How much do reefs really matter to Hawksbill turtles?

Lucy Hawkes
Jesus Tomas
Yolanda Leon
Ohiana Revuelta
Annette Broderick
Marianne Fish
Toni Raga
Matthew Witt
Brendan Godley

Outline

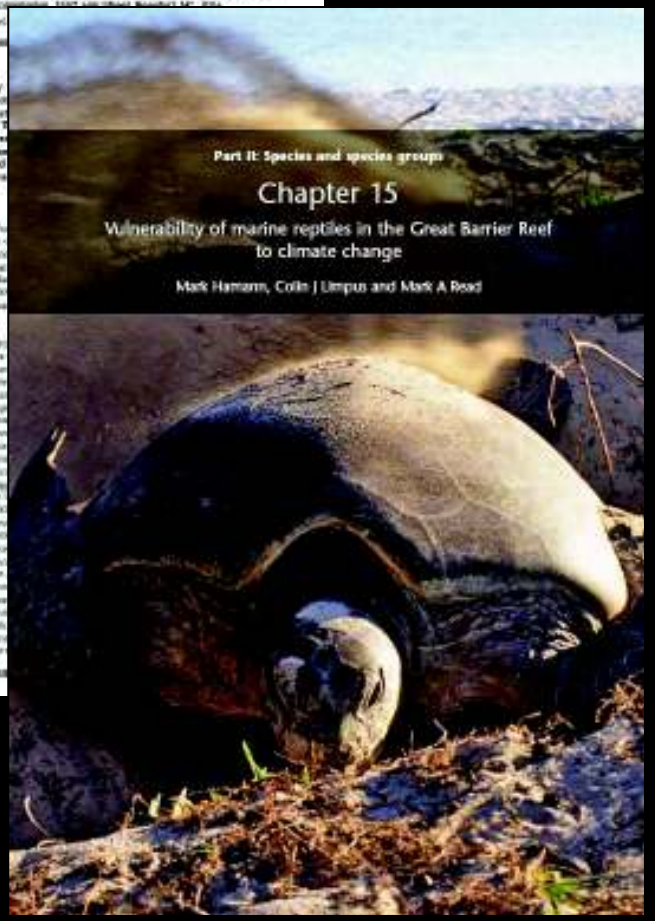
- home range size
- depth preferences
- legislation / protection
- reefs

Climate change and marine turtles...

Predicting the impacts of climate change on a globally distributed species: the case of the loggerhead turtle

REVIEW

Climate change and marine turtles



Part II: Species and species groups

Chapter 15

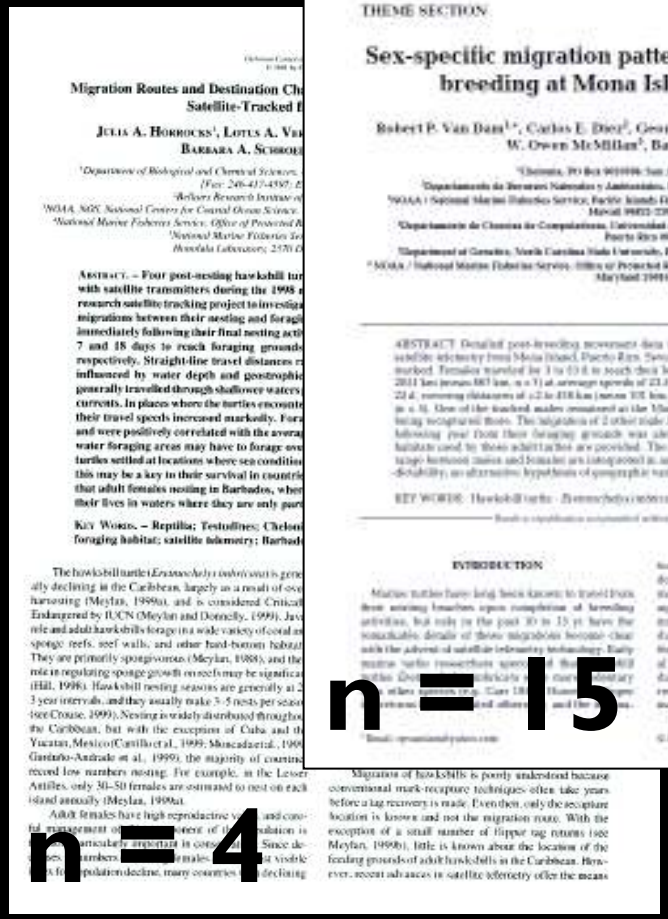
Vulnerability of marine reptiles in the Great Barrier Reef to climate change

Mark Hamann, Colin J Limpus and Mark A Read

Methods

n = 10

Methods



Migration Routes and Destination Ch
Satellite-Tracked

JULIA A. HORROCKS[1], LOTUS A. VA
BARBARA A. SCHROE

[1]Department of Biological and Chemical Sciences,
[Fax: 246-417-4357;
[2]Bellairs Research Institute o
[3]NOAA, NOS, National Centers for Coastal Ocean Science,
[4]National Marine Fisheries Service, Office of Protected R
[5]National Marine Fisheries Se
Honolulu Laboratory, 2570 D

ABSTRACT. – Four post-nesting hawksbill tur
with satellite transmitters during the 1998
research satellite tracking project to investig
migrations between their nesting and foragi
immediately following their final nesting acti
7 and 18 days to reach foraging grounds
respectively. Straight-line travel distances r
influenced by water depth and geostrophic
generally travelled through shallower waters
currents. In places where the turtles encounte
their travel speeds increased markedly. Fora
and were positively correlated with the avera
water foraging areas may have to forage ov
turtles settled at locations where sea conditio
this may be a key to their survival in countri
that adult females nesting in Barbados, whe
their lives in waters where they are only part

KEY WORDS. – Reptilia; Testudines; Chelon
foraging habitat; satellite telemetry; Barbad

The hawksbill turtle (*Eretmochelys imbricata*) is glo
ally declining in the Caribbean, largely as a result of ov
harvesting (Meylan, 1999a), and is considered Critical
Endangered by IUCN (Meylan and Donnelly, 1999). Juv
nile and adult hawksbills forage in a wide variety of coral r
sponge reefs, reef walls, and other hard-bottom habitat
They are primarily spongivorous (Meylan, 1988), and the
role in regulating sponge growth on reefs may be significa
(Hill, 1998). Hawksbill nesting seasons are generally at 2
3 year intervals...and they usually make 3–5 nests per seas
(see Crouse, 1999). Nesting is widely distributed throughou
the Caribbean, but with the exception of Cuba and th
Yucatan, Mexico (Carrillo et al., 1999; Moncada et al., 199
Garduño-Andrade et al., 1999), the majority of countri
record low numbers nesting. For example, in the Lesser
Antilles, only 30–50 females are estimated to nest on each
island annually (Meylan, 1999a).

