Genetic characterization of Tobago hawksbills and their regional connectivity

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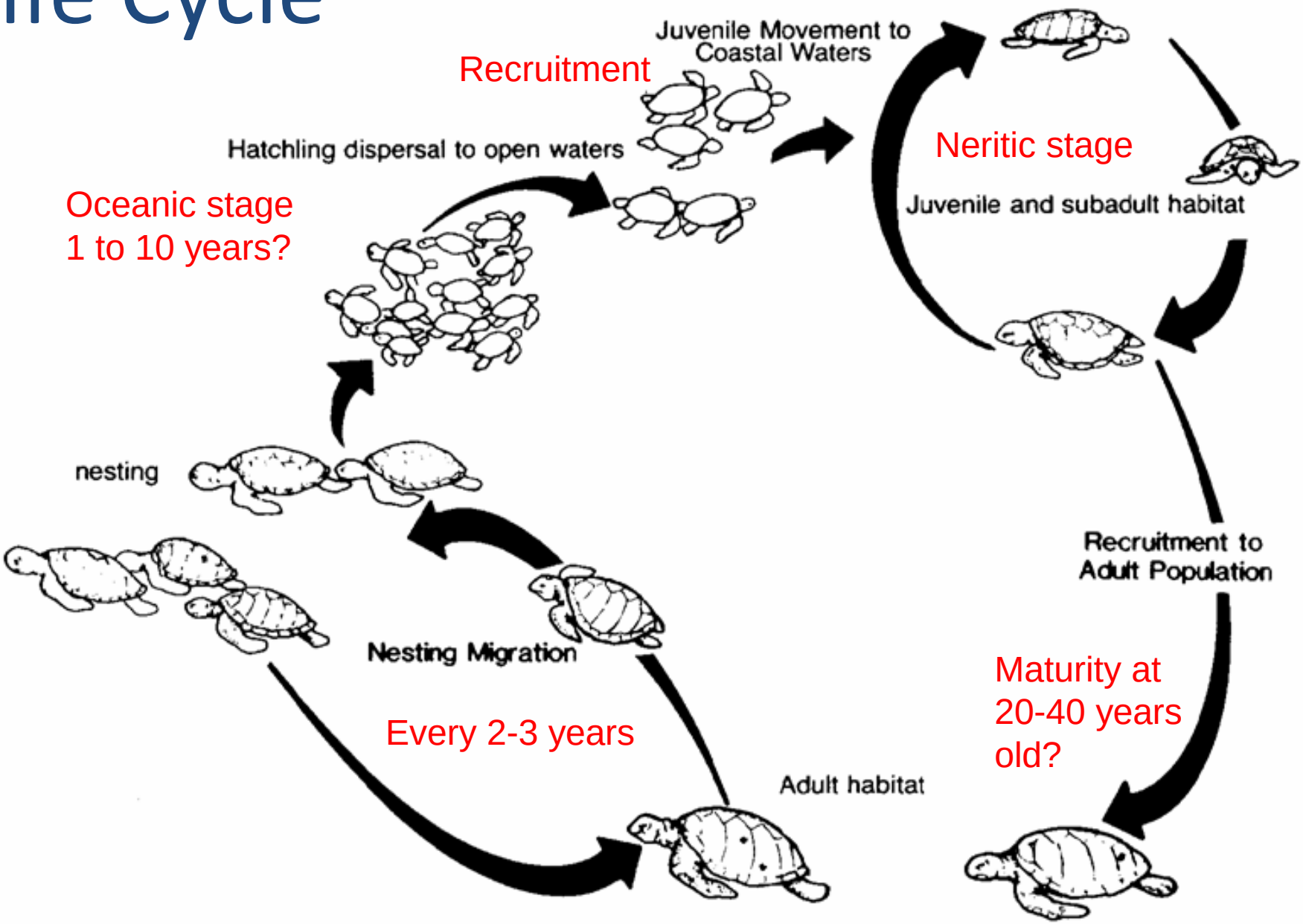
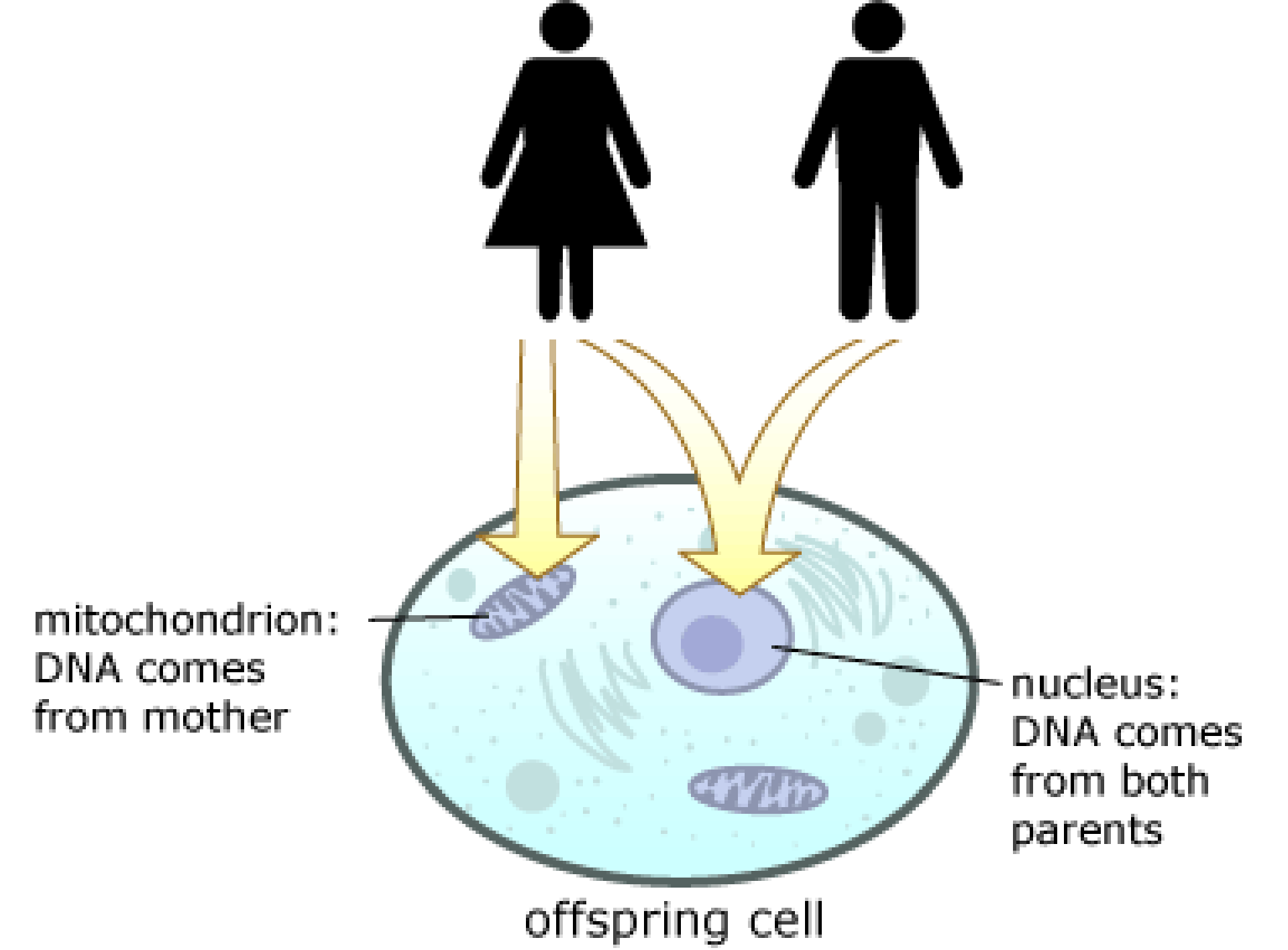
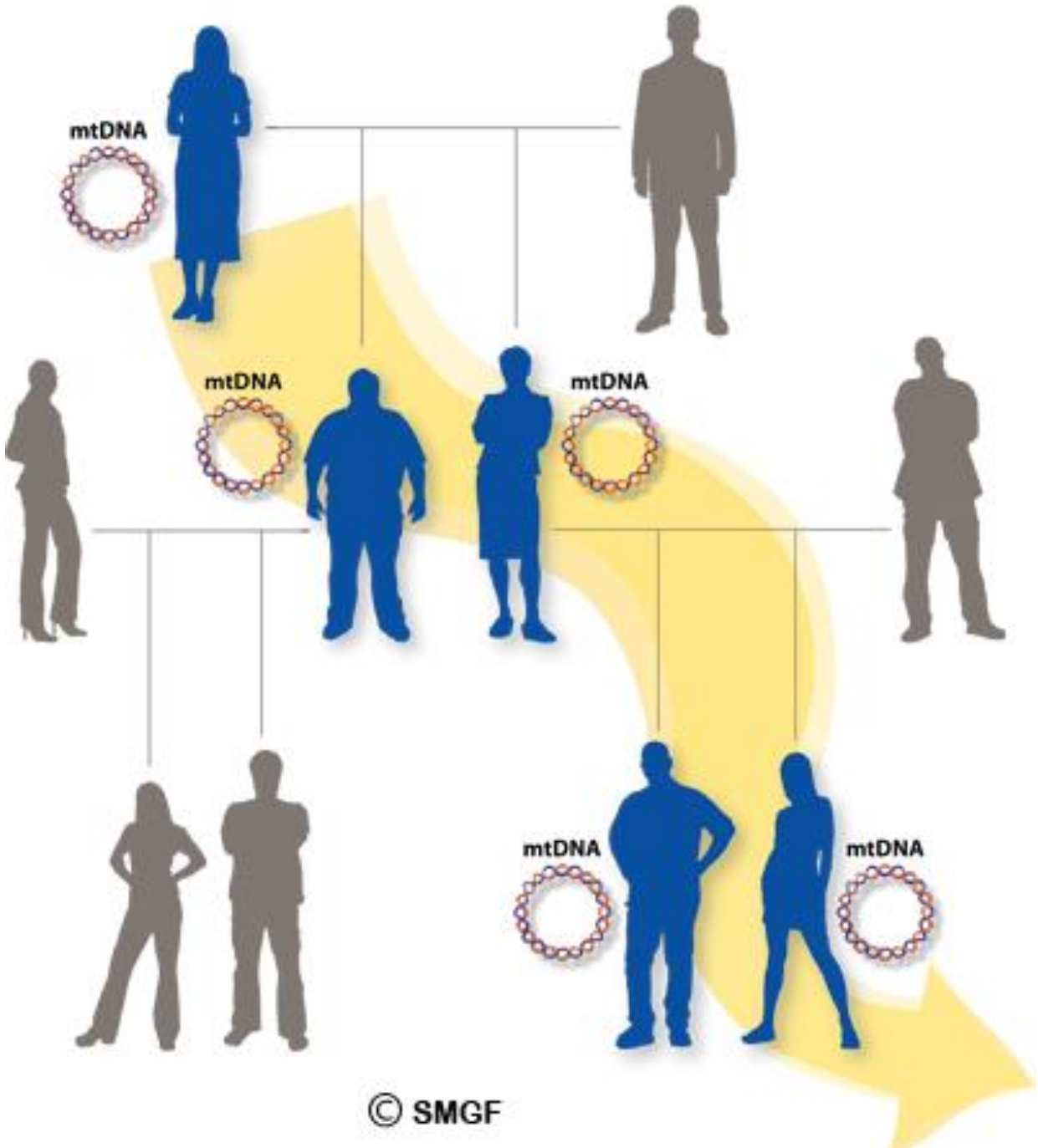
Save Our Sea Turtles Tobago

