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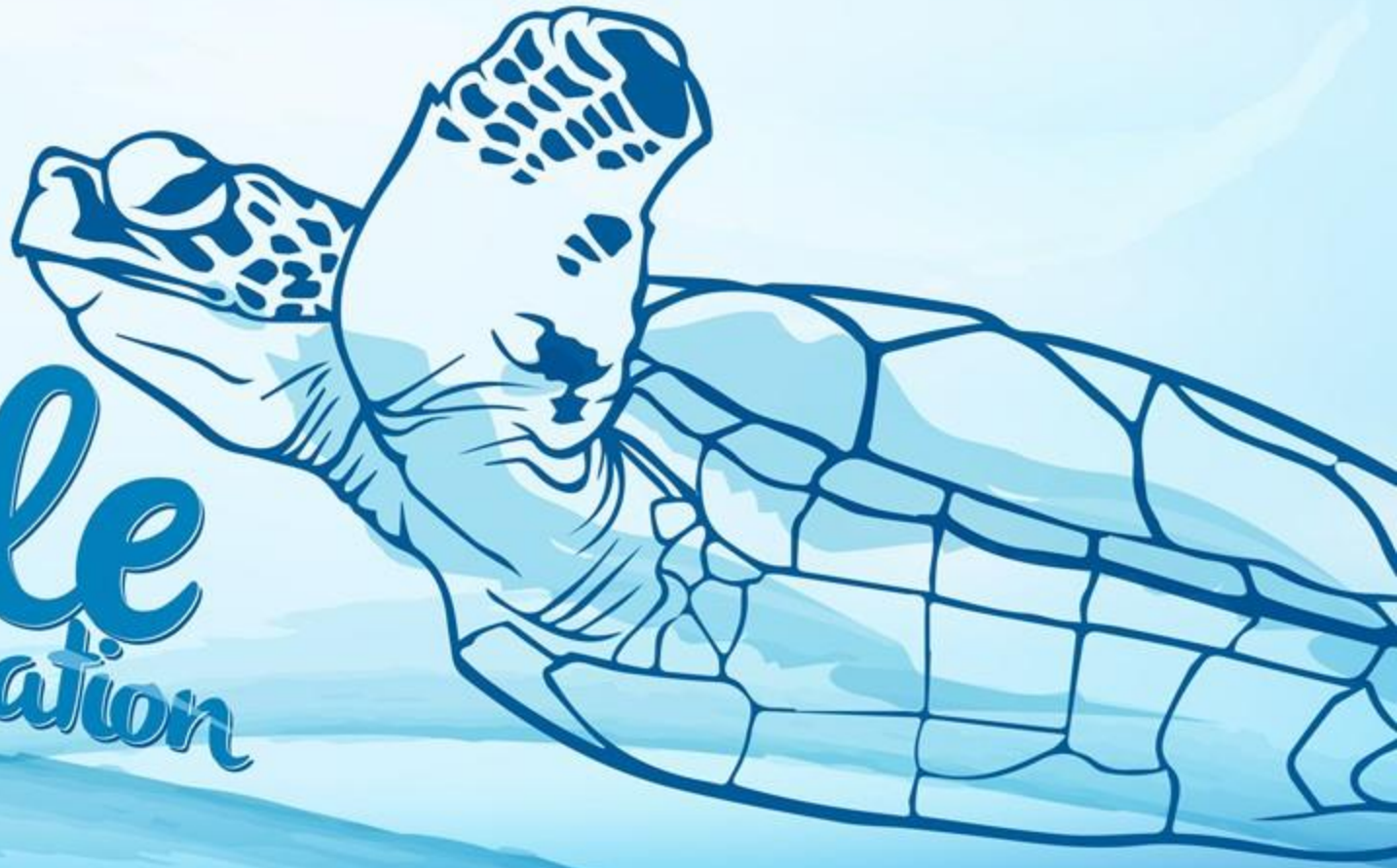

Sea Turtle Biology & Conservation

UNIVERSITI MALAYSIA TERENGGANU

TOPIC 2:
BIOLOGY OF SEA TURTLES

By:

