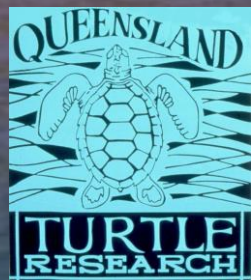


# MARINE TURTLE GENETIC STOCKS OF THE INDO-PACIFIC: IDENTIFYING BOUNDARIES AND KNOWLEDGE GAPS

NANCY N. FITZSIMMONS & COLIN J. LIMPUS



7<sup>th</sup> MEETING OF SIGNATORY STATES,  
INDIAN OCEAN – SOUTH-EAST ASIAN  
MARINE TURTLE MEMORANDUM OF UNDERSTANDING,  
8-11 September 2014, Bonn, Germany



## **BASIC TURTLE BIOLOGY:**

**MARINE TURTLES RETURN TO BREED IN THE AREA WHERE HATCHED, BUT**  
• NOT NECESSARILY TO THE EXACT BEACH WHERE THEY HATCHED

**FEMALES DISPERSE FROM A MATING AREA TO NEST ON ALL LOCAL BEACHES**

**MOST ADULTS RETURN TO BREED AT SAME BEACH ACROSS YEARS, BUT**  
• SOME ADULT TURTLES WILL INTERCHANGE BETWEEN ADJACENT NESTING BEACHES

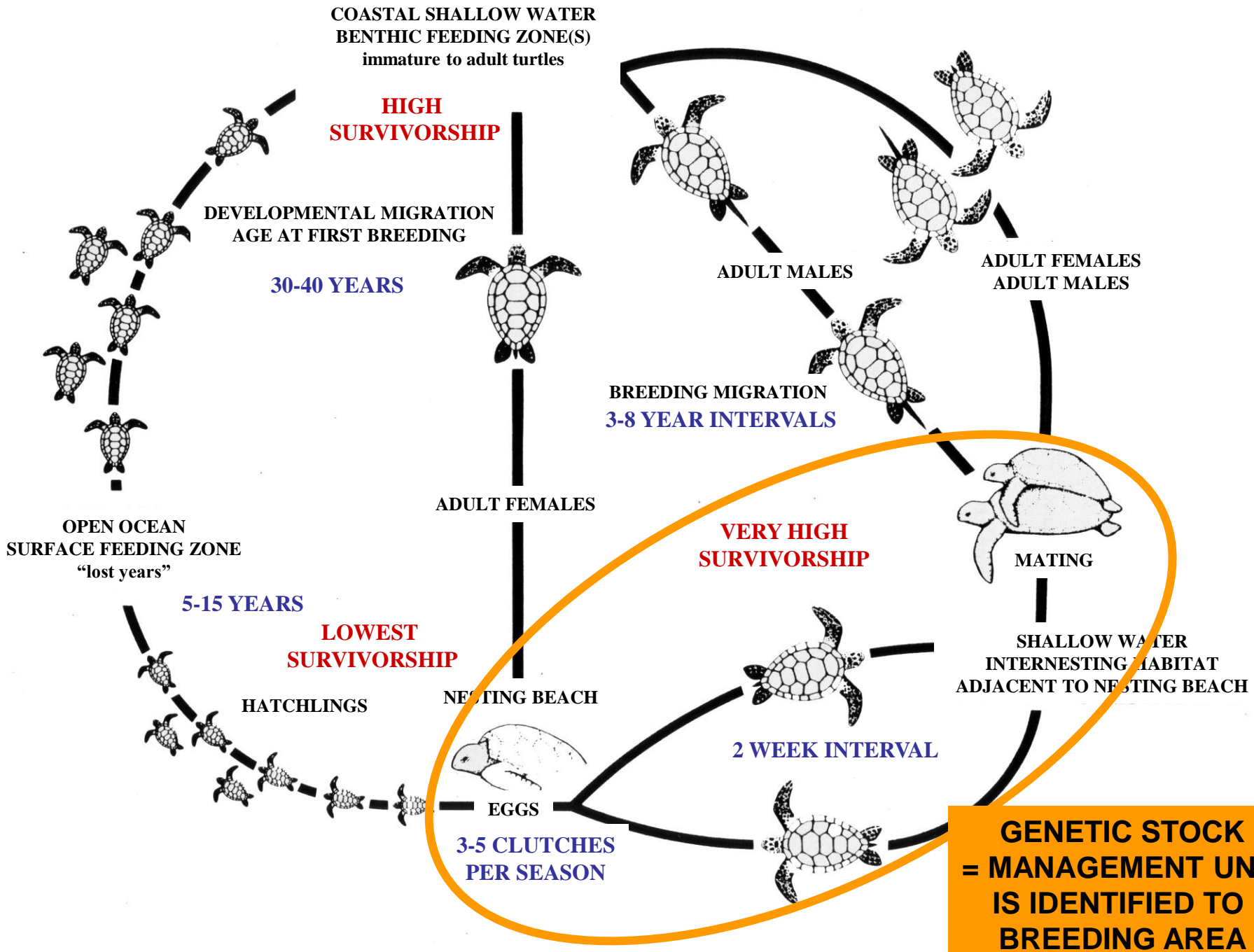


## **BIOLOGICAL CONSEQUENCES:**

- INTER-BREEDING AMONG TURTLES FROM ADJACENT NESTING BEACHES & COURTSHIP AREAS.
- LIMITED GENE FLOW BETWEEN WIDELY SEPARATED BREEDING AREAS