Adult females have high reproductive v
ful management of
particularly important in cons
pecies. Since de
numbers
females
visible
n fo
population decline, many countries
declining

THEME SECTION

Sex-specific migration patterns of haw
breeding at Mona Island, Puert

Robert P. Van Dam[1,*], Carlos E. Diez[2], George H. Balazs[3], L
W. Owen McMillan[5], Barbara Schroeder[

[1]Chemistry, PO Box 9019598, San Juan, Puerto Rico 00902
[2]Departamento de Recursos Naturales y Ambientales, PO Box 1801
[3]NOAA / National Marine Fisheries Service, Pacific Islands Fisheries Science Center,
Hawaii 96822-2396, USA
[4]Departamento de Ciencias de Computadoras, Universidad de Puerto Rico en Aguad
Puerto Rico 00631
[5]Department of Genetics, North Carolina State University, PO Box 7614, Raleigh, No
[*]NOAA / National Marine Fisheries Service, Office of Protected Resources F/PR3, 1315 E
Maryland 20910, USA

ABSTRACT: Detailed post-breeding movement data is presented for hawksb
satellite telemetry from Mona Island, Puerto Rico. Seven nesting females and
marked. Females traveled for 3 to 13 d to reach their foraging grounds, swim
2011 km (mean 887 km, n = 7) at average speeds of 23.3 to 30.7 km d[-1] (n = 7).
22 d, covering distances of ≥2 to 458 km (mean 105 km, n = 6) at average spee
(n = 3). One of the tracked males remained at the Mona Island breeding gro
being recaptured there. The migrations of 2 other male hawksbill turtles were
following year from their foraging grounds was also documented. Hawksb
habitats used by these adult turtles are provided. The significant differences
range between males and females are interpreted as an oceanic current
–dichotomy, an alternative hypothesis of sex-specific variables is normally rule

KEY WORDS: Hawksbill turtle · *Eretmochelys imbricata* · Migration · Mona

Resale or republication not permitted without written consent of the publi

INTRODUCTION

Marine turtles have long been known to travel from
their nesting beaches upon completion of breeding
activities, but only in the past 10 to 15 yr have the
remarkable details of these migrations become clear
with the advent of satellite telemetry technology. Early
marine turtle researchers speculated that
Ehrenfeld & Carr 1967, Hasbrouck & Carr 1989)
tracked with post-breeding
Carr et al. 1966) revealed that few foraging
males returned every

© Inter-Research 2008 · www

Migration of hawksbill turtles (*Eretmochelys imbricata*) breeding at Mona Island, Puerto Rico, is poorly understood because conventional mark-recapture techniques often take years before a tag recovery is made. Even then, only the recapture location is known and not the migration route. With the exception of a small number of flipper tag returns (see Meylan, 1999b), little is known about the location of the feeding grounds of adult hawksbills in the Caribbean. However, recent advances in satellite telemetry offer the means

Migration of hawksbill turtles *Eretm*
Tortuguero, Costa Rica

Sebastian Troeng, Peter H. Dutton and Daniel Evans

The hawksbill turtle *Eretmochelys imbricata* is a species with a circumglobal tropical distribution including 180 countries and territories (Mast 2000). The hawksbill turtle feeds primarily on several species of marine sponges and cnidarians (Meylan 1988, Leon and Bjorndal 2002). It fills an important ecological role in the coral reef ecosystem by influencing community diversity and structure through selective feeding, reducing the cover of certain species of sponge and cnidarians and lowering their species' ability to outcompete other reef organisms (Leon and Bjorndal 2002).

Humans have captured hawksbill turtles for centuries for meat, eggs and as manufacturers for keratinous carapace plates into tortoiseshell items (Parsons 1972,

Vol. 10: 121–133 | ENDANGERED SPECIES RESEARCH | Published online October 28, 2009

Contribution to the Theme Section 'Belogging technologies: new tools for conservation'

OPEN ACCESS

Post-nesting migratory movements of hawksbill turtles *Eretmochelys imbricata* in waters adjacent to the Yucatan Peninsula, Mexico

Eduardo Cuevas[1,*], F. Alberto Abreu-Grobois[2], Vicente Guzman-Hernandez[3], M. A. Liceaga-Correa[1], Robert P. van Dam[4]

[1]CINVESTAV-IPN, Km. 6 Antiguo Camino a Progreso, A. P. 73 Cordemex, C. P. 97320, Mérida, Yucatán, México
[2]Unidad Académica Mazatlán, Instituto de Ciencias del Mar y Limnología, UNAM, Calle Joel Montes Camarena s/n, C.P. 82320, Mazatlán, Sinaloa, México
[3]Área de Protección de Flora y Fauna Laguna de Términos, Comisión Nacional de Áreas Naturales Protegidas, Av. Adolfo López Mateos, Prolongación Playa Norte, C. P. 24180, Ciudad del Carmen, Campeche, México
[4]Chelonia Inc., PO Box 902709, San Juan, Puerto Rico 00902-4709, USA

ABSTRACT: The Yucatan Peninsula harbors the largest nesting population of hawksbill turtle *Eretmochelys imbricata* in the Atlantic Basin. In Mexico, one of the most significant conservation problems for this species is the lack of knowledge on migratory pathways and the location of feeding grounds for post-nesting hawksbill females. The main goal of this study was to gather information on the hawksbill's migratory patterns and the location of their feeding grounds by tracking 5 post-nesting females from Campeche state, Mexico. We attached satellite transmitters and tracked the 3 turtles for 196, 446 and 130 d, respectively. The turtles remained within Mexican territorial waters, reaching separate foraging grounds off the coast of Campeche and in the Mexican Caribbean. No significant relationships were observed between turtles' migrating behavior and sea surface temperature or geostrophic current. Spatial analysis of the data recorded in this study has generated novel information on hawksbill turtle migratory patterns and feeding grounds, which will aid in decision-making for hawksbill turtle conservation in the Yucatan Peninsula.

KEY WORDS: Hawksbill turtle · Yucatan Peninsula · Migration · Post-nesting

Resale or republication not permitted without written consent of the publisher

INTRODUCTION

The hawksbill turtle *Eretmochelys imbricata*, like other sea turtles, has a complex life cycle that makes use of various terrestrial and marine habitats, including beaches, shallow coastal waters, coral reefs and oceanic waters. These turtles are also long-lived, taking decades to reach sexual maturity. Together, this spatial and temporal complexity exposes them to increasing anthropogenic threats on critical nesting, feeding, mating and resting habitats, rendering them highly vulnerable to extinction. Particularly as a result

*Email: acuevas@mda.cinvestav.mx

of unsustainable exploitation for food and tortoiseshell, this pan-tropical species is listed globally as critically endangered on the International Union for Conservation of Nature Red List (IUCN 2003) and legally protected by various international (Convention on International Trade in Endangered Species of Wild Flora and Fauna, Protocol of Specially Protected Areas and Wildlife of the Wider Caribbean Region, Inter-American Convention for the Protection and Conservation of Sea Turtles) and national legislations. Endangered Species Act [illegible]-NOAA, NOS [illegible]-AT-010-3[illegible] in Mexico)

