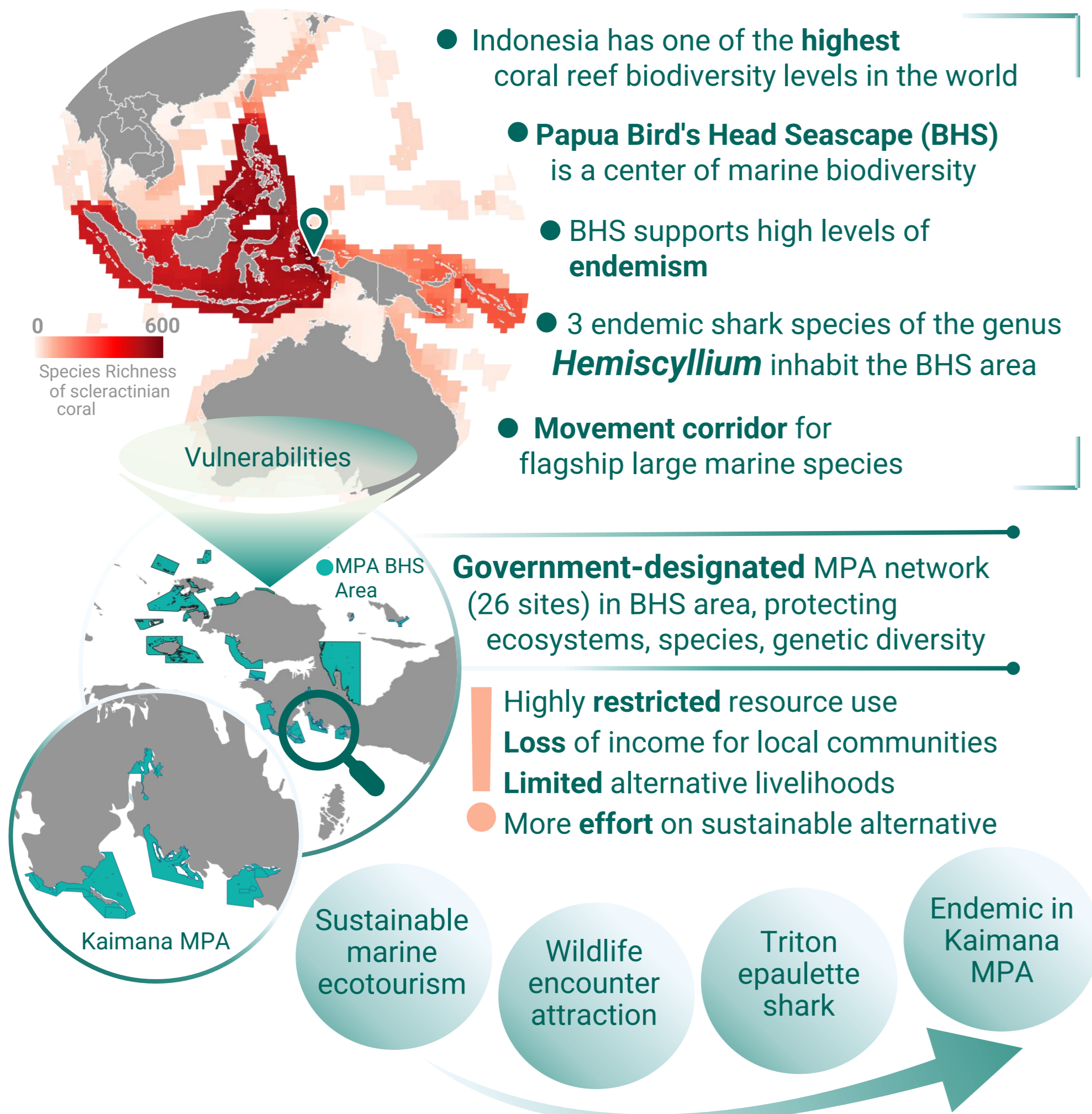


## 1. Why This Matters



## 2. Meet the Species



*Hemiscyllium henryi* / Triton epaulette shark is a **small shark** (Max total length 88 cm)

