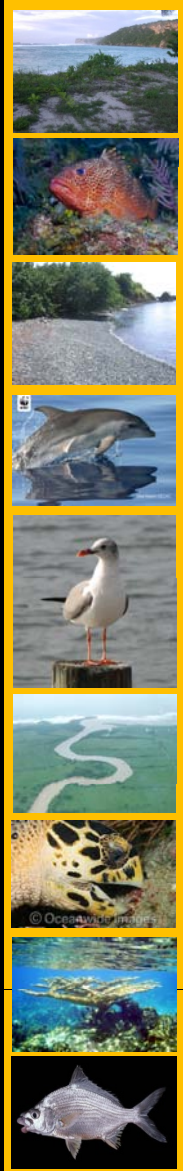**IITF GIS and Remote Sensing Laboratory**

Center for Tropical Landscape Analyses

Integrated Gap Analysis Project

Recent progress

Gap Team:

María Isabel Herrera-M.

Mariano Solórzano   Patricia Rincón-Díaz

Suhey Ortíz-Rosa   Maya Quiñones

Gary Potts   Benjamin Crain

Jessica Castro   Nilda Jiménez

William Gould, USDA Forest Service-Research Ecologist

Objective

To develop databases on Puerto Rico and the US Virgin Islands' freshwater, estuarine, and marine resources including habitat description and mapping, species distributions and conservation status, and protected areas and conservation priorities combined with existing Puerto Rico and USVI terrestrial GAP databases to conduct integrated analyses of gaps in conservation protection for the U.S. Territories in the Caribbean.

Aquatic Gap Collaborators Meetings
Announcement the project

1. DRNA December 2010
2. Joyuda March 2011
3. Jobos Bay May 2011

Next meetings: UPR Humacao, USVI

Meeting attendance

Components: Six data gathering tasks….

1. Species list and prioritization.

2. Compile information on the natural history of selected species.

3. Compile information on species occurrences.

4. Develop geospatial layers of habitat characteristics.

5. Species habitat modeling.

6. Compile information on protected areas.

30% Completed

Species List Summary

246 species

Freshwater
Species

30   43   203
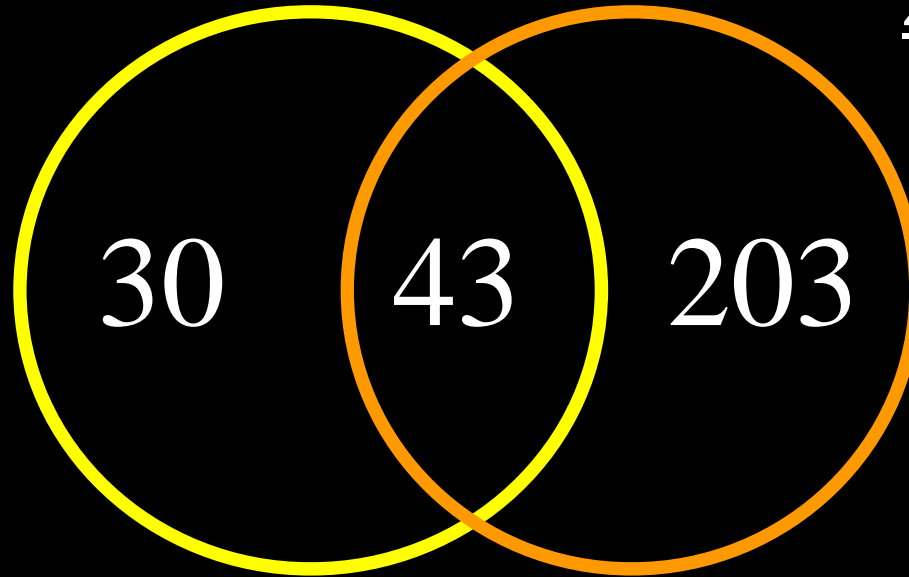
Marine
Species

Species Prioritization

✓ Endangered or vulnerable species
✓ Species with commercial and/or recreational use
✓ Key species according CFMC (1998)
✓ Residence status

PRIORITY 1:   **66 SPECIES**

PRIORITY 2:   72 SPECIES

PRIORITY 3:   108 SPECIES

THE PUERTO RICO AND U.S. VIRGIN ISLANDS AQUATIC GAP ANALYSIS PROJECT

SPECIES LIST

	Family	SciName	Common Names	
			English	Spanish
1	Balistidae	Balistes vetula	Queen Triggerfish	Pejepuerco
2	Carangidae	Seriola rivoliana	Almaco Jack	Medregal, Escolar
3	Chaetodontidae	Chaetodon striatus	Banded Butterflyfish	
4	Haemulidae	Haemulon macrostomum	Spanish Grunt	Colombiana
5		Haemulon plumierii	White Grunt	Boquicolorao, Cachicata
6	Holocentridae	Holocentrus adscensionis	Squirrelfish	Gallo, Candil, Candilero
7	Labridae	Lachnolaimus maximus	Hogfish	Capitán
8	Lobotidae	Lobotes surinamensis	Tripletail	Pargo sargo, Macuri
9	Lutjanidae	Lutjanus analis	Mutton Snapper	Sama
10		Lutjanus apodus	Schoolmaster	Pargo amarillo, Cají
11		Lutjanus synagris	Lane Snapper	Arrayado, Manchego
12		Lutjanus vivanus	Silk Snapper	Chillo
13		Ocyurus chrysurus	Yellowtail Snapper	Colirrubia
14	Malacanthidae	Malacanthus plumieri	Sand Tilefish	Jolocho
15	Muraenidae	Gymnothorax miliaris	Goldentail Moray	
16	Ostraciidae	Acanthostracion polygonius	Honeycomb Cowfish	Chapín
17		Acanthostracion quadricornis	Scrawled Cowfish	Chapín
18		Lactophrys bicaudalis	Spotted Trunkfish	Chapín
19	Scaridae	Scarus taeniopterus	Princess Parrotfish	
20		Scarus vetula	Queen Parrotfish	
21		Sparisoma atomarium	Greenblotch Parrotfish	
22		Sparisoma aurofrenatum	Redband Parrotfish	
23		Sparisoma chrysopterum	Redtail Parrotfish	

PRIORITY 1

2. Compile information on the natural history of selected species.

30% marine and freshwater species

Database

Natural History Reports

20% marine and freshwater species

Taxonomic information

Natural history summary

Geographic distribution information

Habitat affinity data

Life history synopsis

Important literature

Eretmochelys imbricata Hawksbill Turtle Tortuga Carey

Taxonomy

Class:	Reptilia
Order:	Testudines
Family:	Cheloniidae
FUSESA Status:	Endangered
IUCN Category:	Critically Endangered
DNER Category:	Endangered
Residence Status in PR:	Migrant
Residence Status in USVI:	Resident

