The Great Red Snapper Count

Initial Sample Design

GoMFMC-SSC

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Initial strata determination and required sample sizes

Uncharacterized bottom
- Determination of strata for stratified random sampling
- Estimation of sample size requirements and allocation

Artificial structures
- Determination of strata for stratified random sampling
- Estimation of sample size requirements and allocation

Known hardbottom
- See individual presentation for design

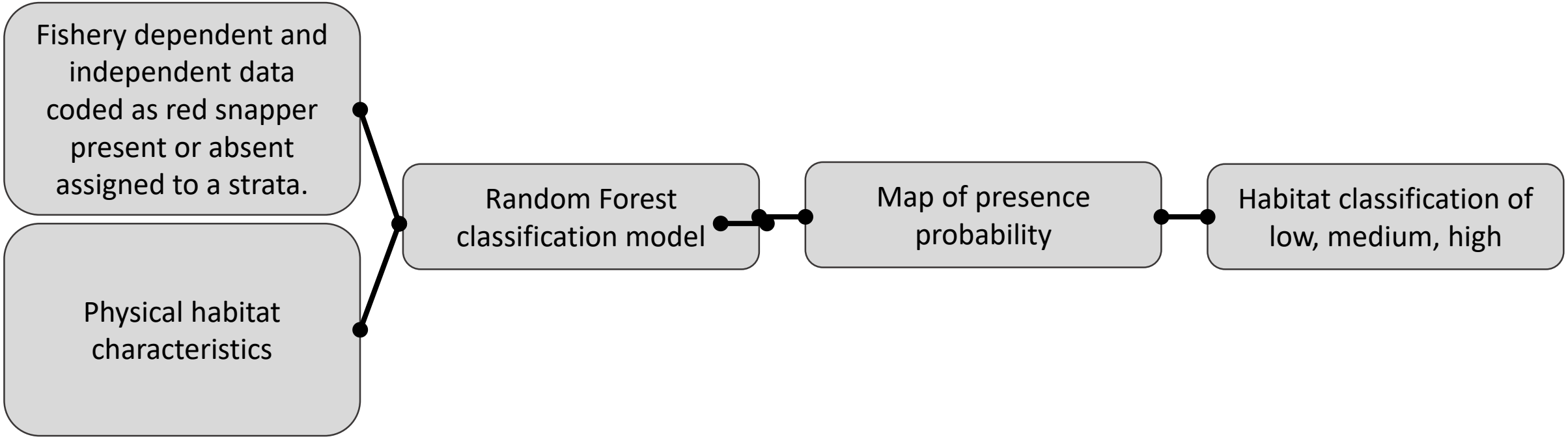
Pipelines
- See individual presentation for design

