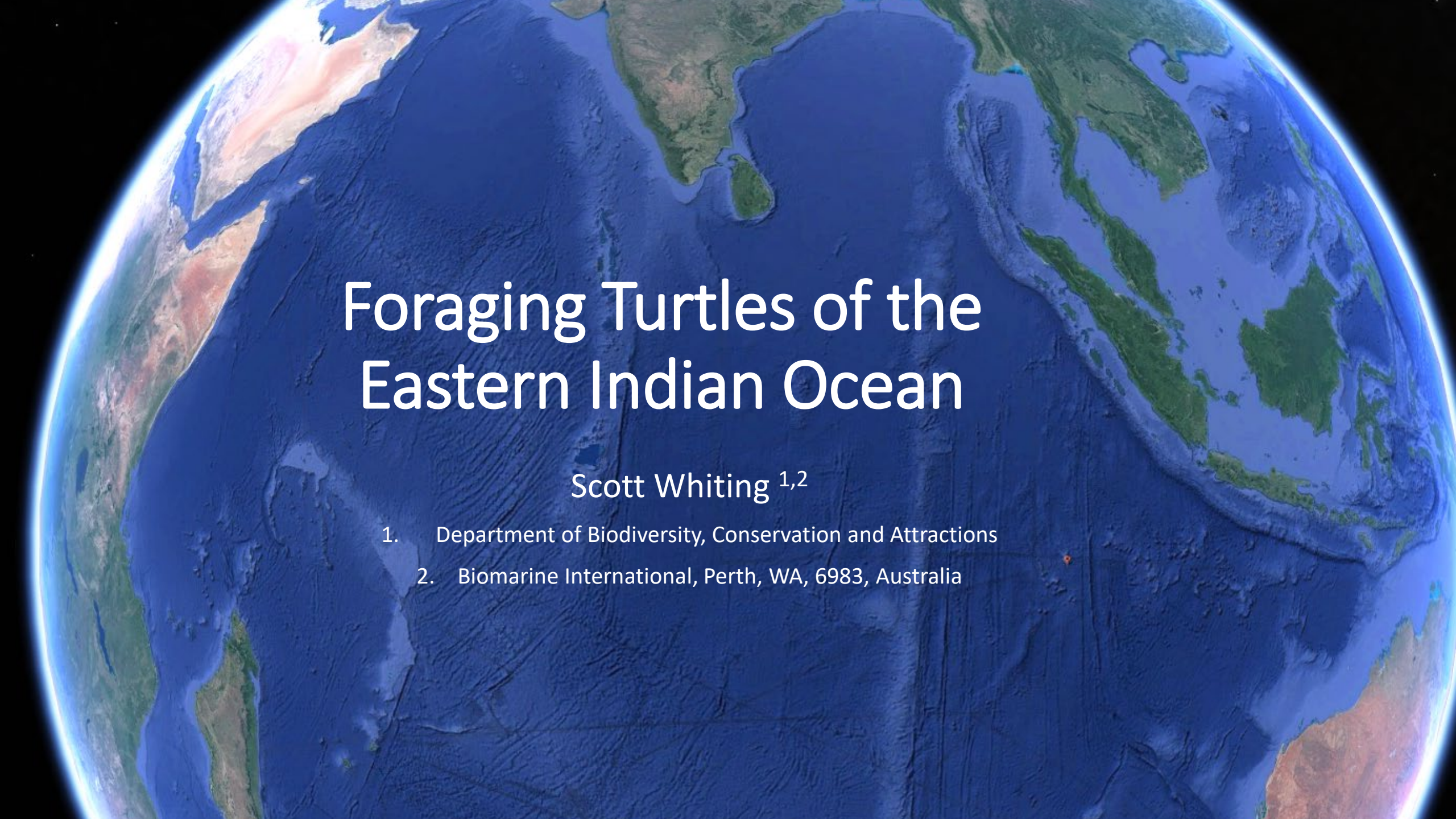


# Foraging Turtles of the Eastern Indian Ocean

Scott Whiting [1,2]

1. Department of Biodiversity, Conservation and Attractions
2. Biomarine International, Perth, WA, 6983, Australia

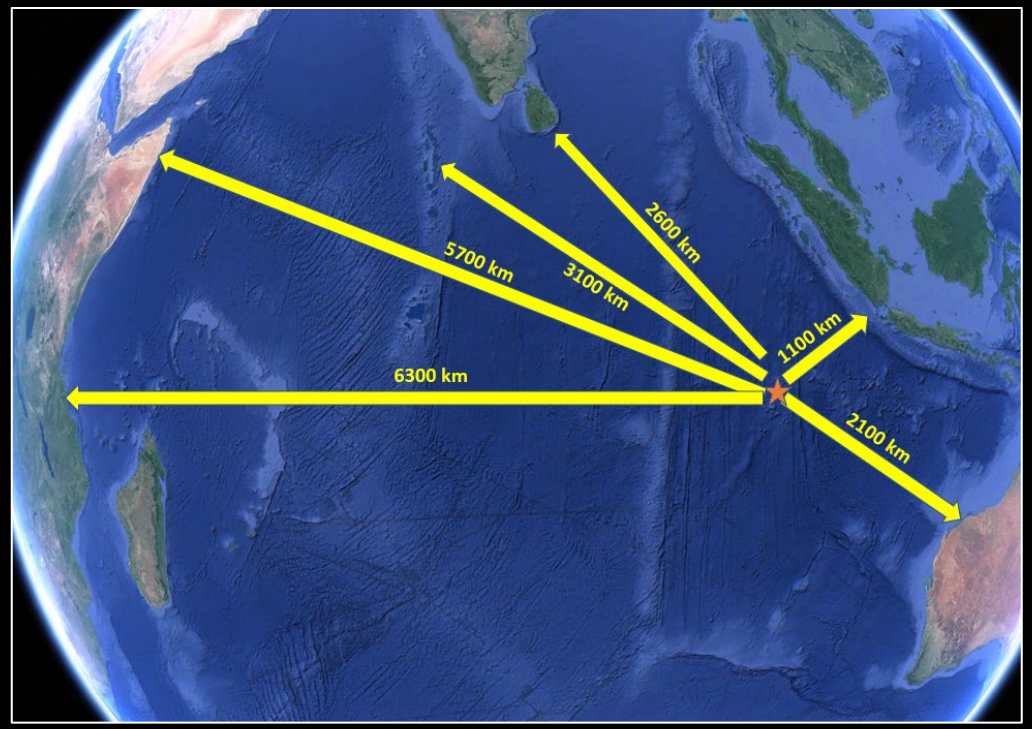
# Scope of Talk

1. Cocos Keeling Islands
   I. Connectivity
   II. Turtles at risk from catastrophic seagrass loss

2. Leatherbacks in south west Australia with links to Indian Ocean

3. Loggerheads from Western Australia

# About Cocos Keeling




# Unique History

- 1609 –Willian Keeling – uninhabited
- 1825 – Clunies-Ross and Hare established settlements for coconut plantations
  - Workers from Malaysia, Indonesia, Africa, Sri Lanka
- 1983 – residents vote to come under Australian Government with UN vote
- Primary Muslim culture – descendants mainly from SE Asia, call themselves Cocos Malays


https://cocoskeelingislands.com.au/

# Turtles

- Scant records up until 2000
- 1900-1950 Turtles in short supply during WWII-brought from Java and held in a sea enclosure – farming attempt
- 1970s - turtle hunting stopped by a re-interpretation of religious law
- Turtles studies began in 1999
- Between 1999-2016 –abundant Green and Hawksbill

*RAFFLES BULLETIN OF ZOOLOGY* Supplement No. **30**: 162–167
Date of publication: 25 December 2014
http://zoobank.org/urn:lsid:zoobank.org:pub:FE8F2393-8DCD-42B3-BB6B-0616FA5C19D8

**Positive conservation outcome from religious teachings: changes to subsistence turtle harvest practices at Cocos (Keeling) Islands, Indian Ocean**

Ismail Macrae[1] & Scott Whiting[2*]

# Nesting

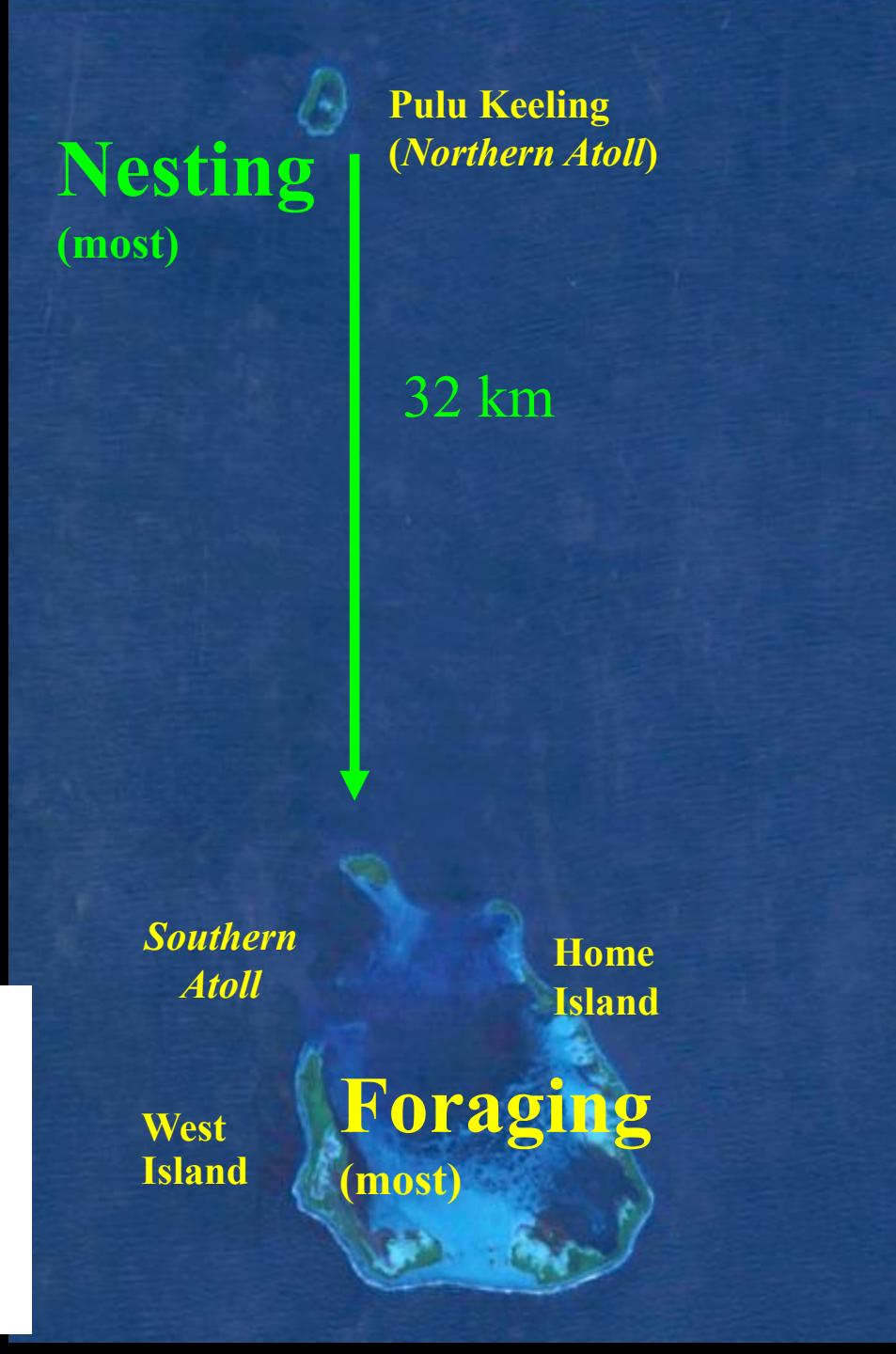
- Moderate – green nesting
- Separate genetic stock
- No Hawksbill nesting

