Critical habitat of juvenile Nassau grouper

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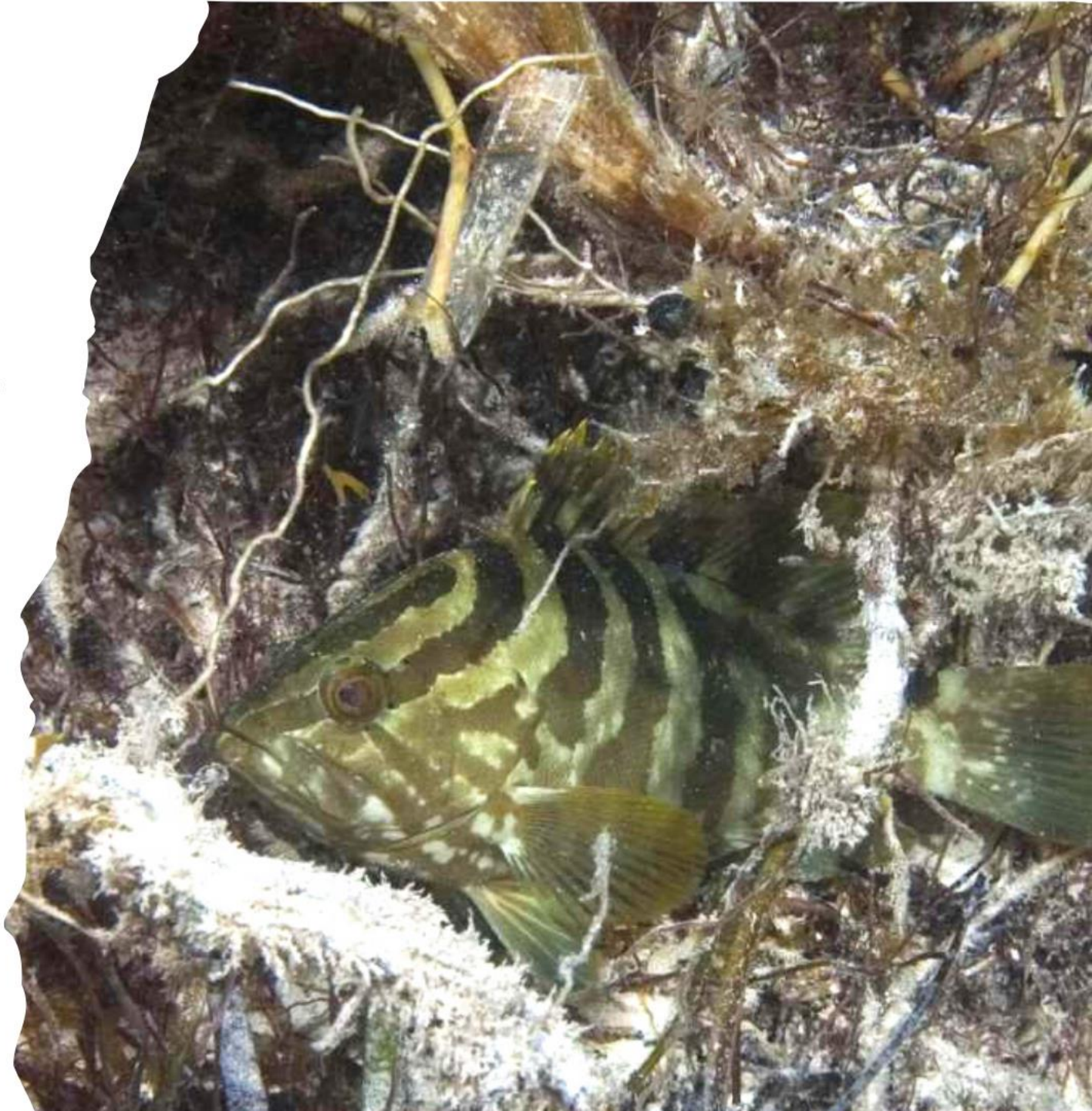