© Mary Kayoe

Summary
Hawksbills are the most abundant sea turtles in Puerto Rican and U.S. Virgin Islands coasts. Individuals of this species are highly migratory, and use a wide range of broadly separated localities and habitats during their lifetime. In water, the hawksbill occur in hard-bottomed and reef areas, and it is also found in mangrove bordered areas, shallow inlets, remote oceanic islands, offshore cays, and mainland shores…

Geographic Distribution:
Hawksbills sea turtles have are distributed throughout tropical and, to a lesser extent, subtropical waters of the Atlantic Ocean, Indian Ocean, and Pacific Ocean (Mortimer and Donnelly 2008). Hawksbills are the most abundant sea turtles in Puerto Rican coasts. The main aggregation is located at the coral reefs areas and sea cliffs around Mona and Monito Islands, in the west side of Puerto Rico, where important reproduction and feeding sites exists (Diez and van Dam 2002)…

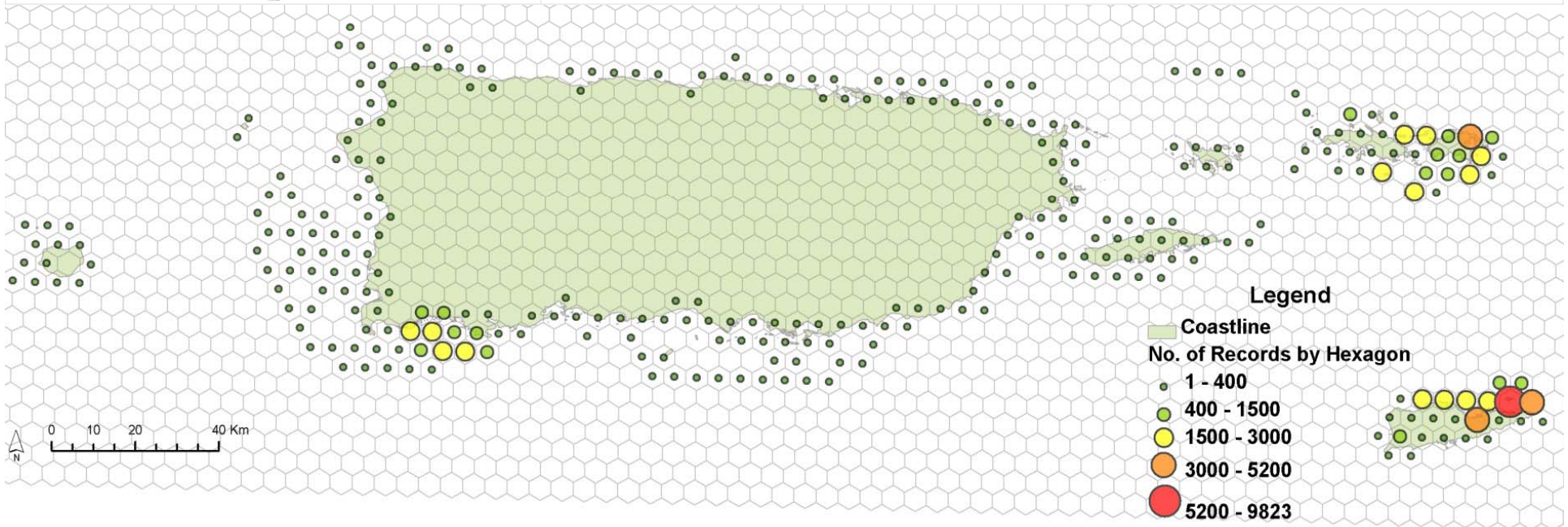**Habitat Associations**
Females of hawksbill sea turtles select nesting sites located above high tide levels, in exposed marine beaches, with relatively eroded sand, free of buried debris, with abundant coastal vegetation and sand, and close to coral reefs areas (Mortimer and Donnelly 2008, Diez pers. Comm.).

Life History:
This species is highly migratory, and uses a wide range of broadly separated localities and habitats during its lifetimes. Hawksbills have breeding migrations between foraging grounds and breeding areas. In the Caribbean, the displacement distances reported are of up to 1930 km (Meylan 1999). Nesting females from Mona Island can disperse approximately 85 to 451 km from their nesting sites (van Dam et al. 2007).

References Cited:

Beggs, J.A.; Horrocks, J.A.; Krueger, B.H. 2007. Increase in hawksbill sea turtle *Eretmochelys imbricata* nesting in Barbados, West Indies.. Endangered Species Research 3:159-168.
van Dam, R.P.; Diez, C.E.; Balazs, G.H.; Colón Colón, L.A.; McMillan, W.O.; Schroeder, B. 2008. Sex-specific migration patterns of hawksbill turtles breeding at Mona Island, Puerto Rico. Endangered Species Research. 4:85-94.

We will publish the natural history reports

3. Compile information on species occurrences.

Number of Records by Taxonomic Group

(bar chart; y-axis: Number of Records (Thousands), values 0–160; categories: Fish, Reptiles, Mammals)

Sources of Records in GAP Database

(bar chart; y-axis: Number of Records (Thousands), values 0–50; categories: NOAA, REEF, DRNA/SeaGrant/Other, García-Sais Reports, Rodríguez-Class)

Legend

Coastline

No. of Records by Hexagon
- 1 - 400
- 400 - 1500
- 1500 - 3000
- 3000 - 5200
- 5200 - 9823