Naturwissenschaften
DOI 10.1007/s00114-007-0327-y

SHORT COMMUNICATION

**Non-migratory breeding by isolated green sea turtles (*Chelonia mydas*) in the Indian Ocean: biological and conservation implications**

Scott D. Whiting · Wendy Murray · Ismail Macrae · Robert Thorn · Mohammad Chongkin · Andrea U. Koch



# 16 year Foraging Study

- Methods
  - mark – Recapture
  - Boat transects
  - health assessment
  - growth rates
  - Diet
  - Tracking
  - blood chemistry
  - laparoscopy

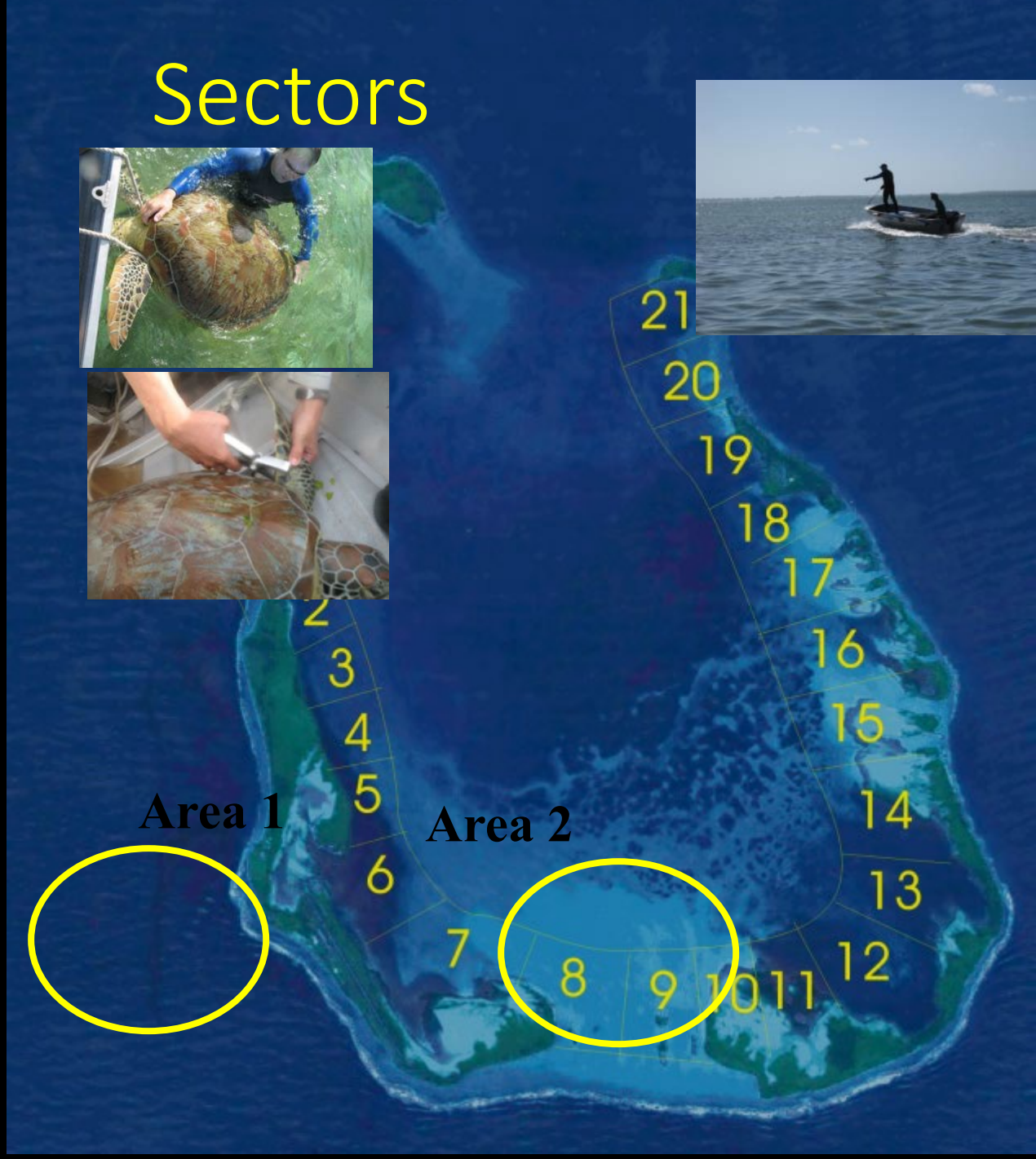
  - 2 weeks each year 1999-2016
  - 2023-2025

