Supplement 6 DSM Overview and Evaluation for the Eastern Bering Sea Beluga Case Study

Table S6.1. Key aspects of all 2017 Eastern Bering Sea beluga density surface models constructed and evaluated. Blue highlighting indicates models included in the ensemble.

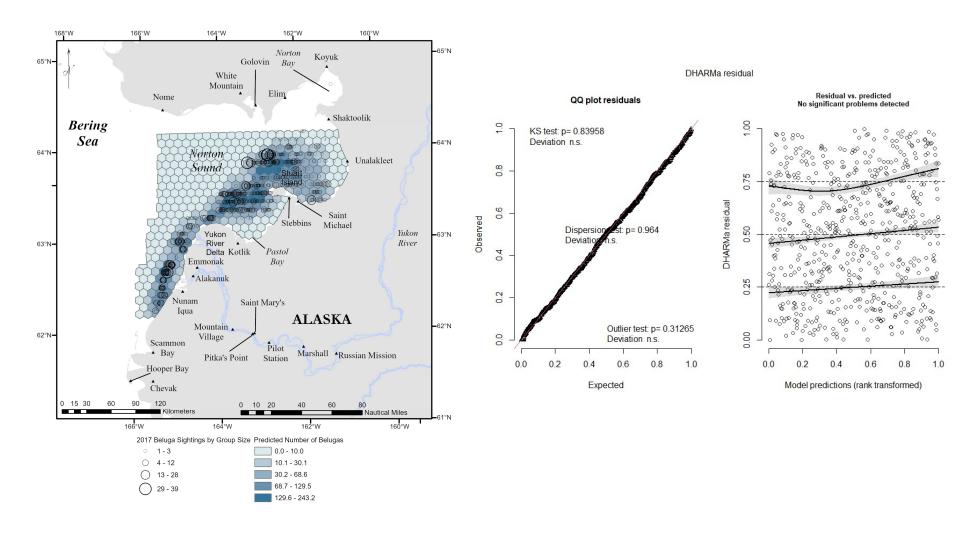
_	T				1			1	1		
		Number of	Number of Transect	Number of Prediction	Number of	max.edge Inside		Inner			number unsampled cells with extreme predicted
Year	Spatial Formulation	Observations	Segments	Cells	Nodes	(Outside)	Cutoff	Boundary	Outer Boundary	Smoothing Spline Variables	abundance
								non-convex			
								hull around all	offset from the inner		
								segment	boundary by a distance		
								midpoints,	equal to 1/3 the		
								plus a buffer	latitudinal range of the		
2017	SPDE Matérn	598	604	342	595	25 (50)	0.2*max.edge	of 25 km	study area	NA	0
								non-convex	offset from the inner		
								hull around all	boundary by a distance		
2017	CDDE M. /	500	604	242	574	25 (50)	0.0%	segment	equal to 35% of the	NIA.	
2017	SPDE Matérn	598	604	342	564	25 (50)	0.2*max.edge	midpoints	inner boundary diameter	NA	0
								non-convex	offset from the inner		
								hull around all	boundary by a distance		
								segment	equal to 20% of the		
2017	SPDE Matérn	598	604	342	528	25 (50)	0.2*max.edge	midpoints	inner boundary diameter	NA	0
2017	SI DE Materii	370	004	342	320	23 (30)	0.2 max.euge	mapoms	miler boundary diameter	101	V
								non-convex	offset from the inner		
								hull around all	boundary by a distance		
								segment	equal to 35% of the		
2017	SPDE Matérn	598	604	342	289	50 (100)	0.2*max.edge	midpoints	inner boundary diameter	NA	0
						00 (100)	· · · · · · · · · · · · · · · · · · ·				· ·
								non-convex	offset from the inner		
								hull around all	boundary by a distance		
								segment	equal to 35% of the		
2017	SPDE Matérn	598	604	342	160	75 (150)	0.2*max.edge	midpoints	inner boundary diameter	NA	0
								non-convex	offset from the inner		
								hull around all	boundary by a distance		
								segment	equal to 35% of the		
2017	SPDE Matérn	598	604	342	199	60 (120)	0.2*max.edge	midpoints	inner boundary diameter	NA	0
								coastline and			
								study area			
2017	SPDE Matérn with barriers	598	604	342	660	25 (50)	0.2*max.edge	boundaries	NA	NA	0
		1						coastline and	1		
		l					l	study area	1		
2017	SPDE Matérn with barriers	598	604	342	292	50 (100)	0.2*max.edge	boundaries	NA	NA	0
		1						coastline and	1		
2017	CDDE Markey with how	500	604	242	175	75 (150)	0.2*	study area	NIA	NIA	
2017	SPDE Matérn with barriers	598	604	342	175	75 (150)	0.2*max.edge	boundaries	NA	NA	0
		1						coastline and	1		
2017	SPDE Matérn with barriers	598	604	342	21.4	(0 (120°	0.2*	study area boundaries	NIA	NA	
2017	Soap film smoother	598 598	604	342	214 NA	60 (120) NA	0.2*max.edge NA	NA	NA NA	s(easting, northing, bs="so", k=150)	0
2017	Tensor product smoother	598	604	342	NA NA	NA NA	NA NA	NA NA	NA NA	te(easting, northing, bs="ts", k=14)	0
	Bivariate isotropic tprs	598	604	342	NA NA	NA NA	NA NA	NA NA	NA NA	s(easting, northing, bs="ts", k=200)	0
2017	Divariate isotropic tprs	370	004	342	INA	INA	INA	INA	INA	steasung, northing, bs- ts , k=200)	U