History of Decline

1970S

Drastic population declines

1980S

Commerically extinct FSAs extirpated

1990

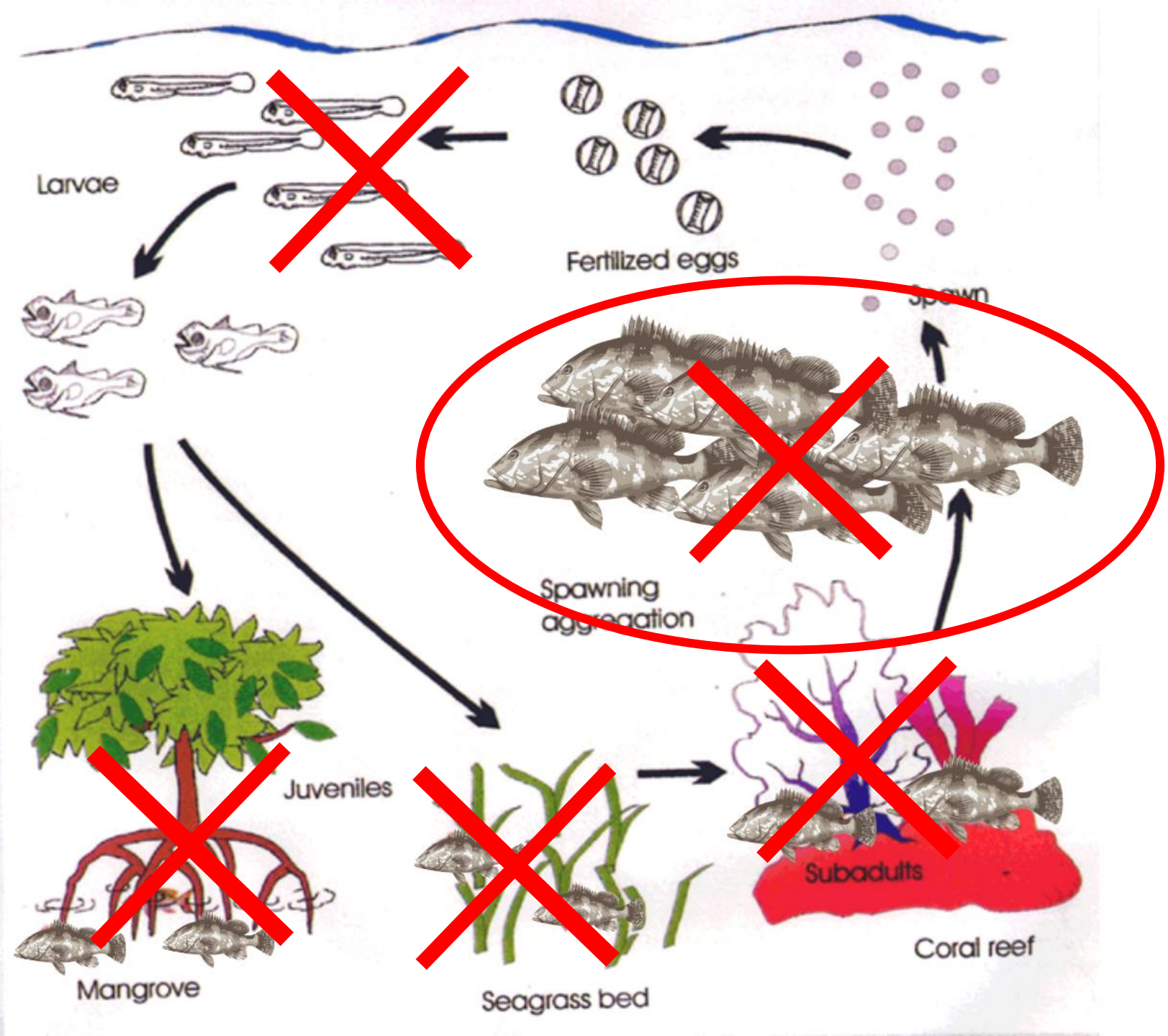
Protected as "no take" in federal waters (>9 nm)

2004

Protected locally in Puerto Rico (< 9 nm)

2016

Listed on the Endangered Species Act



Reef fish lifecycle

Study Sites

SEARCHING FOR NASSAU GROUPER

Anecdotal accounts of increased sightings of juveniles in Fajardo and Ceiba Reefs, bays and lagoons

43 scouting expeditions:
23 Nassau grouper in 15 sites, early juveniles to adult stages (range TL=10-50 cm)
total area surveyed of 0.15km^2

1 km

10 m

1 m

Strategy

Document the size distribution of Nassau grouper from inshore to offshore in various habitats at three spatial scales.

Scan to read the report

Methods

CHARACTERIZING HABITAT

Scout known areas where juvenile Nassau grouper were sighted
Explore new areas of similar habitat characteristics
Conduct benthic surveys to characterize habitat
Analyze habitat results to look for trends by size class

1 km scale

LARGEST SPATIAL SCALE

Measured in GIS to identify potential areas of habitat complexes used by Nassau grouper

Shortest distance measured in a straight-line to the nearest coastline or main relief habitat types

Plotted for each individual and discriminated by size

Corresponds to NOAA MMU

10 m scale

MEDIUM SPATIAL SCALE

Benthic and topographical composition was assessed within a 7.5 m radius (total area = 176.72 m^2)

Quantified in-situ following NCRMP protocol

1 m scale

SMALLEST SPATIAL SCALE

Series of replicate photo-quadrats to quantify the benthic organisms

Three parallel 25 m transects,
placed 7 m apart

Eighteen replicate photo quadrats, one at every 5 m along each transect

Overlaid 50 randomly distributed points on the image, classified to the lowest possible benthic species or category

Results: Size distribution

Life Phase	Size Range (TL cm)	N
Post-settlement	2.5 - 3.5	0
Early juveniles	6 - 15	1
Large juveniles	15 - 30	14
Immature adults	30-40	6
Adults	>40 cm	2
Total		23