**RESULTS IN GENETIC DIFFERENCES BETWEEN BREEDING GROUPS**

**GENETICALLY DIFFERENT POPULATIONS  
CALLED “GENETIC STOCKS” = MANAGEMENT UNITS**



**GENETIC STOCK  
= MANAGEMENT UNIT  
IS IDENTIFIED TO  
BREEDING AREA**

# IDENTIFYING STOCK BOUNDARIES

## 1. MAP THE DISTRIBUTION OF TURTLE BREEDING FOR THE REGION

### 2A. GENETIC ANALYSIS: TISSUE SAMPLES FROM BREEDING TURTLES AT MULTIPLE SITES

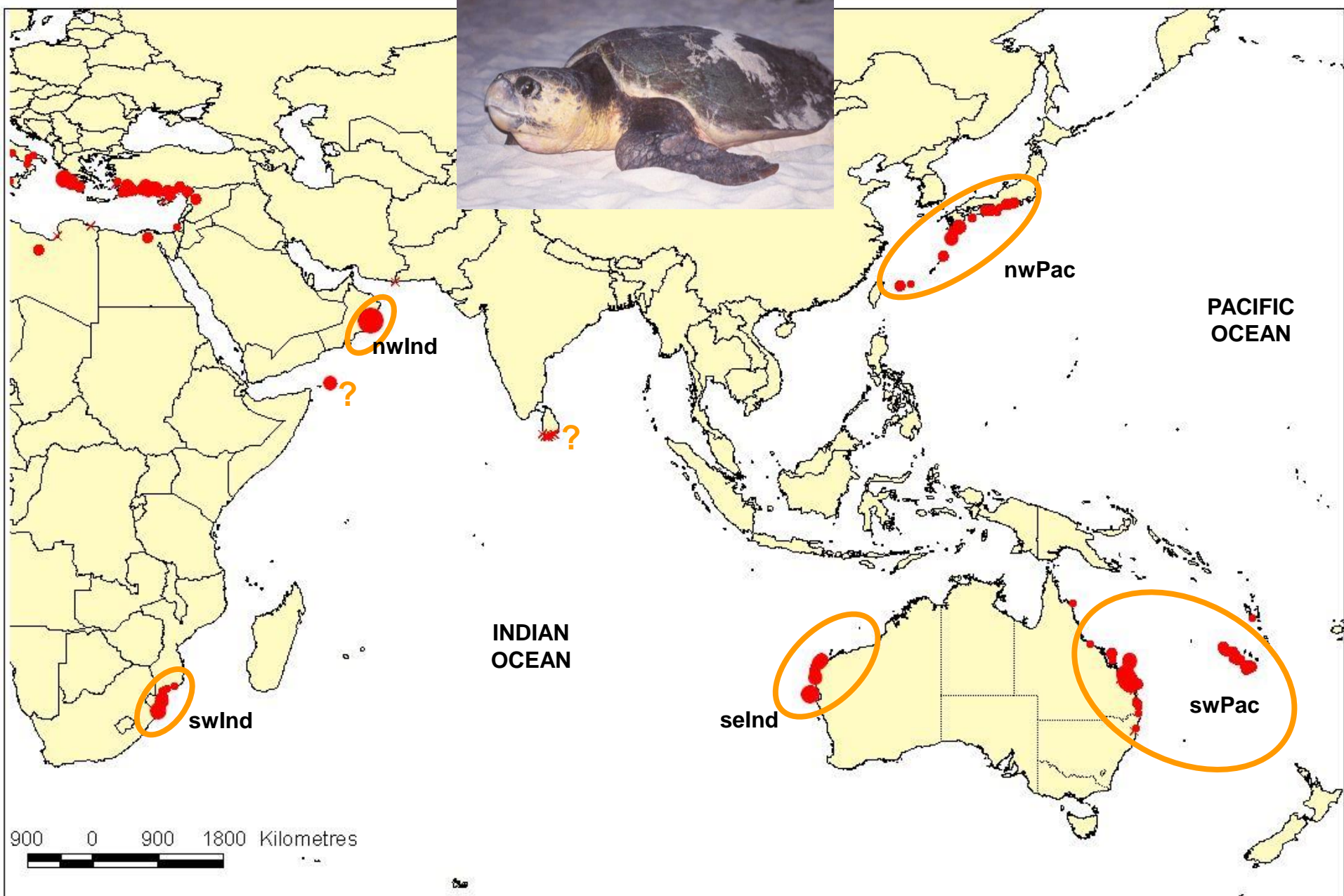
- NESTING FEMALES / MATING MALES / EGGS / HATCHLINGS
- TISSUES FIXED IN 20% DMSO (SATURATED WITH SALT) OR 95% ETHANOL

