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Table 1: Geophysical and environmental variables used in the production of the habitat suitability models. The footnotes indicate any particular analysis or treatment of data. The validation statistics for selected variables were obtained by performing a linear regression (R^2 and slope) for CTD records from bottom values obtained from World Ocean Database using Ocean-station data and high-resolution CTD data collected between 2005 and 2013, all relationships were significant at $p < 0.001$. The training gain for a model constructed on an individual variable is shown and was used to select several variables for the final analysis (marked in bold).

Variable name	Units	Source	Native resolution	Validation statistics	Training gain for sediment model	Training gain for non-sediment model
Bathymetry variables						
Depth	m	NOAA (2013)	90 m	-	**1.305**	**1.362**
Aspect[1,2]	Degree	Jenness (2012)	90 m	-	0.269	0.220
Northness[1,3]	-		90 m	-	0.291	0.287
Eastness[1,4]	-		90 m	-	0.288	0.254
Slope[1,2]	Degrees	Jenness (2012)	90 m	-	0.264	0.223
Biological production variables						
MODIS[5]	mg m^{-3}	NASA Ocean Color	0.04°	R^2=0.225, slope=0.730, n=60	**1.146**	0.863
Particulate organic carbon[6]	gC_{org} m^{-2} yr^{-1}	Lutz et al. (2007)	0.08°	-	1.048	**0.932**
Carbonate chemistry variable						
Omega aragonite[7]	Ω_{ARAG}	Orr et al. (2005)	1°	-	**1.191**	**1.113**
Chemical variables						
Nitrate[7]	µmol l^{-1}	Garcia et al. (2006b)	1°	R^2=0.598, slope=0.938, n=43	0.951	0.796
Phosphate[7]	µmol l^{-1}	Garcia et al. (2006b)	1°	R^2=0.650, slope=0.976, n=44	1.007	**0.987**
Silicate[7]	µmol l^{-1}	Garcia et al. (2006b)	1°	R^2=0.704, slope=0.945, n=44	**1.020**	0.935
Geology						
Seabed substrate size8	φ	Reid et al. (2005)	XYZ	-	**0.188**	N/A
Other variables						
Salinity[7]	pss	Boyer et al. (2005)	0.25°	R^2=0.593, slope=0.964, n=3377	0.612	0.611
Temperature[7]	°C	Boyer et al. (2005)	0.25°	R^2=0.287, slope=0.693, n=3363	**0.851**	**0.932**
Oxygen variable						
Dissolved oxygen[7]	ml l^{-1}	Garcia et al. (2006a)	1°	R^2=0.620, slope=0.940, n=420	**1.173**	**1.042**
Physical oceanography						
Current speed[7,9]	m s^{-1}	Carton et al. (2005)	0.5°	-	**0.573**	**0.482**
Terrain variables[1]						
Curvature – Profile[1,2,10]	-	Jenness (2012)	90 m	-	0.182	0.154
Curvature – Plan[1,2,11]	-	Jenness (2012)	90 m	-	0.139	0.150
Curvature – Tangential[1,2,12]	-	Jenness (2012)	90 m	-	0.132	0.136
Rugosity[1,13]	-	Jenness (2012)	90 m	-	0.269	0.243
Terrain Ruggedness Index[1,14]	-	Wilson et al. (2007)	90 m	-	0.251	0.223
Topographic Position Index[1,14]	-	Wilson et al. (2007)	90 m	-	0.066	0.057
Roughness[1,14]	-	Wilson et al. (2007)	90 m	-	**0.282**	**0.247**

[1] Variables were derived from volumes 1, 2 and 3 of the Coastal Relief Model bathymetry for the east coast of the USA. [2] Calculated using the 4 cell method in Jenness (2012). [3] Calculation from Wilson et al. (2007) using Cos(Aspect * π/180), to produce 1 = north and -1 = south orientation. [4] Calculation from Wilson et al. (2007) using Sin(Aspect * π/180, to produce 1 = east and -1 = west orientation. [5] Constructed from 2002-2008 annual averages from National Aeronautics and Space Administration (NASA) Ocean Color Data Gateway. [6] Resampled using nearest neighbour interpolation to a higher resolution to expand data into adjacent areas. [7] Variable creation process followed the Davies and Guinotte (2011) upscaling approach. [8] Constructed from 26,600 points of grain size data (φ) collated from the Atlantic coast usSeabed database (Reid et al 2005), Data were converted from point into raster and a focal mean was calculated to extrapolate data into a larger spatial area for predictive modelling, note, this layer is based on sparsely

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distributed points, especially further offshore and is unlikely to capture fine scale heterogeneity in grain size. [9] Data extracted from version 2.0.4 of the Simple Ocean Data Assimilation model, monthly means for the years 1990-2007. [10] Defined in in Jenness (2012)as “Profile curvatures are set to positive when the curvature is concave (i.e. when water would decelerate as it flows over this point). Negative values indicate convex curvature where stream flow would accelerate.” Zero indicates an undefined value. [11] Defined in Jenness (2012) as “Plan curvatures are set to positive when the curvature is convex (i.e. when water would diverge as it flows over this point). Negative values indicate concave curvature where stream flow would converge.” Zero indicates an undefined value. [12] Defined in Jenness (2012) as “Tangential curvatures are set to positive when the curvature is convex (i.e. when water would diverge as it flows over this point). Negative values indicate concave curvature where stream flow would converge.” Zero indicates an undefined value. [13] Calculated in Jenness (2012), flat areas exhibit values of 1, with high relief areas have higher values but very rarely exceed 3. [14] Calculated using GDAL DEM Tool. Values at zero indicate flat areas, higher values indicate rough and variable terrain.