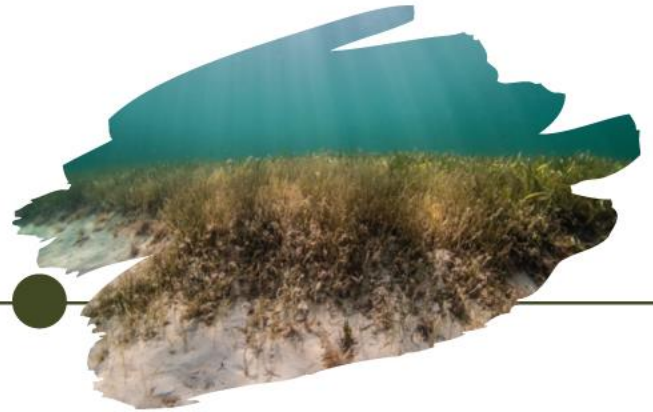
Nassau grouper were observed to be primarily large juveniles

Life phase distribution by size of Nassau grouper as per Eggleston, 1995.

Results: Habitat

1 km scale

NOAA Habitat Maps
GIS analysis



10 m scale

NOAA NCRMP protocol
7.5m radius

1 m scale

1 m photoquadrats
Transect

Results: Habitat

1 km scale

10 m scale

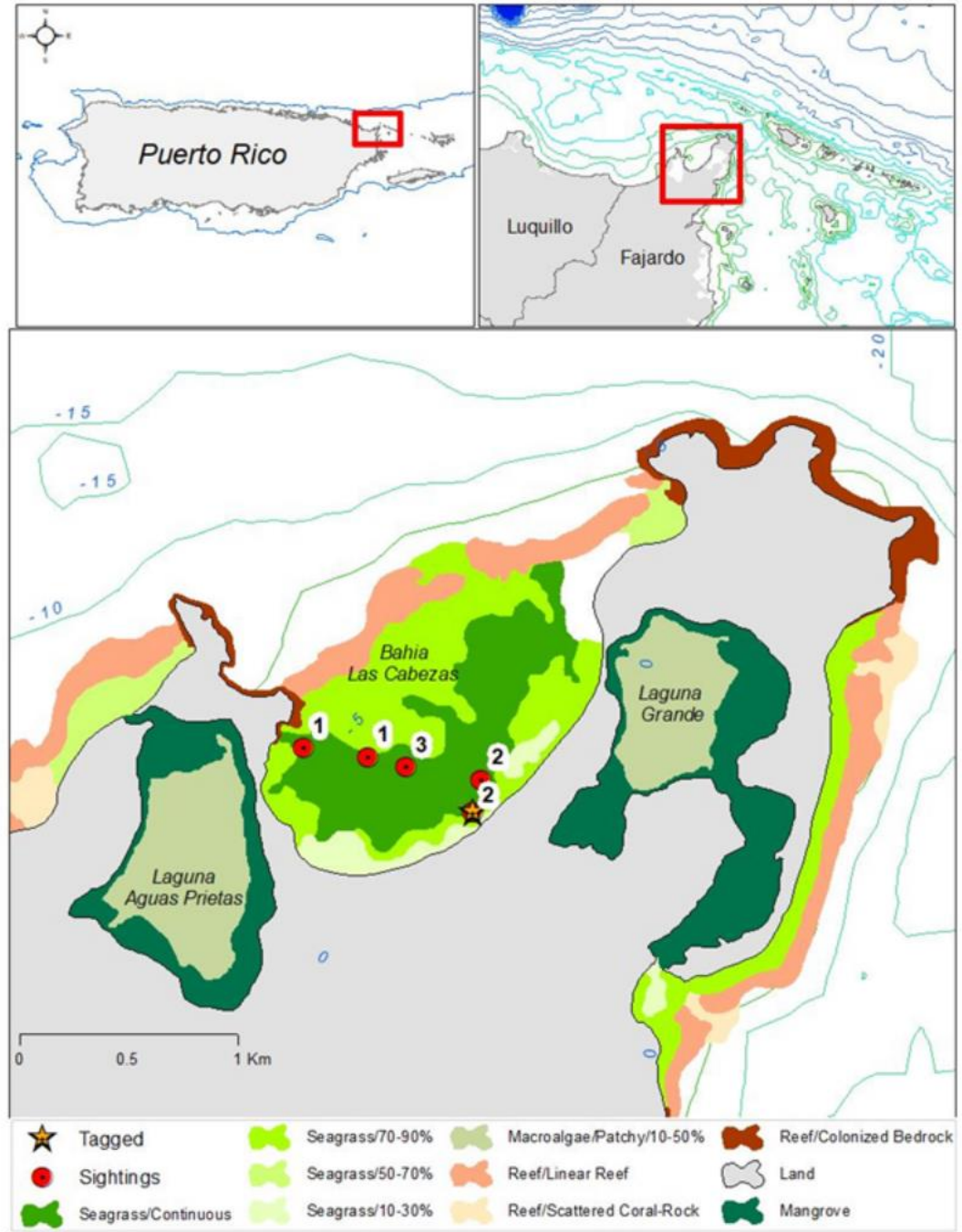
1 m scale

Close to seagrass

All the sites with Nassau grouper were within, near or surrounded by dense seagrass patches.