© Inter-Research 2009 · www.int-res.com

n = 15

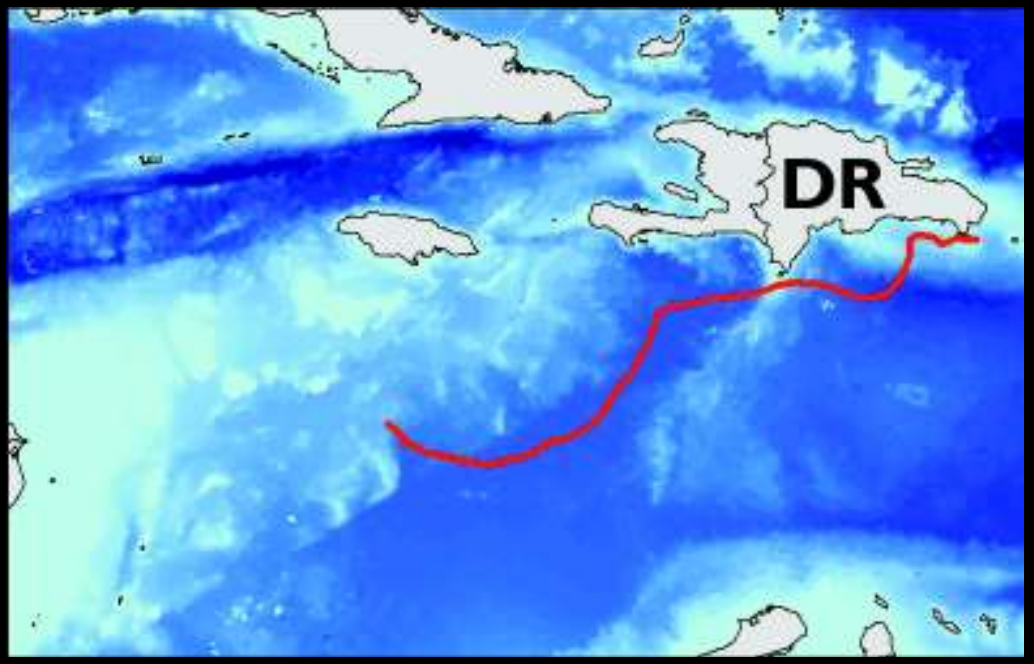
n = 3

n = 4

n = 2

Methods

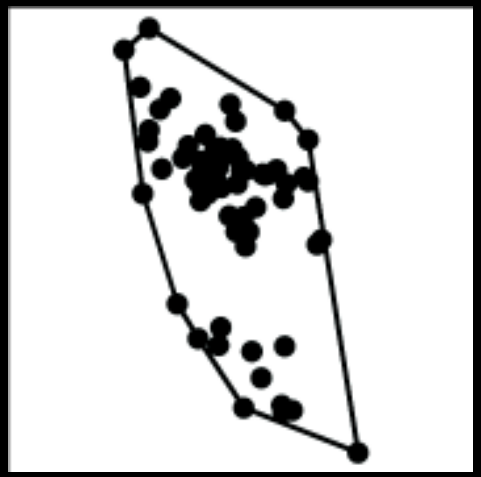
n=21

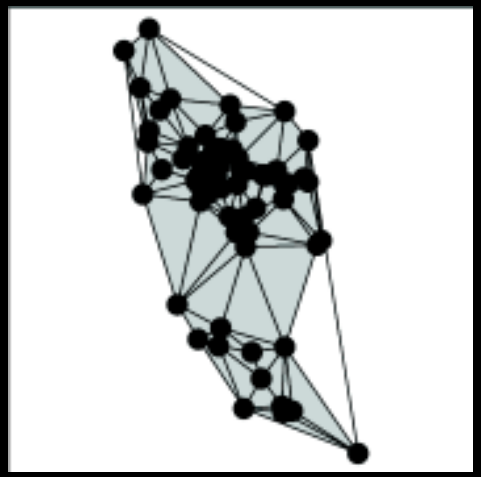


n=13

Methods

- **Home ranges**
  - **MCPs**
  - **α-hulls**

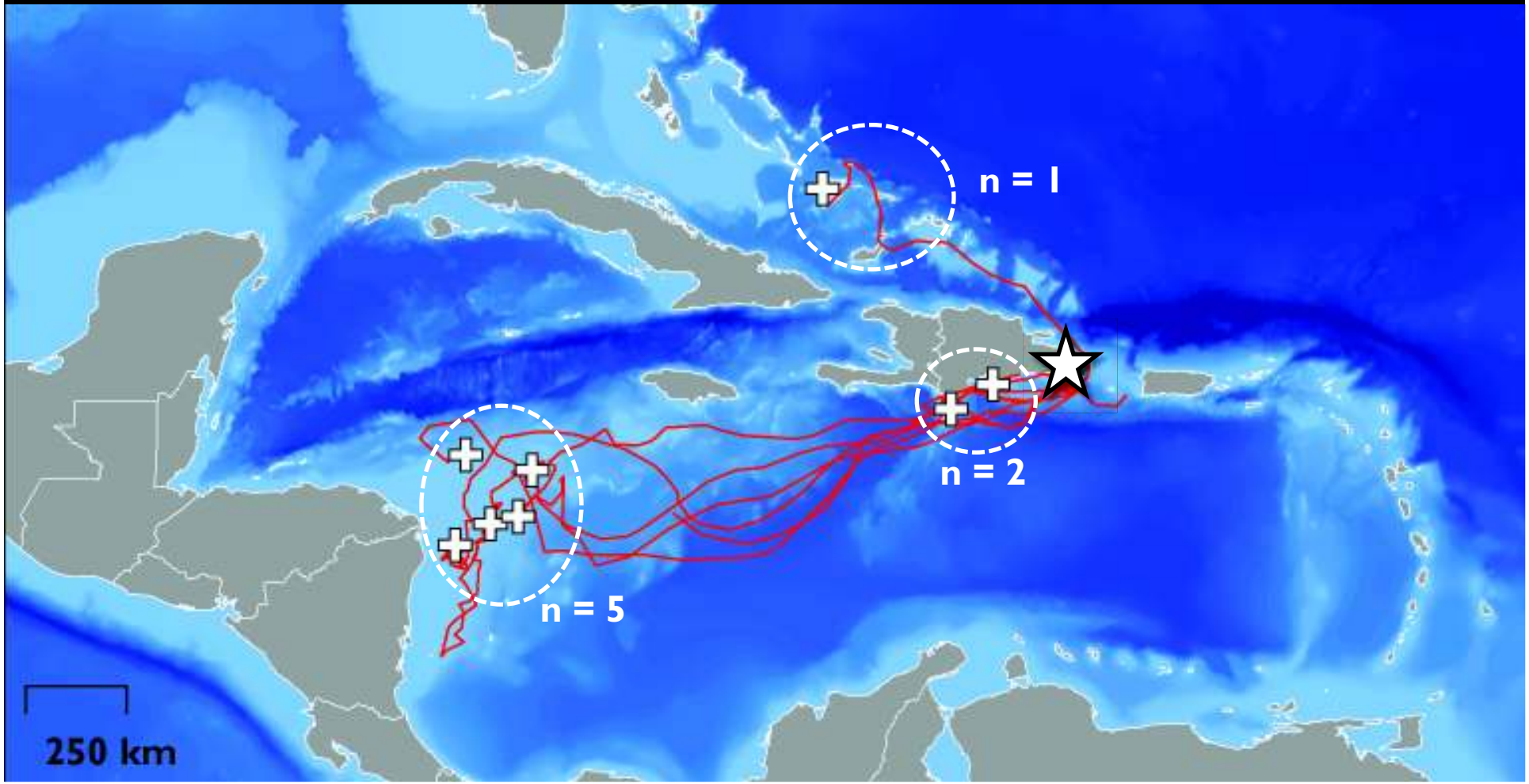