0 10 20 40 Km

Hawksbill Sea Turtle - *Eretmochelys imbricata* - Carey
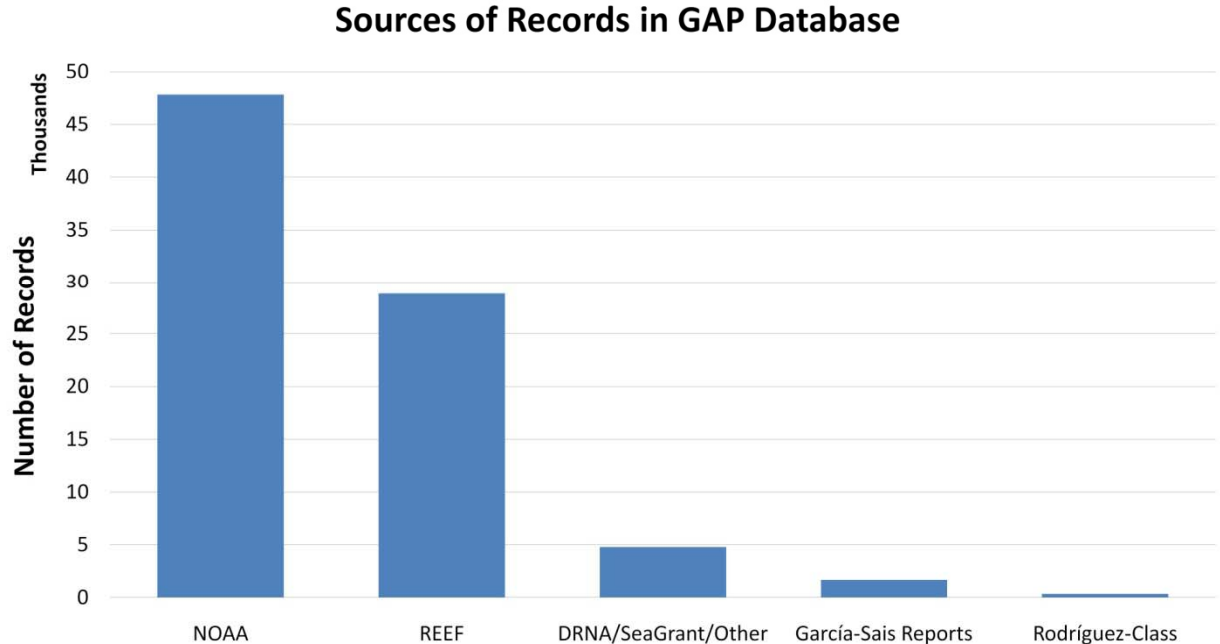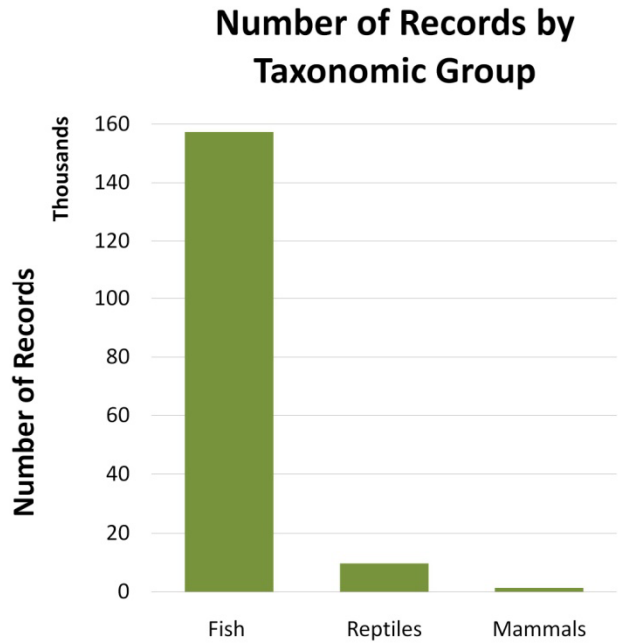
DRAFT July 20, 2011

Occurrence Map Activity

Confirmed **Probable** **Historical**

The map shows hawksbill presence based in our database, not yearly or seasonally represented. It is a summary of crawls, nests, seaturtles sight in water and beaches; including nesting and feeding areas.

Data Sources

■ ONG Database 1.73%
■ Protocol 5.64%
■ NOAA Report
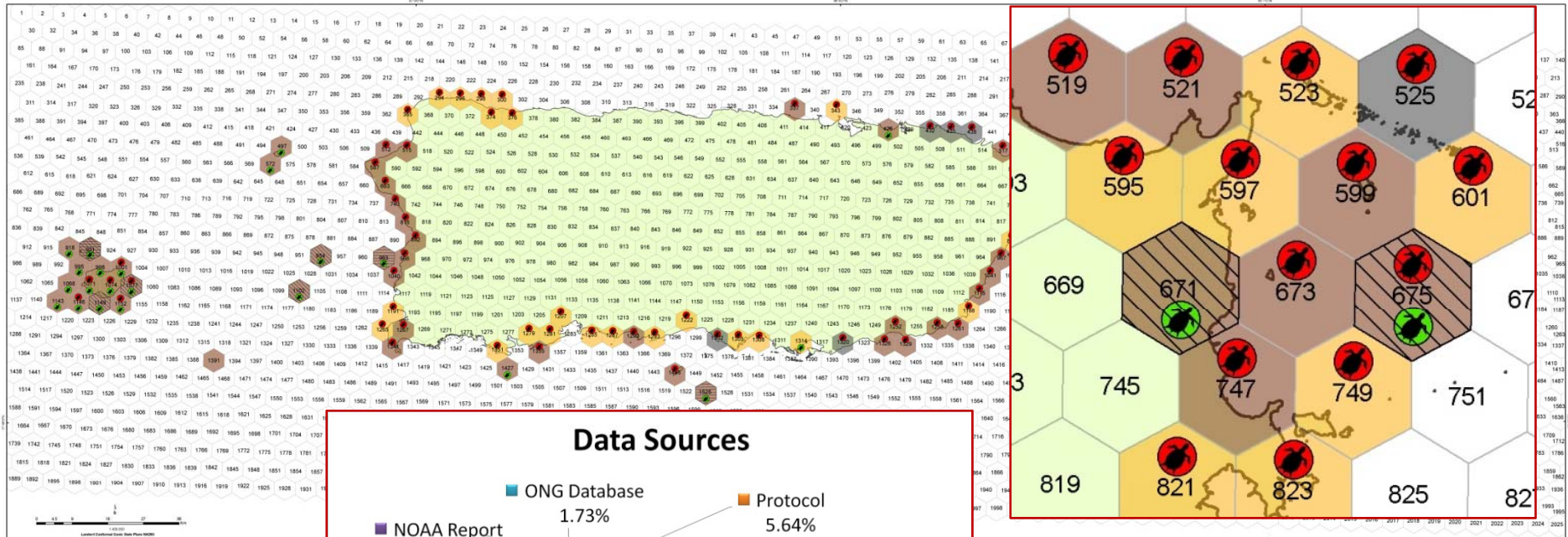
Occurrence status in hexagons which you visit:

Please provide the name of the area: _____

Very Common ☐	4	You see turtles or nests always or most of the time you visit the area.
Common ☐	3	You can see turtles or nests frequently (7 out of 10 times you visit the area)
Rare ☐	2	You see turtles or nests rarely (4 out of 10 times you visit the area)
Very Rare ☐	1	You see turtles or nests sporadically (1 out of 10 times you visit the area)
Absent ☐	0	The species is not actually observed when you visit the area