## Sectors



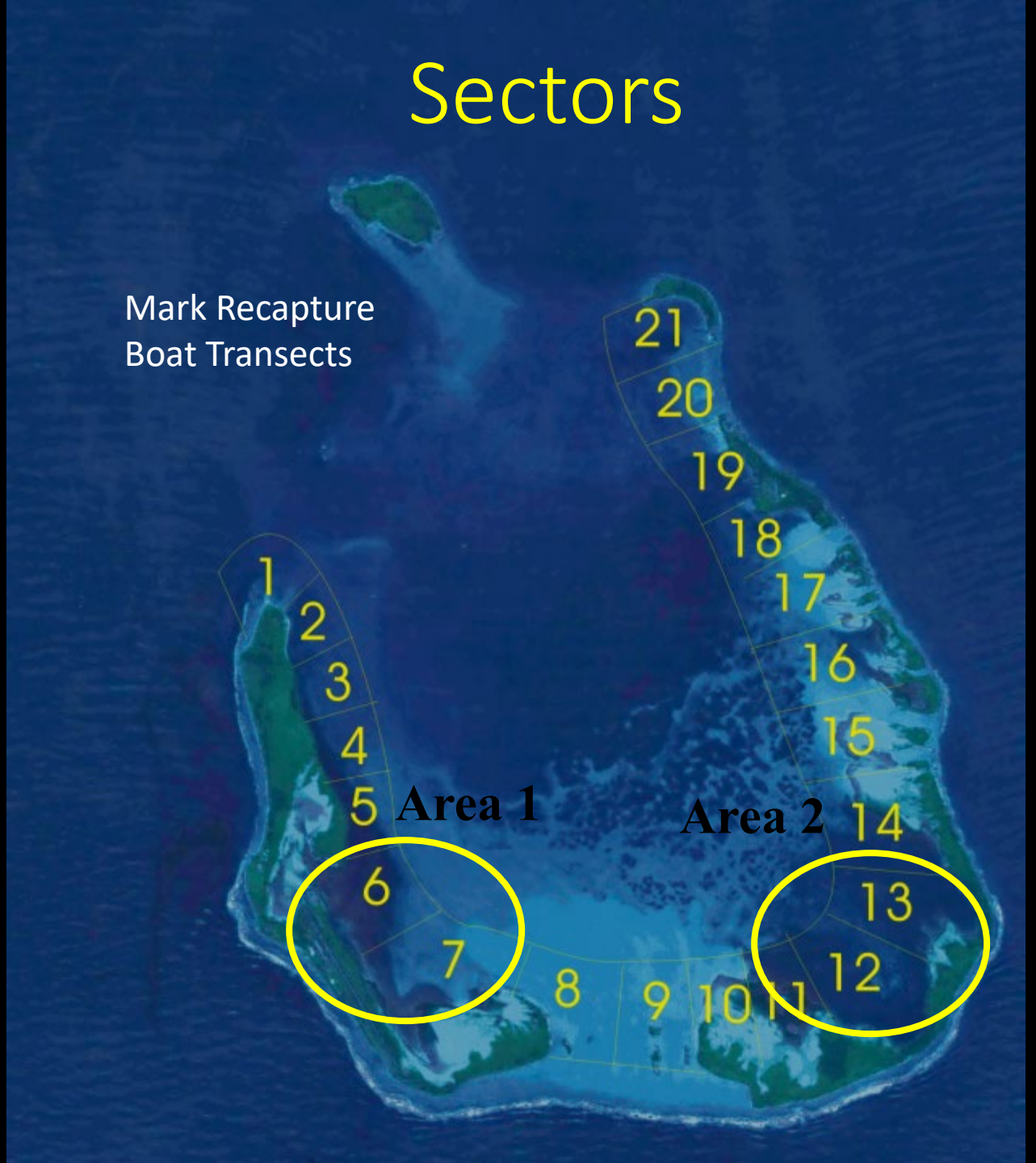






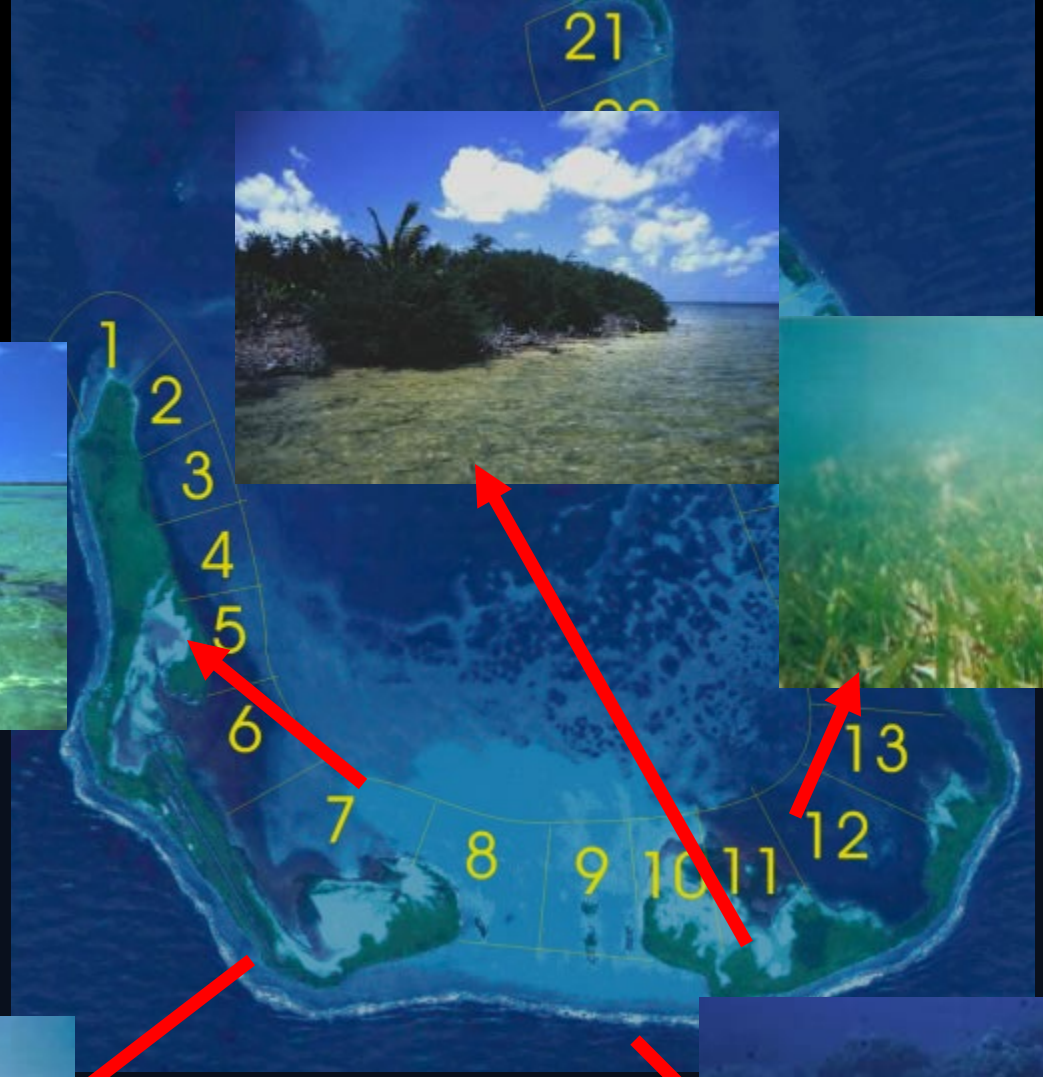
# Sectors

Mark Recapture
Boat Transects



# Foraging Habitat

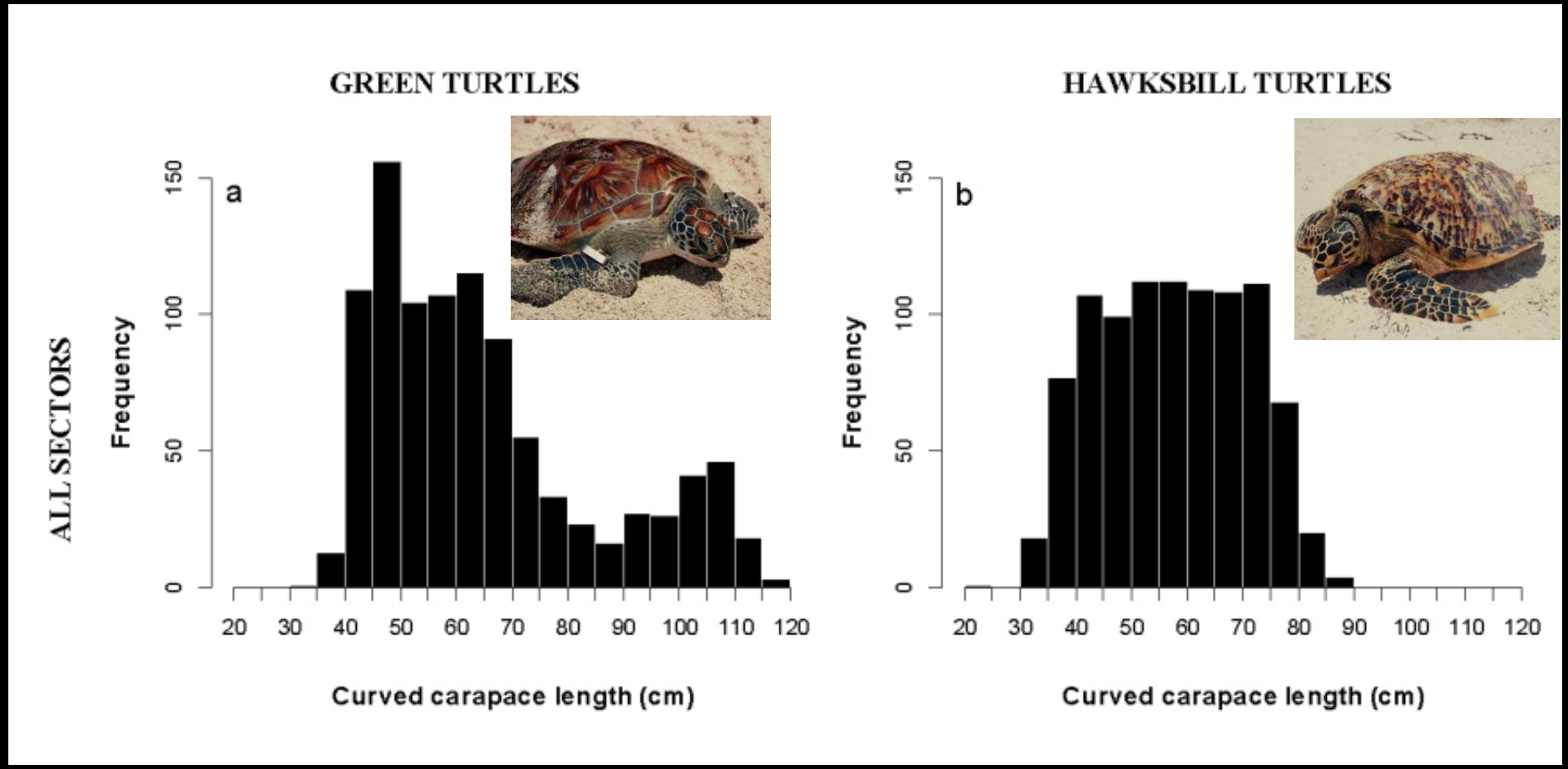





# Results-Foraging

**Lots of turtles**

2450 turtles since 1999. 56 % green and 44 % hawksbill

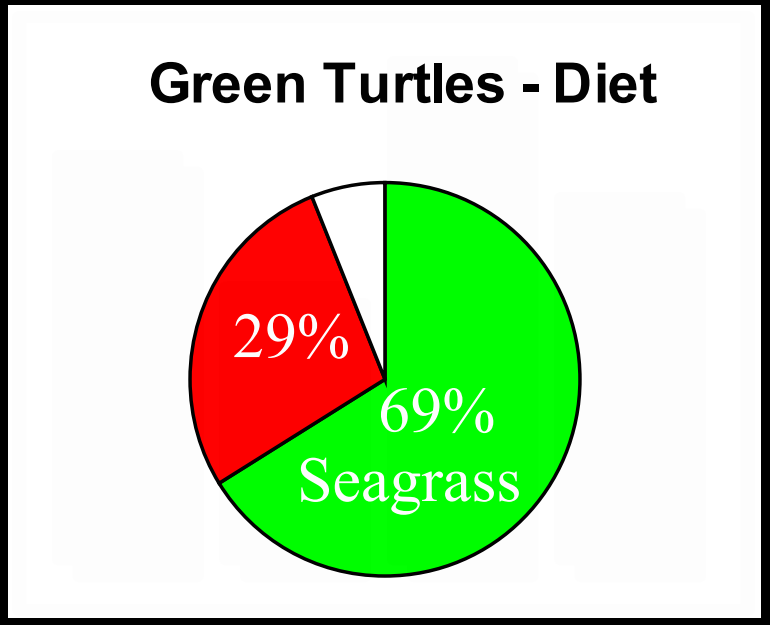


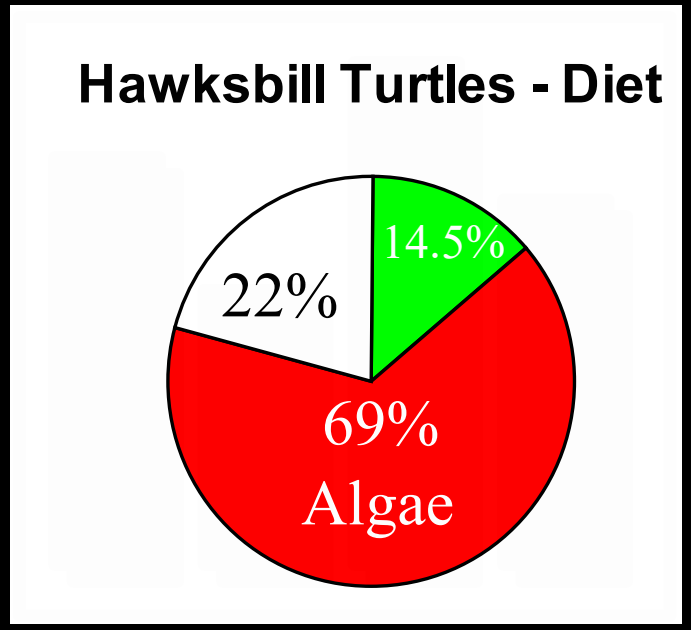
# Sex ratio

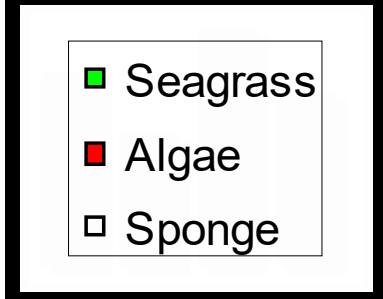
| | Green | | | Hawksbill | | | Sub Total |
|---|---|---|---|---|---|---|---|
| | Male | Female | | | Male | Female | |
| 2009 | 7 | 8 | | | 1 | 17 | 35 |
| 2010 | 0 | 0 | | | 1 | 12 | 13 |
| Sub Total | 7 | 8 | | | 2 | 29 | 48 |

# Diet & Feeding

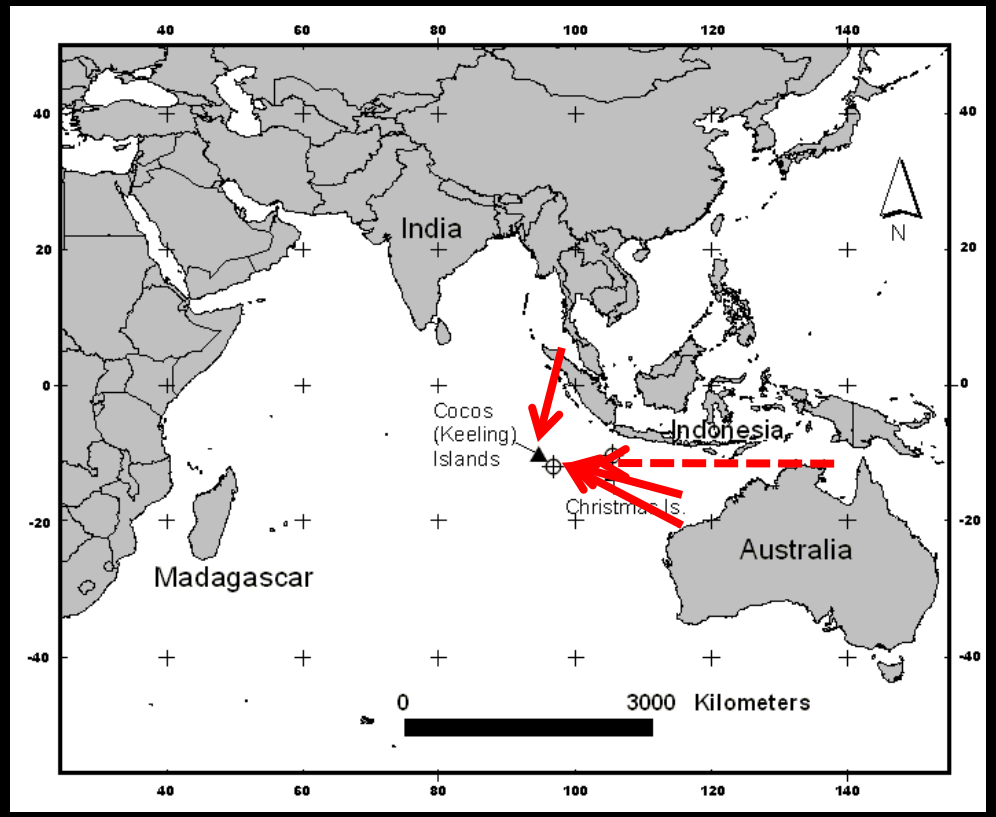
Gastric Lavage - Mean of the individual samples

