**Table 1.** Spatial predictors prepared for habitat suitability modeling. BTM: Benthic Terrain Modeler ArcGIS extension (v3.0). All calculations were performed using a moving window 3 cells 3 cells unless otherwise specified. Grayed-out predictors were not included in models due to collinearity issues.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Predictor** | **Units** | | **Description** | **Calculation Tool Used** |
| **Habitat** | Benthic Habitat | Categorical (12) | | Bottom habitat type | Not applicable |
| Distance to Mangrove | Meters | | Geographic distance to the nearest  mangrove habitat cell | *distance* function from the *terra* R package |
| **Bathymetry & Seafloor Morphology** | Depth | Meters | | Water depth in each cell | None |
| Slope | Degrees | | Maximum rate of change of depth | *Slope* tool in arcpy.sa\* |
| Curvature | th of a meter, upwardly convex (+) or concave (-) | | Second derivative of the  bathymetric surface | *Curvature* tool in arcpy.sa |
| Planform Curvature | th of a meter, upwardly convex (+) or concave (-) | | Curvature perpendicular to the  direction of maximum slope | *Curvature* tool in arcpy.sa |
| Profile Curvature | th of a meter, upwardly convex (-) or concave (+) | | Curvature parallel to the  direction of maximum slope | *Curvature* tool in arcpy.sa |
| Arc-chord Ratio (ACR) Rugosity | Ratio | | Ratio between the 3D surface area and the planar area of the terrain, corrected for slope | *Surface area to planar area  (slope-corrected)* tool in BTM |
| Vector Ruggedness  Measure (VRM) | No variation (0) to maximum variation (1) | | Variation in 3D orientation of cells  within a neighbourhood | *Terrain ruggedness (VRM)* tool in BTM |
| Broad-scale Bathymetric Position Index (BPI) | Ridge (+), flat (0),  or valley (-) | | Cell depth relative to a neighbourhood: concentric rings of 125 m and 1250 m | *Broad-scale BPI* tool in BTM (standardized) |
| Fine-scale BPI | Ridge (+), flat (0),  or valley (-) | | Cell depth relative to a neighborhood: concentric rings of 5 m and 125 m | *Fine-scale BPI* tool in BTM (standardized) |
| **Water Conditions** | Summer Temperature | °C | Mean summer (June – August)  water temperature | | *krige* function from the *gstat* R package |
| Summer Salinity | Practical Salinity Units | Mean summer (June – August)  water salinity | | *krige* function from the *gstat* R package |
| Summer Dissolved Oxygen | mg/L | Mean summer (June – August)  dissolved oxygen | | *krige* function from the *gstat* R package |
| Winter Temperature | °C | Mean winter (December – February)  water temperature | | *krige* function from the *gstat* R package R |
| Winter Salinity | Practical Salinity Units | Mean winter (December – February)  water salinity | | *krige* function from the *gstat* R package |
| Winter Dissolved Oxygen | mg/L | Mean winter (December – February)  dissolved oxygen | | *krige* function from the *gstat* R package R |

\* The Spatial Analyst python module, with functionality provided by the ArcGIS Spatial Analyst extension.

**Table 2.** …

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Size (cm TL)** | **Presence Sites** | **Absence Sites** | **Total** | **Prevalence** |
| **Full Data - PA** | |  |  |  |  |
| *Scarus coelestinus* | 24.43 – 42.5 | 186 | 3293 | 3479 | 5.35% |
| *Scarus coeruleus* | 23.59 – 35.3 | 271 | 3208 | 3479 | 7.79% |
| *Scarus guacamaia* | 27.31 – 42.7 | 326 | 3153 | 3479 | 9.37% |
| *Lutjanus griseus* | 11.9 – 25.33 | 1046 | 2433 | 3479 | 30.07% |
| *Haemulon sciurus* | 9.51 – 32.1 | 1186 | 2293 | 3479 | 34.09% |

**Supplementary Table S1.** Variance inflation factor (VIF) scores and Pearson pairwise correlation coefficients were used to assess collinearity among the available spatial predictors of habitat suitability. Predictors were retained from modeling if the VIF score and fell below the standard thresholds of |0.7| and 5, respectively. For variable descriptions, see Table 1 in the main text. For correlation matrices, see Supplementary Figures 1 and 2.

|  |  |  |
| --- | --- | --- |
| **Spatial Predictor** | **VIF (Full Predictor Set)** | **VIF (Retained Predictor Set)** |
| Benthic Habitat | 1.13 | 1.12 |
| Distance to Mangrove | 1.47 | 1.44 |
| Depth | 1.92 | 1.87 |
| Slope | 1.88 | 1.53 |
| Curvature |  | 1.03 |
| Planform Curvature |  | / |
| Profile Curvature |  | / |
| Arc-chord Ratio Rugosity | 1.97 | 1.38 |
| Terrain Ruggedness | 2.33 | / |
| Broad-scale Bathymetric Position Index | 1.29 | 1.22 |
| Fine-scale Bathymetric Position Index | 1.20 | 1.12 |
| Summer Temperature | 1.74 | 1.52 |
| Summer Salinity | 3.09 | / |
| Summer Dissolved Oxygen | 2.17 | 2.27 |
| Winter Temperature | 2.07 | 1.72 |
| Winter Salinity | 3.05 | 2.35 |
| Winter Dissolved Oxygen | 1.71 | 1.74 |

Pearson pairwise correlation coefficients > |0.5|

|  |  |
| --- | --- |
| **Spatial Predictor Pair** | **Pearson Pairwise Correlation Coefficient (*r*)** |
| Curvature & Profile Curvature | -0.91 |
| Curvature & Plan Curvature | 0.83 |
| ACR Rugosity & Terrain Ruggedness | 0.71 |
| Winter Salinity & Summer Salinity | 0.69 |
| Winter Salinity & Summer Dissolved Oxygen | 0.63 |
| Summer Salinity & Winter Temperature | 0.58 |
| Summer Salinity & Summer Dissolved Oxygen | 0.52 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Species &  Life Stage** | **Size (cm TL)** | **Home Range Size (m)** | **MVS Presence  Sites** | **MVS Absence Sites** | **RVC Presence Sites** | **RVC Absence Sites** |
| *Scarus coelestinus* |  |  |  |  |  |  |
| Juvenile | < 24.43 |  |  |  |  |  |
| Sub-adult | 24.43 – 42.5 |  | 2 | 734 |  |  |
| Adult | > 42.5 |  |  |  |  |  |
| *Scarus coeruleus* |  |  |  |  |  |  |
| Juvenile | < 23.59 |  |  |  |  |  |
| Sub-adult | 23.59 – 35.3 |  | 0 | 736 | 271 | 2472 |
| Adult | > 35.3 |  |  |  |  |  |
| *Scarus guacamaia* |  |  |  |  |  |  |
| Juvenile | < 27.31 |  |  |  |  |  |
| Sub-adult | 27.31 – 42.7 |  |  |  |  |  |
| Adult | > 42.7 |  |  |  |  |  |
| *Haemulon sciurus* |  |  |  |  |  |  |
| Juvenile | < 11.9 |  |  |  |  |  |
| Sub-adult | 11.9 – 25.33 |  |  |  |  |  |
| Adult | > 25.33 |  |  |  |  |  |
| *Lutjanus griseus* |  |  |  |  |  |  |
| Juvenile | < 9.51 |  |  |  |  |  |
| Sub-adult | 9.51 – 32.1 |  |  |  |  |  |
| Adult | > 32.1 |  |  |  |  |  |