Life Cycle


Juvenile Movement to Coastal Waters
Recruitment
Hatchling dispersal to open waters
Neritic stage
Oceanic stage
1 to 10 years?
Juvenile and subadult habitat
nesting
Recruitment to Adult Population
Nesting Migration
Maturity at 20-40 years old?
Every 2-3 years
Adult habitat

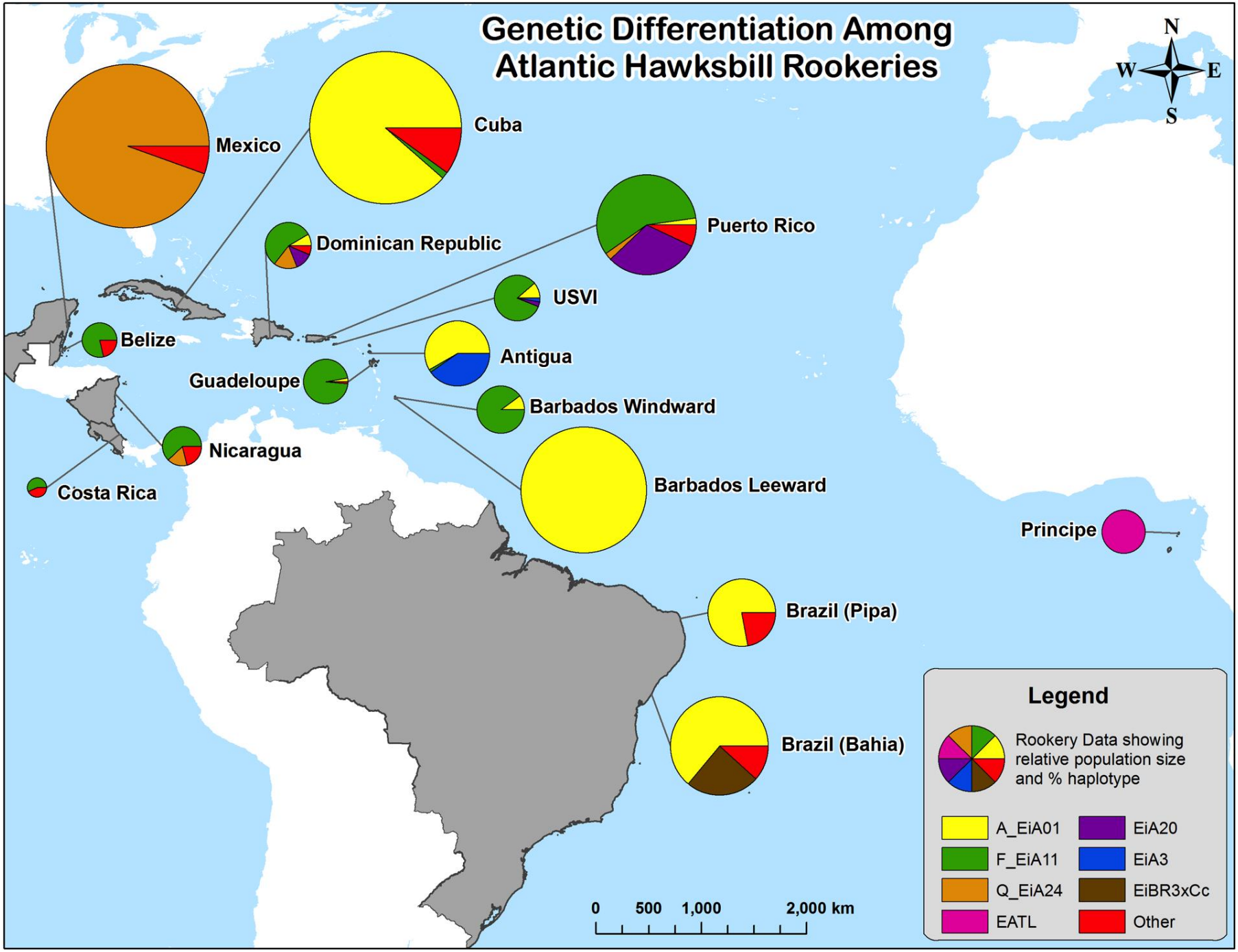

mitochondrion:
DNA comes
from mother
nucleus:
DNA comes
from both
parents
offspring cell


mtDNA
mtDNA
mtDNA
mtDNA
mtDNA
© SMGF

Haplotypes

- Unique sequence or pattern of DNA
- Each one is assigned a code or name

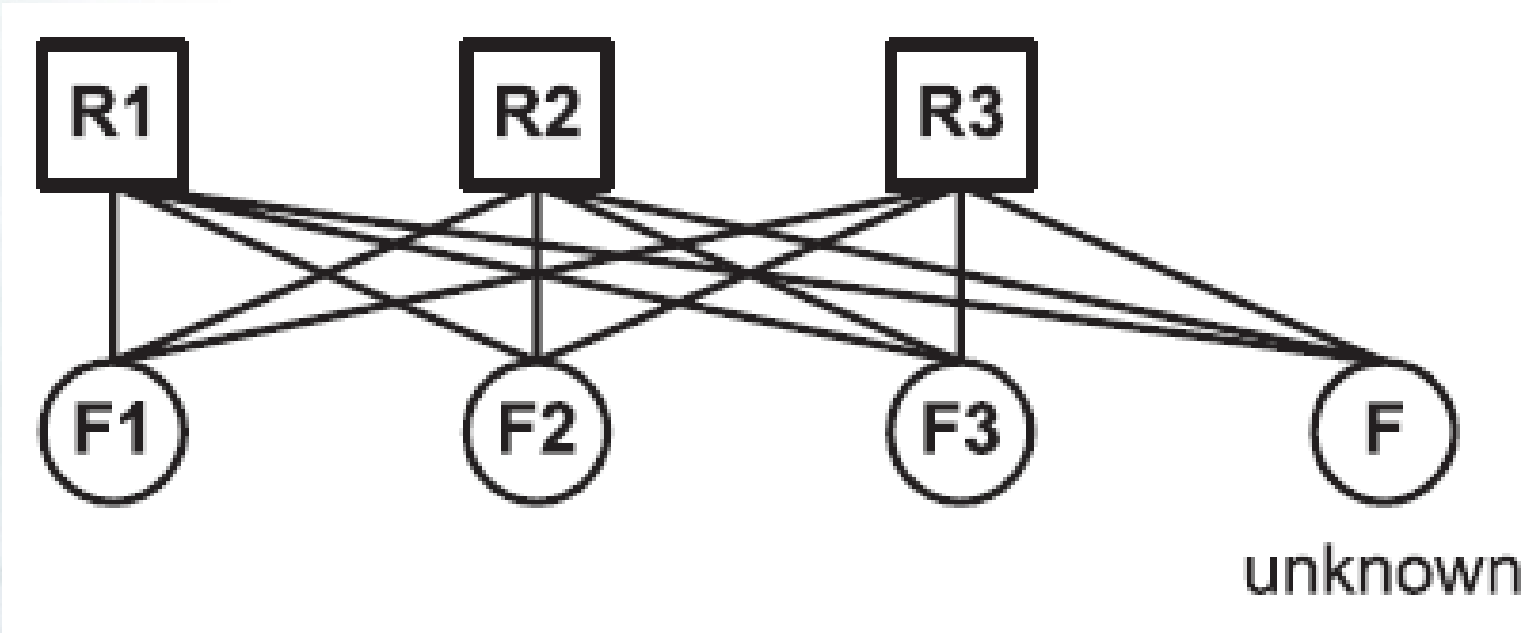
TTAAACTATCCCTTGACGCAGAATAAGCGCCAACACATAAA
CTTACCTATATCCTCTACCGTGCCCAGCAGACCAATATCCGC
AACACTTACCTATGTACTATTGTACATCTACTTATTTACCACTAG
CATATGACCAGTAGTACTGCTGATTAATCTGACCTAAAACATA
AAATTATTGGTTTTACATAAACTGTTTAAACTACATGACTATTATAC
AGGTAATAAGAATGAAATGGTATAGGACATAATATTAAGTAATT
ATTCTCAAACATGAATATCGTCACAGTAATGGGTTATTTCTTAGTT
CAGCTCATCACGAGAAATAAGCAATCCTTGTTAGTAAGATAC
AACATTACCAGTTTCAGGCCCATTAATTTATGGC