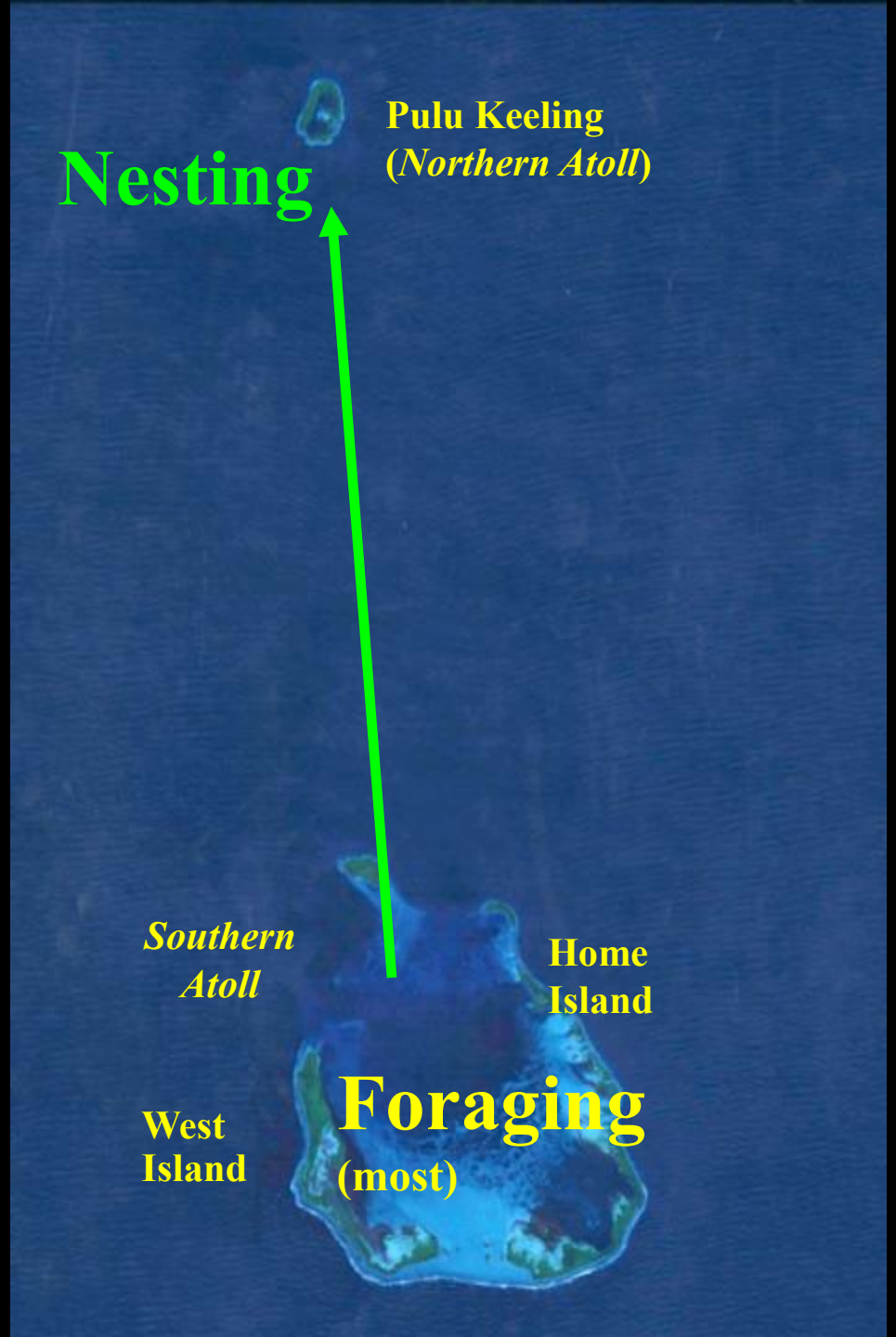


# Foraging Green Turtles - connectivity

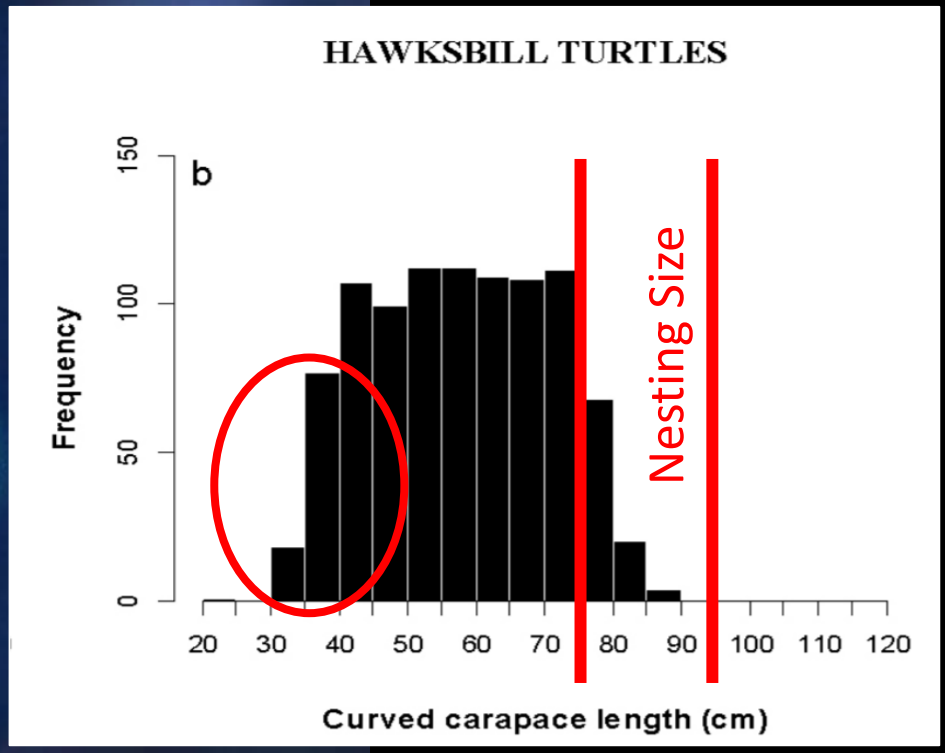


# Hawksbills

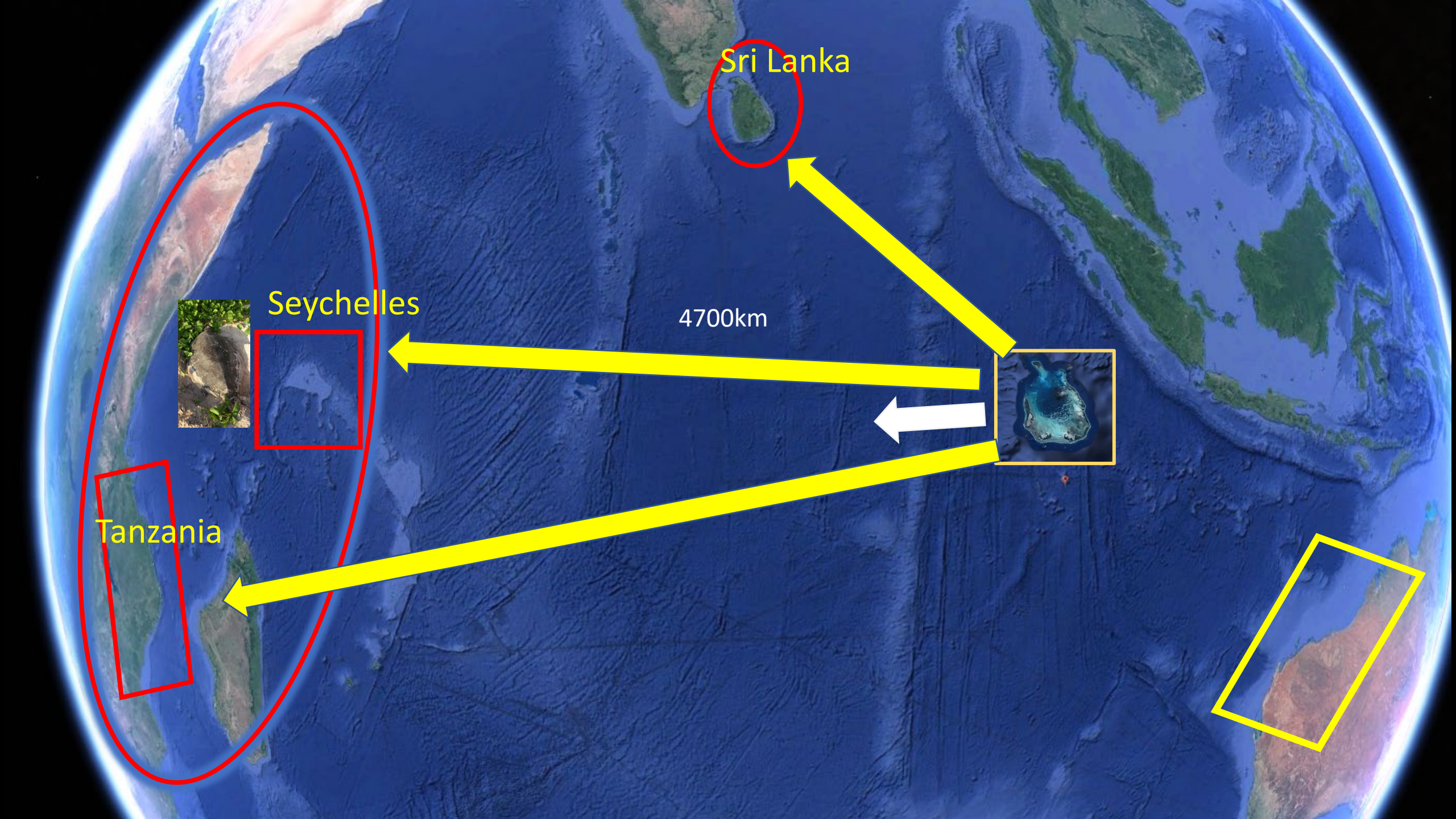
- 45% foraging hawksbills
- 0% nesting hawksbills