Table S6.2. Key aspects of all 2022 Eastern Bering Sea beluga density surface models constructed and evaluated. Blue highlighting indicates models included in the ensemble.

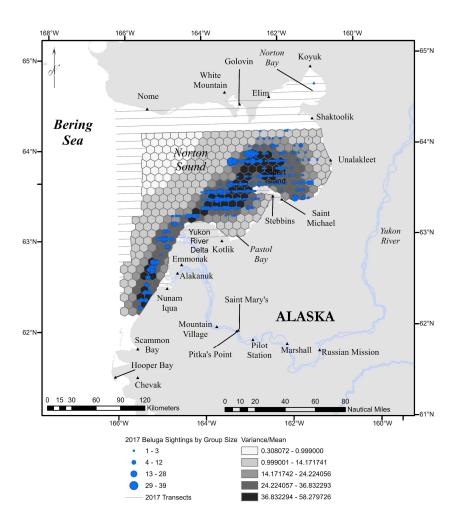
										0 0	
Year	Spatial Formulation	Number of Observations	Number of Transect Segments	Number of Prediction Cells	Number of Nodes	max.edge Inside (Outside)	Cutoff	Inner Boundary	Outer Boundary	Smoothing Spline Variables	number unsampled cells with extreme predicted abundance
			- cge		110000	(o anotae)		non-convex	offset from the inner		
								hull around all	boundary by a distance		
								segment	equal to 35% of the		
2022	SPDE Matérn	241	317	554	831	25 (50)	0.2*max.edge		inner boundary diameter	NA	0
								non-convex	offset from the inner		
								hull around all	boundary by a distance		
								segment	equal to 35% of the		
2022	SPDE Matérn	241	317	554	257	75 (150)	0.2*max.edge	midpoints	inner boundary diameter	NA	0
								non-convex	offset from the inner		
								hull around all	boundary by a distance		
								segment	equal to 35% of the		
2022	SPDE Matérn	241	317	554	351	50 (100)	0.2*max.edge	midpoints	inner boundary diameter	NA	0
								non-convex	offset from the inner		
								hull around all	boundary by a distance		
								segment	equal to 35% of the		
2022	SPDE Matérn	241	317	554	308	60 (120)	0.2*max.edge	midpoints	inner boundary diameter	NA	0
1			1	l			1	non-convex	offset from the inner		
1		l	l	l			1	hull around all	boundary by a distance		
								segment	equal to 35% of the		
2022	SPDE Matérn	241	317	554	326	55 (110)	0.2*max.edge	midpoints	inner boundary diameter	NΛ	0
								non-convex			
								hull around all	offset from the inner		
								segment	boundary by a distance		
								midpoints;	equal to 35% of the		
2022	SPDE Matérn	241	317	550	308	60 (120)	0.2*max.edge	omit Scammon	inner boundary diameter	NA	0
								coastline and			
								study area			
								boundaries;			
2022	SPDE Matérn with barriers	241	317	550	953	25 (50)	0.2*max.edge	omit Scammon	NA	NA	0
								coastline and			
								study area			
								boundaries;			
2022	SPDE Matérn with barriers	241	317	550	350	55 (110)	0.2*max.edge		NA	NΛ	0
								coastline and			
								study area			
								boundaries;			
2022	SPDE Matérn with barriers	241	317	550	316	60 (120)	0.2*max.edge	omit Scammon	NA	NA	0
								coastline and			
								study area			
								boundaries;			
2022	SPDE Matérn with barriers	241	317	550	258	75 (150)	0.2*max.edge	omit Scammon	NA	NΛ	0
1			1	l			1	coastline and	1		
1		l	l	l			1	study area	i		
1			1	l			1	boundaries;	1		
2022	SPDE Matérn with barriers	241	317	550	782	30 (60)	0.2*max.edge	omit Scammon	NA	NA	1
								coastline and			
1		l	l	l			1	study area	i		
l			1	l			1	boundaries;	1		
2022	SPDE Matérn with barriers	241	317	550	616	40 (80)	0.2*max.edge	omit Scammon	NA	NA	1
								coastline and			
1			1	l			1	study area	1		
1		l	l	l			1	boundaries;	i		
2022	SPDE Matérn with barriers	241	317	550	702	35 (70)	0.2*max.edge	omit Scammon	NA	NA	1
								coastline and			
l		l						study area			
1			1	l			1	boundaries;	1		
2022	SPDE Matérn with barriers	241	317	550	387	50 (100)	0.2*max.edge	omit Scammon	NA	NA	0
2022	Soap film smoother	241	317	554	NA	NA	NA	NA	NA	s(easting, northing, bs="so", k=222)	0
2022	Tensor product smoother	241	317	554	NA	NA	NA	NA	NA	te(easting, northing, bs="ts", k=18)	0
2022	Bivariate isotropic tprs	241	317	554	NA	NA	NA	NA	NA	s(easting, northing, bs="ts", k=309)	0