Las Cabezas

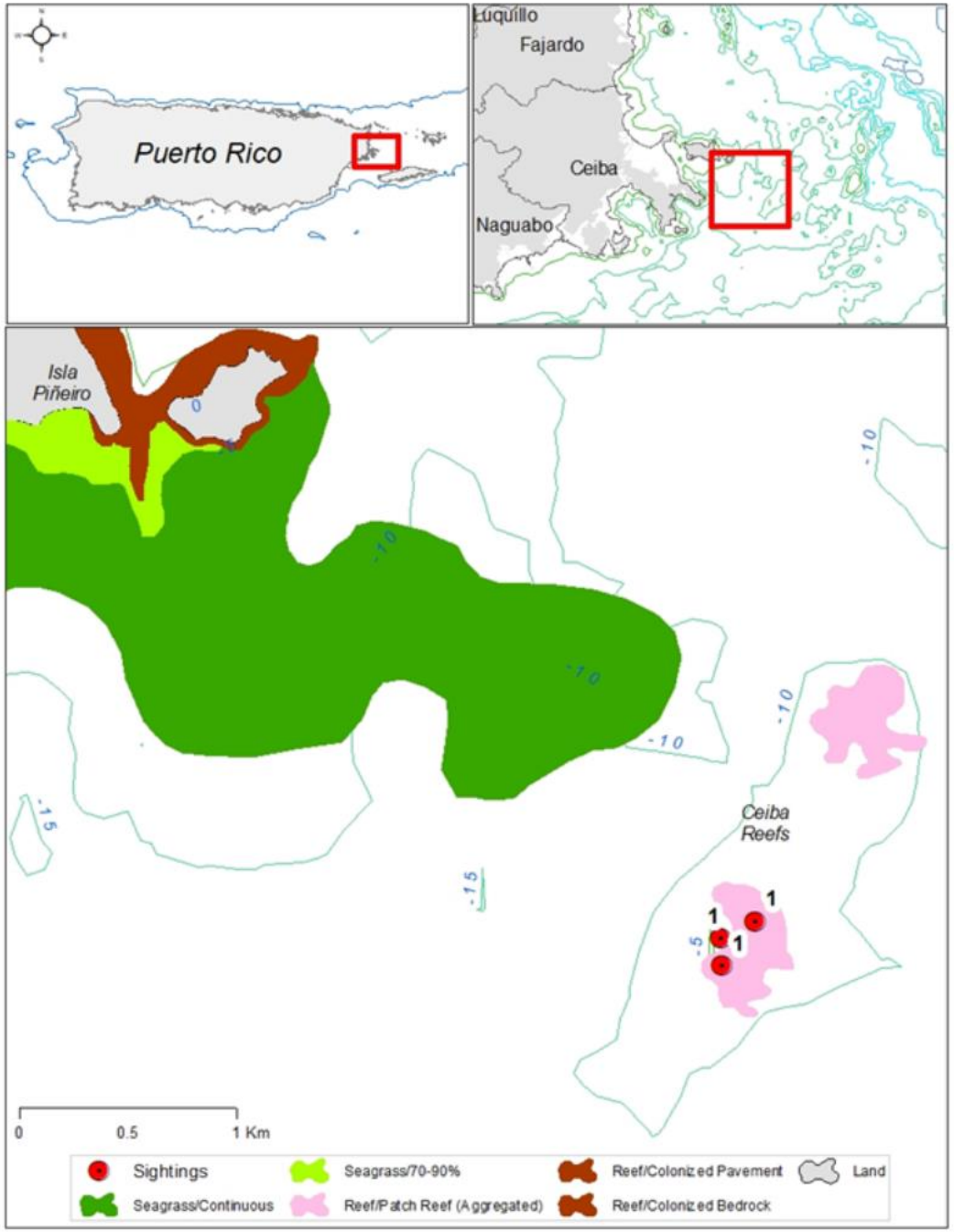
The five sites where grouper were present were along the fringing edges of hard substratum within continuous seagrass, bordered by patches of less dense seagrass.



Ceiba Reefs

Three of the larger sized (30-50 cm TL) Nassau grouper were located furthest from seagrass (approximately 100 m) and in reef habitats (3-4 km) off the coast of Ceiba.