Feeding Area

Nesting Area

Adult

Juvenile

# Hawksbill - *Eretmochelys imbricata* - Carey

DRAFT July 20, 2011

Nests Abundance Map

The map shows hawksbill nests abundance not yearly or seasonally represented. It is a summary of nests in our database. You can used the information below the map to attribute an abundance number and write it in the hexagon.

nesting area

Nests Abundance

0	3	6	21	80	193	452	564	7652
1	5	7	64	118	301	534	1760
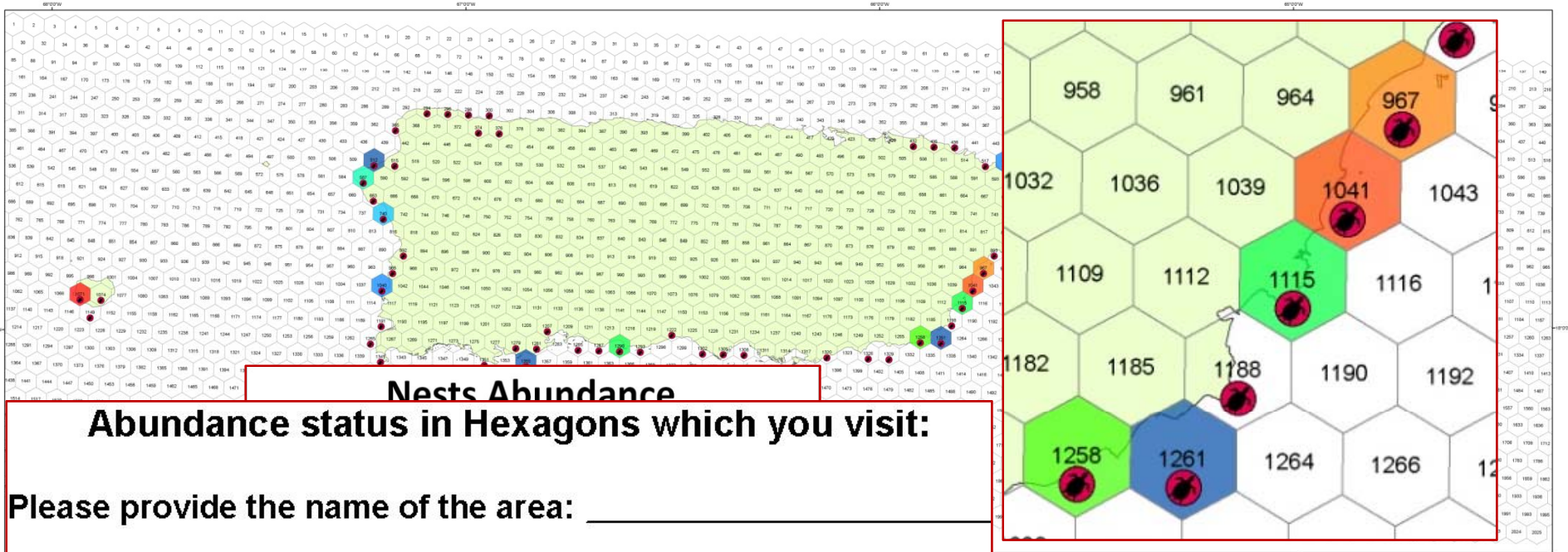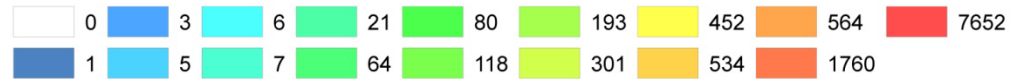
Abundance status in Hexagons which you visit:

Please provide the name of the area: _____

Highly Abundant	4	☐	**51 or more nests per year**
Abundant	3	☐	**26 to 50 nests per year**
Low Abundance	2	☐	**11 to 25 nests per year**
Very Low Abundance	1	☐	**1 to 10 nests per year**
Absent	0	☐	**No nests in the area**

Nests Abundance Sources

- Dow, W. E. and Eckert, K. L. 2007 — 12.13%
- Sea Grant — 10.26%
- DRNA Records — 76.86%
- WIMARC — 0.75%
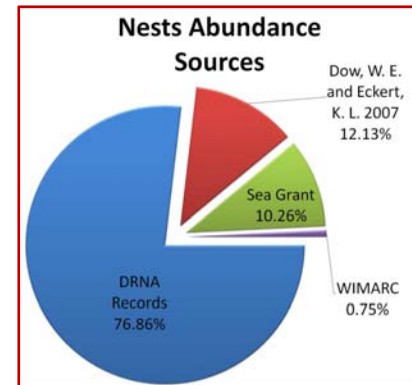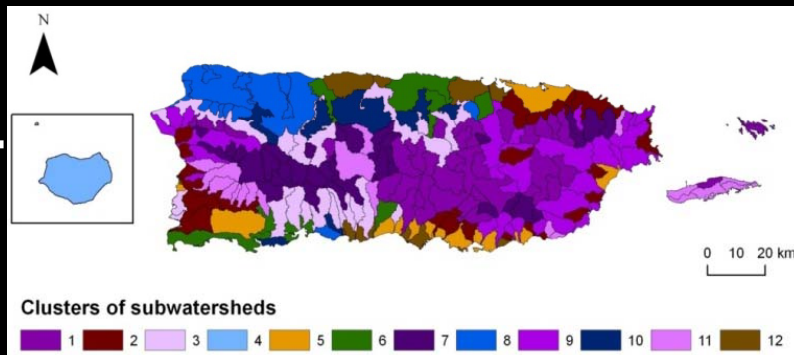
4. Develop geospatial layers of habitat characteristics.