Commonly known as **walking shark** (crawling using both pectoral fins)

**Nocturnal** demersal shark inhabit coral reef and seagrass ecosystems

**Restricted geographic** range with limited dispersal capacity

**Founder speciation** has played a significant role in species diversification

## 3. The Challenges

Knowledge gap in marine ecotourism **viability**

**Limited and imbalanced** ecological survey data

Surveys are **resource-intensive**

**Model** Triton epaulette shark habitat suitability using *Species Distribution Modeling*

Develop **habitat suitability map** for Kaimana MPA, West Papua

Develop a **citizen science platform** to collect geospatial sighting data

Provide **science-based recommendations** for ecotourism and management

## 4. Approach

### Data Set

- ✓ Presence: sighting data ( $n = 123$ )
- ✓ Absence: survey track ( $n = 4100$ )
- ✓ Imbalanced data ratio (1:33)
- ✓ Congeneric species strategy
- ✓ Predictors: 10m resolution (6 variables)

### Species Distribution Model

- ✓ The Random Forest Algorithm
- ✓ Balanced sampling with replacement
- ✓ 50 iterations
- ✓ Parameter:  $mtry = 3$ ;  $ntree = 1000$
- ✓ Model validation: split ratio 80:20
- ✓ Model prediction with uncertainty

User

Frontend: R Shiny UI

Backend: R Shiny server

Database: PostgreSQL

Citizen Science Platform

## 5. Results

### Model Performance

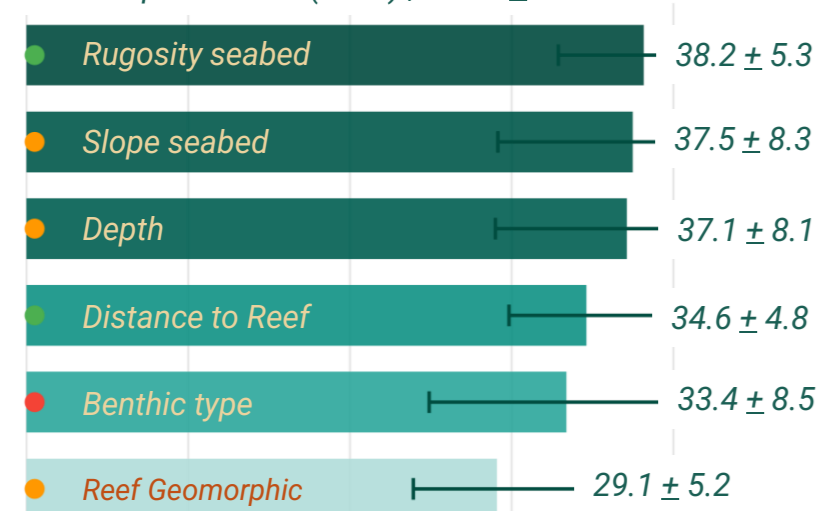
#### Performance metrics summary

Metric	Mean	sd
AUC	0.66	0.04
TSS	0.24	0.09
Sensitivity	0.53	0.09
Specificity	0.71	0.04
Accuracy	0.71	0.04

\*Predictive Accuracy (50 bootstrap iterations,  $n=844$  test samples)