### 2A. LARGE SCALE TAGGING – RECAPTURES STUDIES

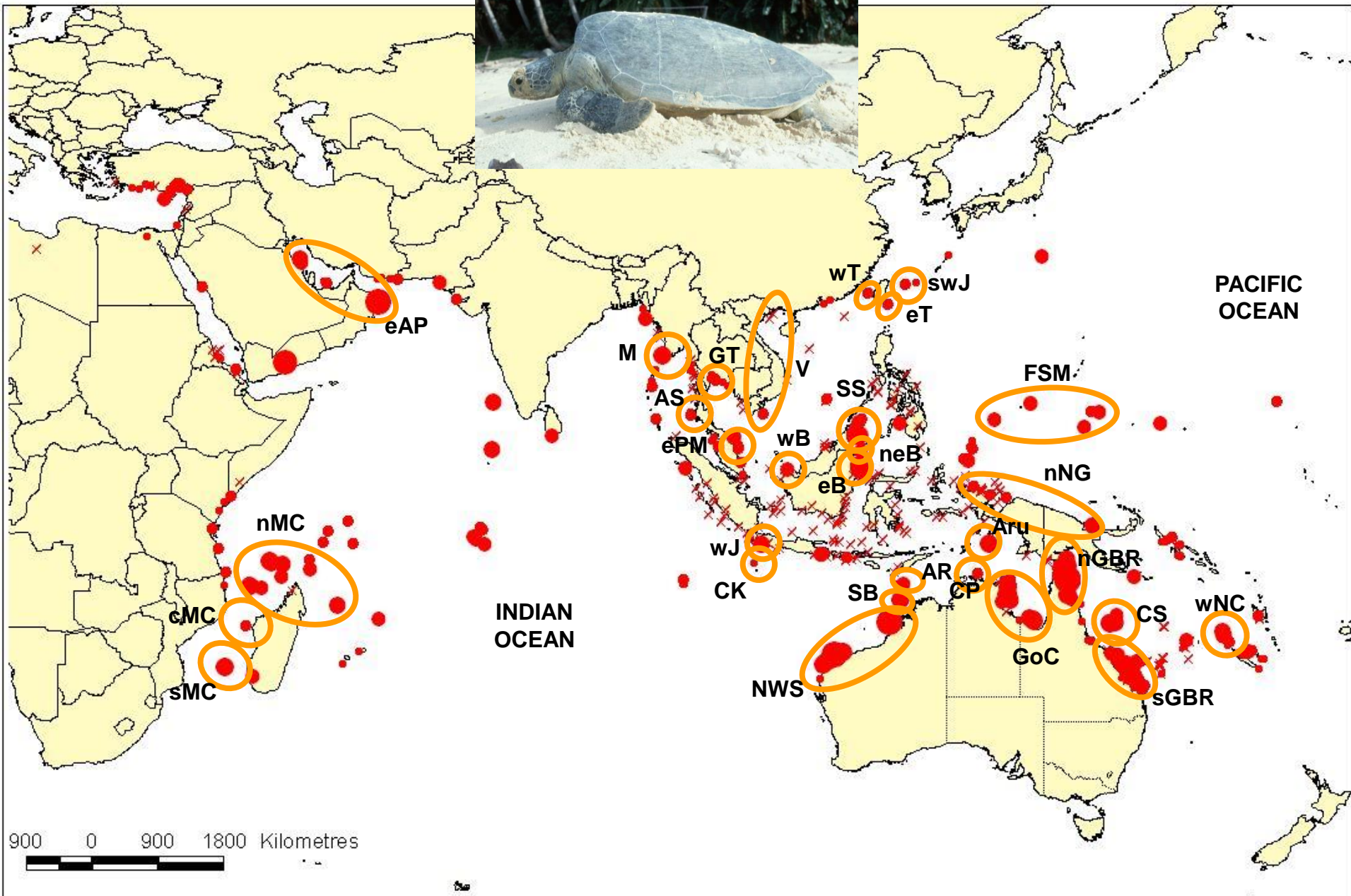
- MANY ROOKERIES & MANY YEARS

### 2C. INDEPTH BIOLOGICAL DATA COLLECTED FROM SEPARATE BREEDING AREAS

