

Table S1. Summary of large vessel survey effort used in this analysis. Surveys included both large scale line-transect abundance surveys (Survey Type = Abundance) and studies that included focused tracklines inside the Rice’s whale core habitat (Survey Type = Directed; Figure 1). Confirmed groups include sightings where rostral ridges could be observed to confirm species identification. Unconfirmed groups include cases where a definitive identification could not be made due to distance or weather conditions. GU = NOAA Ship *Gordon Gunter*, PC = NOAA Ship *Pisces*

Survey Code	Year	Season	Survey Type	Effort Outside of Core Habitat (km)	Effort Inside of Core Habitat (km)	Confirmed Rice’s Whale Groups Observed	Unconfirmed Rice’s Whale Groups Observed	Number of Whales Observed
GU0302	2003	Summer	Abundance	6511	576	0	0	0
GU0402	2004	Spring	Abundance	6340	691	4	1	8
GU0704	2007	Summer	Abundance	3876	1170	3	0	12
GU0903	2009	Summer	Abundance	4359	306	3	1	9
GU1003	2010	Summer	Directed	3375	1053	2	0	2
GU1005	2010	Fall	Directed	884	2499	4	0	9
GU1202	2012	Summer	Directed	5510	836	2	0	5
GU1505	2015	Summer	Directed	2827	4348	20	1	36
GU1703	2017	Summer	Abundance	7543	885	3	0	9
GU1801	2018	Winter	Abundance	6049	862	2	0	9
GU1802	2018	Summer	Directed	0	1481	16	10	73
GU1806	2018	Fall	Directed	0	1919	11	7	23
PC1805	2018	Summer	Abundance	7923	736	1	2	3
GU1901	2019	Summer	Directed	141	5528	53	6	173

Table S2. Physiographic and dynamic oceanographic variables considered as possible explanatory variables in the Density Surface Model.

Variable	Units	Source	Spatial Resolution	Temporal Resolution
Distance to Shoreline	km	Derived from Global Self-consistent Hierarchical High-resolution Geography Database (Wessel and Smith 1996)	NA	NA
Distance to Shelf Break	km	Derived from Global Seafloor Geomorphic Features (GSFM, Harris et al. 2014)	NA	NA
Distance to Canyons	km	Derived from Global Seafloor Geomorphic Features (GSFM, Harris et al. 2014)	NA	NA
Bottom Depth	m	Shuttle Radar Topography Mapping (SRTM30 plus, Becker et al 2020)	30 arc seconds	NA
Bathymetric Slope	degrees	Derived from SRTM30 plus (Becker et al 2020)	1.2 x 1.1 km	NA
log10 Chlorophyll-a Concentration	mg/m ³	MODIS-Aqua, NASA Ocean color Level 3 products (NASA Goddard Space Flight Center 2022)	4 km	8 days
Sea Surface Temperature	deg.C	GHRSSST Level 4 MUR Global Foundation Sea Surface Temperature Analysis (v4.1) (JPL MUR MEaSURES Project 2015)	0.01 degree	1 day
Sea Surface Salinity	psu	HYCOM Gulf of Mexico 1/25° experiments 20.1, 31.5, 32.5, 90.1m000 (Naval Research Laboratory 2022)	0.04 degree	1 day
Bottom Temperature	deg.C	HYCOM Gulf of Mexico 1/25° experiments 20.1, 31.5, 32.5, 90.1m000 (Naval Research Laboratory 2022)	0.04 degree	1 day
Bottom Salinity	psu	HYCOM Gulf of Mexico 1/25° experiments 20.1, 31.5, 32.5, 90.1m000 (Naval Research Laboratory 2022)	0.04 degree	1 day
Sea Surface Height	cm	HYCOM Gulf of Mexico 1/25° experiments 20.1, 31.5, 32.5, 90.1m000 (Naval Research Laboratory 2022)	0.04 degree	1 day
Surface velocity - Meridional Component (v)	m/s	HYCOM Gulf of Mexico 1/25° experiments 20.1, 31.5, 32.5, 90.1m000 (Naval Research Laboratory 2022)	0.04 degree	1 day
Surface velocity - Zonal Component (u)	m/s	HYCOM Gulf of Mexico 1/25° experiments 20.1, 31.5, 32.5, 90.1m000 (Naval Research Laboratory 2022)	0.04 degree	1 day
Surface velocity - Magnitude	m/s	HYCOM Gulf of Mexico 1/25° experiments 20.1, 31.5, 32.5, 90.1m000 (Naval Research Laboratory 2022)	0.04 degree	1 day
Bottom velocity - Magnitude	m/s	HYCOM Gulf of Mexico 1/25° experiments 20.1, 31.5, 32.5, 90.1m000 (Naval Research Laboratory 2022)	0.04 degree	1 day