Genetic Differentiation Among
Atlantic Hawksbill Rookeries
N
W
E
S
Mexico
Cuba
Puerto Rico
Dominican Republic
USVI
Belize
Antigua
Guadeloupe
Barbados Windward
Nicaragua
Barbados Leeward
Costa Rica
Principe
Brazil (Pipa)
Brazil (Bahia)
0 500 1,000 2,000 km
Legend
Rookery Data showing relative population size and % haplotype
A_EiA01
EiA20
F_EiA11
EiA3
Q_EiA24
EiBR3xCc
EATL
Other

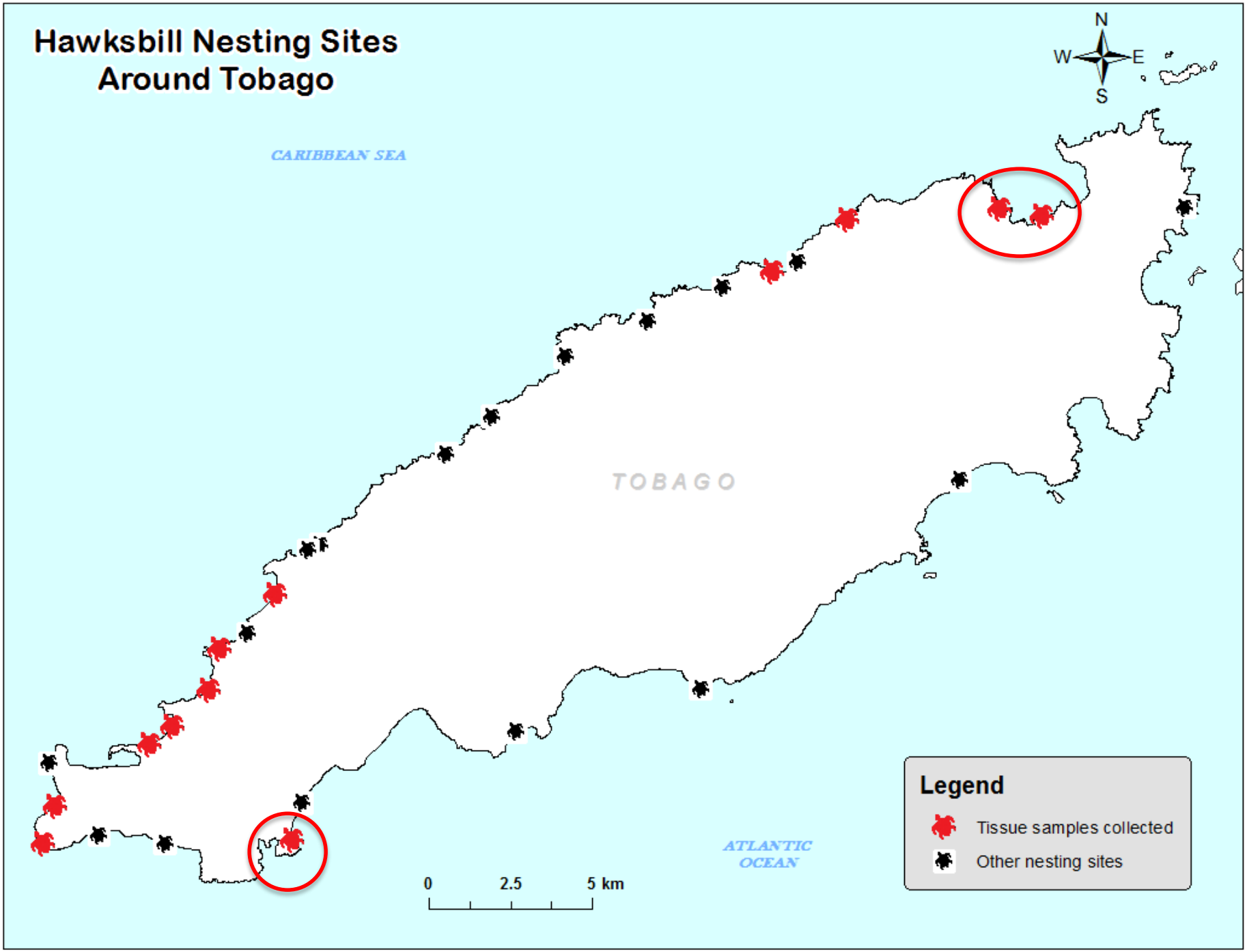
Mixed Stock Analysis

- Haplotypes act as genetic tags or markers to study movements among rookeries and mixed stocks
  - Origin of Tobago's "mixed stock"
  - Dispersal of Tobago's hatchlings and contribution to regional foraging grounds
  - Some advantages over tagging and telemetry