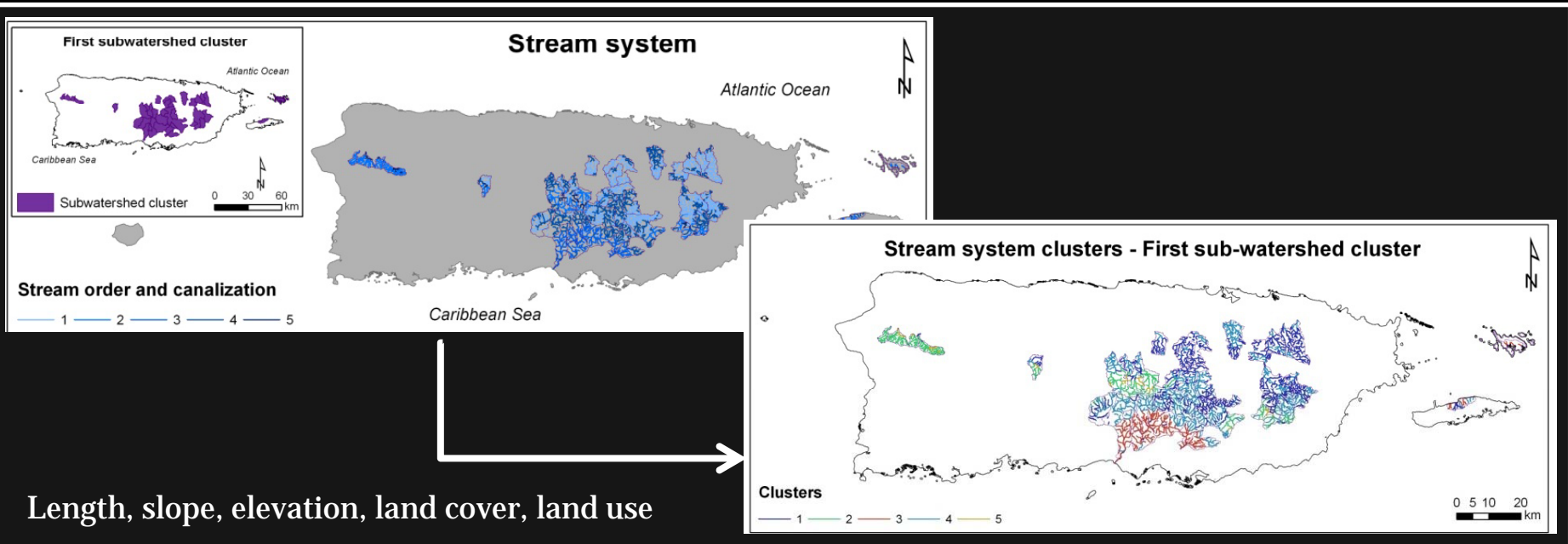## Identification and classification of freshwater habitats

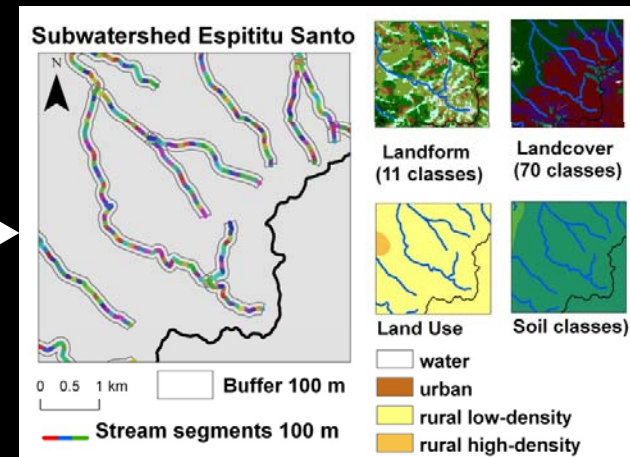**Subwatershed level (100 % completed)**

Stream segment level (1.5% completed)

Climatic, geology and land cover features

Stream system level (31 % Completed)

Length, slope, elevation, land cover, land use

Habitat: Land and seascape features compiled to map potential species habitats
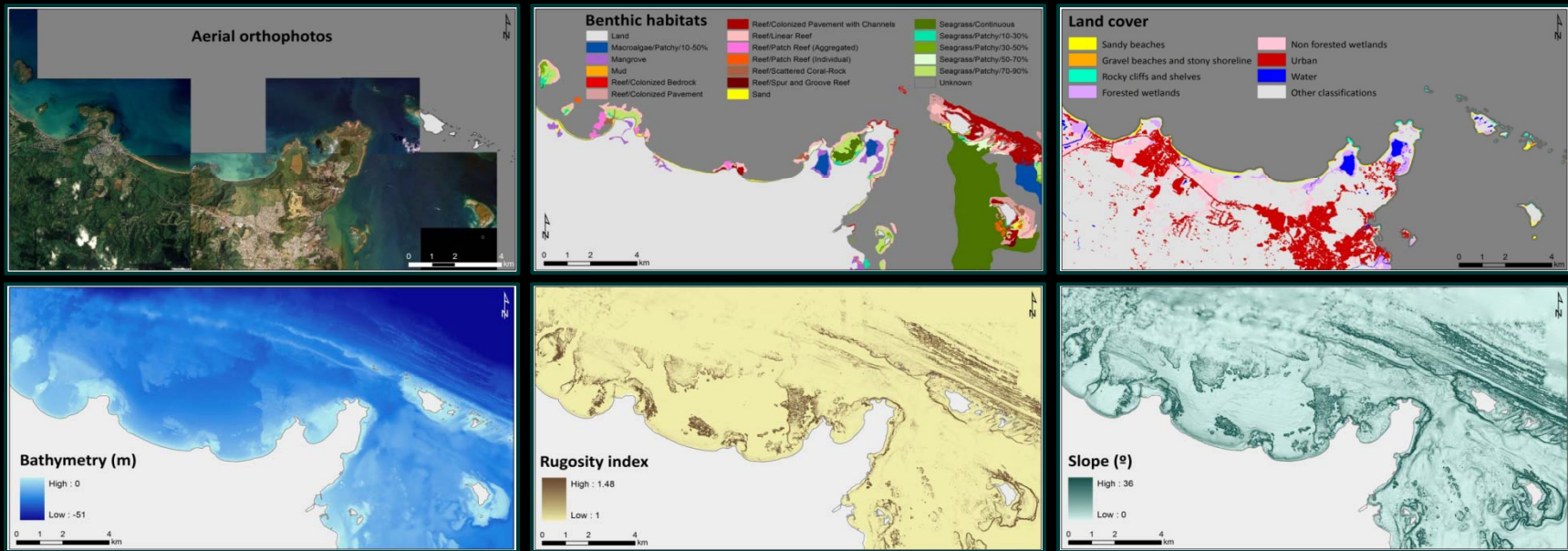
- Compilation of information about coastal and benthic habitats along with bathymetric data and derivate products.