- Dominated by smaller turtles
- Lots of annual recruitment

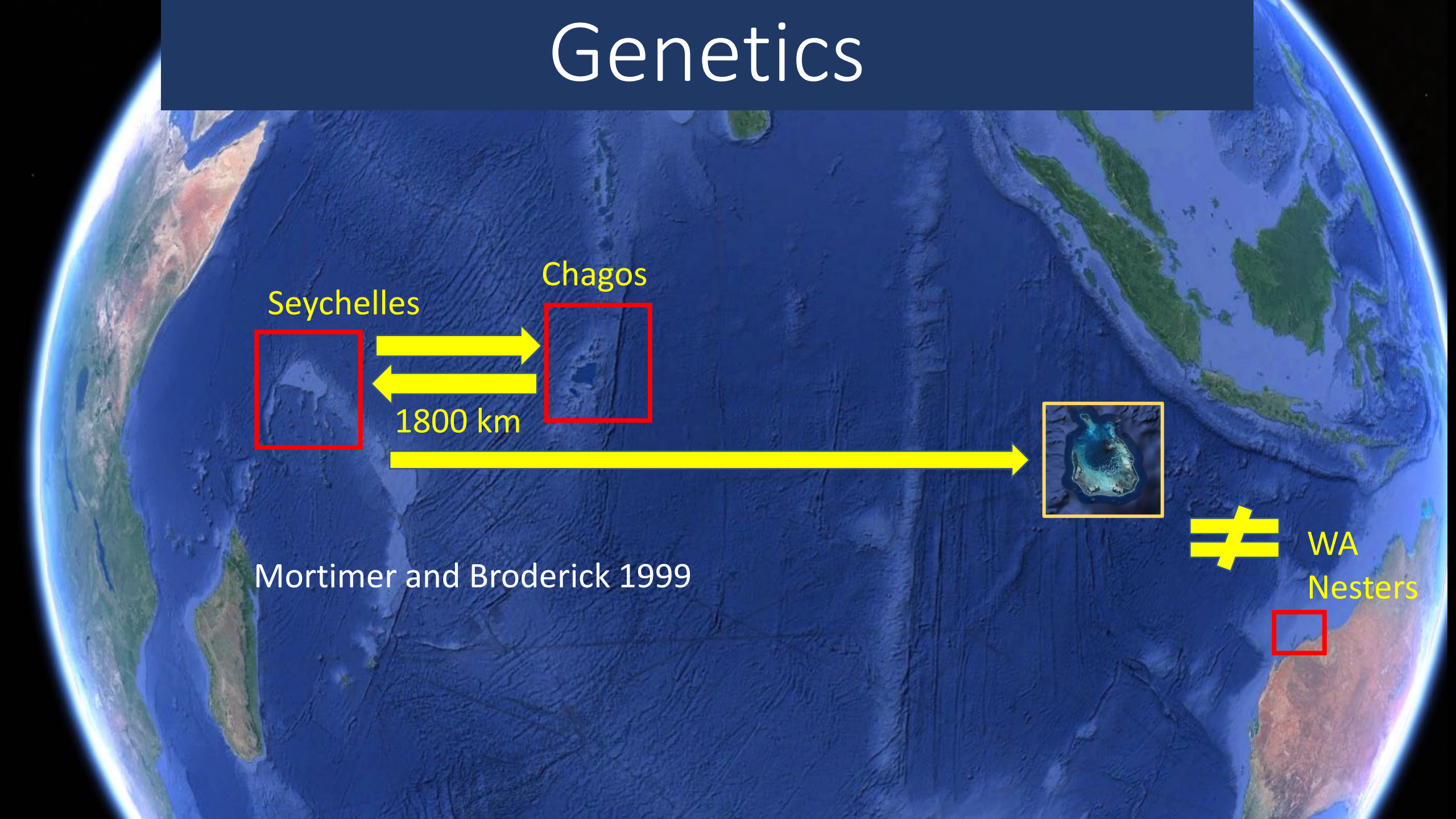



## Questions:

1. Where do the recruits come from?
2. Where do the adults go to nest?


Sri Lanka
Seychelles
4700km
Tanzania

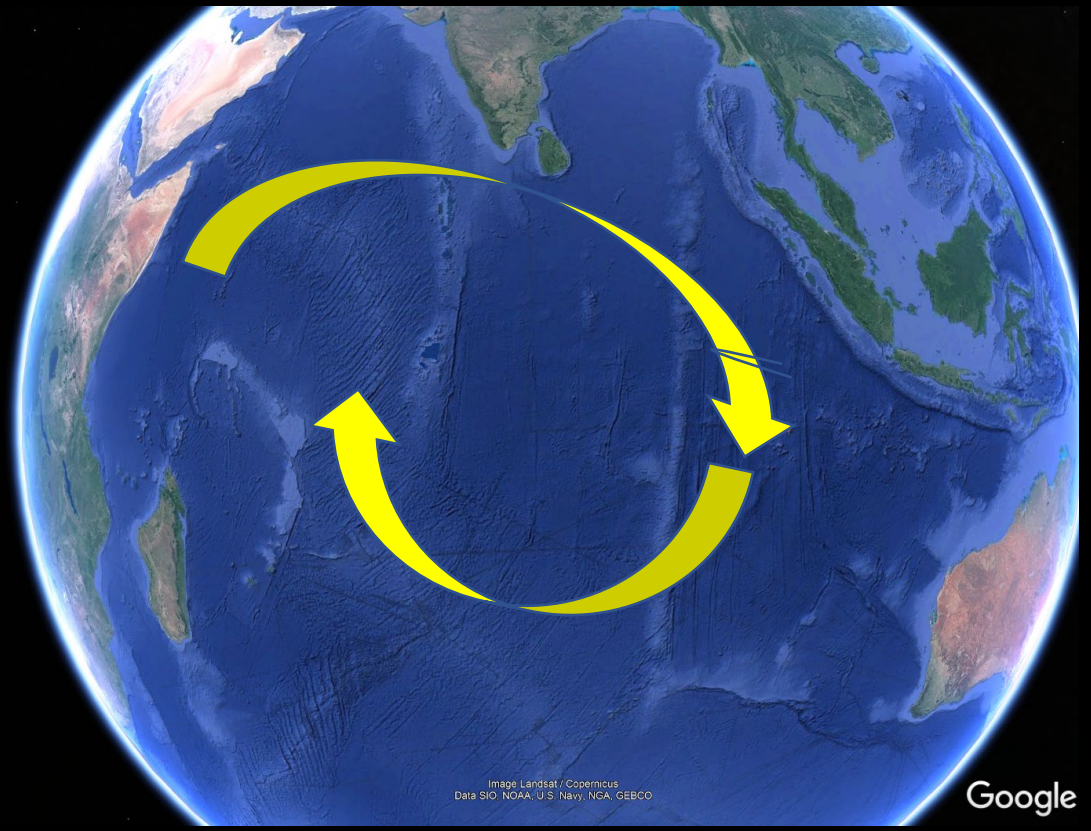
# Genetics




Mortimer and Broderick 1999

# Hawksbill turtle

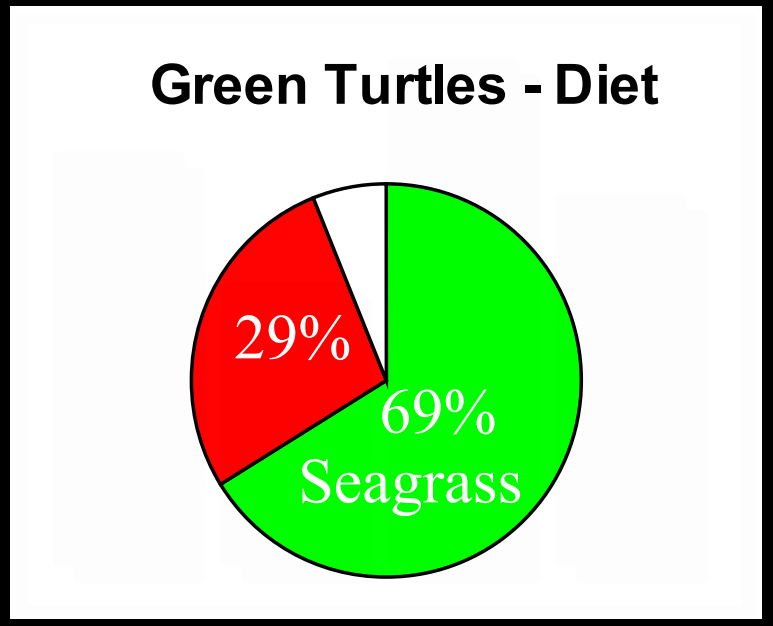
- Hatchlings are produced in the western Indian Ocean
- Use developmental habitat at Cocos Keeling and other areas around Indian Ocean.
- Make one-way migrations back closer to rookery when larger
- The huge rookery in Western Australia is not linked with Cocos.