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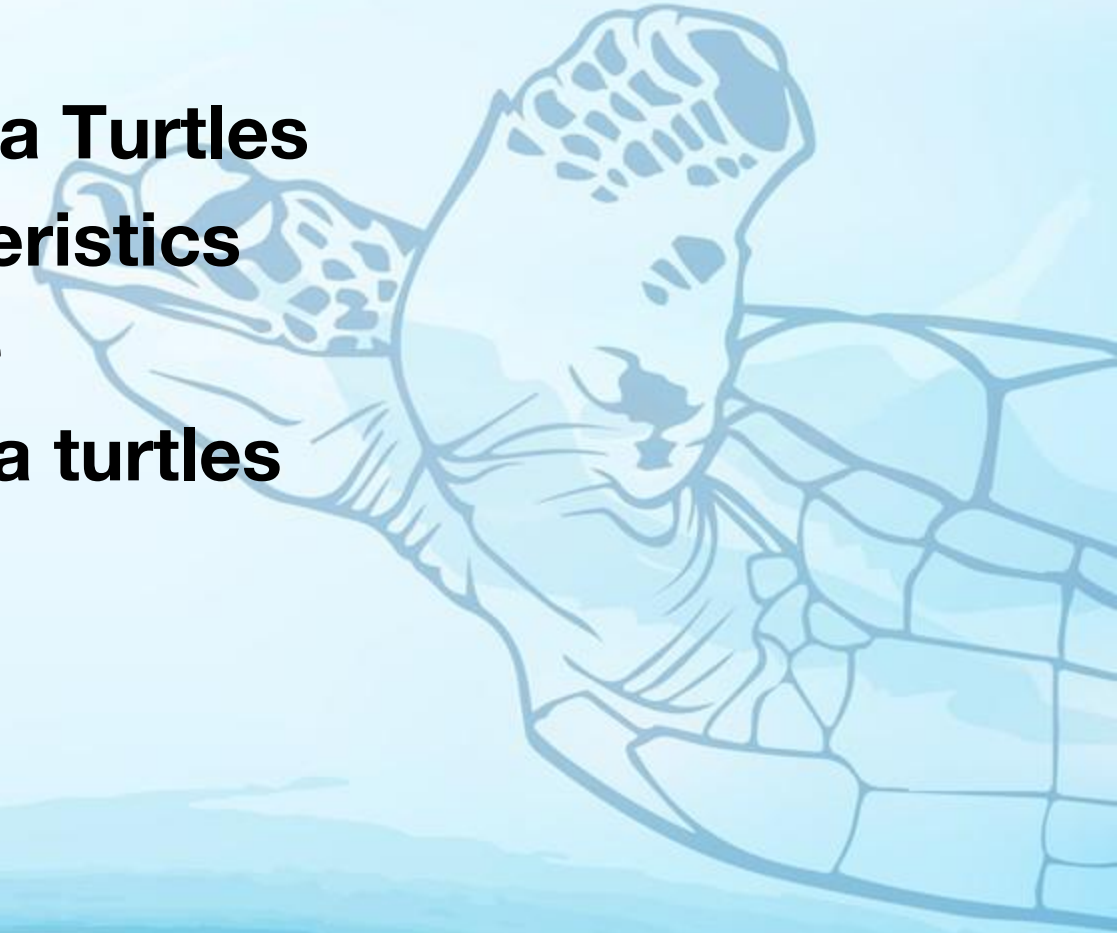
Topic Outline:

- Introduction to Sea Turtles
- Unique Characteristics
- Life cycle
- Importance of sea turtles



Introduction to Sea Turtles

- Sea turtles are reptiles: cold blooded, scales on body and lay shelled – eggs. Their shell consist of two parts: the top is called carapace and the bottom called plastron.
- They are ancient animals, with fossil records date back 150-200 million years
- They breath air and spend most (99.9%) of their life in the sea. Only female will come up to the beach to lay eggs.
- Their eyes are adapted for underwater vision