Uncharacterized bottom determination of strata for stratified random sampling

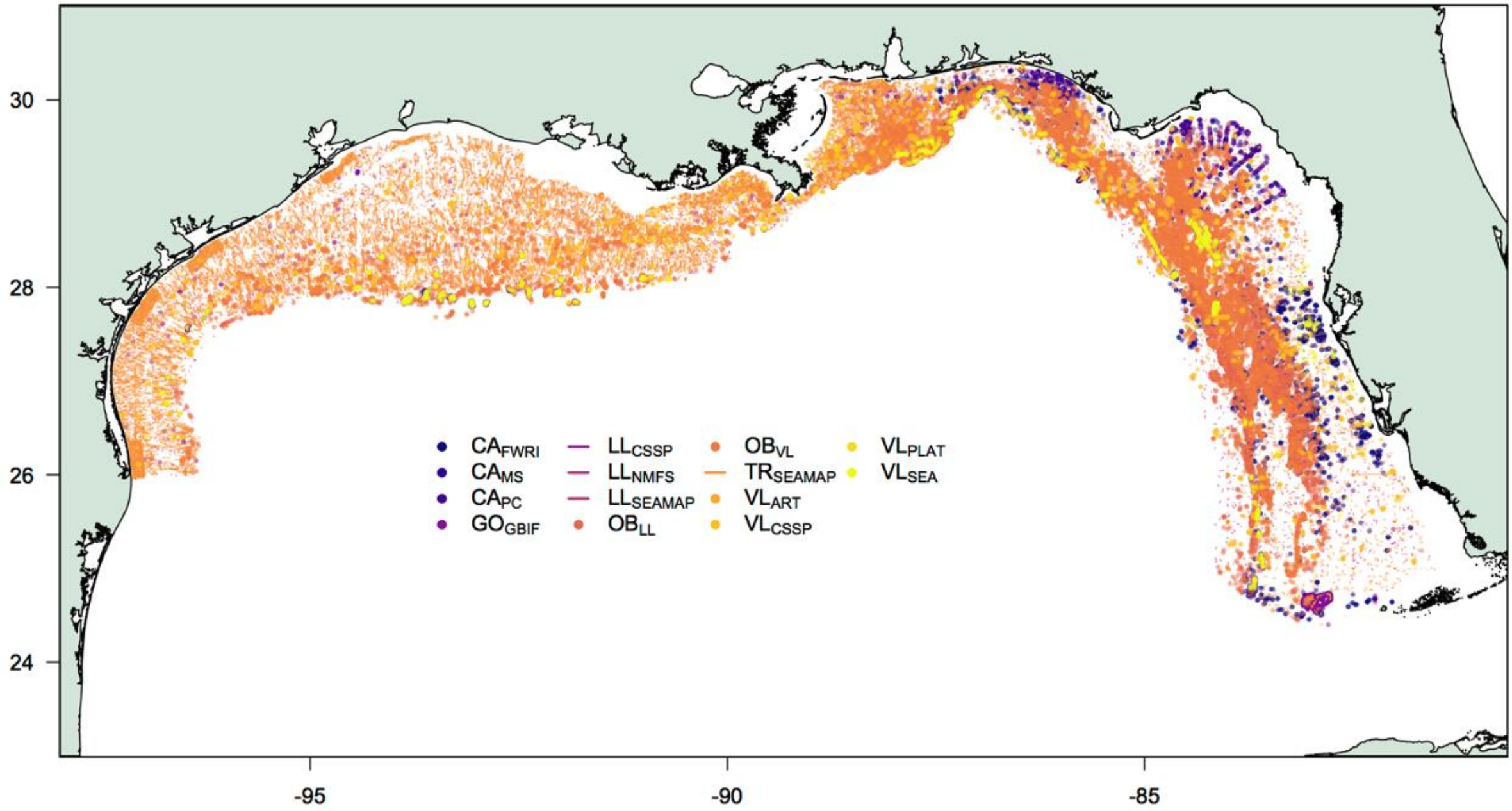
Strata were defined based on region, depth, and the probability of red snapper presence estimated using a Random Forest model trained on fishery dependent and fishery independent data.

Basic sampling unit was 3 arc seconds x 3 arc seconds (~ 90m x 90m) from BOEM bathymetry