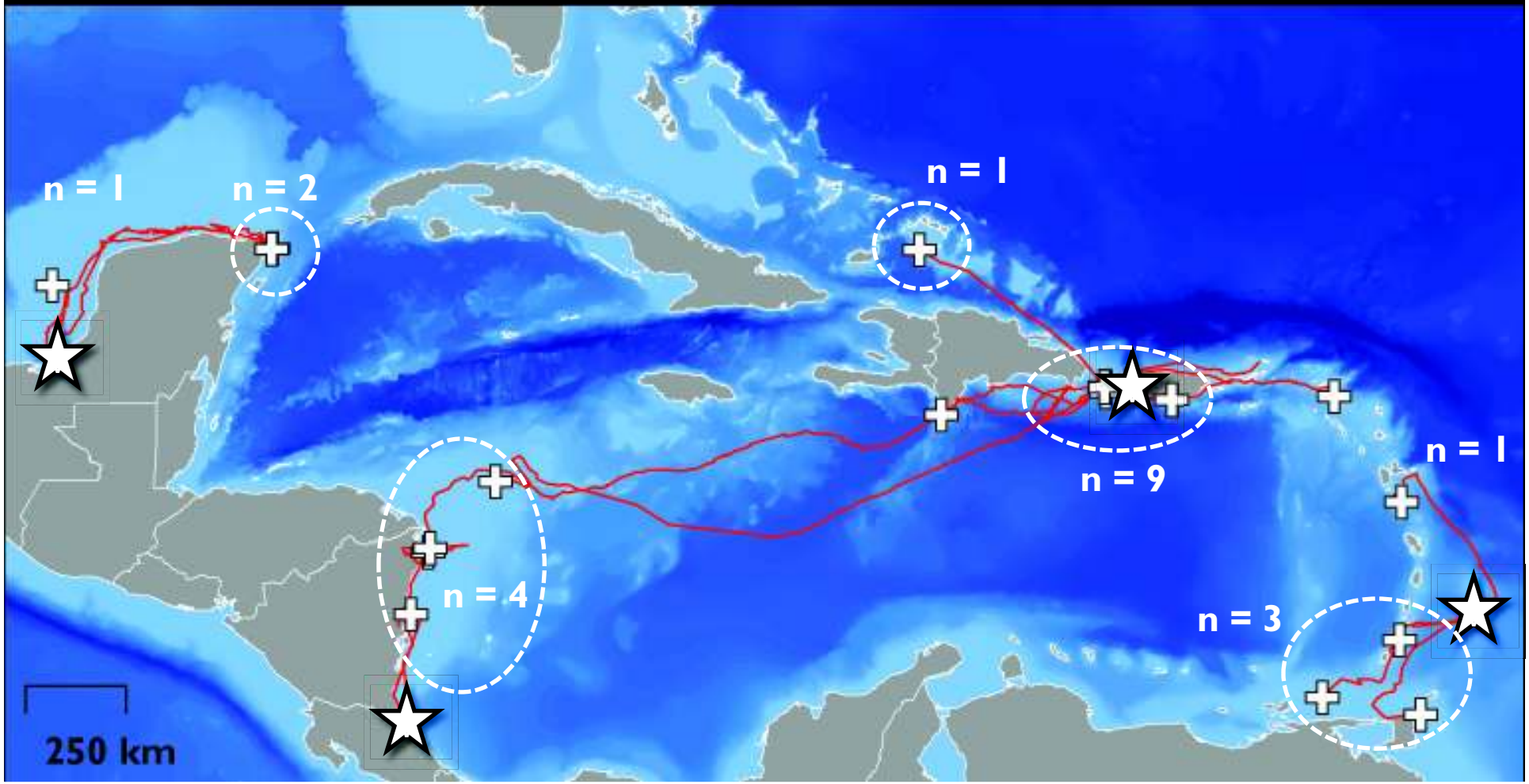
Methods

- depth
- national jurisdictions
- MPAs
- coral reefs

Results – DR tracking

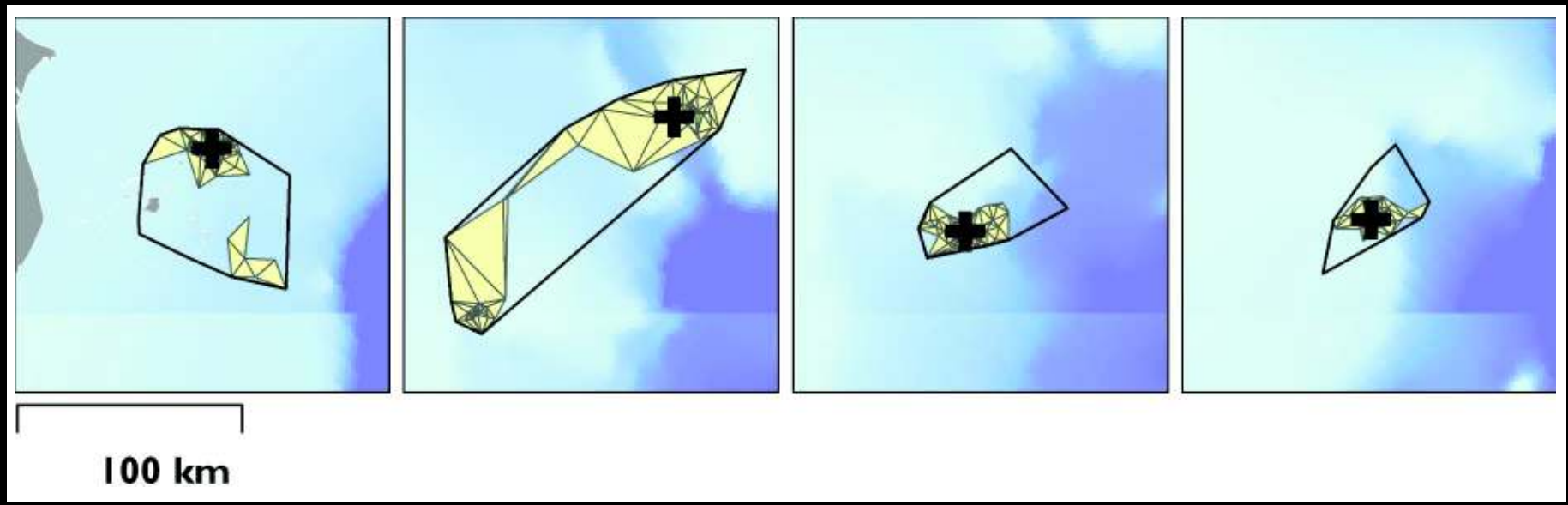


Results – previously published



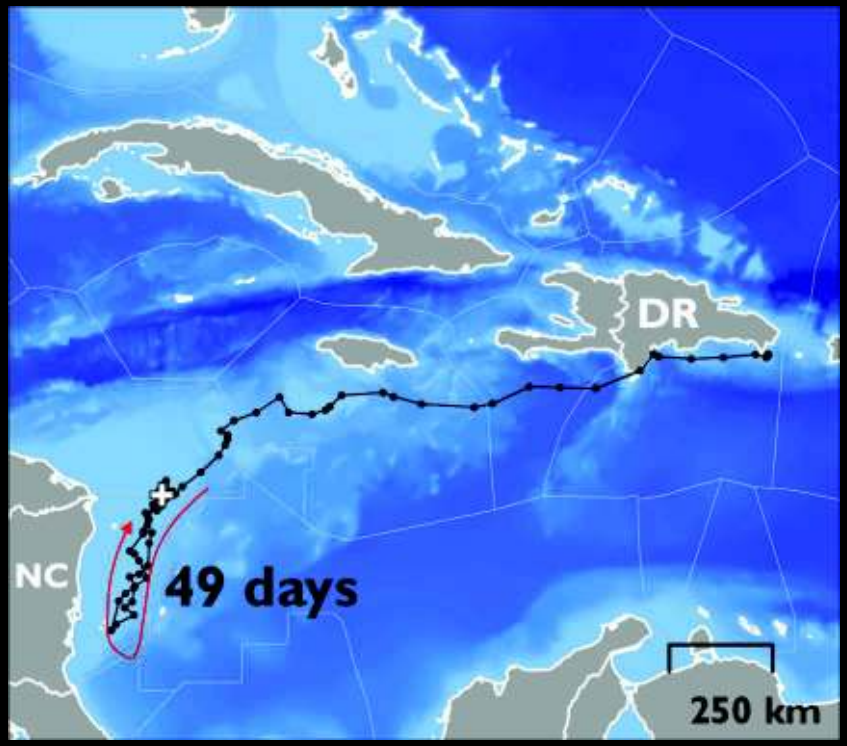
Results

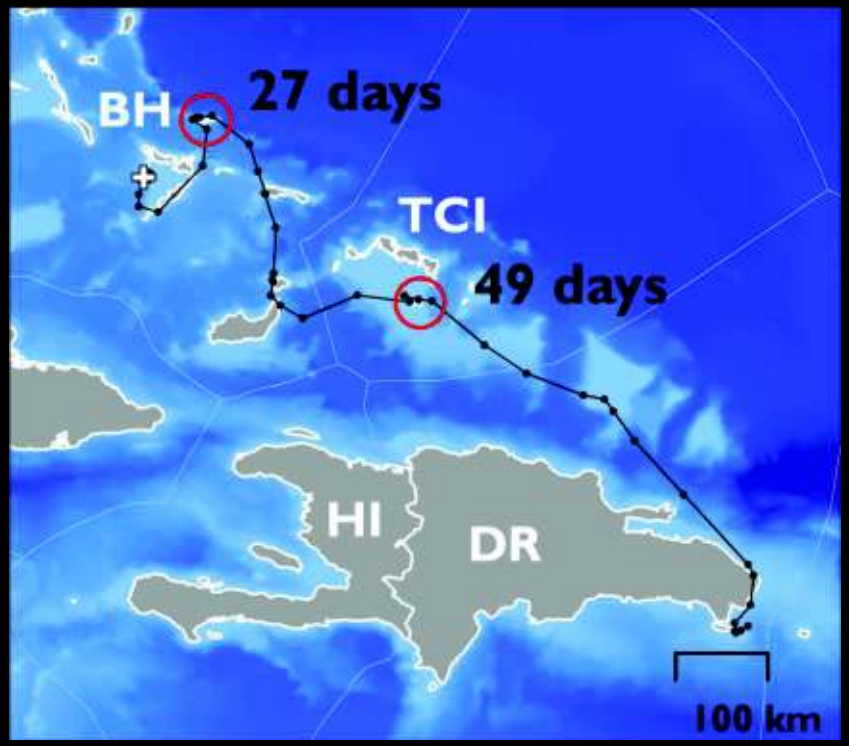