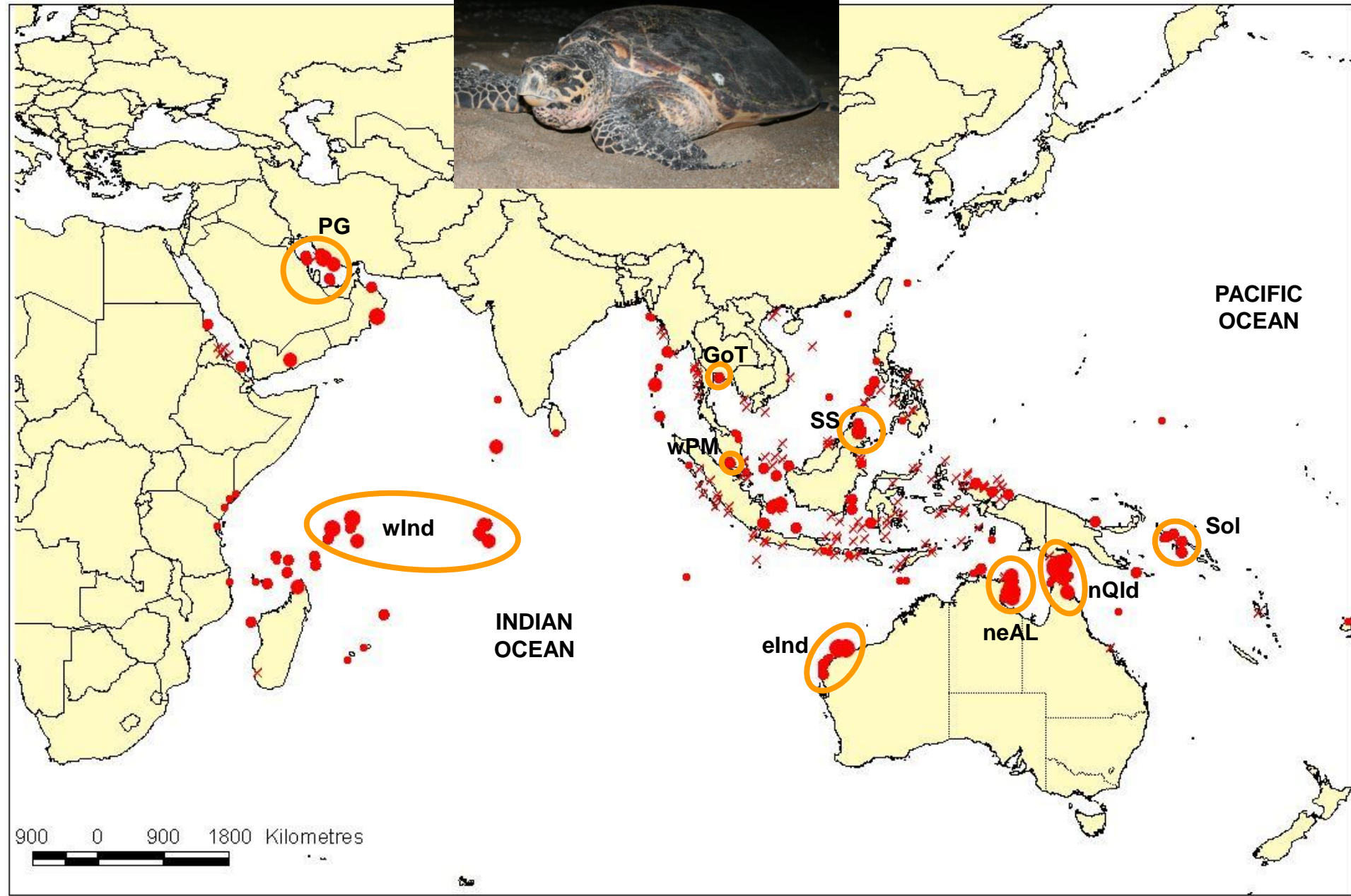
- DIFFERENT BREEDING SEASONS / MORPHOLOGICAL DIFFERENCES



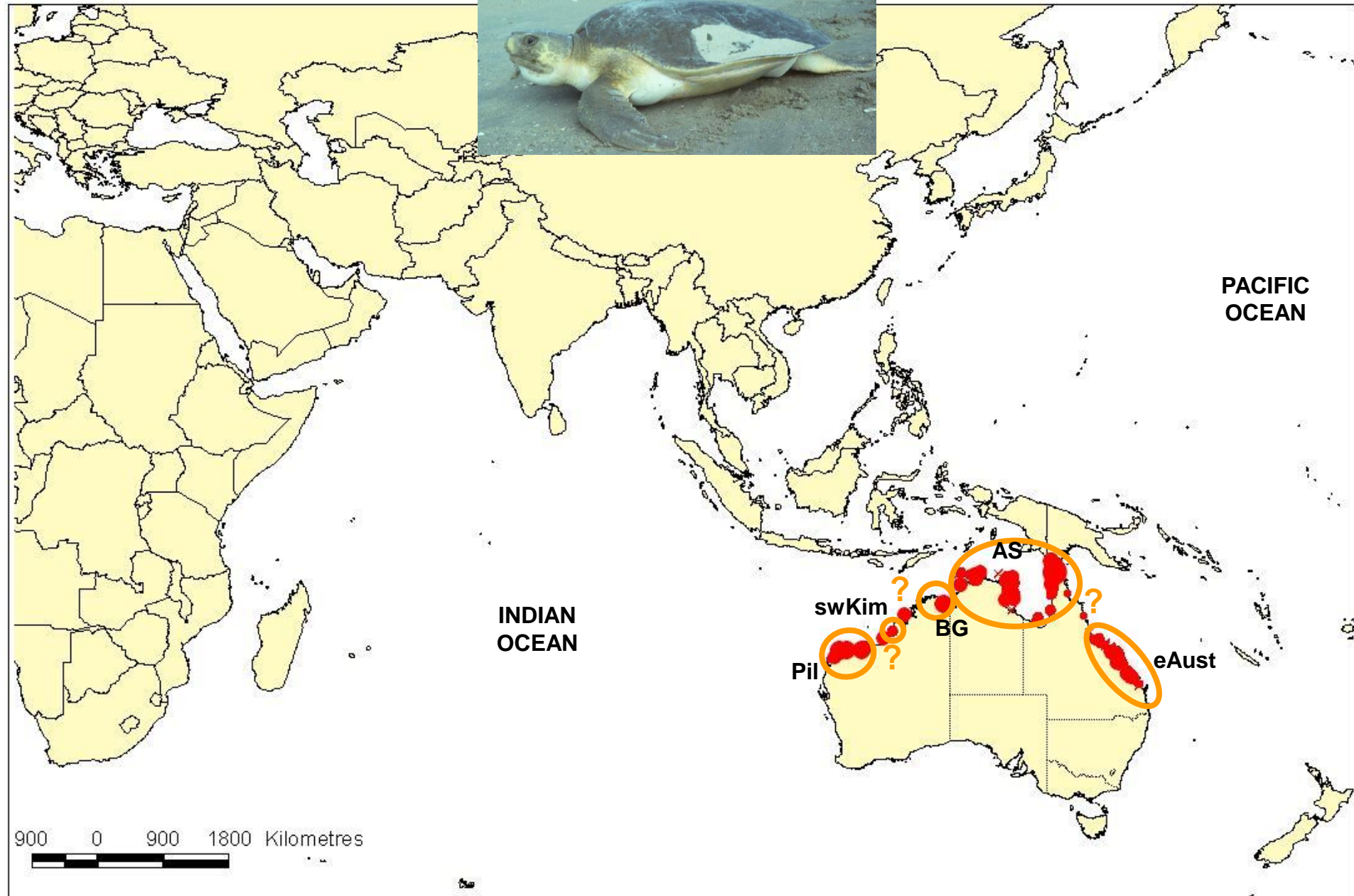
**LOGGERHEAD TURTLE, *Caretta caretta*  
GENETIC STOCKS**