- Geospatial information, e.g. bathymetry, varied in extend and in resolution (from coarse to fine) in pelagic areas covering up 35 miles from the coast line.
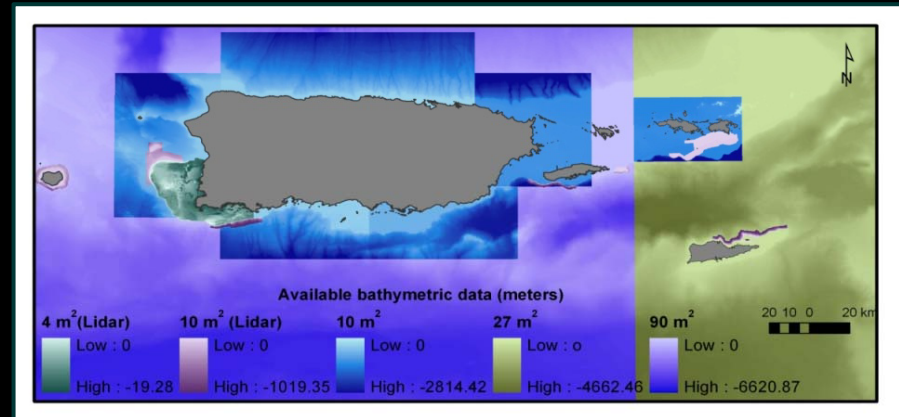
The Aquatic-GAP analysis project for Puerto Rico and the USVI invites to:

Workshop:
Benthic habitat mapping to improve modeling of marine species distribution in the U.S. Caribbean.

Entry by invitation or prior registration. Limited availability

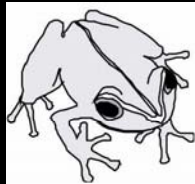Place: Pending
Date: October 18th, 2011
Hour: 9:00 am - 4:00 pm

Contact: Patricia Rincon
mrincondiaz@fs.fed.us
(787)766-5335 Ext: 303

Sponsored by:

KEEPING COMMON SPECIES COMMON

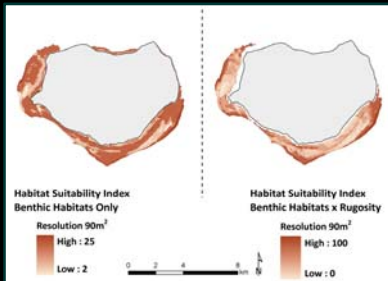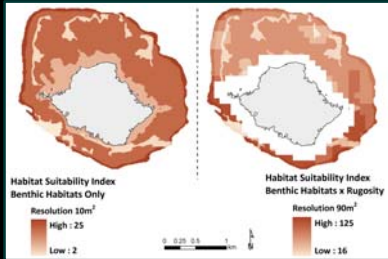DRNA

FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE

INTERNATIONAL INSTITUTE OF TROPICAL FORESTRY

Puerto Rico and US Virgin Islands Integrated Terrestrial-Aquatic Gap Analysis Project

5. Species habitat modeling.

Juveniles hawksbill sea turtle

Habitat Suitability Index

10m² Resolution

High : 100

Low : 0
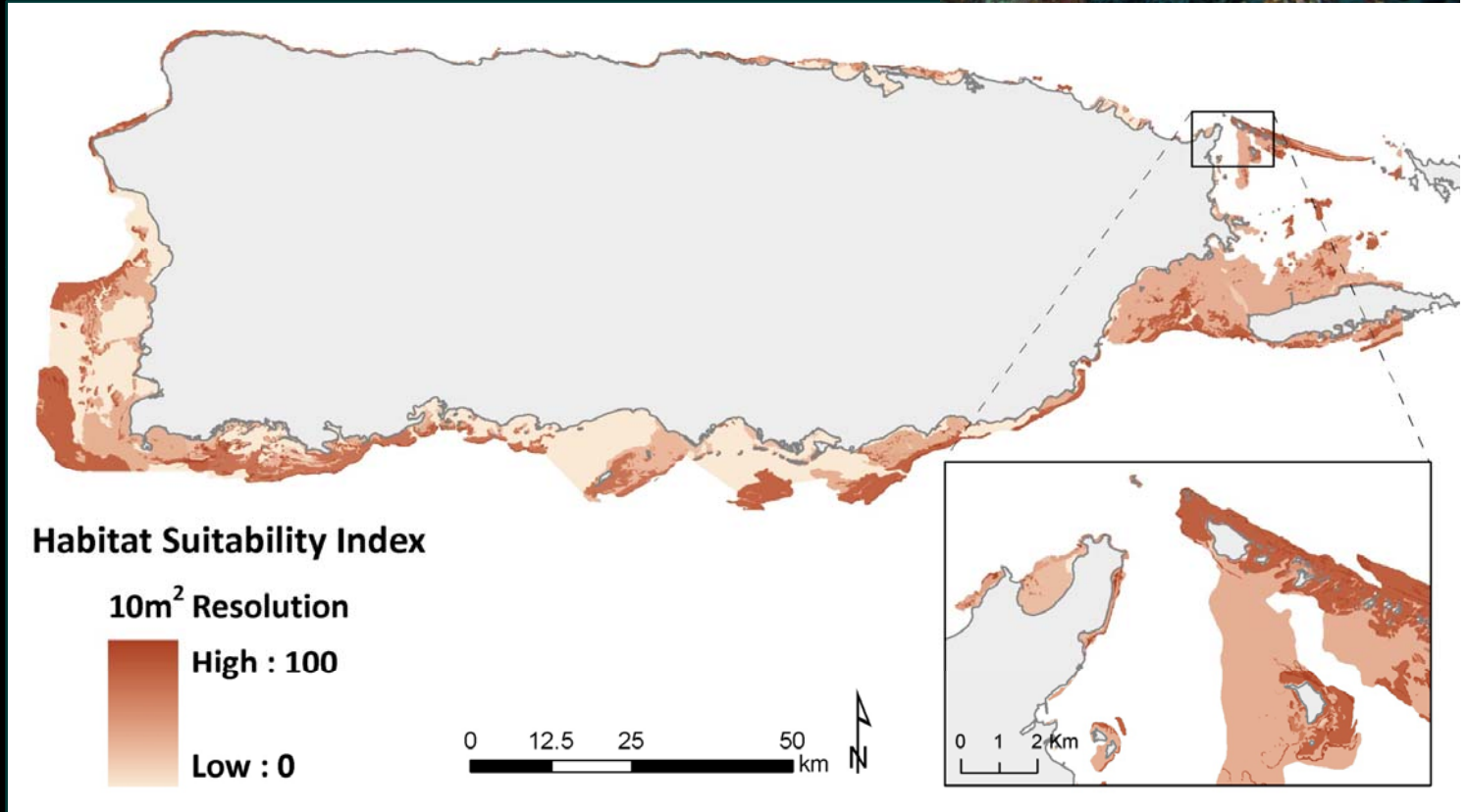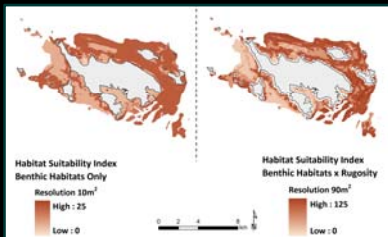
[Structure (*value*)] x [Zone (*value*)] x [Rugosity (*value*)] = Suitability of habitat

[Linear reef (*5*)] x [Back reef (*5*)] x [Rugosity (*5*)] = *125* i.e. suitable habitat;
[Mud (*0*)] x [Dredged (*1*)] x [Rugosity (*1*)] = *0* i.e. unsuitable habitat.