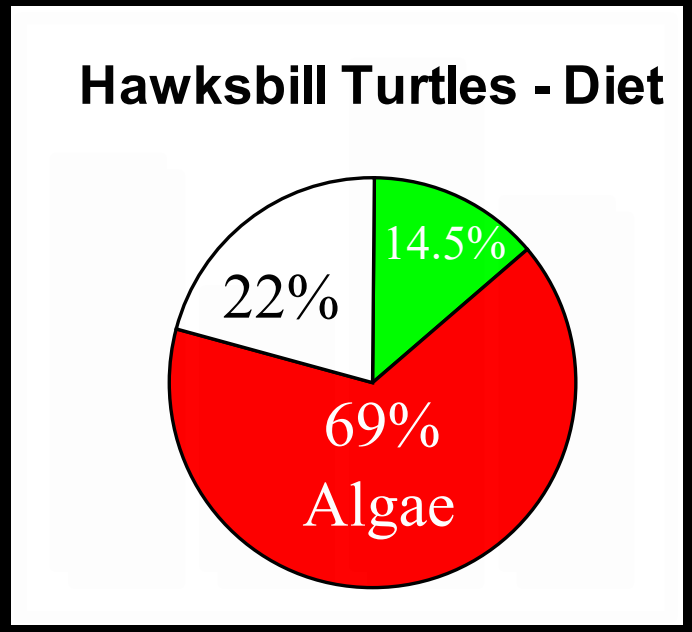


# Catastrophic Loss of Seagrass from 2016

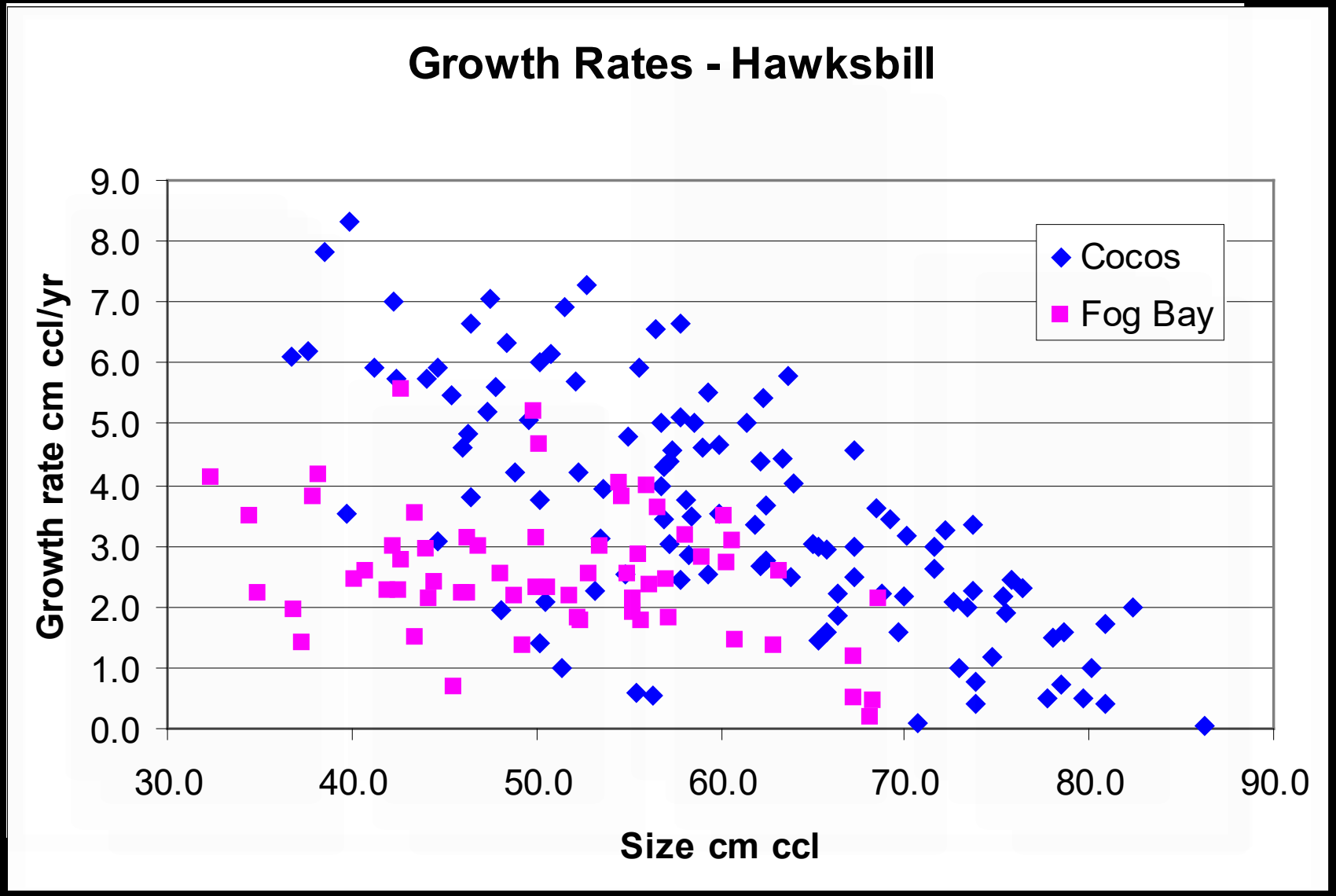
Scott Whiting

# Diet & Feeding



# Growth Rates



# Catastrophic Seagrass Loss

ELSEVIER

Marine Pollution Bulletin
Volume 170, September 2021, 112602

## Catastrophic loss of tropical seagrass habitats at the Cocos (Keeling) Islands due to multiple stressors

Joanna Buckee [a], Yasha Hetzel [b], Marianne Nyegaard [a], Scott Evans [c], Scott Whiting [d], Sarah Scott [e], Suzanne Ayvazian [f], Mike van Keulen [a], Jennifer Verduin [a]

Show more

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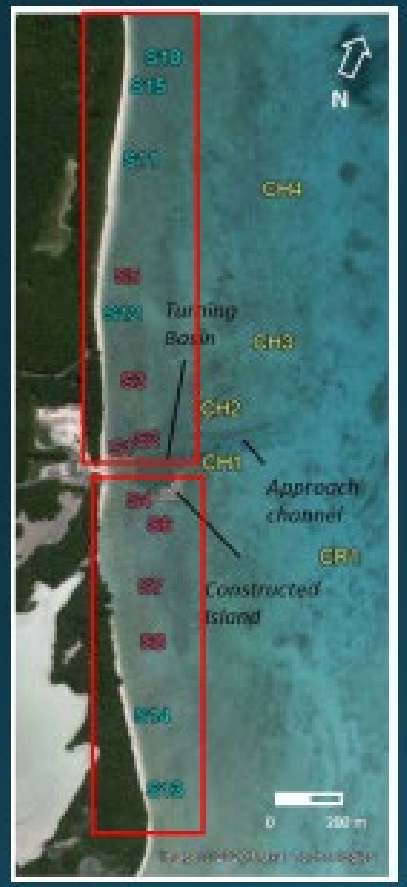
https://doi.org/10.1016/j.marpolbul.2021.112602  Get rights and con

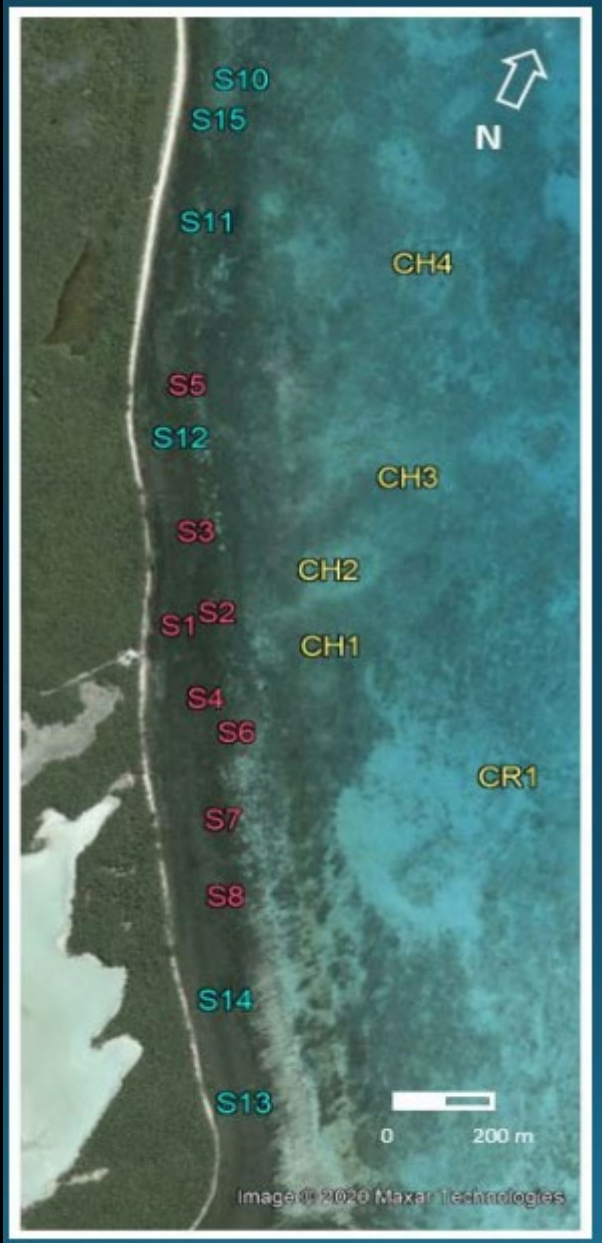
- 1200ha (80%) of tropical seagrass has been lost at the Cocos (Keeling) Islands.
- Loss is attributed to multiple coastal development and climate-related stressors.
- Numerous lagoon die-off and thermal stress events are documented over recent decades.
- Sea turtle overgrazing is also implicated in seagrass loss.
- Turbidity-related impacts from coastal development are ongoing.

UB1

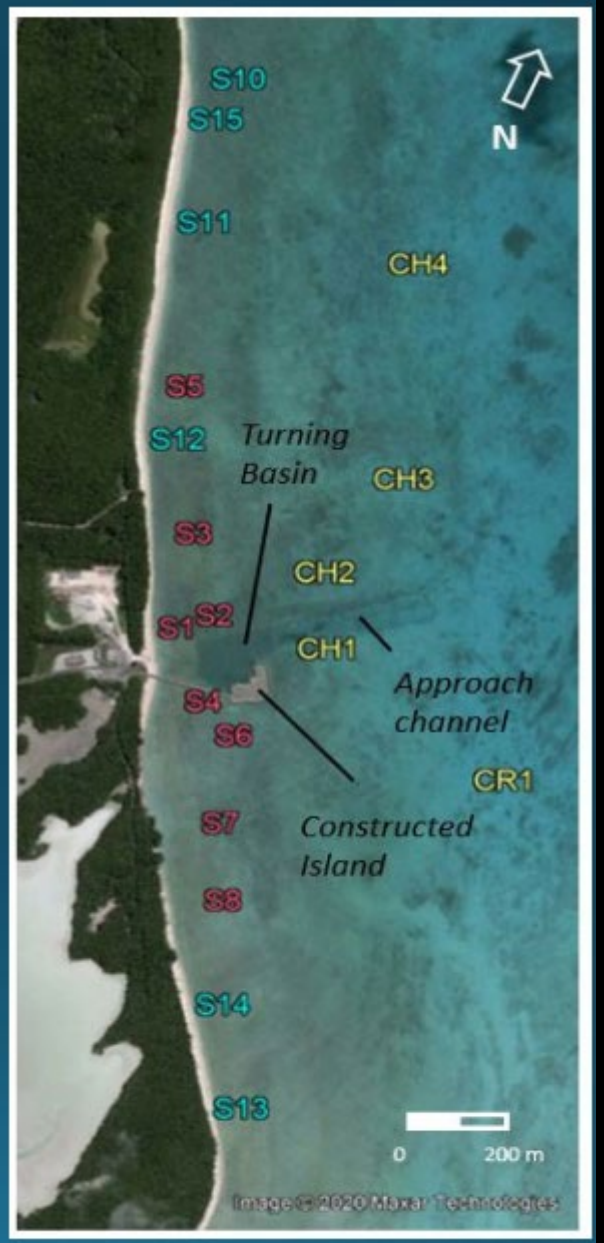
# Results % Cover (1996 – 2020)