Bayesian Mixed Stock Analysis many to many

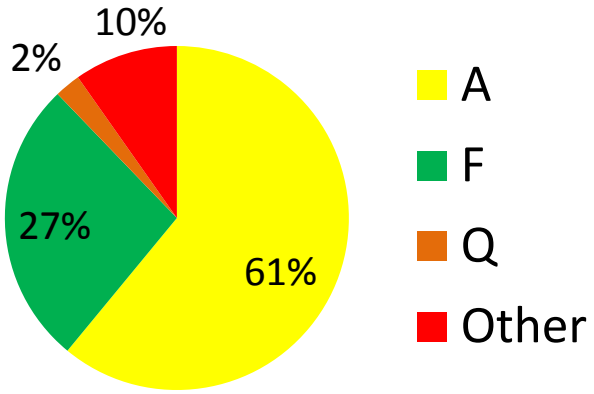


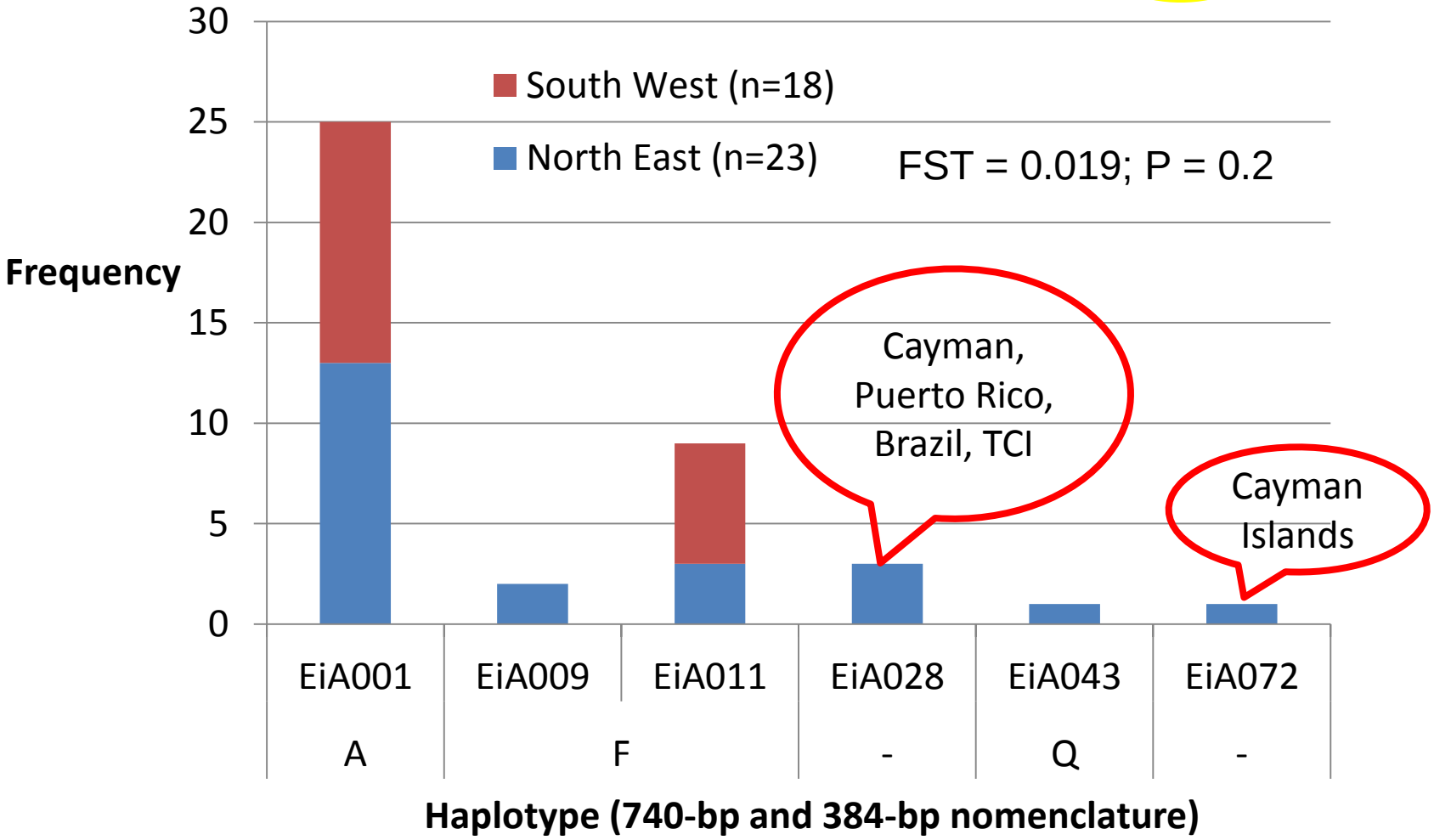
- Haplotype frequency data for 16 rookeries; 23 mixed stocks
- Relative rookery size - # annual nesting females


Hawksbill Nesting Sites
Around Tobago
N
W
E
S
CARIBBEAN SEA
TOBAGO
ATLANTIC
OCEAN
0
2.5
5 km
Legend
Tissue samples collected
Other nesting sites

