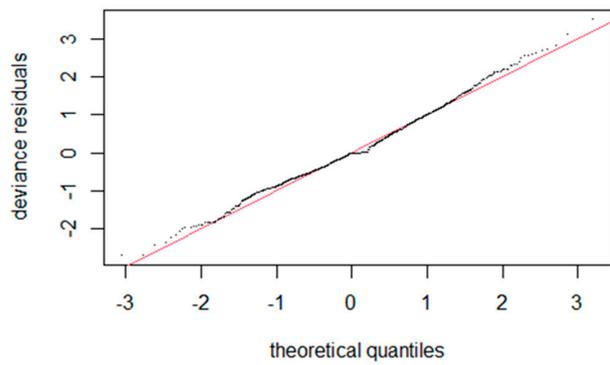
Approximate significance of smooth terms:

	edf	Ref.df	Chi.sq	p-value
s(anom)	3.740	3.959	27.328	1×10^{-5} ***
s(logdepth)	2.999	3.273	7.422	0.081634 .
s(CI.FGM)	3.237	3.711	11.494	0.014141 *
s(SST.FGM)	3.449	3.820	17.857	0.000656 ***
s(lat_utm,lon_utm)	22.130	25.931	138.767	$< 2 \times 10^{-16}$ ***
s(id)	3.970	6.000	255.442	$< 2 \times 10^{-16}$ ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.423 Deviance explained = 54.7%

-REML = -493.23 Scale est. = 1 n = 836



SPLASH Tag Specifications

Data Product: TAD Histogram

Depth accuracy	1% of reading +/- 1m ¹
Depth resolution	0.5m ¹
Depth units	mH ₂ O
Bins	2-14 or 12
Bin limits	0 to 1700m ¹
Type	Percent of summary period (frequency)
Frequency resolution	1%

1. Standard range

all depth logging tags utilized in this analysis are standard range (as opposed to extended range);
source: Wildlife Computers