**GREEN TURTLE, *Chelonia mydas*  
GENETIC STOCKS**

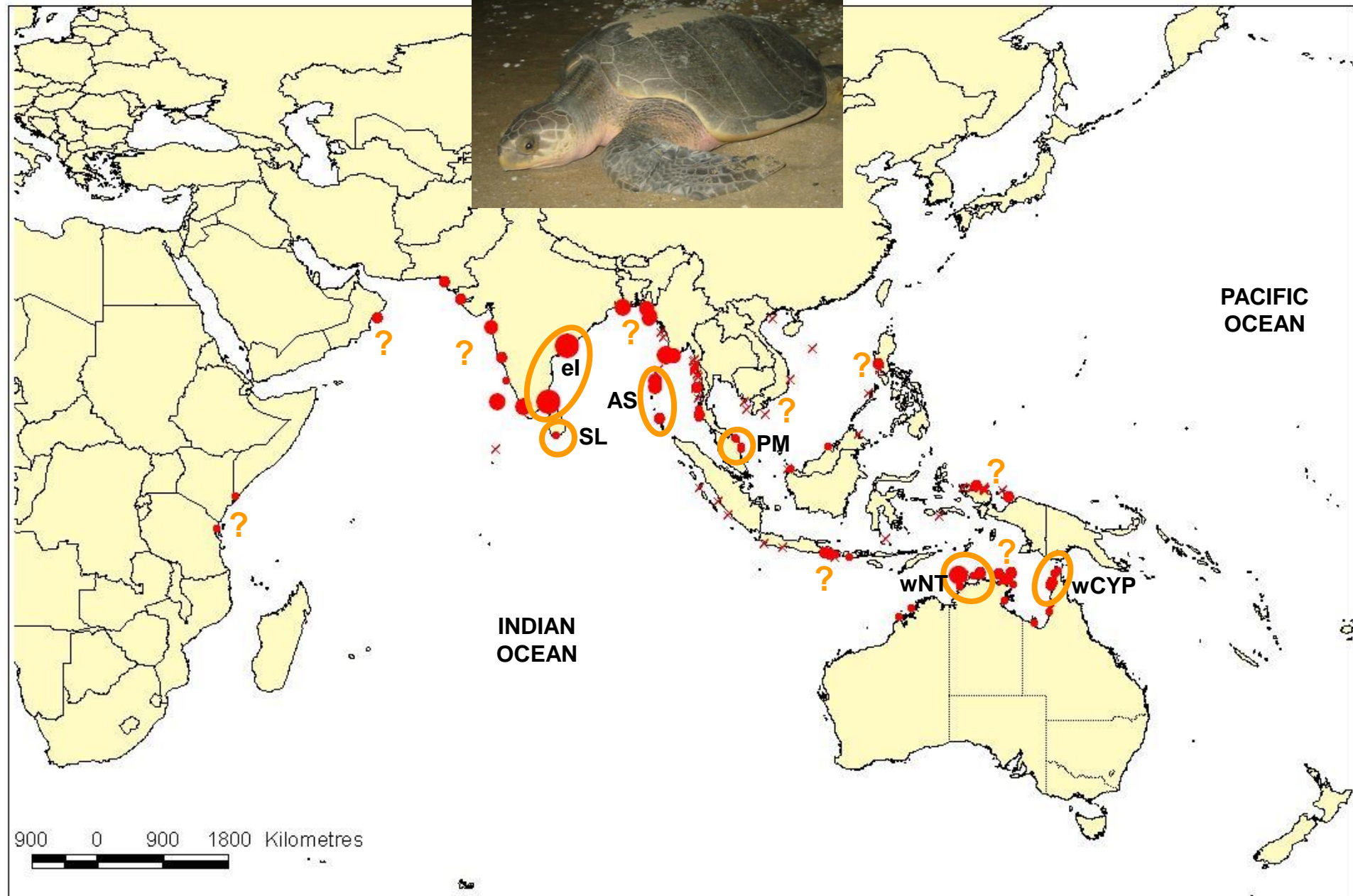


**HAWKSBILL TURTLE, *Eretmochelys imbricata*  
GENETIC STOCKS**

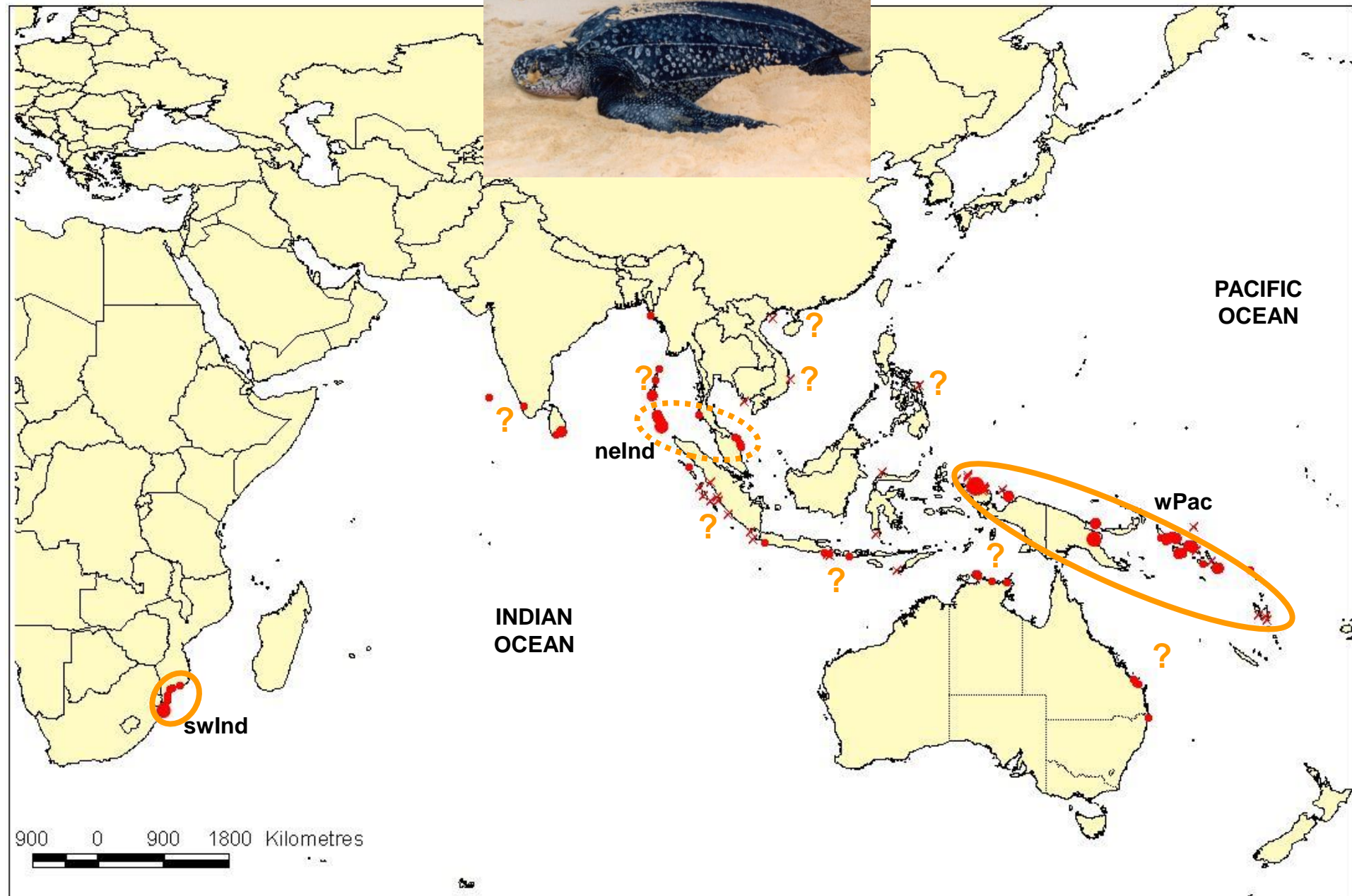


**FLATBACK TURTLE, *Natator depressus*  
GENETIC STOCKS**





**OLIVE RIDLEY TURTLE, *Lepidochelys olivacea***  
**GENETIC STOCKS**



**LEATHERBACK TURTLE, *Dermochelys coriacea*  
GENETIC STOCKS**

# INDIAN OCEAN – WESTERN PACIFIC MARINE TURTLES: 6 SPECIES

## STOCKS

- 5 IDENTIFIED
- ? 6<sup>th</sup> – SRI LANKA



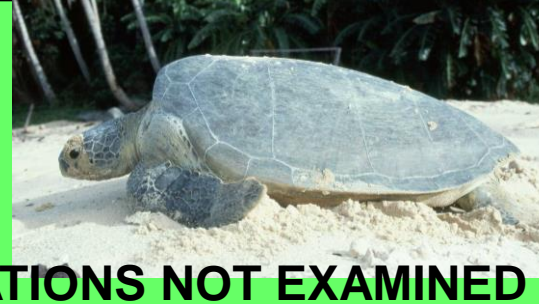
## UNRESOLVED:

- NW & W INDIAN OCEAN

LOGGERHEAD TURTLE, *Caretta caretta*

## STOCKS

- 30 IDENTIFIED

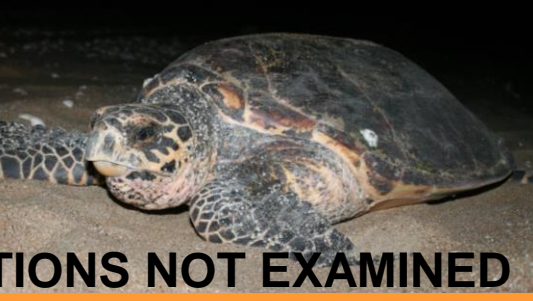


- MANY POPULATIONS NOT EXAMINED

GREEN TURTLE, *Chelonia mydas*

## STOCKS

- 9 IDENTIFIED



- MOST POPULATIONS NOT EXAMINED