- foraging hawksbills (n = 13)
  median 480 km^2 (IQR 104 – 1,328)



Results

- **Plasticity**

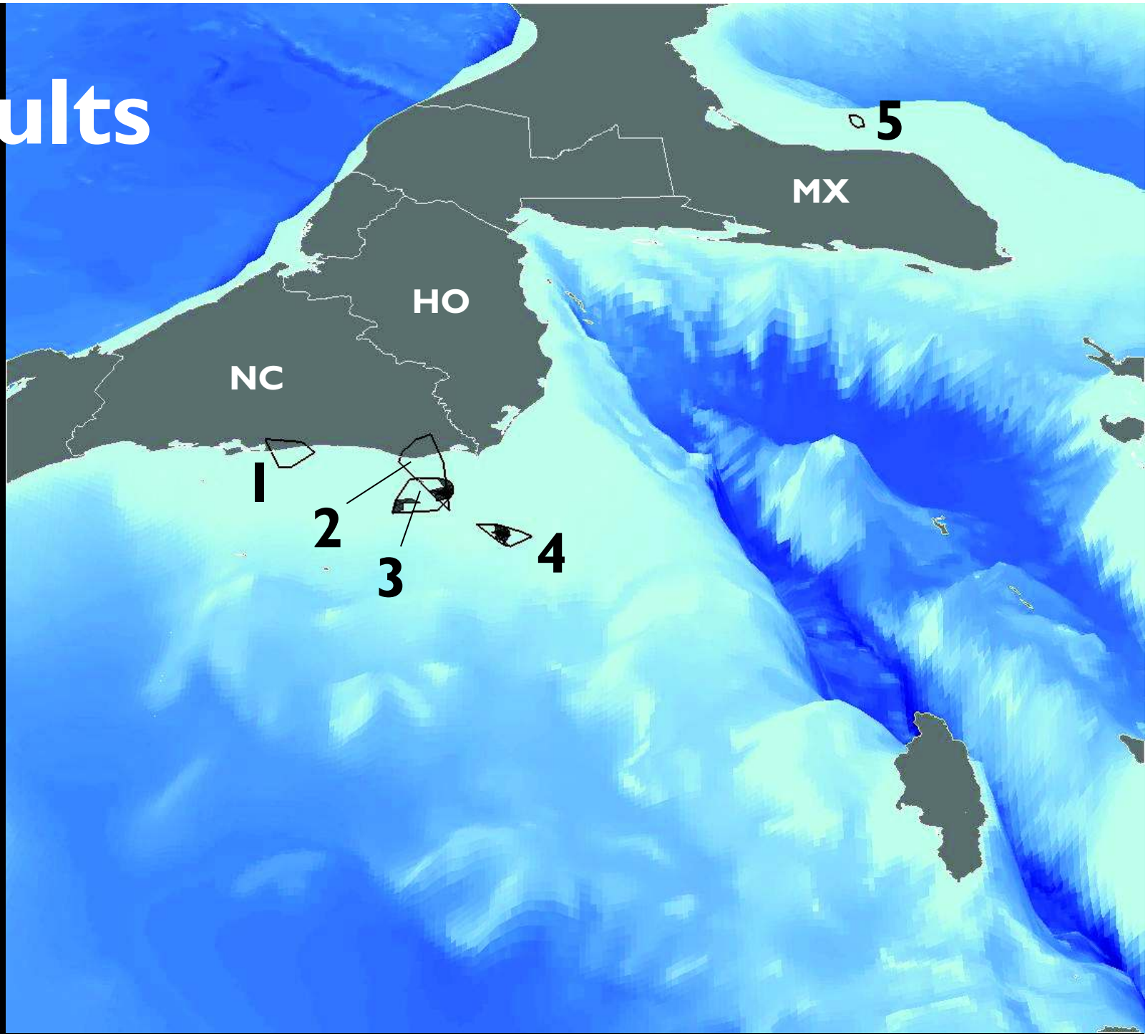




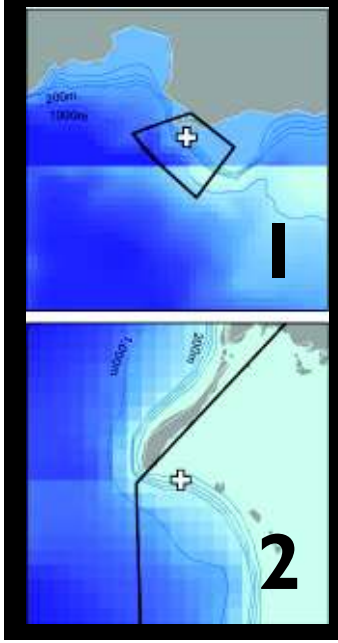
Results

- **Median depth per home range (for all pts)**
  - **66.5m (median, range 3 - 217)**
- **3 types: shallow / wall / deep**