6. Compile information on protected areas.

Protected Natural Areas of Puerto Rico (Gould et al. 2011)

Áreas protegidas por administrador

Now:

A systematic assessment of the effectiveness of existing protected areas in the Caribbean is necessary to evaluate their current role for meeting biodiversity targets.

By using the Puerto Rico Gap Analysis database, we will assess the extent and management effectiveness of terrestrial protected areas in order to address their role for biodiversity conservation in the island.

Thank you!

We are looking and need more collaborators and reviewers!
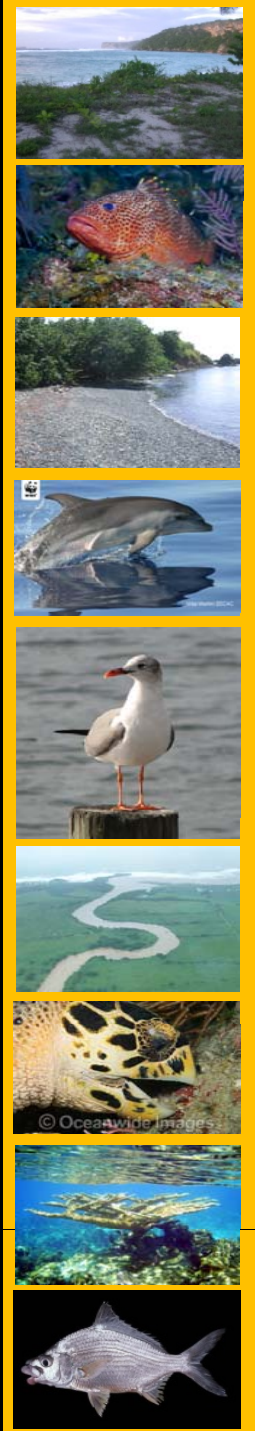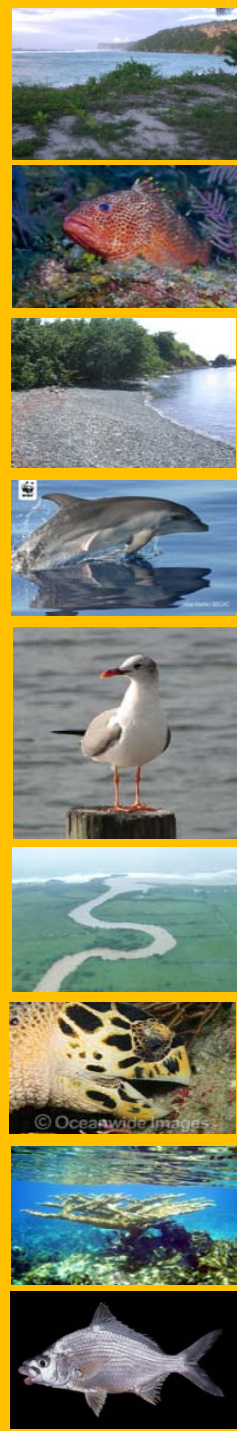
Integrated Gap Analysis Project

¿PREGUNTAS?