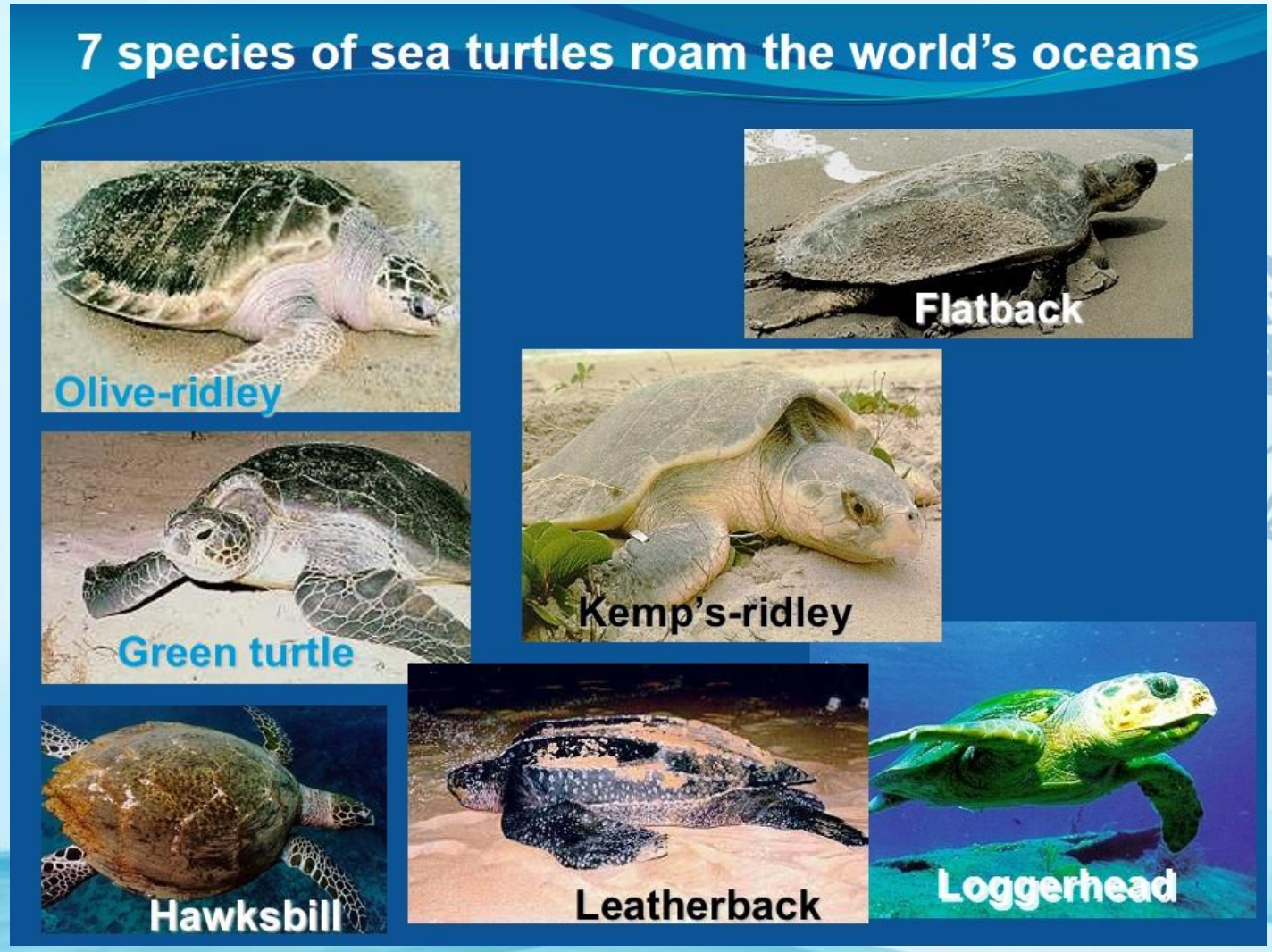
Introduction to Sea Turtles

- No external ears, no teeth and jaws modified into “beaks”.
- The front limbs are modified to serve as paddles and are longer, flatter than those freshwater turtles.
- Sea turtles cannot withdraw the head and limbs inside the shell.
- Sea turtles grow much larger than freshwater turtles.
- Unlike mammals, which mature and stop growing at a certain age, reptiles grow and mature in relation to the amount and quality of food available.