Results



Results



FL

CU

JM

2

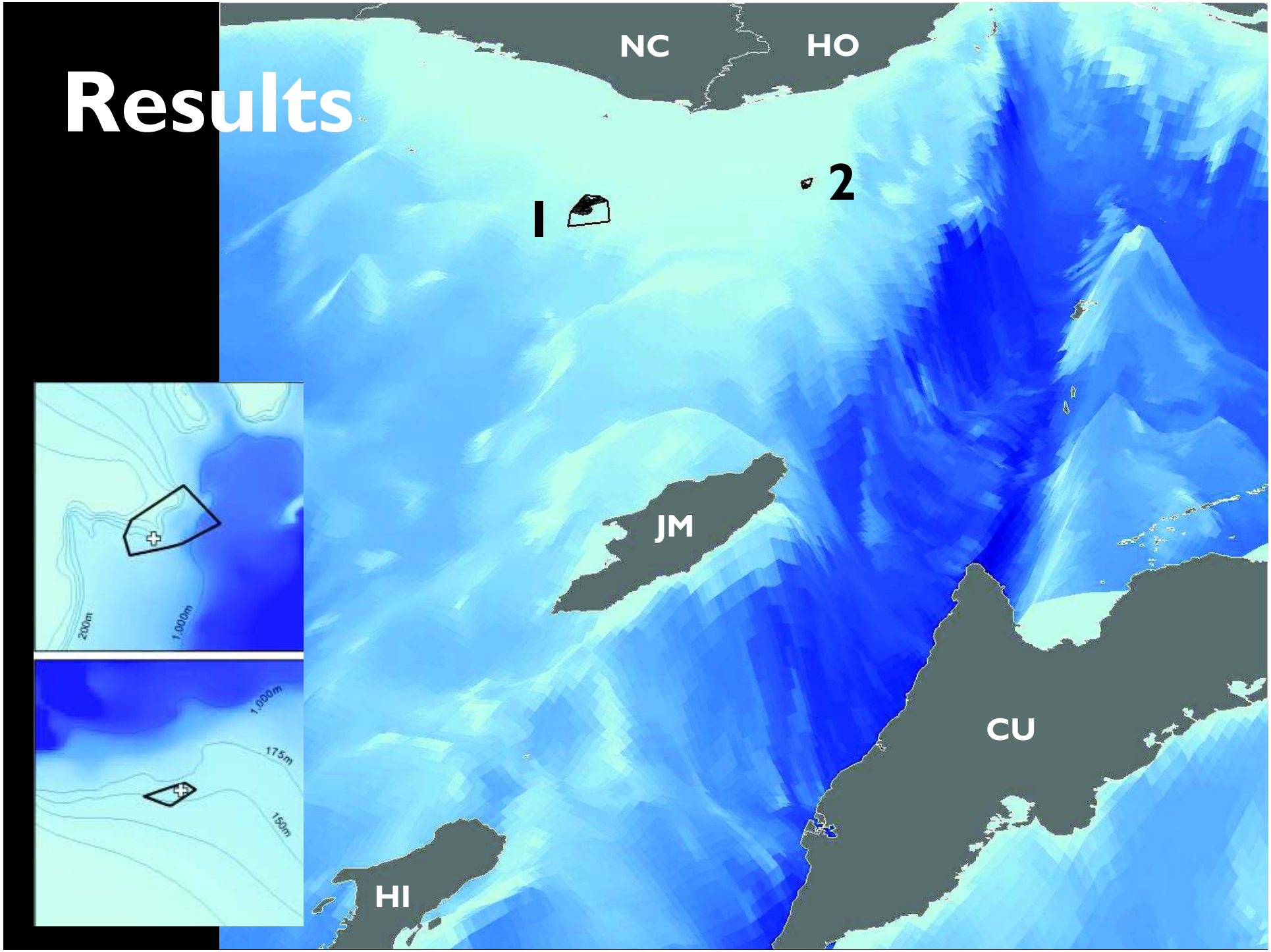
HI

DR

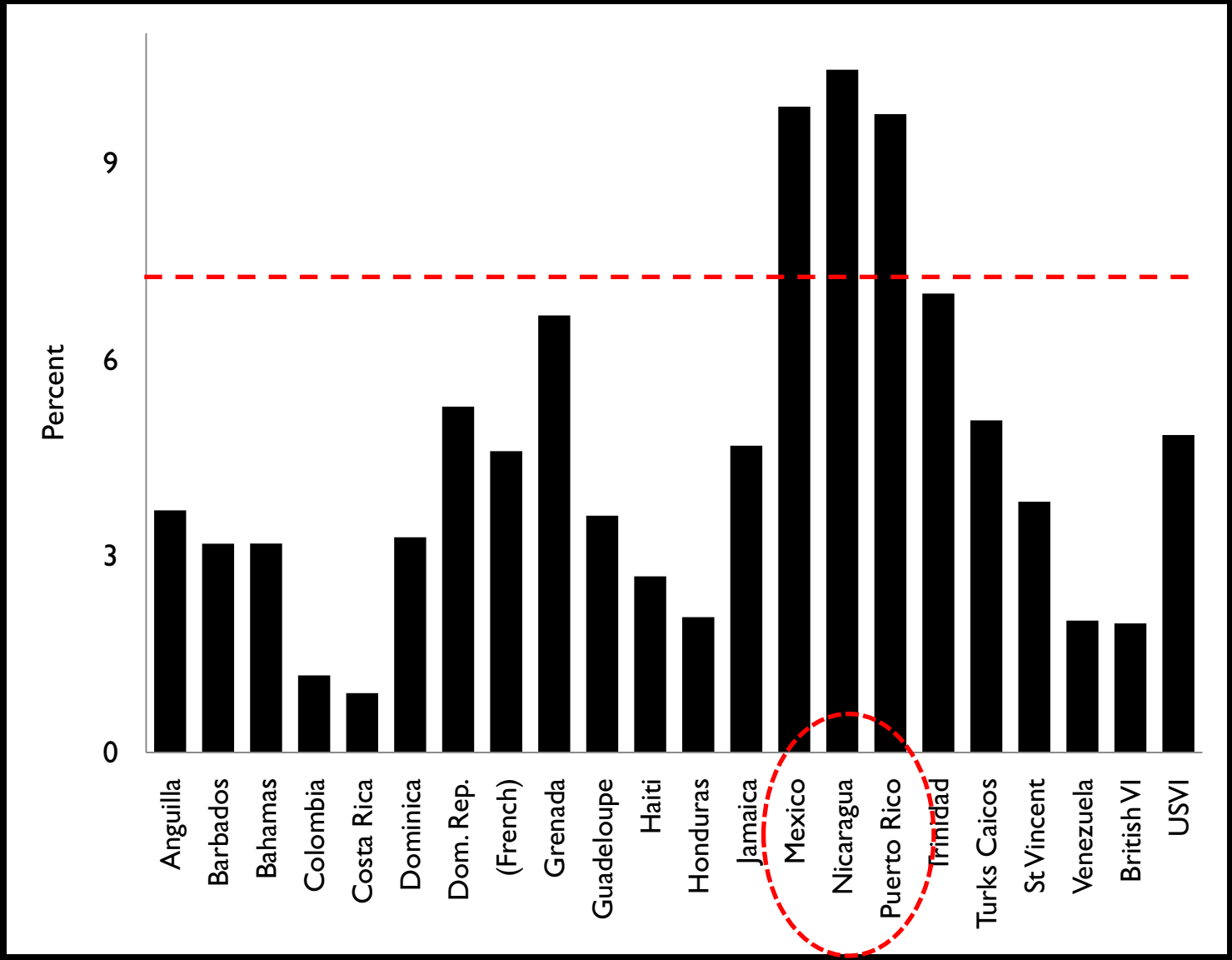
1

PR

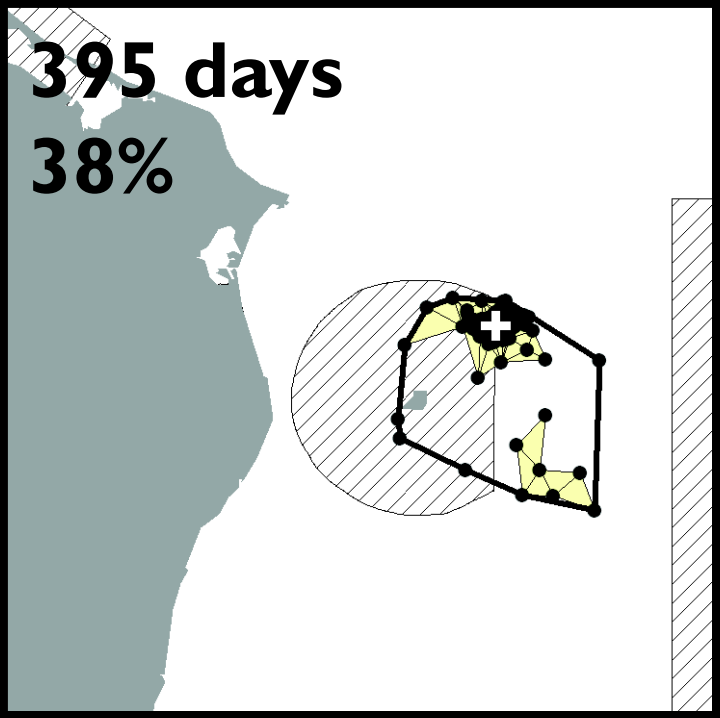
Results

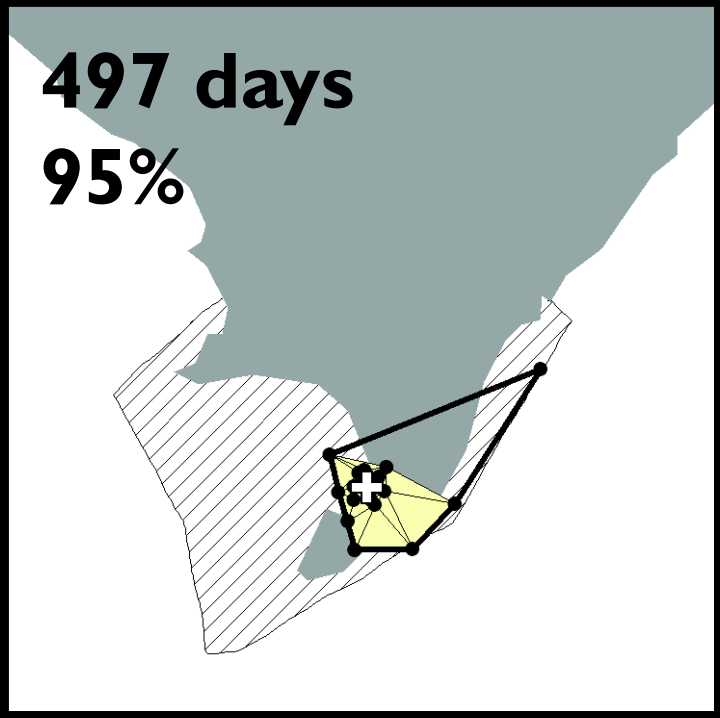


Results – by country (n=34)