2017 candidate models in ensemble

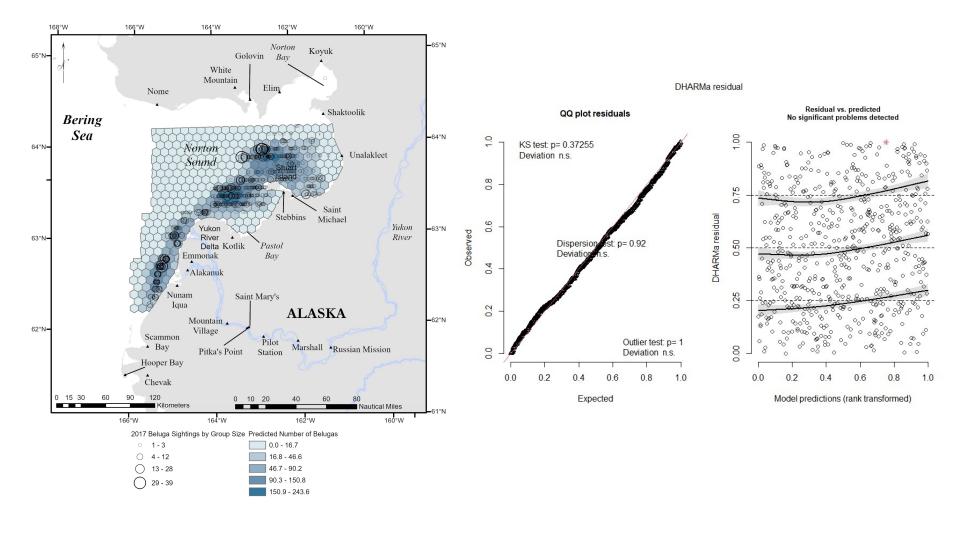
2017 TMB SPDE mesh6 (max.edge = 60 km)