IITF GIS and Remote Sensing Laboratory

Center for Tropical Landscape Analyses

Areas for collaboration

- Habitat characterization:
    Benthic habitats: extent, accuracy, live cover
    Improving terrestrial/marine interface
- Species natural history reports – author and review
- Occurrence data
- Review occurrence maps, habitat models, habitat distributions
- Related projects, data analyses
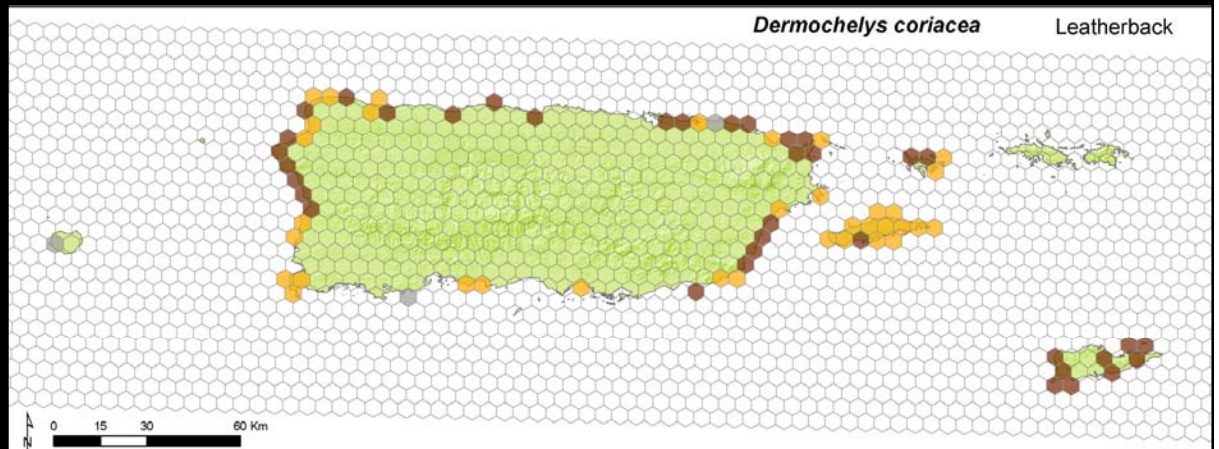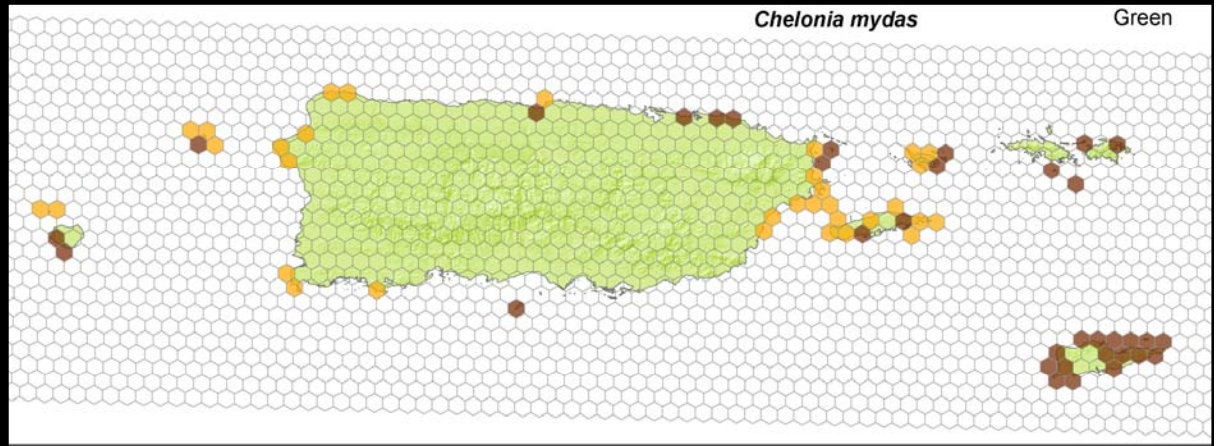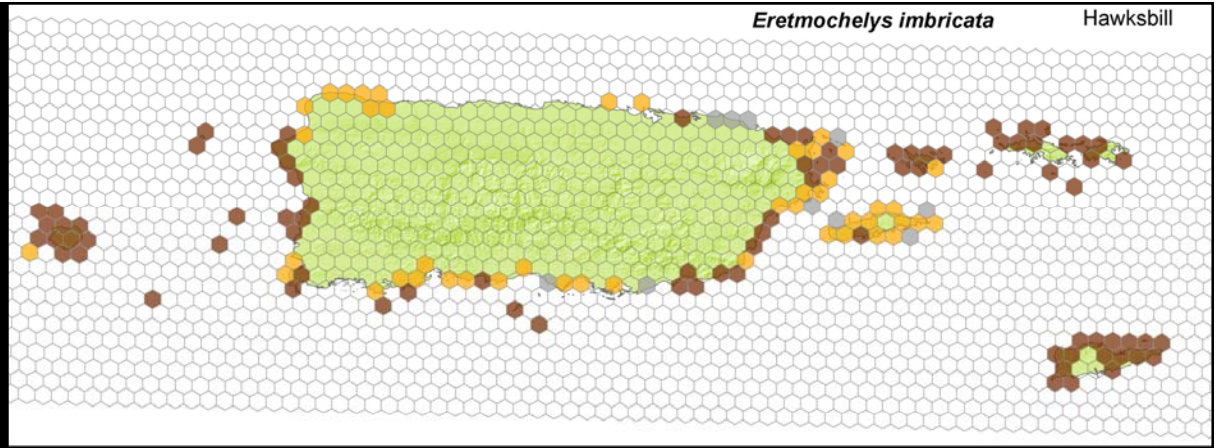- Information on management areas, regulation affecting conservation
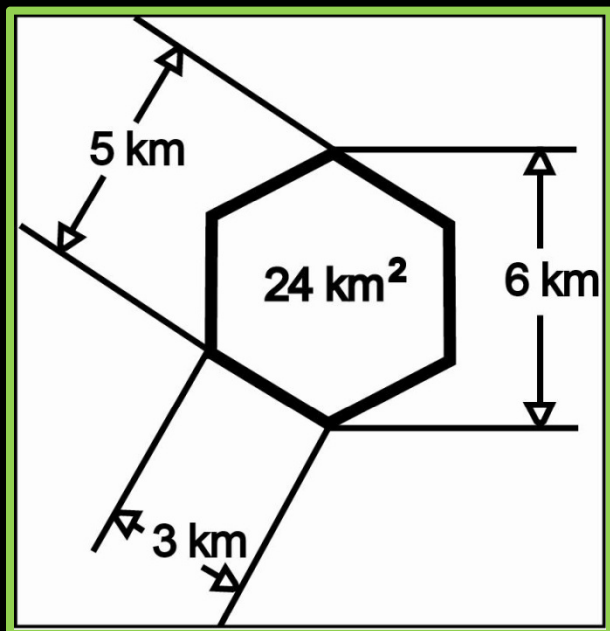
© MarylKayoe

© Pril Fish

© crazycreatures.org

Rincón-Díaz et al. 2011

Eretmochelys imbricata — Hawksbill

Chelonia mydas — Green

Dermochelys coriacea — Leatherback

0   15   30   60 Km

Confirmed: Confidently assumed or known to occur in the hexagon. Sources include species locality records and expert opinion.

Probable: Probable occurrence based on a strong likelihood. Sources include expert opinion and/or published range maps or range descriptions.

Historical: Confidently assumed or known to have occurred in the hexagon prior to 1989 and considered as valid for recent distribution. Source include species locality records and expert opinion.

No Data: Considered absent from hexagon based on no documented records of occurrence and expert opinion. Sources include locality records and expert opinion.
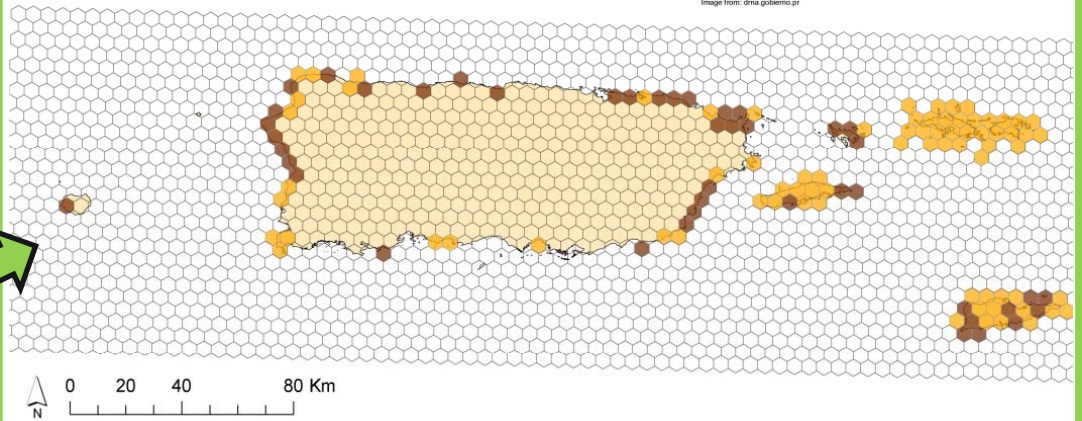
Leatherback Sea Turtle

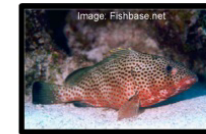*Dermochelys coriacea*   Tinglar
Family Dermochelyidae

Image from: drna.gobierno.pr

Legend
- Probable
- Confirmed
- No Data

0   20   40   80 Km
N

Red Hind   Mero cabrilla

Epinephelus guttatus
Family Serranidae

Image: Fishbase.net

Legend
- Probable
- Confirmed
- No Data

0   20   40   80 Km
N

5 km

24 km²

6 km

3 km