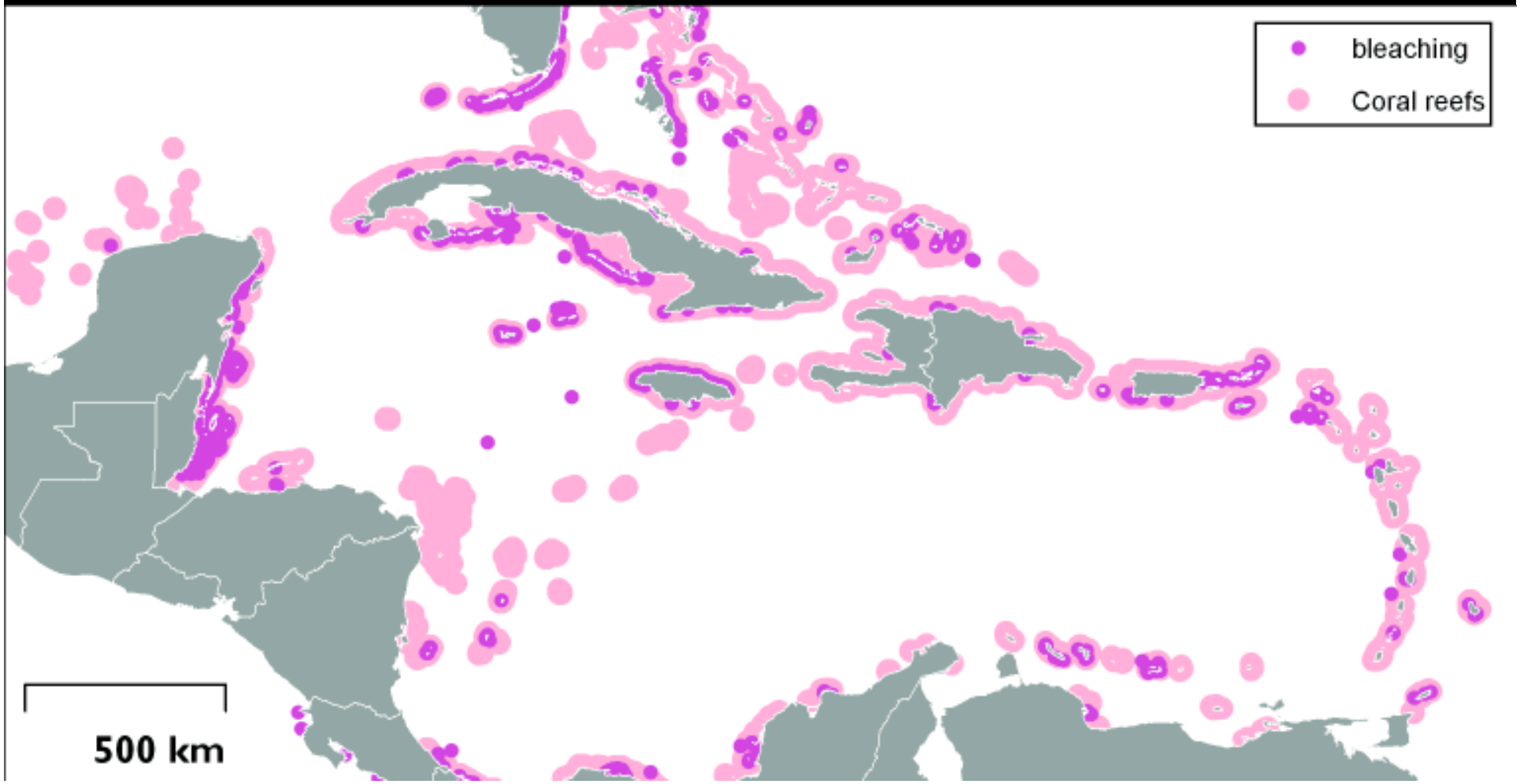
Results – by MPA



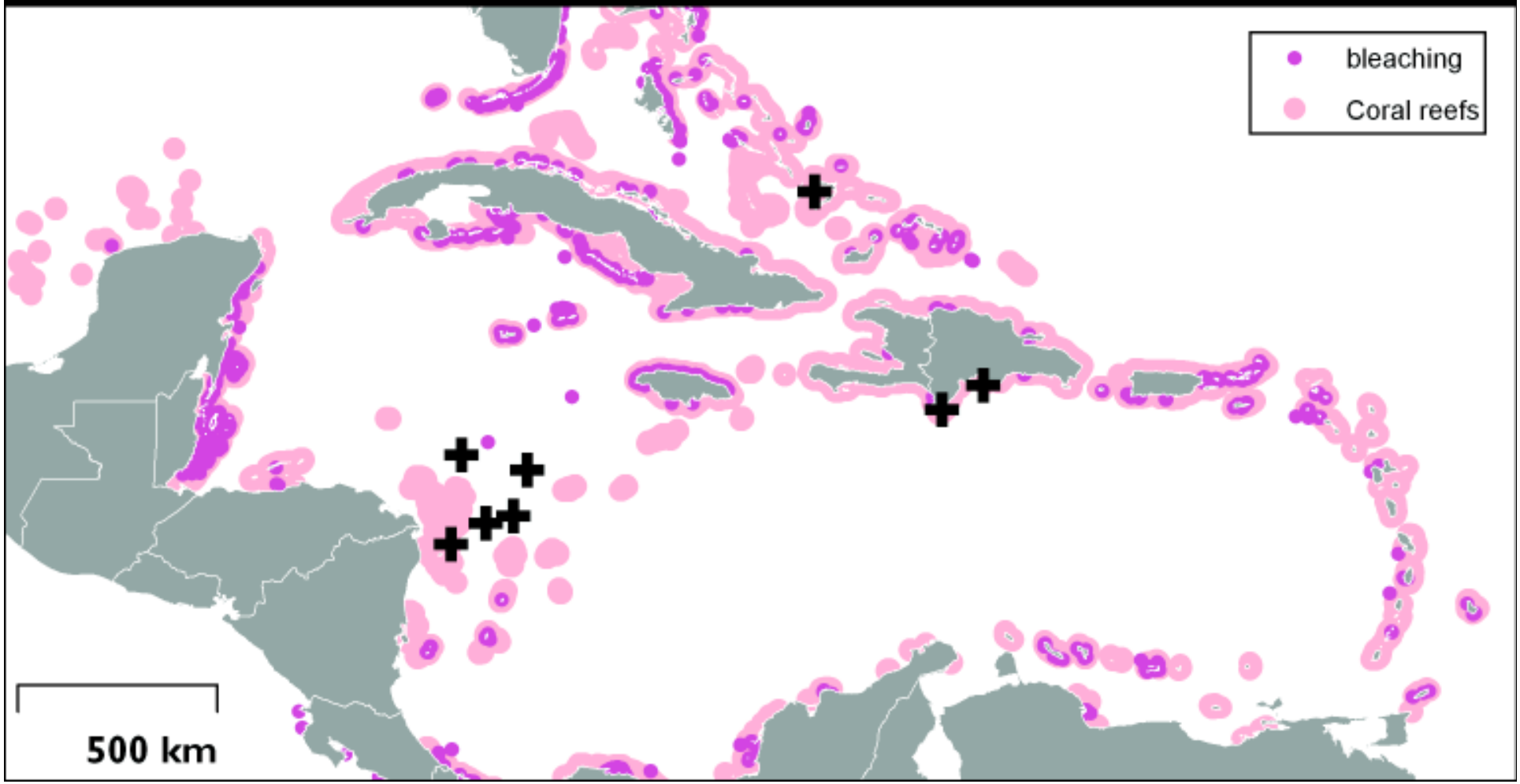


- all locations, all hawksbills (n = 34)
  - median 0% (range 0 – 95%)

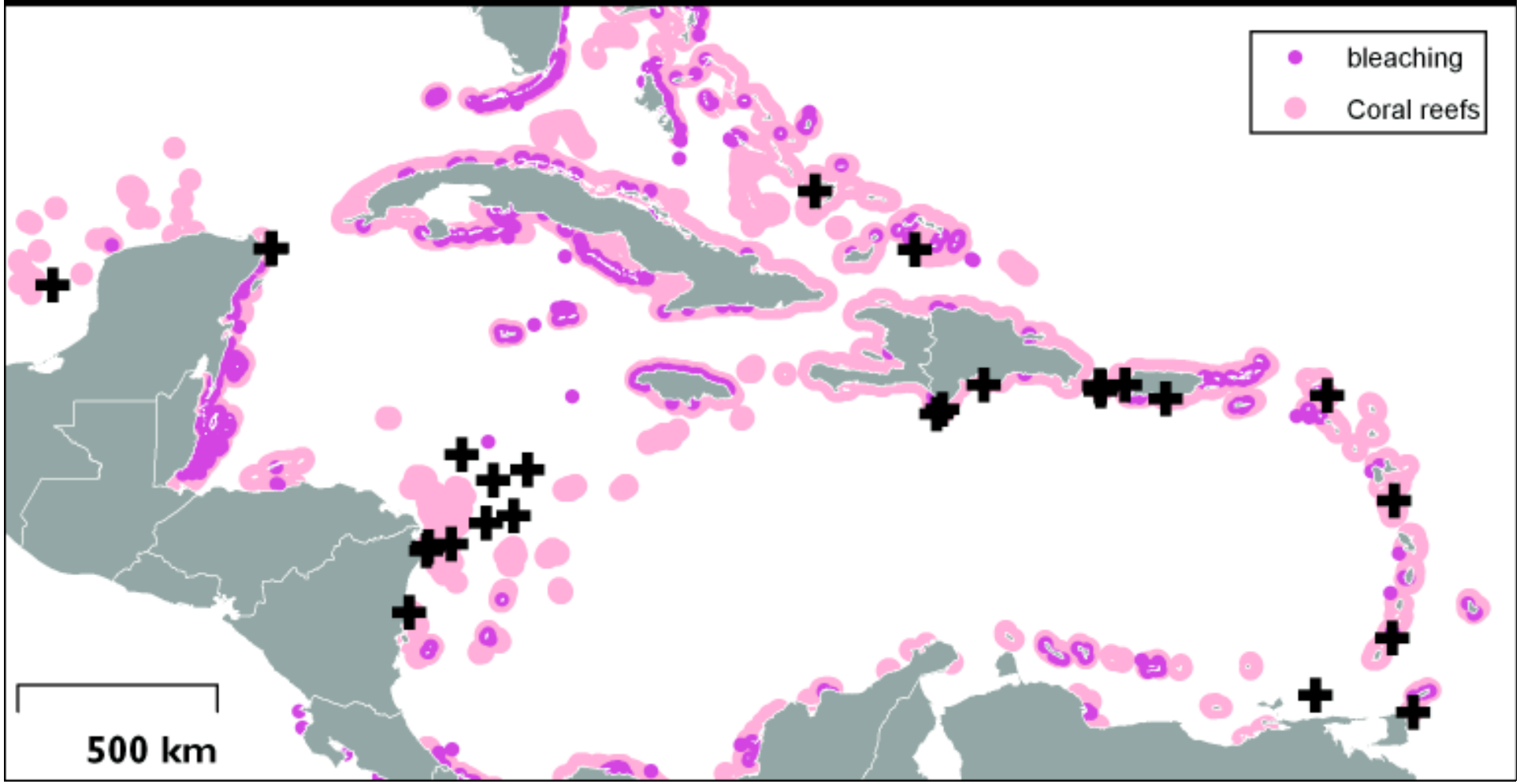
Results – by reefs



Results – by reefs



Results – by reefs

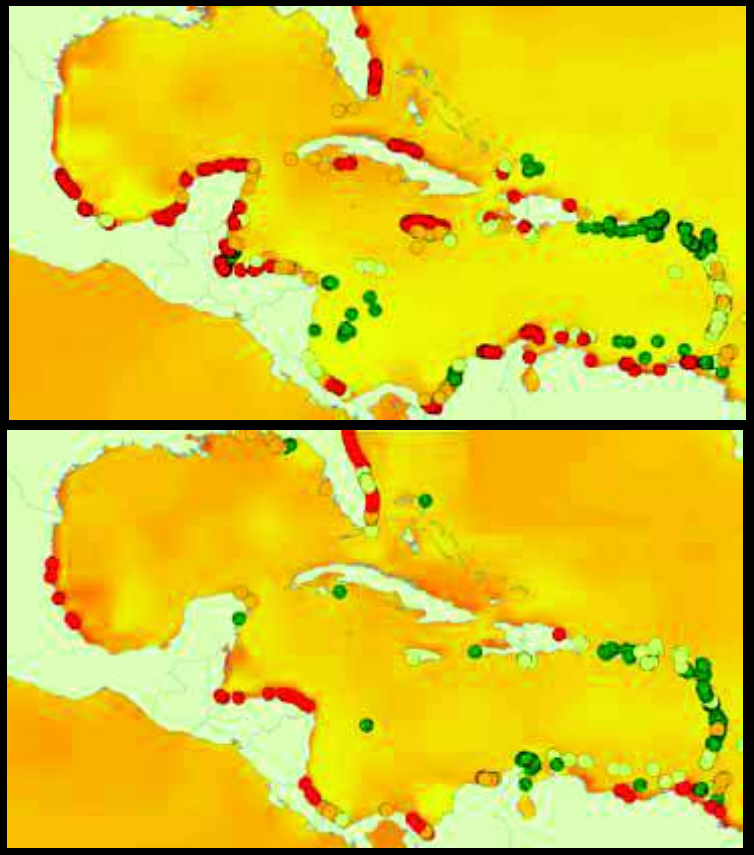


Summary

- home ranges ~ 500km^2
- variety of depths
- key hotspots of occurrence
- few hotspots are protected
- reef association
- some buffering from CC impacts

Gracias!

The climate is changing…



Fish et al. (2009) Climate change and marine turtles in the Wider Caribbean: Regional climate projections. WWF report, San Jose, 20 pp.
http://assets.panda.org/downloads/climate_change_and_marine_turtles_in_the_wider_caribbean_1.pdf

…but how much will that matter?