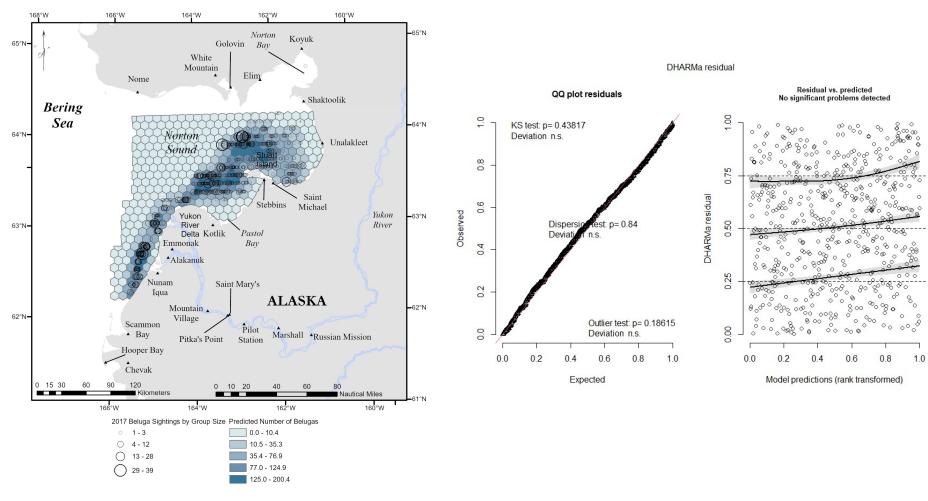
2017 TMB SPDE mesh6 Variance/Mean



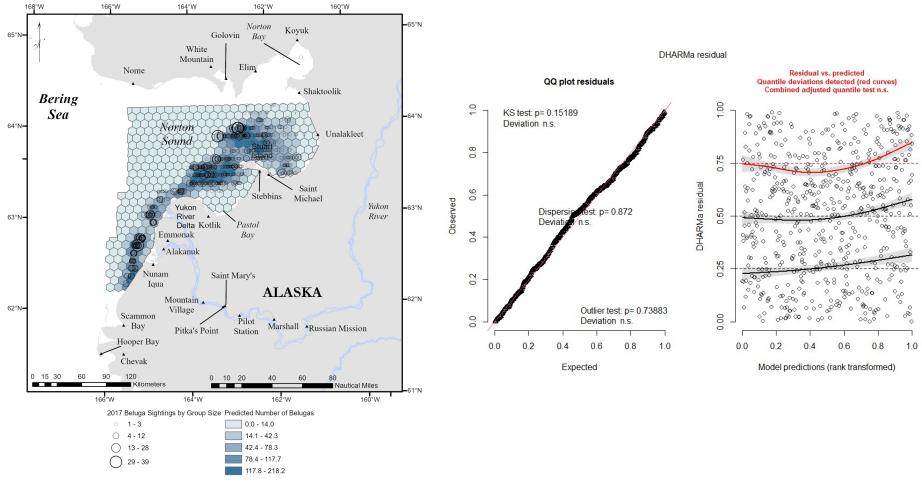
2017 TMB soap(easting,northing)



2017 TMB te(easting, northing)

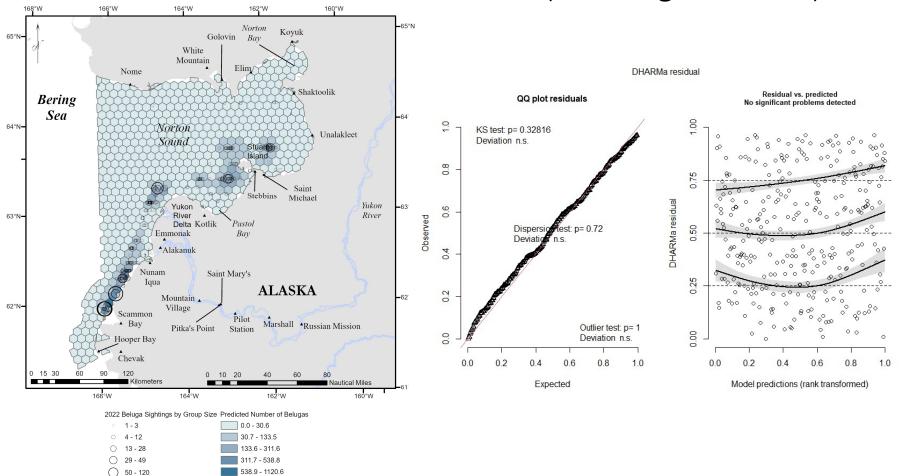


2017 TMB s(easting,northing,bs="ts")

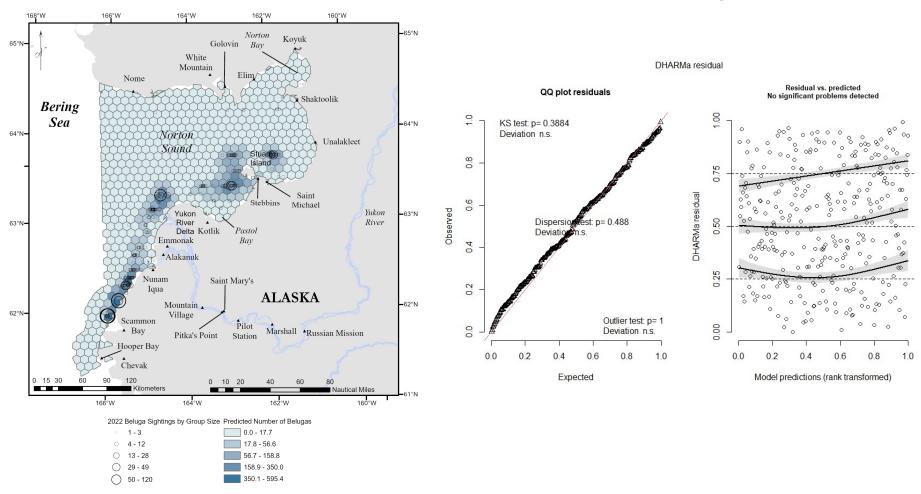


2022 candidate models in ensemble

2022 TMB SPDE no Scammon mesh5 (max.edge = 60 km)



2022 TMB SPDE w/barriers no Scammon mesh2 (max.edge = 60 km)



2022 TMB soap(easting,northing)