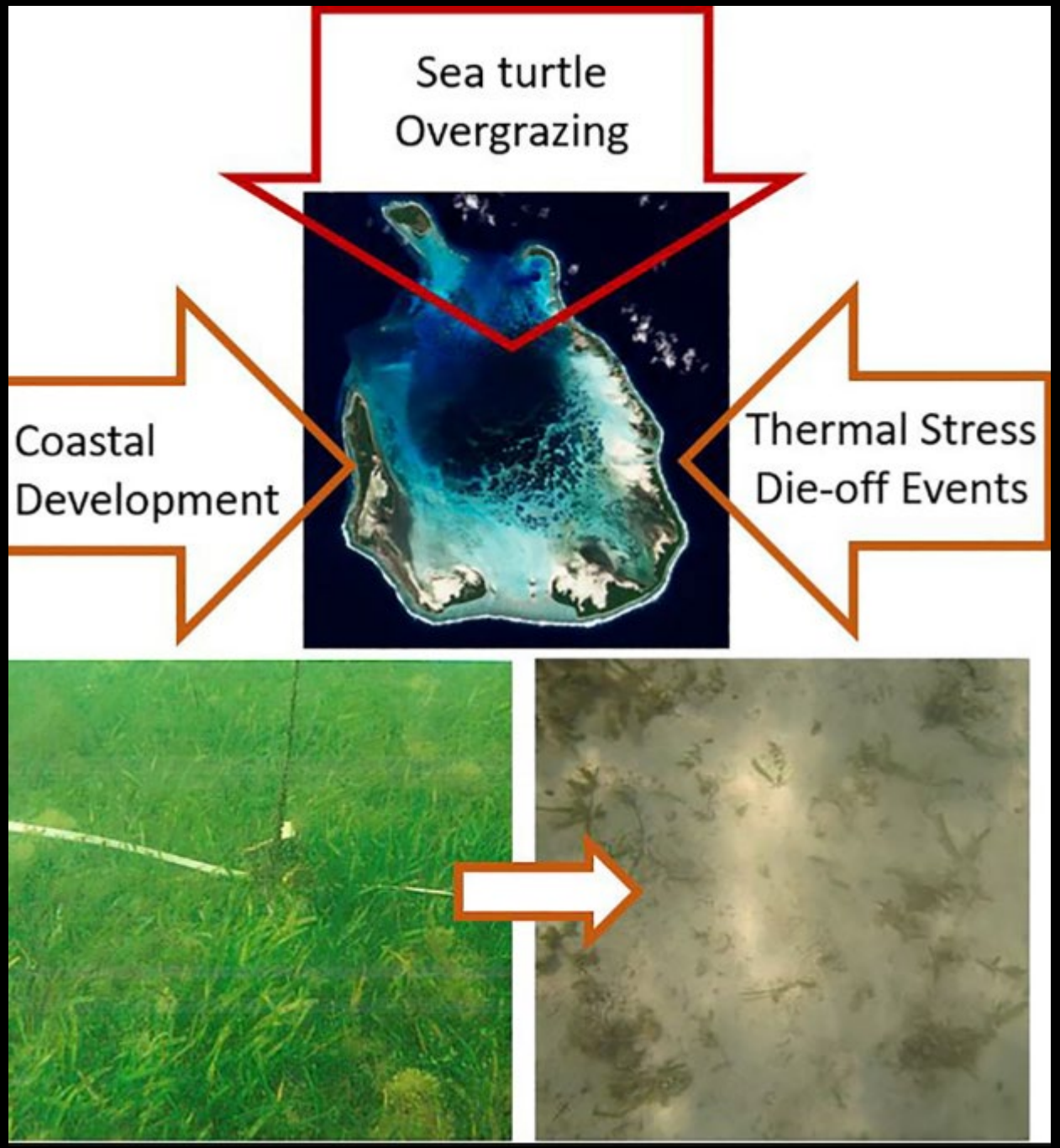





Imagery August 2006
Source: Google Earth




Imagery December 2016
Source: Google Earth


Sea turtle
Overgrazing
Coastal
Development
Thermal Stress
Die-off Events

# Conclusion

- Cocos Keeling I. are extremely isolated, seagrass loss could be for many decades
- Turtles have started dying
- The population is expected to reduce
- The growth rates are expected to reduce
- Turtles may  hinder any seagrass recovery
- Managing local expectations will be important

# End of Cocos

# Leatherbacks


Over 150 stranded leatherback turtles over 30 years. Records held by Western Australian Government and will be submitted for publication.

TRACKING LEATHERBACK TURTLES FROM LITTLE ANDAMAN ISLAND

ADHITH SWAMINATHAN*, NAVEEN NAMBOOTHRI & KARTIK SHANKER

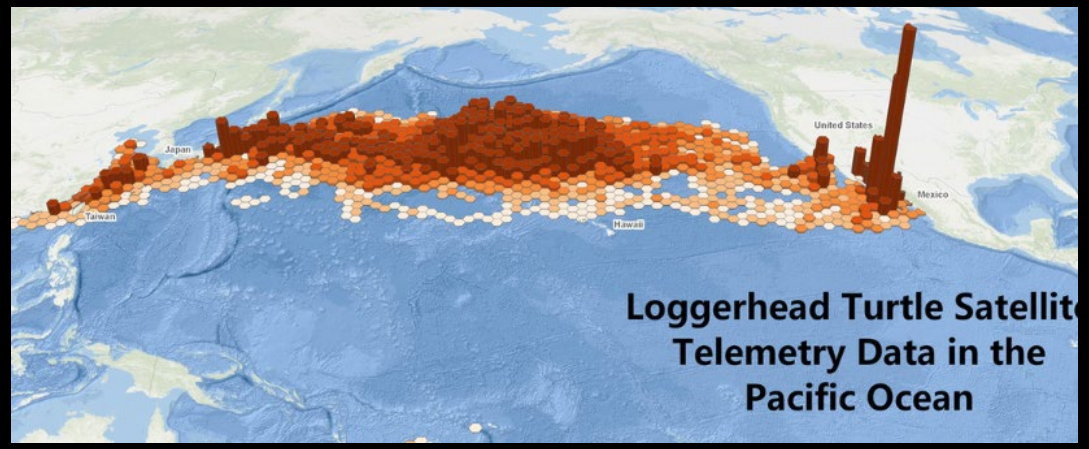
Dakshin Foundation, Bangalore, Karnataka, India