Introduction to Sea Turtles

- Sea turtles are reptiles of the order Testudines, suborder Cryptodira. The first known turtles adapted for a marine existence appear as fossils dating to 150-200 million years ago.
- On a global scale, marine turtles have undergone a considerable reduction in their biodiversity since their peak in the Cretaceous period. Of the five marine turtle families of the Cretaceous, only two are represented among the present day turtle fauna.
- Today, seven species of marine turtles representing two families are recognised. An eighth species, the black turtle or East Pacific green turtle, *Chelonia agassizii* is recognised by some biologists, but morphological, biochemical and genetic data published to date conflict with this view and the black turtle is currently classified as belonging to *Chelonia mydas*.

Sea Turtles: The ancient reptiles



Sea Turtles: The ancient reptiles

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4 species of sea turtles recorded to nest in Malaysia

Extinct in Terengganu
<10 in Penang

Olive-ridley

Hawksbill

Extinct. Last nesting in 2010

Leatherback

Green turtle

Distribution and Conservation Status:

The current taxonomy for marine turtle species:

Class Reptilia
Subclass Anapsida
Order Testudinata
Suborder Cryptodira
Superfamily Chelonioidae

Family:

A. Dermochelyidae
    1. Leatherback, *Dermochelys coriacea* (Vandelli 1761)
B. Cheloniidae
    2. Green, *Chelonia mydas* (Linnaeus 1758)
    3. Hawksbill, *Eretmochelys imbricata* (Linnaeus 1766)
    4. Olive ridley, *Lepidochelys olivacea* (Eschscholtz 1829)
    5. Loggerhead, *Caretta caretta* (Linnaeus 1758)
    6. Flatback *Natator depressus* (Garman 1880)
    7. Kemp's ridley, *Lepidochelys kempi* (Garman 1880)

Six species (1,2,3,4,5,6) regularly occur in Southeast Asian waters

Introduction to Sea Turtles

- The Dermochelyidae, the leatherback turtles, are represented by one genus (Dermochelys) and a single species (*Dermochelys coriacea*).
- The species has a global distribution from tropical seas to sub-arctic and sub-antarctic waters, ranging from oceanic to coastal waters but avoiding reefs. The leatherback turtle is characterised by large paddle-like flippers lacking claws, the absence of keratinised epidermal scutes except in hatchlings, separate ribs, a mosaic of small polygonal dermal bones covering the body, a strong ridged carapace and pronounced cusps (pointed parts) on the upper jaw.

Introduction to Sea Turtles

- The Cheloniidae, hard-shelled turtles, are represented by six species from five genera (*Chelonia, Eretmochelys, Lepidochelys, Caretta and Natator*).
- These species have a global distribution in tropical and temperate waters ranging from lower estuarine to oceanic pelagic habitats. The family is characterised by non-retractable, large, paddle-like flippers, each with one or two claws and keratinised epidermal scutes on the head, flippers, carapace and plastron. The ribs are fused to the overlying pleural bones, which are also fused to each other to form a shield-like bony carapace of adults.

Conservation Status (IUCN Red Lists):

Hawksbill turtle (*Eretmochelys imbricata*): Critically endangered

Green turtle (*Chelonia mydas*): Endangered

Leatherback turtle (*Dermochelys coriacea*): Vulnerable (change in 2013). Extinct in Malaysia

Loggerhead turtle (*Caretta caretta*): Endangered

Olive ridley turtle (*Lepidochelys olivacea):* Endangered

Kemp's ridley turtle (*Lepidochelys kempii*): Critically endangered

Flatback turtle (*Natator depressus):* Data Deficient

Critically Endangered = facing an extremely high risk of extinction in the wild in the immediate future