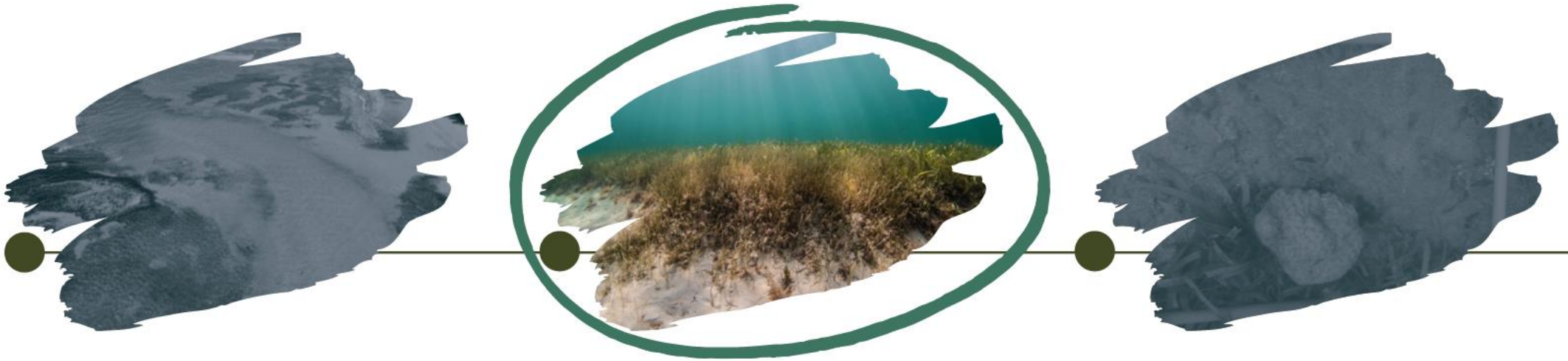
Transitioning to an adult life phase



Range of Nassau grouper total length (cm) per habitat type as per benthic habitat maps available (N=16).

Habitat type	N	Total Length (cm)
Artificial	2	10-25
Seagrass/Patchy/70-90%	1	28
Seagrass/Continuous	9	22-35
Reef/Linear Reef	2	28-30
Reef/Patch Reef	2	30-50