#### Predictor Variable Importance

Bootstrap ensemble ( $n=50$ ) | Mean  $\pm$  sd

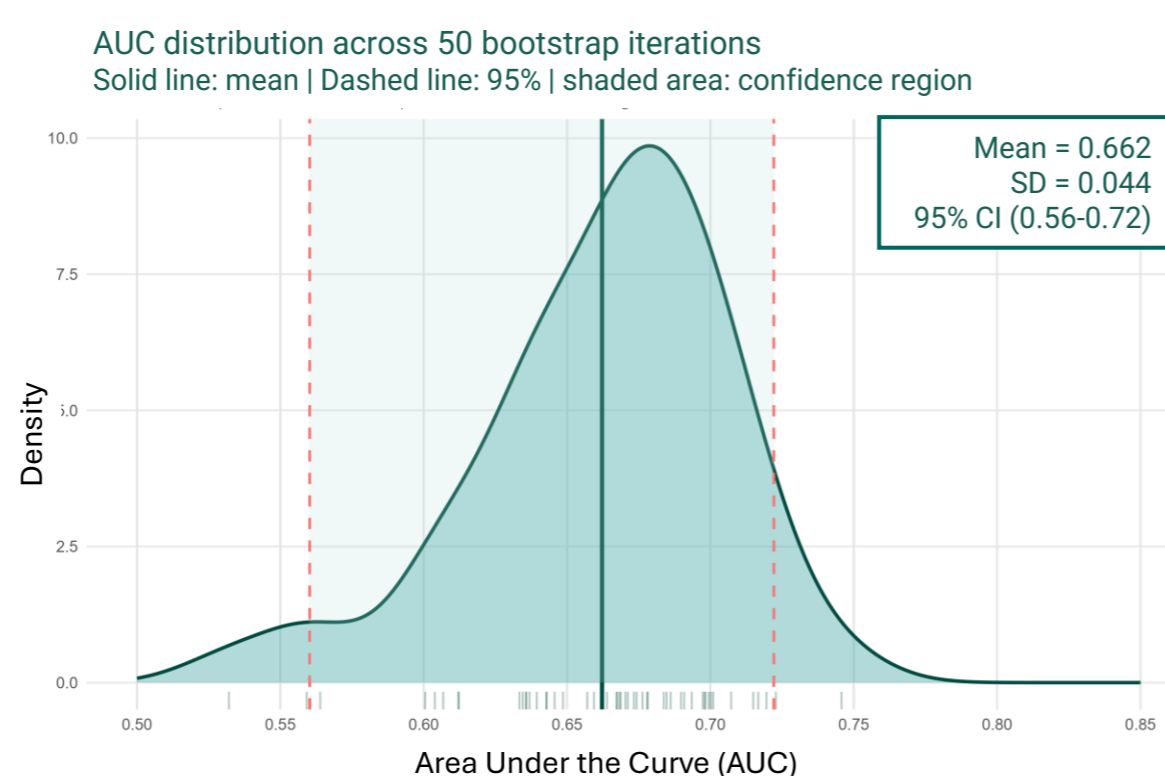


Mean Decrease in Accuracy

Colored dots (left) indicate stability

Cv = Coefficient of variation

● High (<0.15) ● Medium (0.15-0.25) ● Low (>0.25)