HAWKSBILL TURTLE, *Eretmochelys imbricata*

## STOCKS

- 5 IDENTIFIED



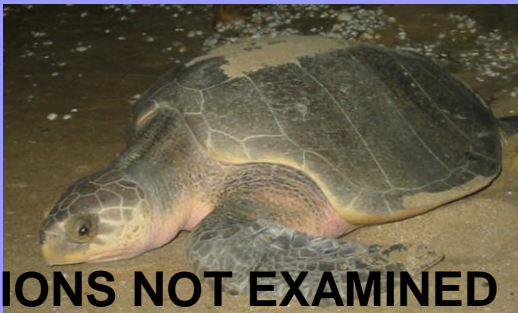
## UNRESOLVED:

- NW WESTERN AUSTRALIA

FLATBACK TURTLE, *Natator depressus*

## STOCKS

- 6 IDENTIFIED



- MANY POPULATIONS NOT EXAMINED

OLIVE RIDLEY TURTLE, *Lepidochelys olivacea*

## STOCKS

- 3 IDENTIFIED



- MOST POPULATIONS NOT EXAMINED

LEATHERBACK TURTLE, *Dermochelys coriacea*

COASTAL SHALLOW WATER  
BENTHIC FEEDING ZONE(S)  
immature to adult turtles

**HIGH  
SURVIVORSHIP**

DEVELOPMENTAL MIGRATION  
AGE AT FIRST BREEDING

30-40 YEARS

ADULT FEMALES  
ADULT MALES

GENERATION  
INTERVALS

OPT  
SURE

**WHERE ARE THE TURTLES FROM YOUR MANAGEMENT UNIT?:  
IDENTIFICATION REQUIRES:  
• POST-HATCHLING DISPERSAL  
• IMMATURE & ADULT FORAGING  
• MIGRATING  
• DNA ANALYSIS; FLIPPER TAG RECOVERIES OR SATELLITE TELEMTRY**