Results: Habitat



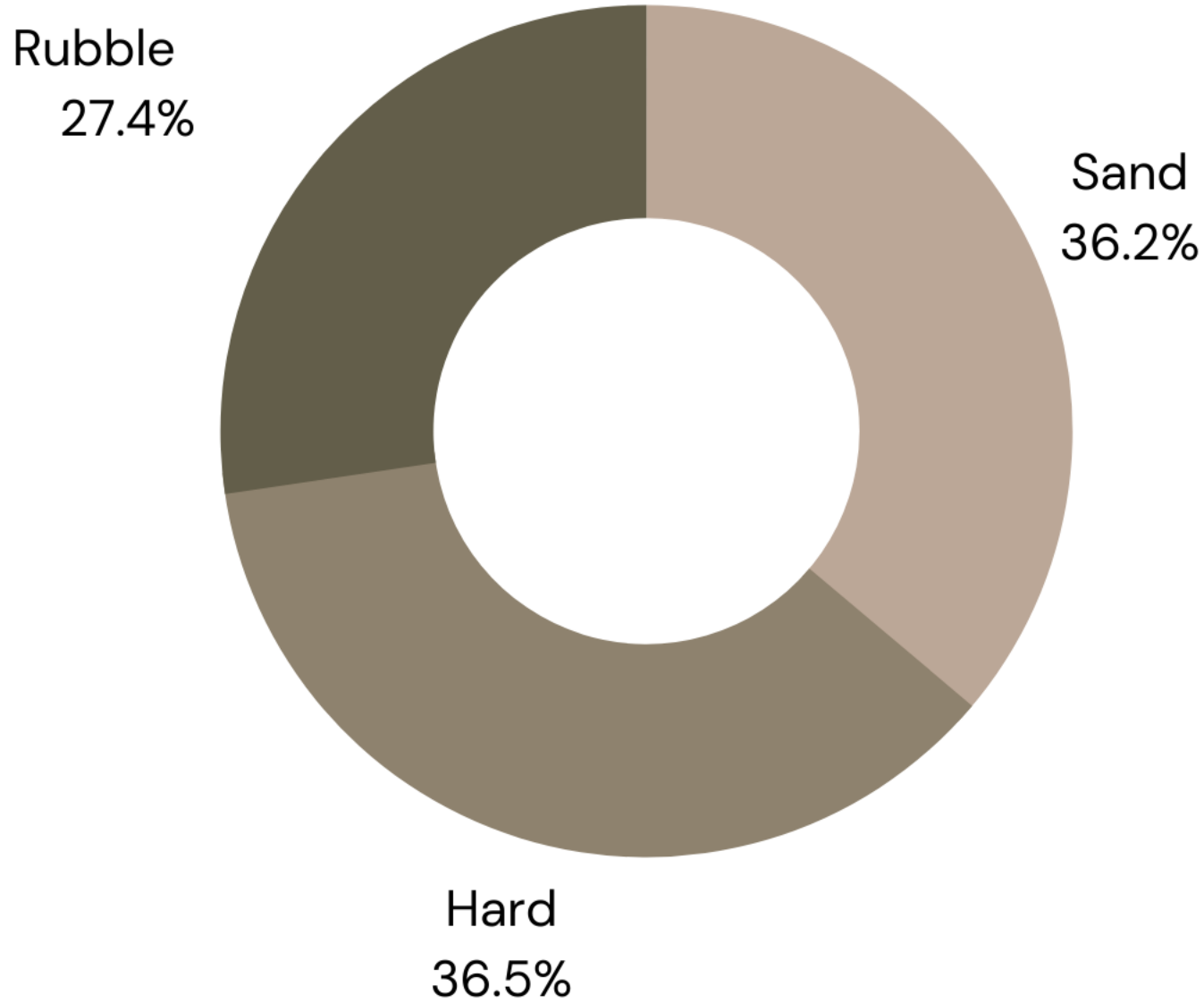
1 km scale

10 m scale

1 m scale

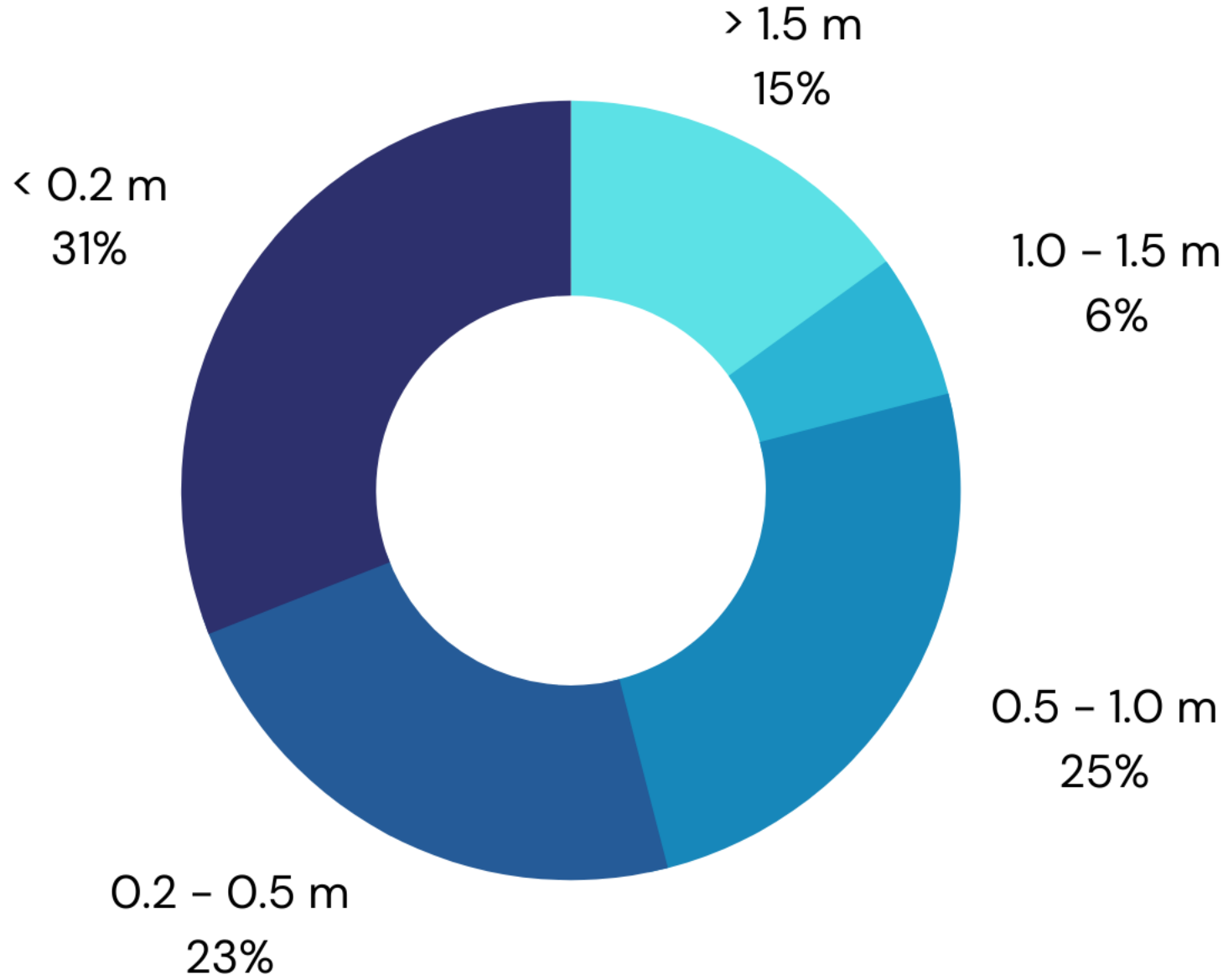
Abiotic Footprint

Mean percentage of the abiotic components within 7.5 m radius cylinders (N=15)