Tobago Rookery n = 41

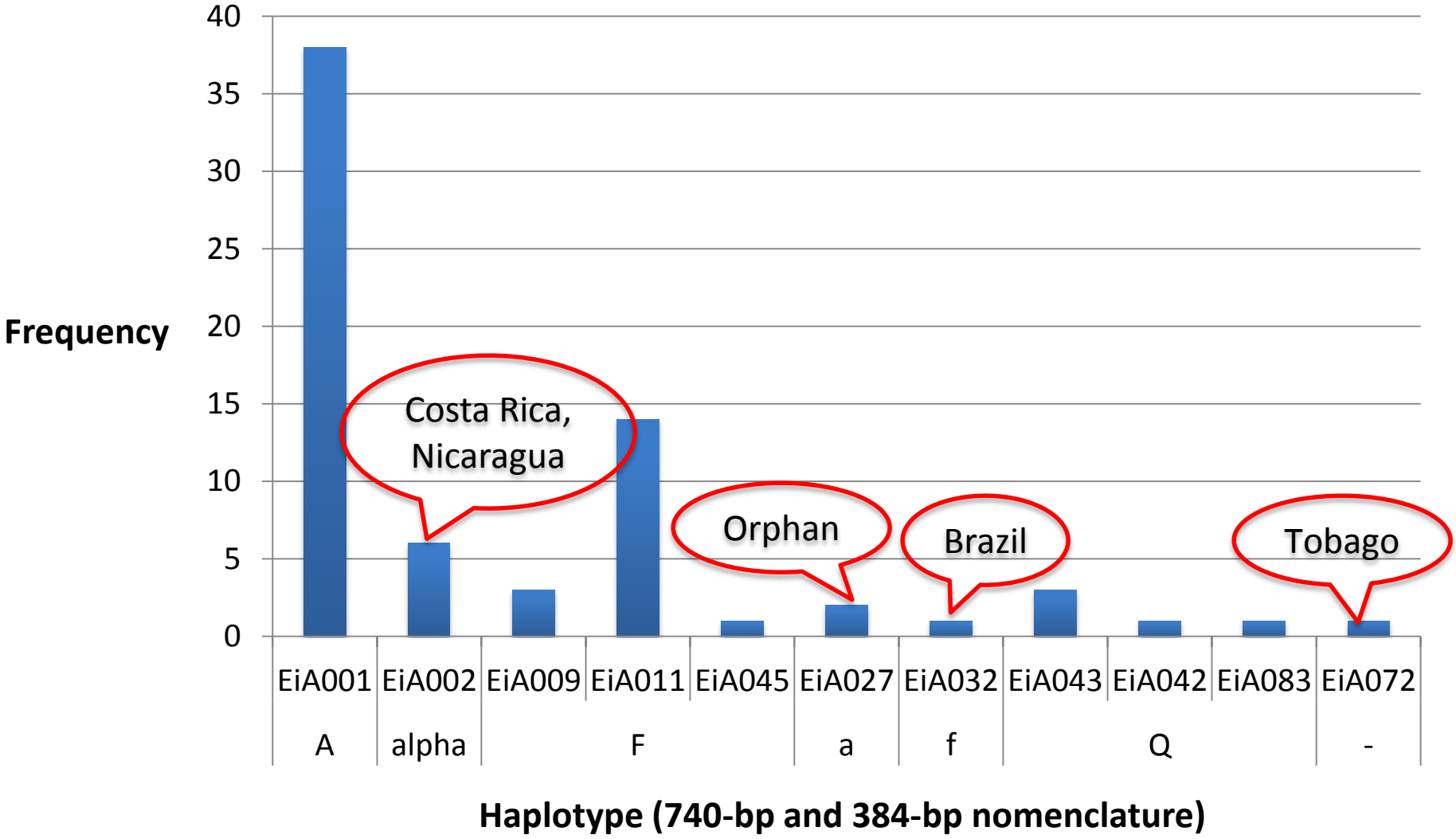
Haplotype diversity = 0.56

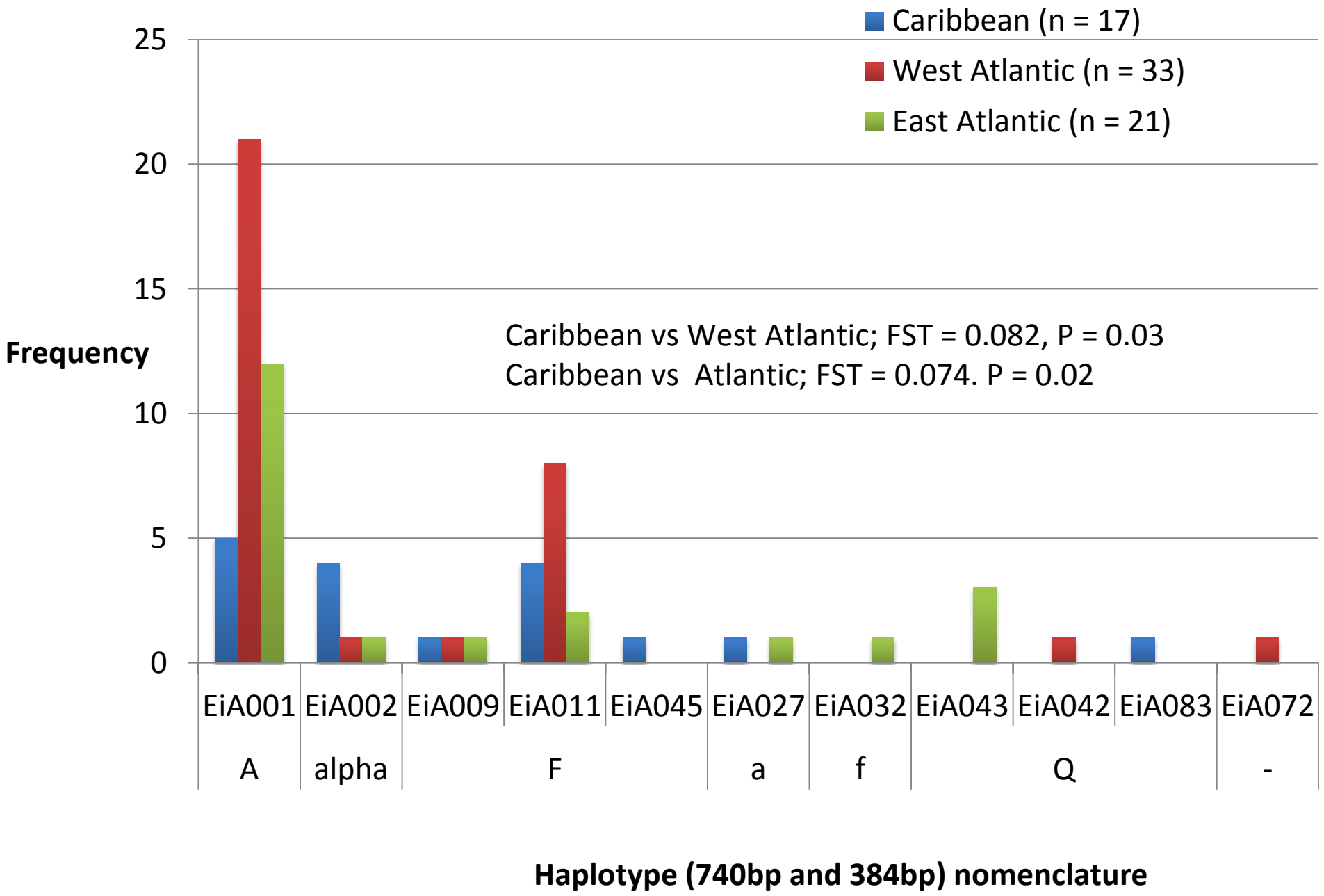




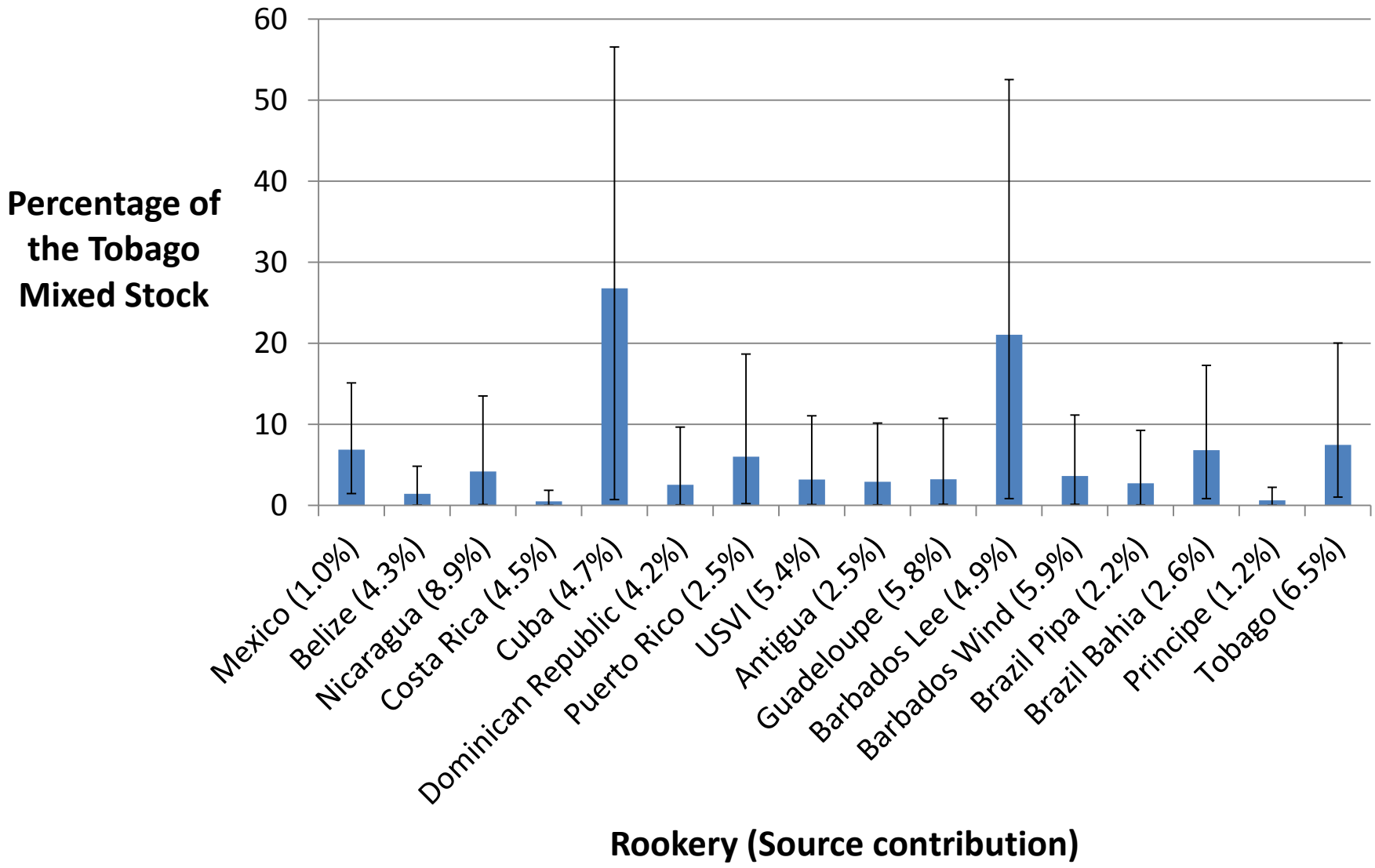
Tobago Mixed stock n = 71

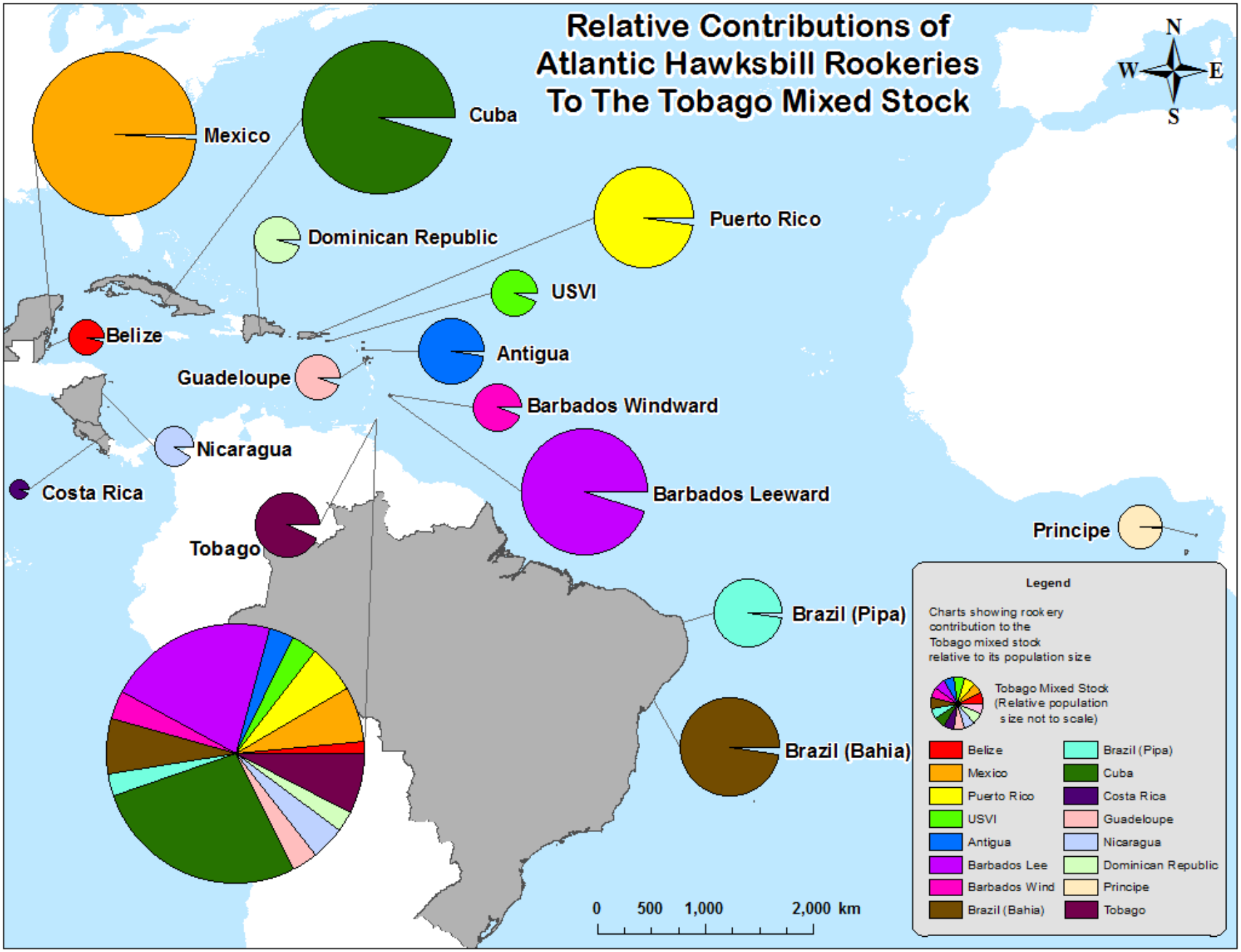
Haplotype diversity = 0.65



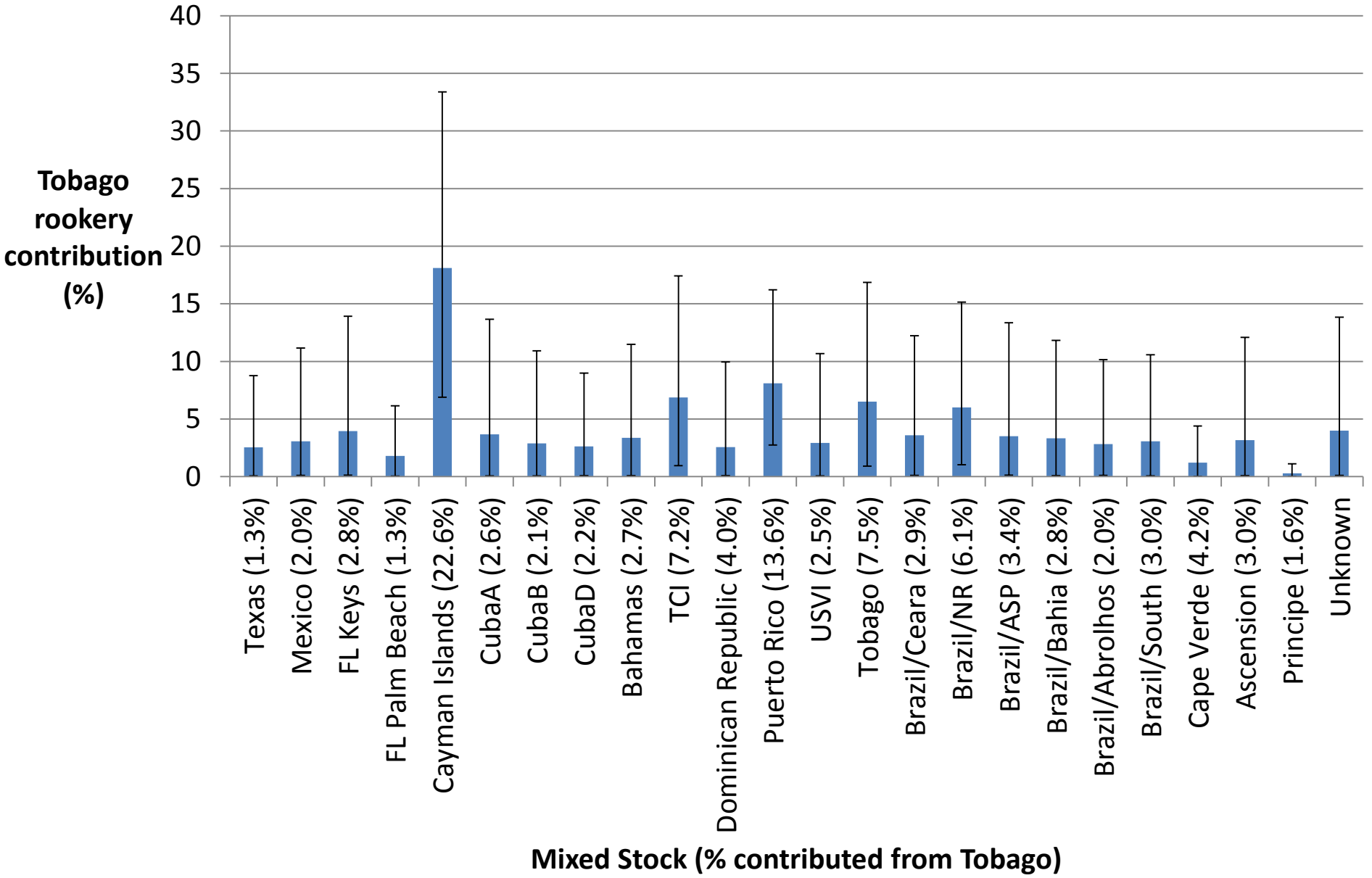

Caribbean (n = 17)
West Atlantic (n = 33)
East Atlantic (n = 21)
Caribbean vs West Atlantic; FST = 0.082, P = 0.03
Caribbean vs Atlantic; FST = 0.074. P = 0.02
Frequency
25
20
15
10
5
0
EiA001
EiA002
EiA009
EiA011
EiA045
EiA027
EiA032
EiA043
EiA042
EiA083
EiA072
A
alpha
F
a
f
Q
-
Haplotype (740bp and 384bp) nomenclature

MSA – Tobago Mixed Stock




Relative Contributions of
Atlantic Hawksbill Rookeries