Strata location was the centroid of the 3” x 3” strata



Fishery dependent and independent data sources



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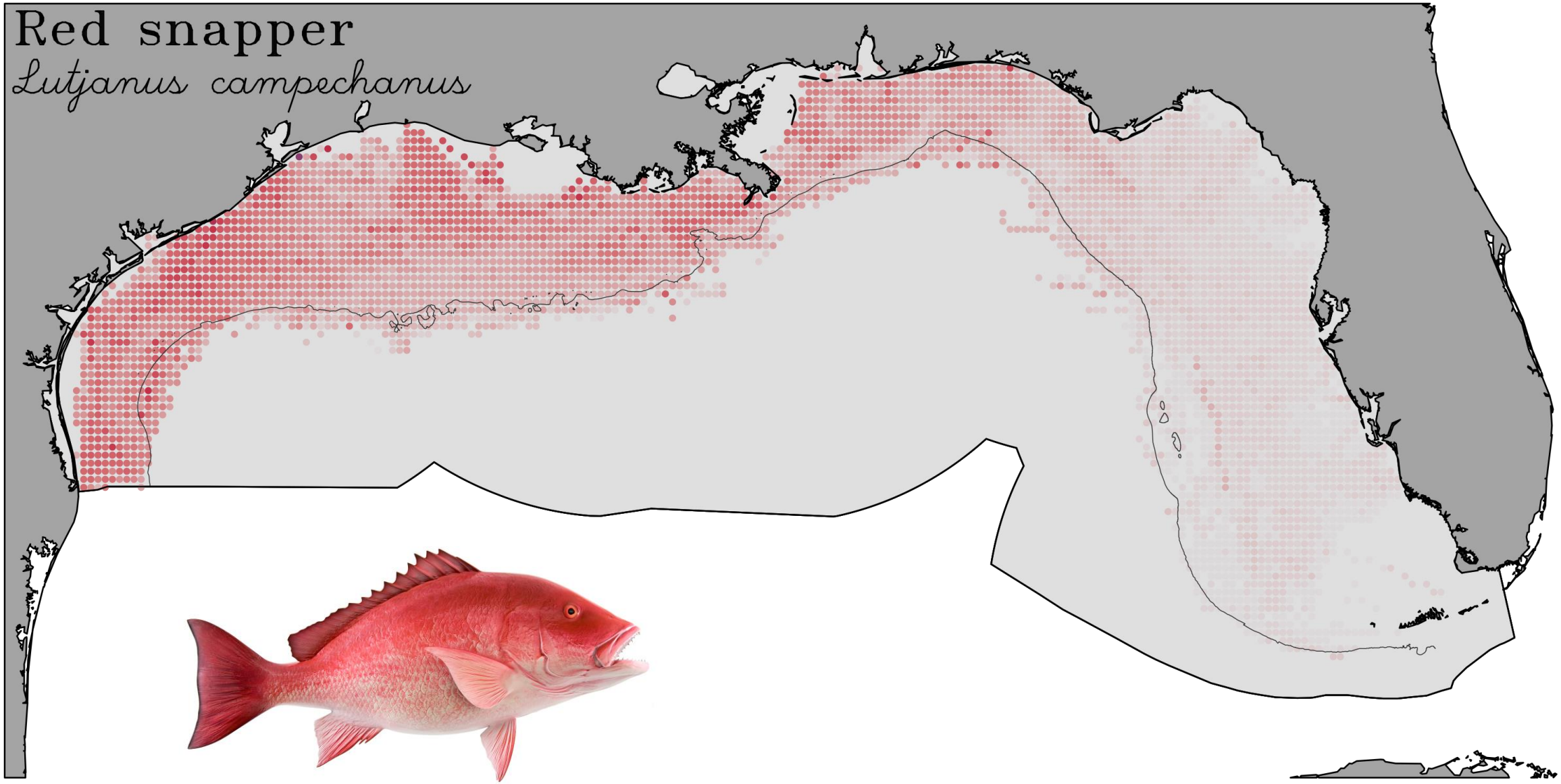
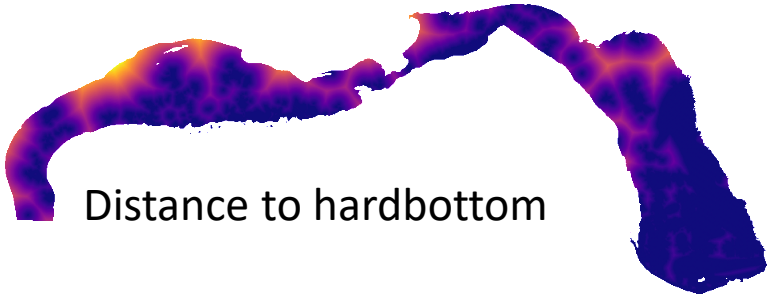
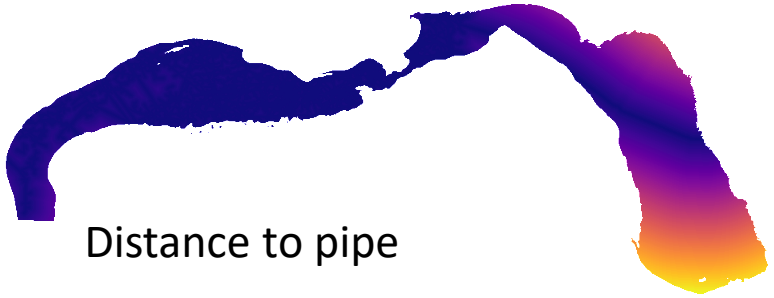
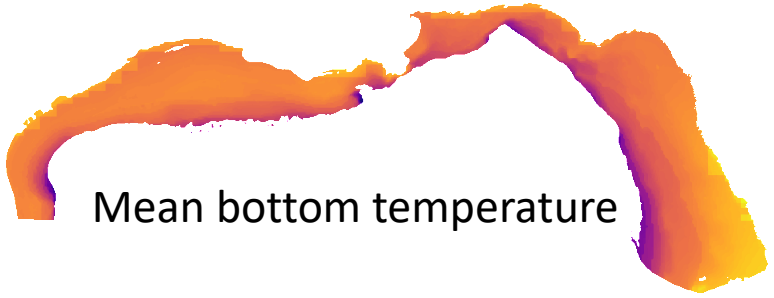