*adhith.me@gmail.com

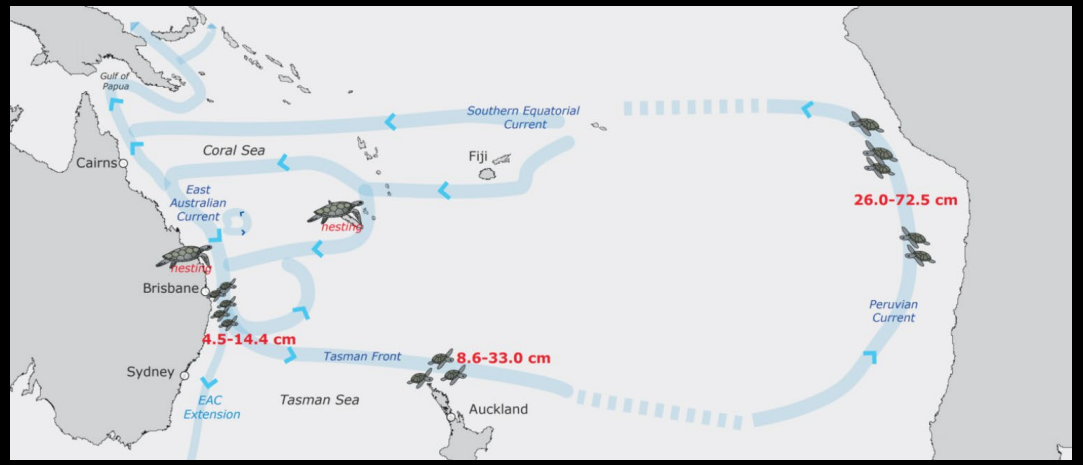
Indian Ocean Turtle Newsletter No. 29

# Loggerheads – other ocean basins

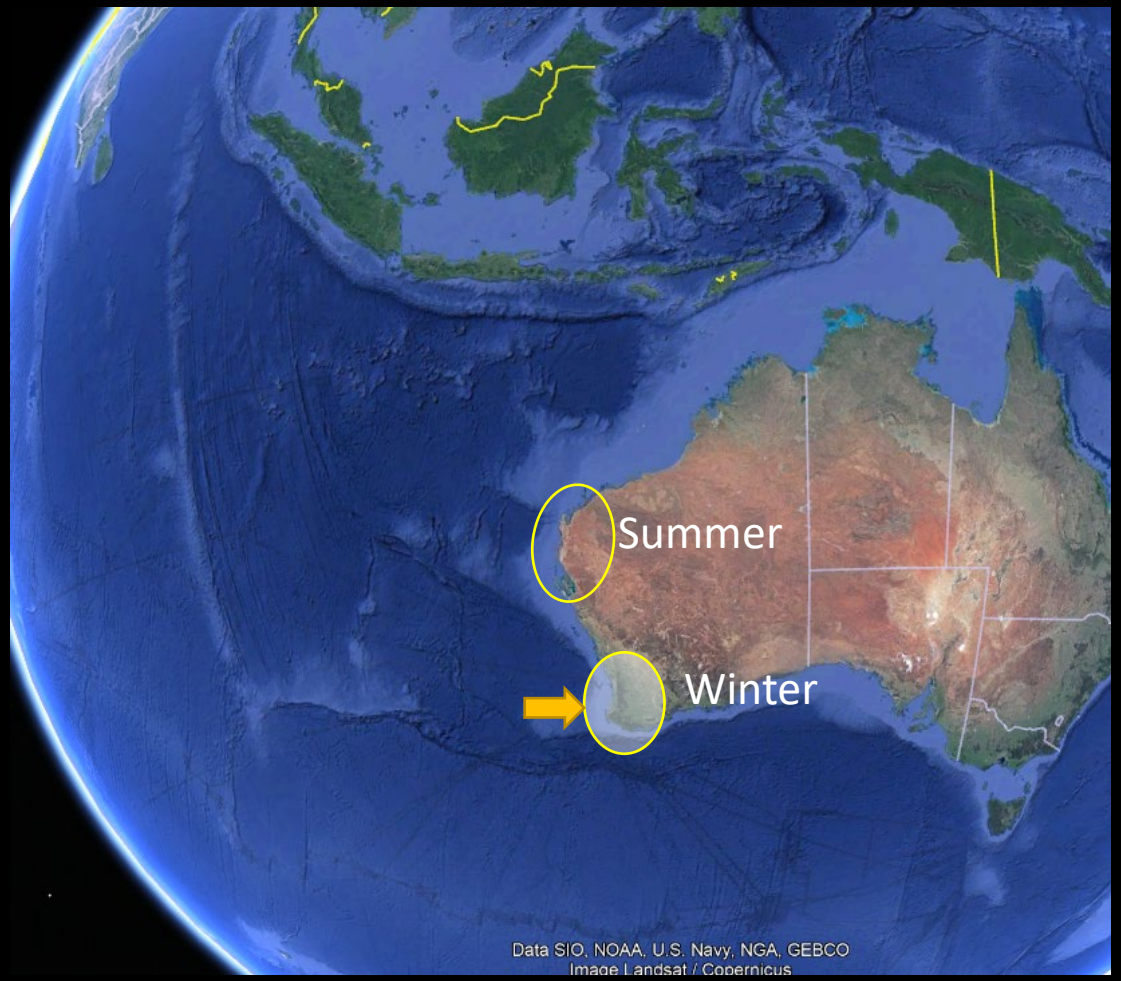
## North Pacific

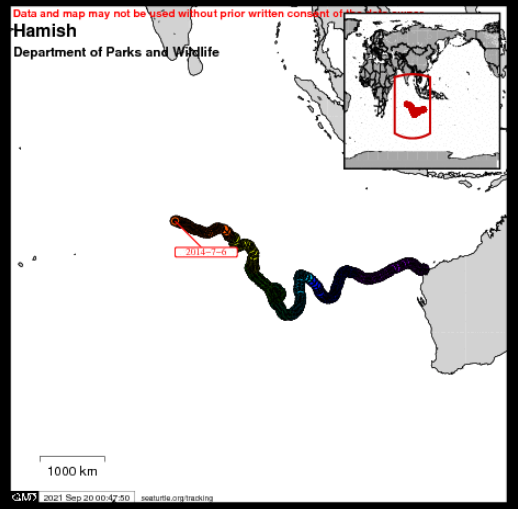


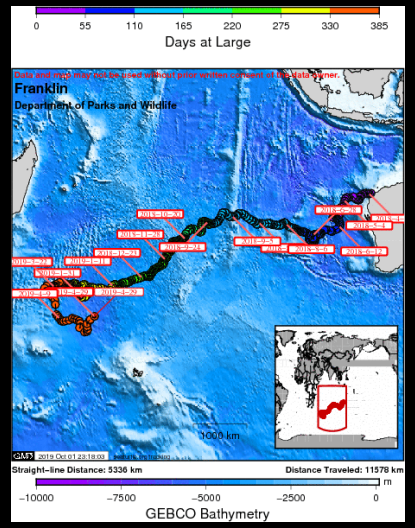

## South Pacific

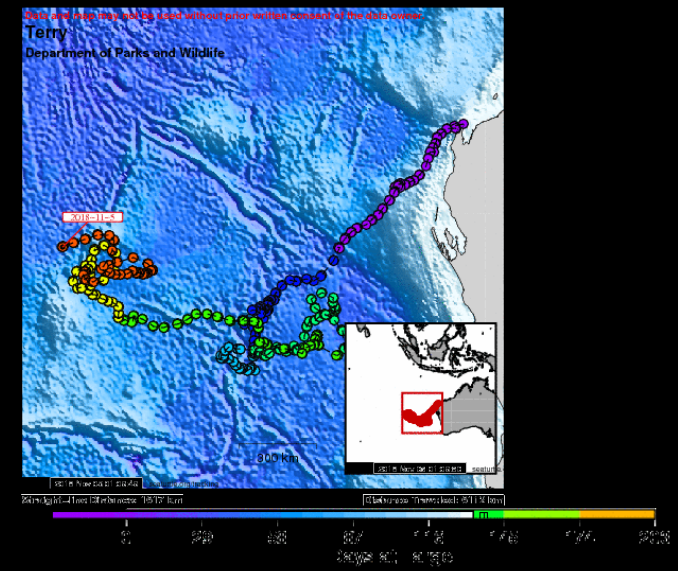


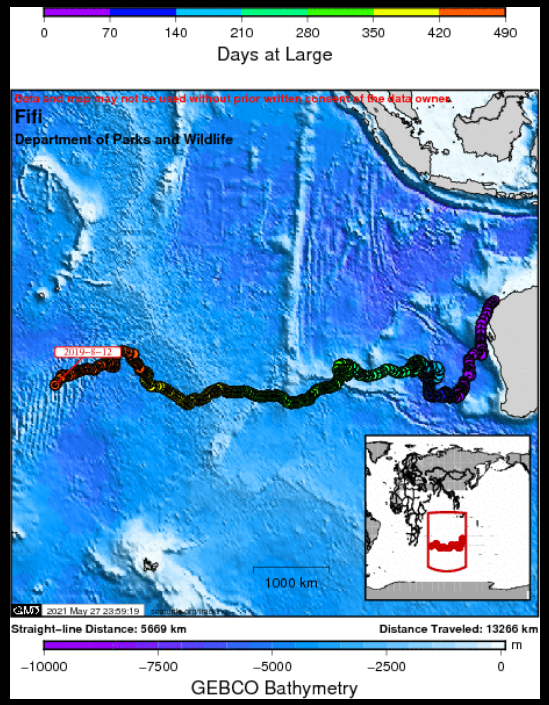

## Atlantic

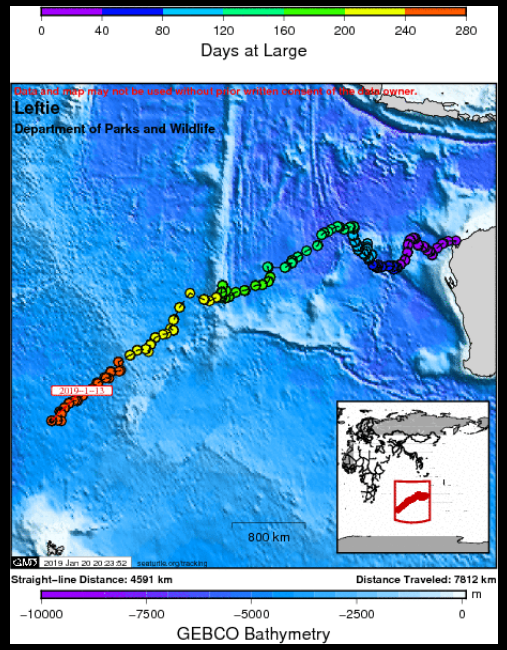

Summer
Winter
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus

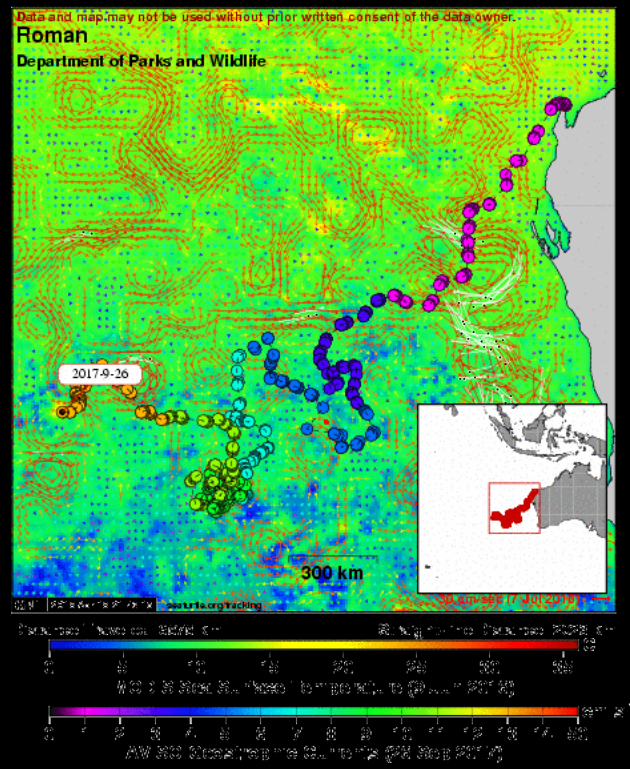

Data and map may not be used without prior written consent of the data owner.
Hamish
Department of Parks and Wildlife
2014-7-6
1000 km


0 55 110 165 220 275 330 385
Days at Large
Franklin
Department of Parks and Wildlife
1000 km
Straight–line Distance: 5336 km
Distance Traveled: 11578 km
m
−10000 −7500 −5000 −2500 0
GEBCO Bathymetry


Terry
Department of Parks and Wildlife
2011-11-5
300 km
m


0 70 140 210 280 350 420 490
Days at Large
Data and map may not be used without prior written consent of the data owner.
Fifi
Department of Parks and Wildlife
2015-5-28
1000 km
Straight–line Distance: 5669 km
Distance Traveled: 13266 km
m
−10000 −7500 −5000 −2500 0
GEBCO Bathymetry

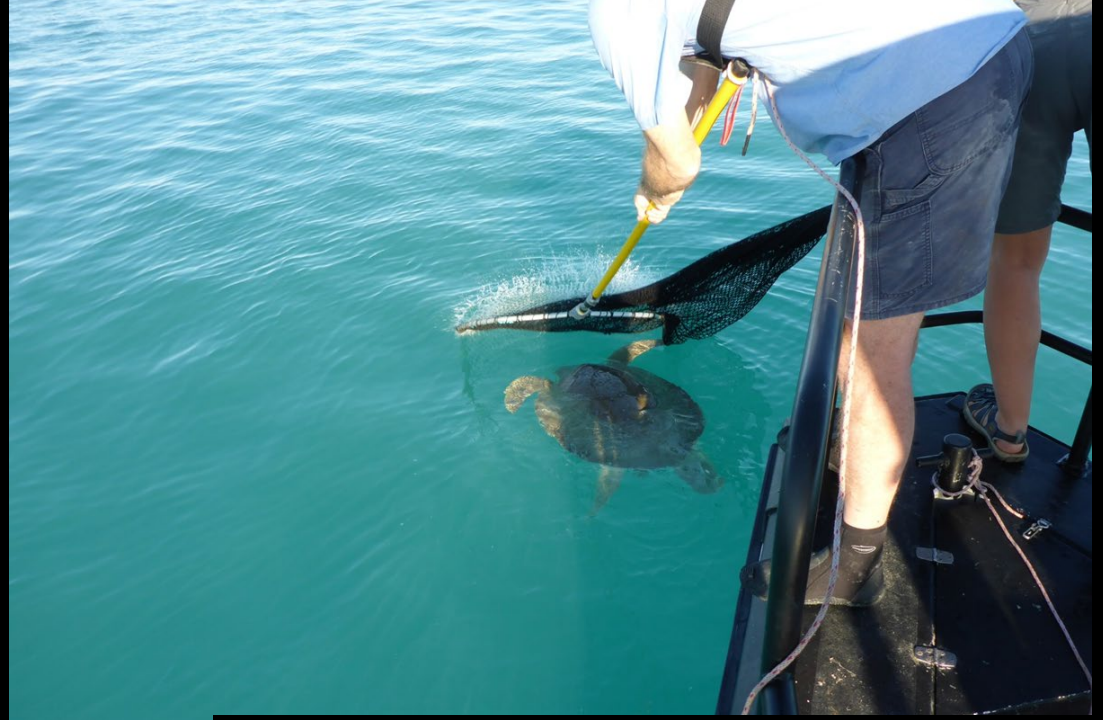

0 40 80 120 160 200 240 280
Days at Large
Data and map may not be used without prior written consent of the data owner.
Leftie
Department of Parks and Wildlife
2015-5-13
800 km
Straight–line Distance: 4591 km
Distance Traveled: 7812 km
m
−10000 −7500 −5000 −2500 0
GEBCO Bathymetry


Data and map may not be used without prior written consent of the data owner.
Roman
Department of Parks and Wildlife
2017-9-26
300 km


Data SIO, NOAA, U.S. Navy, NGA, GEBCO

# Yoshi the Loggerhead turtle -


Loggerheads are likely to ocean basin travelers.



**Methods: Two capture boats used for netting or jumping.**
**Early data: capture rates are equally effective by method, up to mod. sea states.**