APPENDIX C: Calculation of the Additive Index.

The 13 component variables in the multi-metric indices were: (1) number of confluences; (2-4) mean, sum and standard deviation of confluence length; (5) number of drop-offs; (6) standard deviation of drop-off size; (7-8) absolute deviation of mean and maximum drop-off size; (9-10) absolute deviation of mean and standard deviation of depth; (11) distance to nearest channel network; (12-13) area of island and area of sandbar (Kennedy 2013). To construct the additive heterogeneity index, the 40 sites were ranked based on the value of each metric (average ranks were used for ties), then summed (Smith and Mather 2013). The higher the sum rank of this index, the more additive habitat heterogeneity was present. To minimize variation that results from the specific choice of metrics, 15 different heterogeneity indices were created by summing the ranks of different combinations of the metrics (Van Sickle 2010). The final heterogeneity index used was the average of these fifteen indices and values for the 40 sites were mapped to look at spatial patterns.

To create a second categorical measure of heterogeneity, we used a nonhierarchical K-means cluster analysis with a Euclidean distance matrix for the thirteen metrics. Clusters were created, using this matrix, with the partitioning around medoids ('pam') function from the R 'cluster' package (Maechler et al. 2005). Cluster stability was tested using the Jaccard bootstrap mean values that were obtained from the bootstrap method within the 'clusterboot' function ('fpc' package; Hennig 2010). Jaccard values of > 0.60 indicated distinct cluster patterns and values of > 0.75 indicated stable clusters (Hennig 2010). Characteristics of clusters were interpreted using boxplots of metrics by cluster group, barplots of the distribution of the cluster groups across manual survey sites, and by mapping the cluster groups in the estuary. To emphasize variables that contributed to the best group of multiple linear regression models, a

third, weighted heterogeneity index was calculated using the coefficient weights for variables retained in the best group of multiple regression models. Before being summed, the rankings of variables that were used in the multiple linear regression were multiplied by the coefficient weight plus 1. Therefore the rankings of variables that were more important in the regression had a higher weight in the index.

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