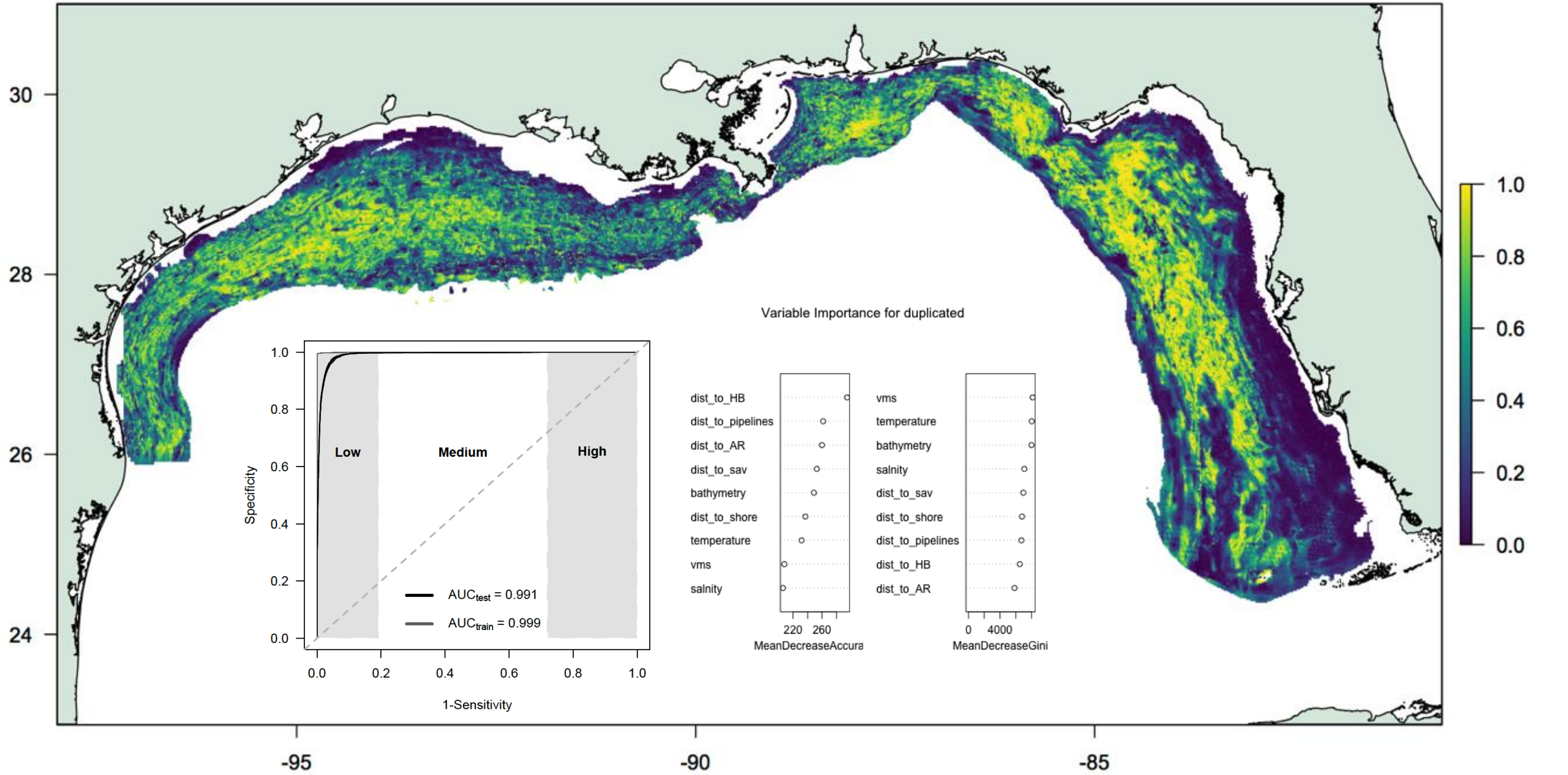
Physical variables







Random Forest probability of presence



Estimation of sample size requirements and allocation

Sample sizes were estimated assuming random stratified sampling of the region, depth, and RF classification strata assuming 90% of a population of 43 million of 2+ red snapper, 10% of the total 3”x 3” are used by red snapper, preliminary estimated of density and variability from scientific research, and ~ 2*SE = 0.3* mean density.

$$n = \frac{\left(\sum w_h s_h \sqrt{c_h}\right) \sum w_h s_h / \sqrt{c_h}}{V + \left({}^{1}/_{N}\right) \sum w_h s_h^2}$$

$$n_h = n \frac{w_h s_h / \sqrt{c_h}}{\sum \left(w_h s_h / \sqrt{c_h}\right)}$$

h	Strata
V	Variance of the mean
w	Stratum weight
s2	Stratum variance
c	cost
N	Total number of strata

Estimation of strata specific density and variability

Individual strata estimates of mean density and variability were derived assuming that scientific research was conducted RF designated **HIGH** quality red snapper habitat (hard bottom). These mean densities were assumed to be at the 95% quantile on a normal distribution with a coefficient of variation 150%

MEDIUM and **LOW** designated habitat means were assumed to be the 50% and 5% quantiles respectively.