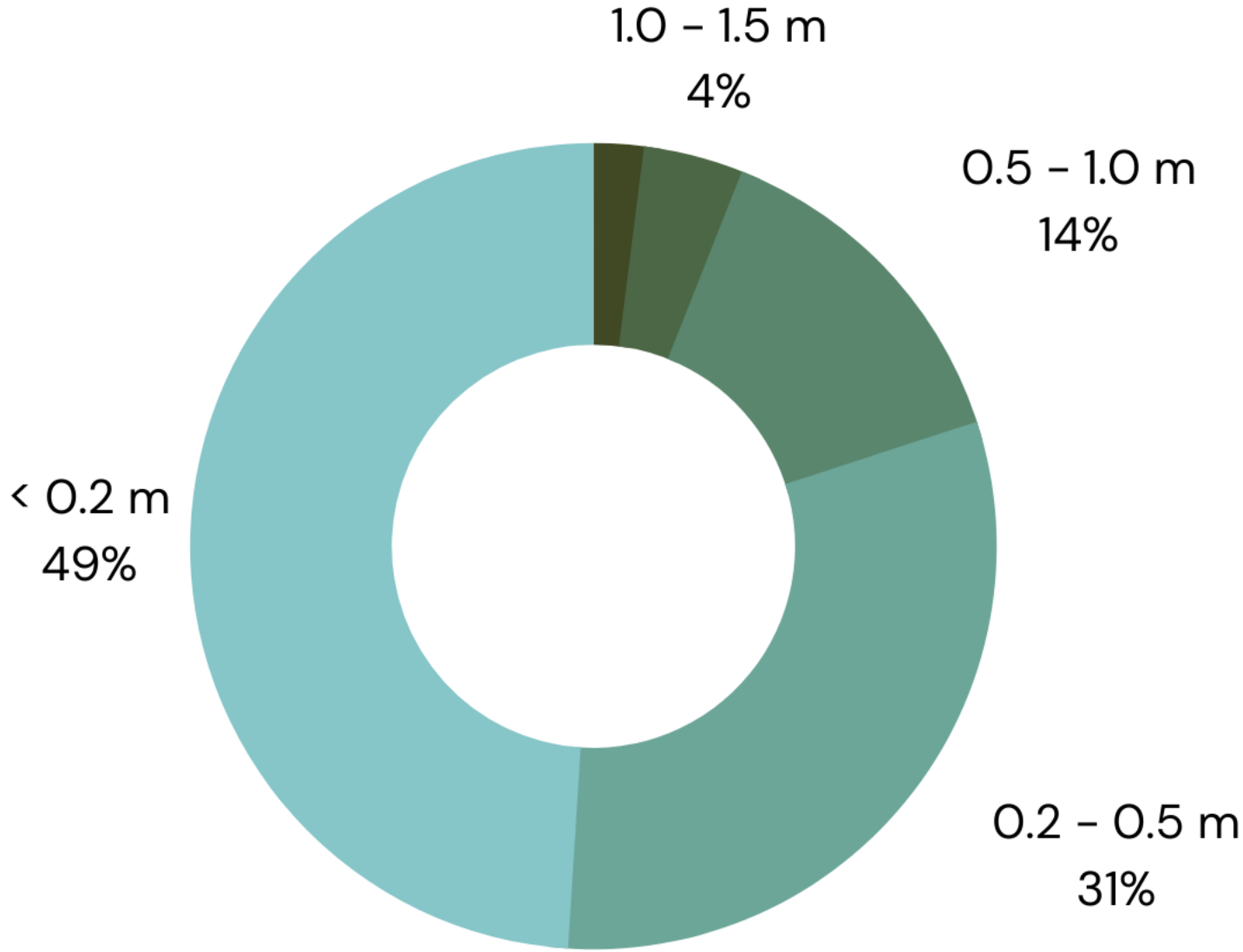
Hard Substrate

Mean proportion of vertical relief categories of hard substratum within 7.5m radius (N=15)

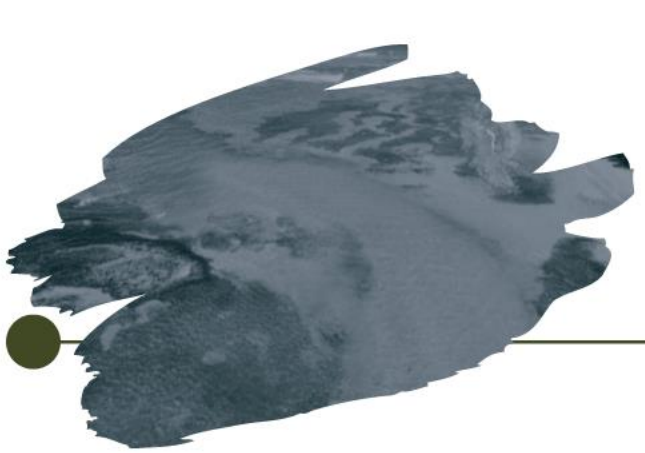


Soft Substrate

Mean proportion of vertical relief categories of soft substratum within 7.5m radius (N=15)



Results: Habitat



1 km scale

10 m scale

1 m scale


Benjamin Jones

Seagrass, sand & algae

At the smallest scale, the benthos contained 36 types of benthic organisms or benthic groups

Top three were:

1. *Thalassia testudinum*
2. Sand
3. Turf filamentous algae

Main Conclusions

Largest spatial scale 1 km

Seagrass (continuous or 70-90%), “unknown”, patch and/or linear reef habitats as per the NOAA (2001) benthic habitat maps available.

Medium spatial scale 10 m

Small (< 100 m^2), discrete, and low-relief patches of hard substratum (reefs, hard substratum, marine debris) and in unconsolidated sediment colonized by seagrasses.