**LOWEST  
SURVIVORSHIP**

**VERY HIGH  
SURVIVORSHIP**

MATING

SHALLOW WATER  
INTERNESTING HABITAT  
ADJACENT TO NESTING BEACH

HATCHLINGS

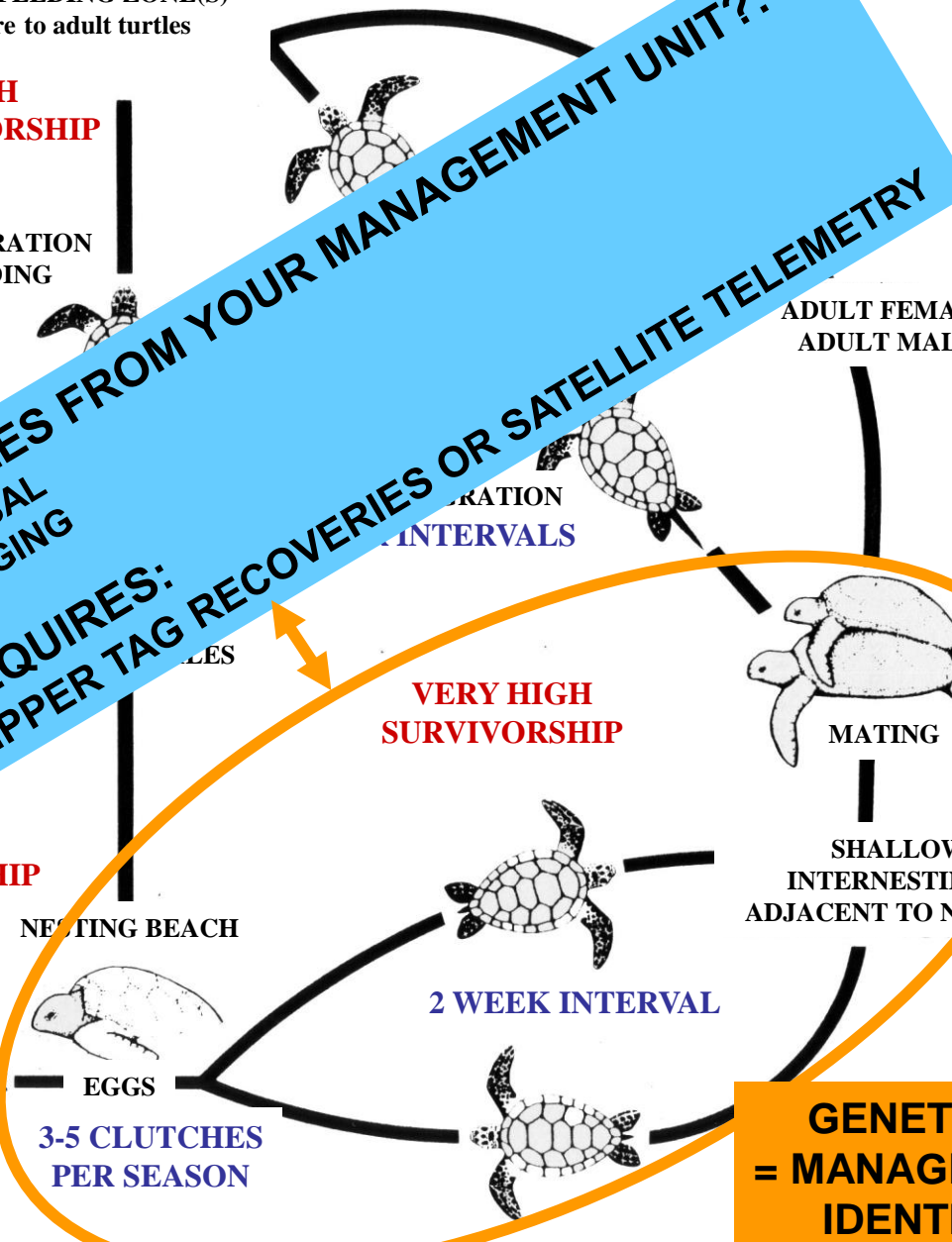
NESTING BEACH

2 WEEK INTERVAL

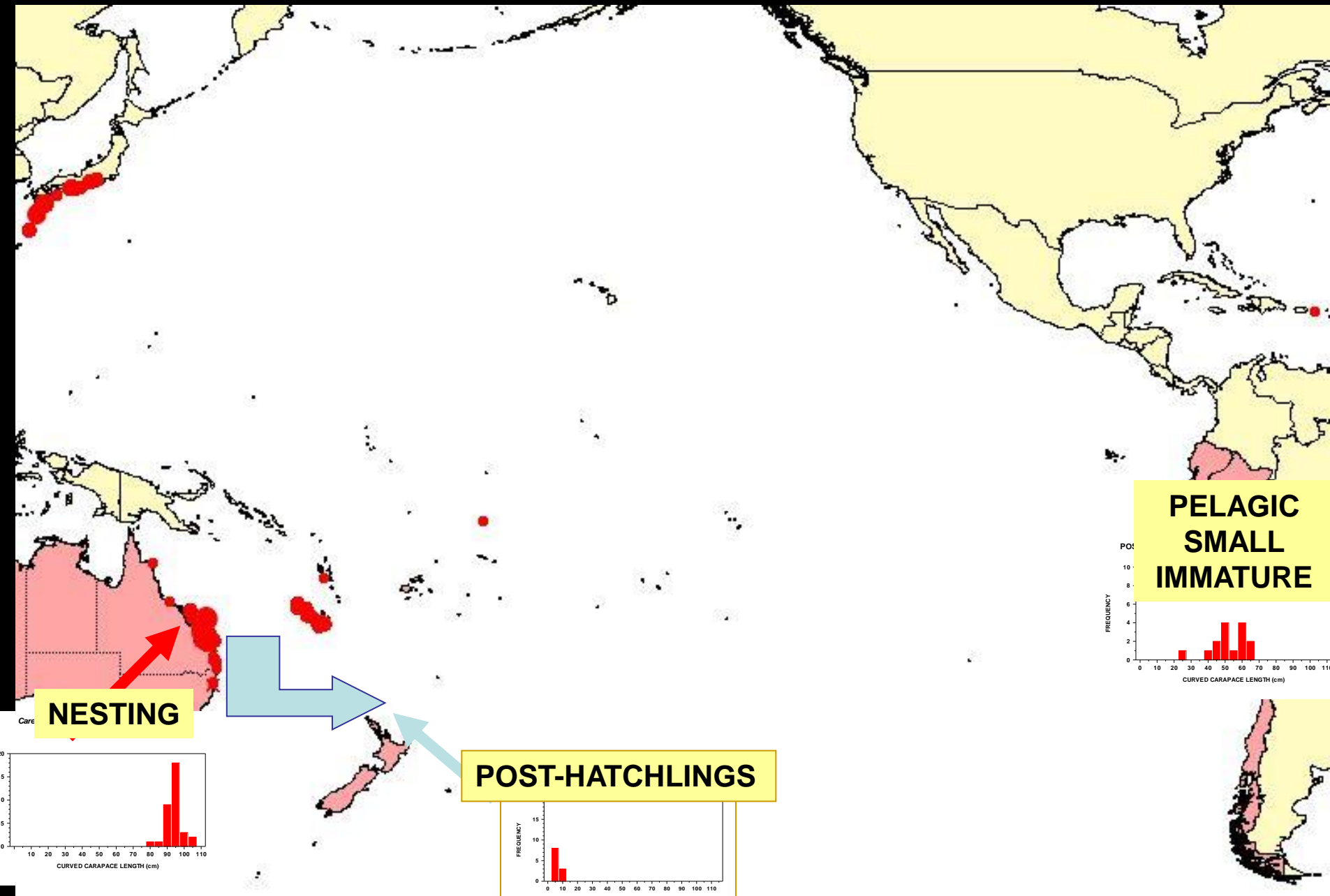
EGGS

3-5 CLUTCHES  
PER SEASON

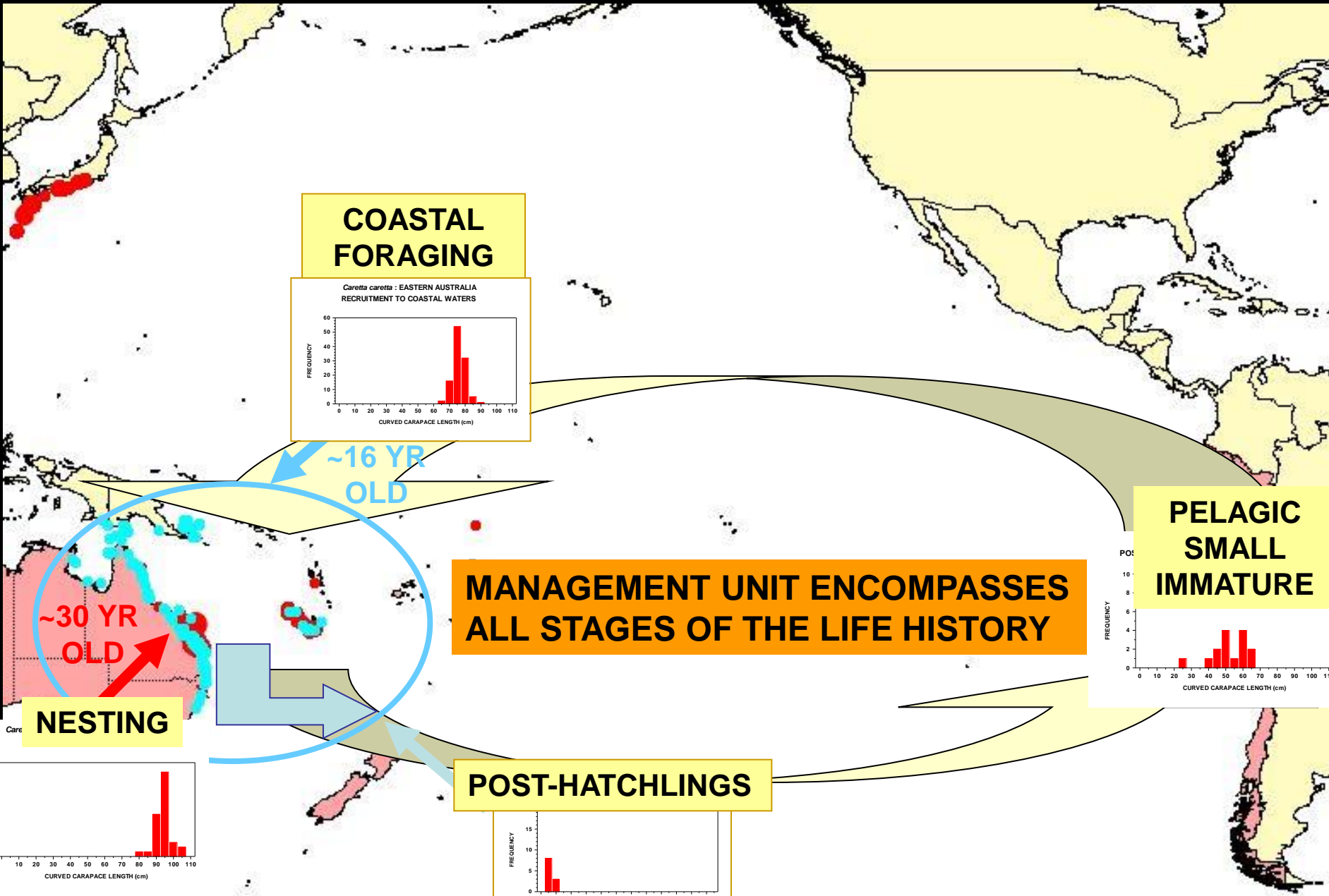
**GENETIC STOCK  
= MANAGEMENT UNIT  
IDENTIFIED TO  
BREEDING AREA**



# CASE STUDY: STH PACIFIC LOGGERHEAD TURTLE STOCK



# CASE STUDY: STH PACIFIC LOGGERHEAD TURTLE STOCK



**MAPPING MARINE TURTLE NESTING DISTRIBUTION  
&  
GENETIC STOCK IDENTIFICATION**

**A FIRST STEP FOR DETERMINING THE SCOPE OF MANAGEMENT  
FOR YOUR TURTLE POPULATIONS (BY MANAGEMENT UNITS)**

A large sea turtle, likely a green sea turtle, is shown resting on a sandy beach at night. The turtle's head is in the foreground, facing the viewer, with its eyes closed. Its shell is dark and textured, and its flippers are