Mean density estimates were region and depth specific where available or imputed from the nearest region level estimate.

A minimum of 10 samples were allocated to each strata.

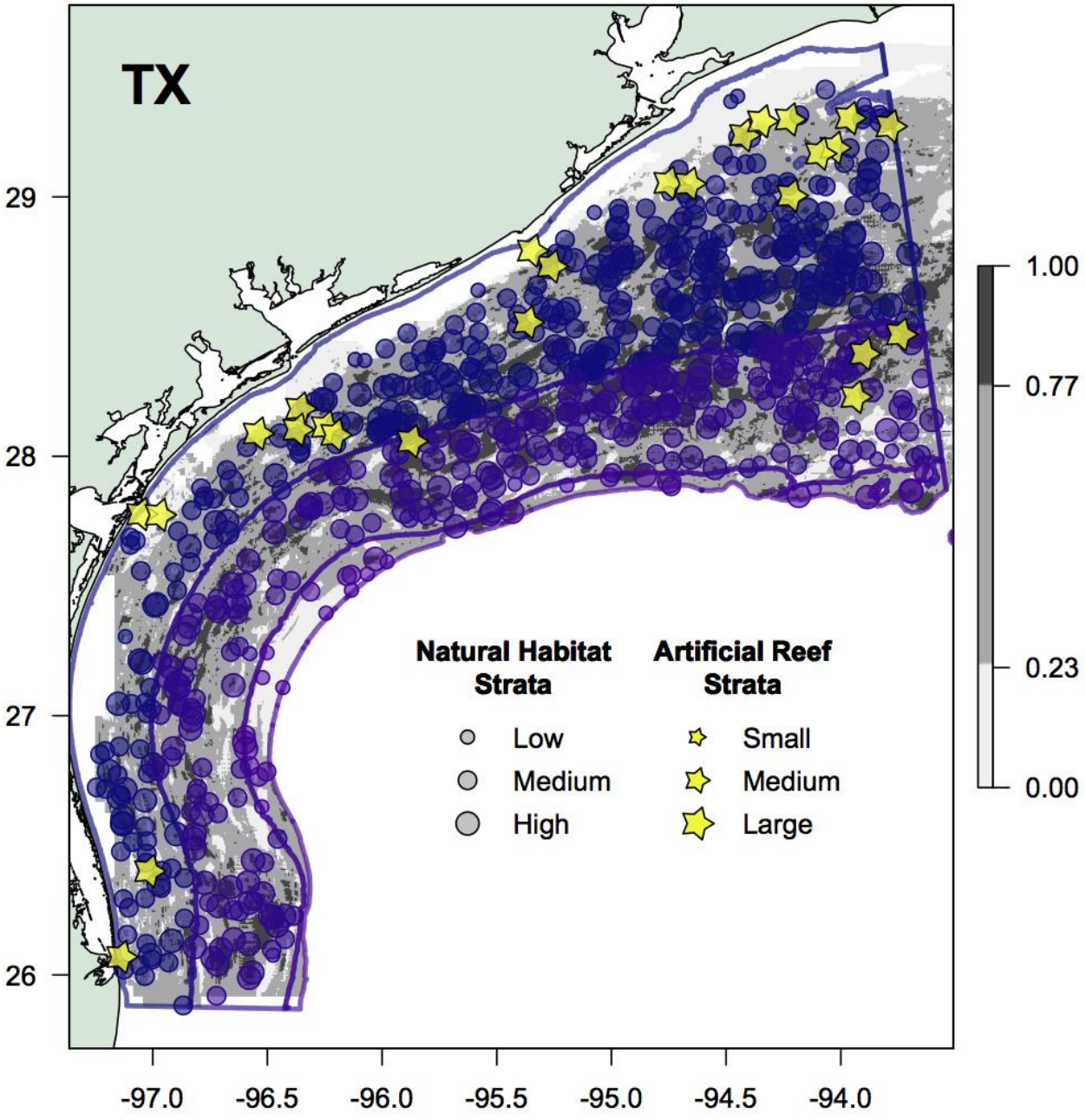
Artificial reef determination of strata for stratified random sampling