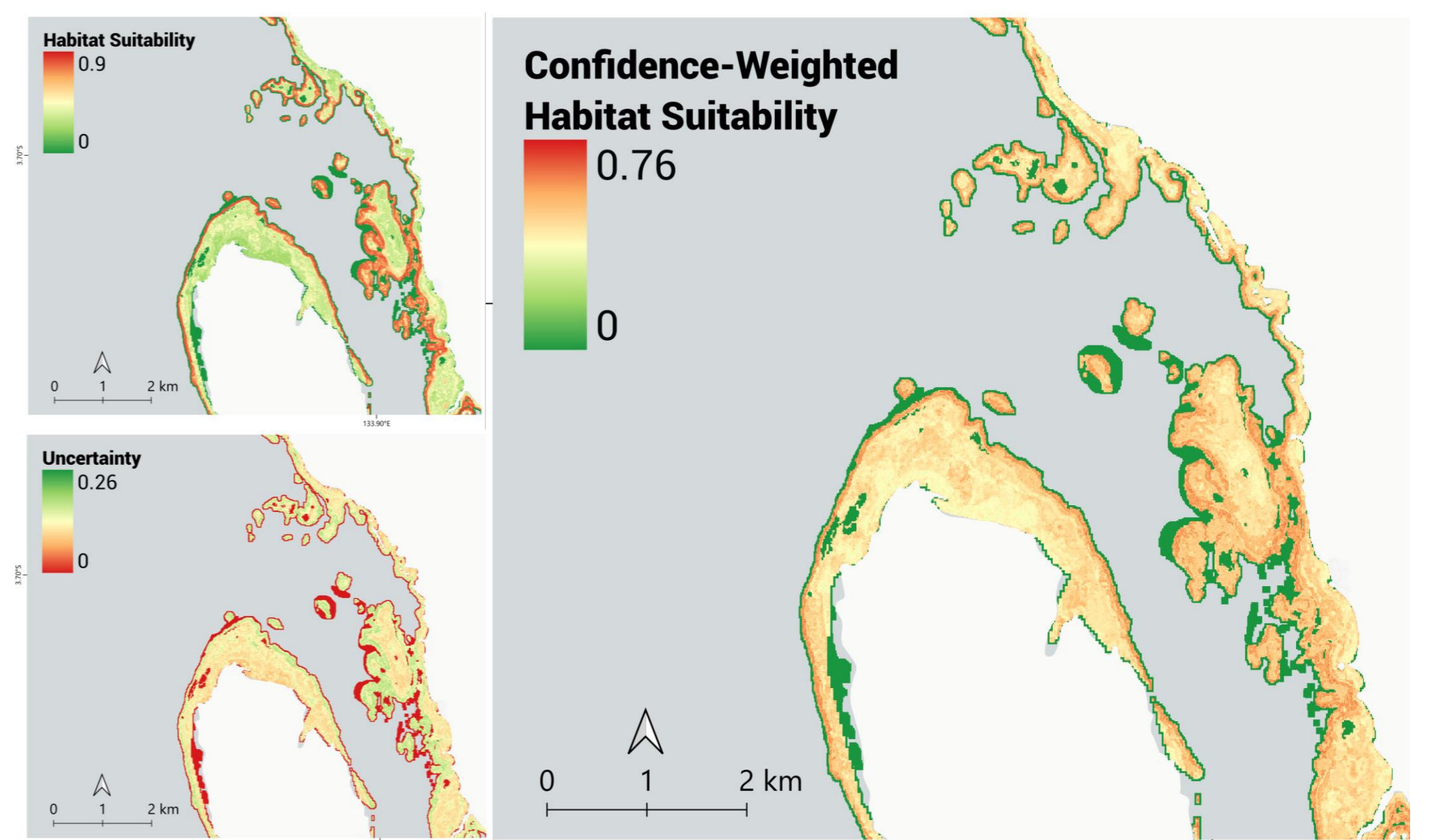
#### Discrimination:

- Bootstrap validation ( $n=50$ ) achieved **moderate discrimination** ( $AUC=0.66\pm0.04$ ) but **low sensitivity** (53%), likely reflecting limitations in survey methodology.
- Missing nearly half of suitable habitat requires **further field validation** before application.

#### Predictor Reliability:

Structural complexity variables (**rugosity, slope, distance to reef**) showed moderate consistency ( $CV < 0.15$ ), while substrate classification (**benthic type, geomorphology**) exhibited substantial variability ( $CV > 0.20$ ).

### Habitat Suitability



**Identification of priority areas** with high habitat suitability and low uncertainty supports marine ecotourism feasibility, MPA management and targeted surveys.

The maps illustrate that the Triton epaulette sharks prefer reef habitats with complex seabed structures and coral substrates, providing essential shelters for this endemic species.

The pattern aligns with variable importance model results.

### Citizen Science Platform



Scan to access The epaulette shark sighting platform and habitat maps

<https://indoshark-sighting-dev-2026.shinyapps.io/Epaulette-Shark-Sighting-2026/>

## 5. Conclusion and Recommendation

- ✓ Model provides preliminary habitat characterization, despite limited Triton epaulette shark data
- ✓ Confidence-weighted habitat suitability maps provide preliminary actionable support for ecological survey planning, MPA evaluation, and sustainable marine ecotourism in Kaimana MPA
- ✓ Citizen science platform deployed to strengthen data collection and validation through community-based monitoring

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