visible on either side. The background is dark, suggesting a nighttime setting. The text is overlaid on the image in white, bold, sans-serif font.

**SITE NETWORKS SHOULD ENCOMPASS  
THE COMPLETE MIGRATORY RANGE OF HABITATS  
OCCUPIED BY A MANAGEMENT UNIT**

## **RECOMMENDED ACTIONS:**

**IN ORDER TO UNDERSTAND THE DISTRIBUTION OF TURTLES AWAY FROM THE NESTING BEACH USING GENETIC ANALYSIS, IT IS ESSENTIAL TO IDENTIFY GENETIC CHARACTERISTICS OF THE NESTING POPULATIONS.**

- SIGNATORY STATES SHOULD PRIORITIZE WHICH GENETIC STOCKS NEED IDENTIFICATION AT NESTING AND FORAGING AREAS AND, WHERE POSSIBLE, ON THE HIGH SEAS.**
- THE SPECIES ASSESSMENTS & SITE NETWORK PROCESS SHOULD INFORM THE PRIORITIZATION OF GENETIC ANALYSIS OF POPULATIONS.**
- THE SECRETARIAT WILL ASSIST COUNTRIES WITH RESPECT TO APPLYING FOR CITES PERMITS**
- ADVISORY COMMITTEE WILL ASSIST WITH CONTACTS FOR LABORATORIES SPECIALIZING IN SEA TURTLE GENETICS.**