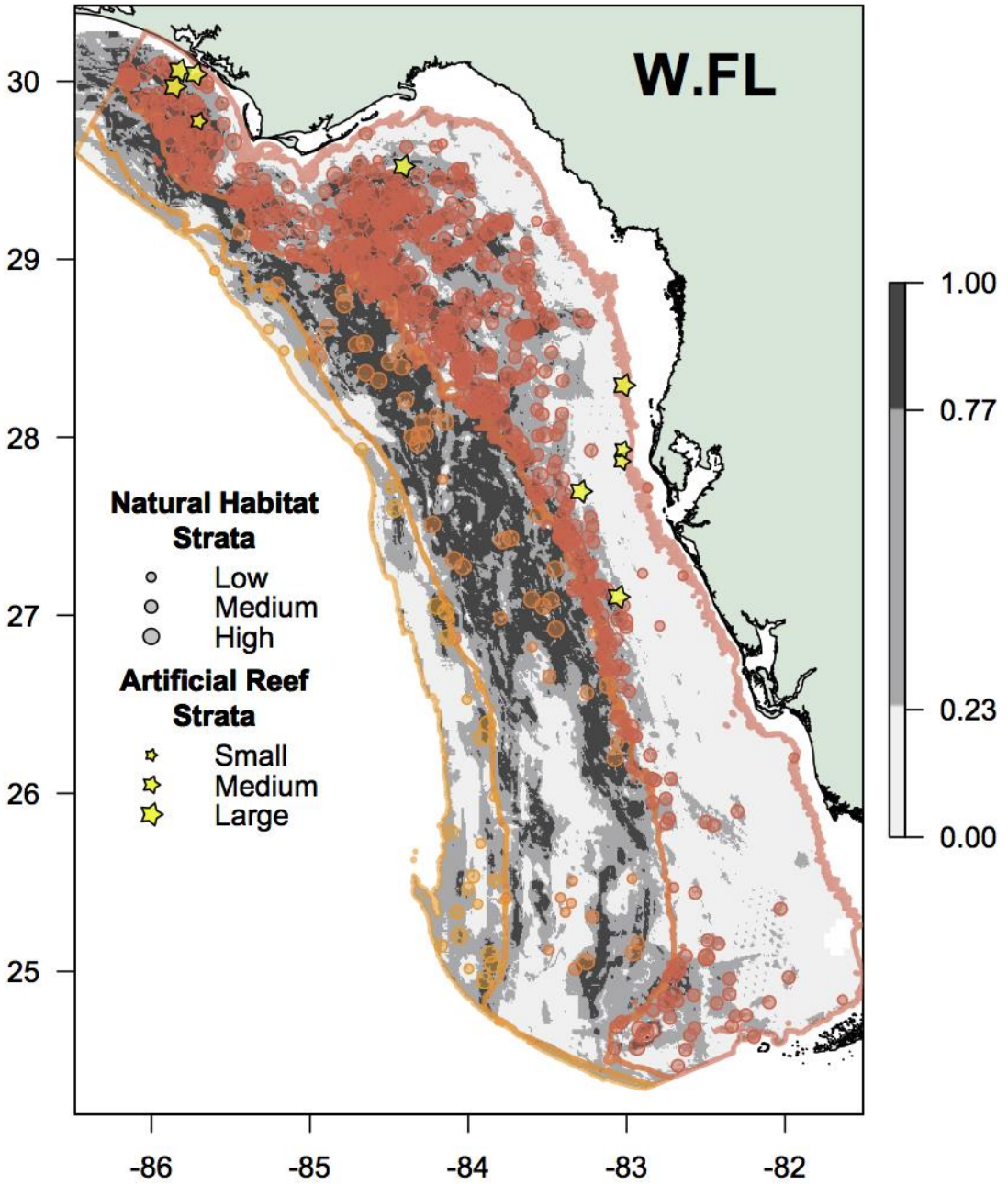
The sampling frame for artificial reefs was taken from available public records. Each unit was categorized into 5 categories based on weight of material or physical description. Samples were allocated assuming a stratified random sample.

Pervious scientific sampling programs were used to estimate density per structure and the associated variability and 10% of the population was assumed to reside on artificial structures.

The process for sample allocation was the same as for unclassified bottom with a minimum of 10 sample in each strata if they existed in the region and depth.

Regional sampling designs





Thank you !