To The Tobago Mixed Stock
N
W
E
S
Mexico
Cuba
Puerto Rico
Dominican Republic
USVI
Belize
Antigua
Guadeloupe
Barbados Windward
Nicaragua
Barbados Leeward
Costa Rica
Tobago
Principe
Brazil (Pipa)
Brazil (Bahia)
0 500 1,000 2,000 km
Legend
Charts showing rookery contribution to the Tobago mixed stock relative to its population size
Tobago Mixed Stock (Relative population size not to scale)
Belize
Mexico
Puerto Rico
USVI
Antigua
Barbados Lee
Barbados Wind
Brazil (Bahia)
Brazil (Pipa)
Cuba
Costa Rica
Guadeloupe
Nicaragua
Dominican Republic
Principe
Tobago

MSA – Tobago Rookery



Conclusions

- Tobago hawksbill aggregation is a typical mixed stock with high genetic diversity
- Cuba and Barbados Leeward are the rookeries that contribute the greatest numbers to Tobago, but the local fishery would impact rookeries across the region - < 10% at each rookery
- Tobago rookery contributes individuals widely across the region, with a large proportion going to Cayman Islands
- There is some indication of genetic differentiation around the island, which deserves closer examination

Thank you!!!

- Adrian Hailey (UWI, St. Augustine)
- Julia Horrocks (UWI, Cavehill and The Barbados Sea Turtle Project)
- Darren Browne (UWI, Cavehill and The Barbados Sea Turtle Project)
- Nigel Austin (UWI, St. Augustine)
- Department of Natural Resources and the Environment (THA)
- Tobago dive operators
- My husband Ryan Mannette

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