Smallest spatial scale 1 m

Composed of turf, macroalgae and pavement/rubble/sand within or nearby seagrass (*T. testudinum*).

Essential Fish Habitat

Smaller sized juveniles found shallower, nearshore in hard substratum with unconsolidated sediment.

Larger individuals were further offshore and in deeper reefs.

Benjamin Jones

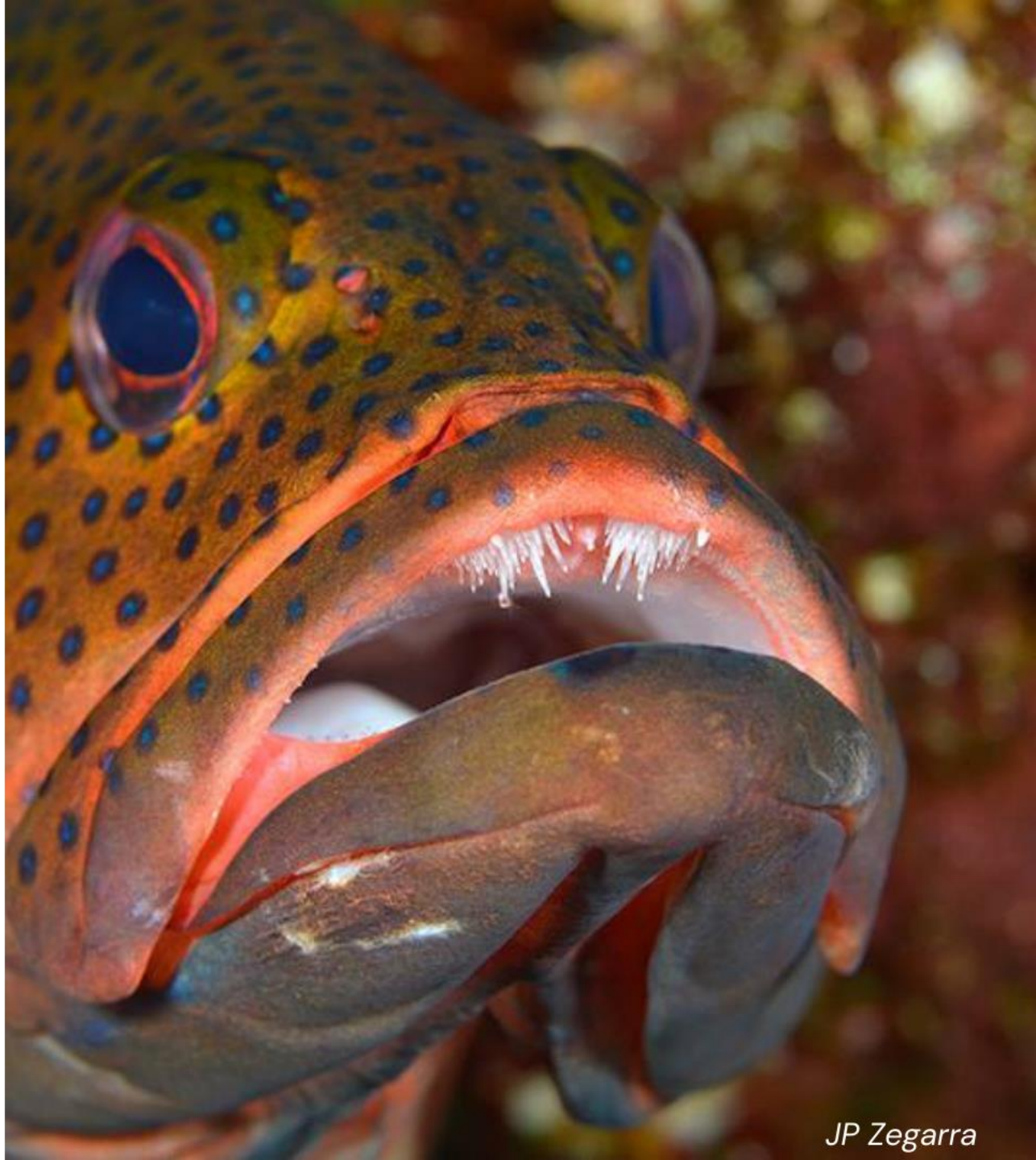
Bays and lagoons

Bay/lagoon environments had 11x the density of Nassau grouper versus sites located in bank/shelf zones

Result of an ontogenetic migration from settlement areas.

Not just for Nassau

Other commercially and ecologically important groupers and fish were found at these habitats *but in much higher densities than Nassau grouper.*



JP Zegarra

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i-Mero app

Next Steps

Characterize EFH for all size classes

Expand this project, search other areas of Puerto Rico for all size classes of Nassau grouper

FSA Monitoring

Education and Outreach

Enforcement, fishers, community signage, guides, workshops

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In Summary

Juvenile Nassau grouper are found in

- Low relief patch, rubble reef or structure within or surrounded by seagrass
- Dominantly within nearshore bays and lagoons
- Inhabit the same Essential Fish Habitat as other fishery species, but in much lower density