Endangered = facing a very high risk of extinction in the wild in the near future

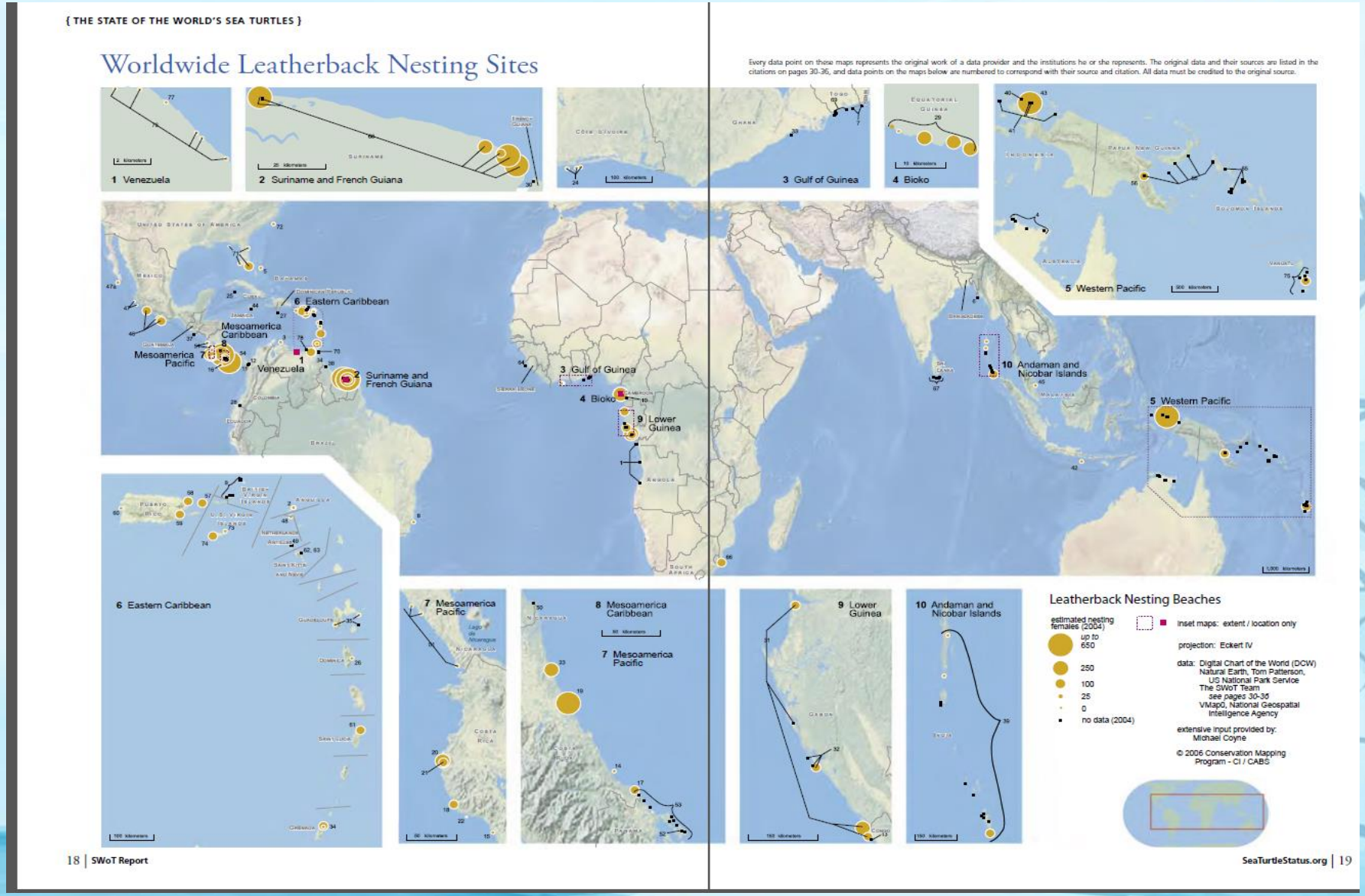
Vulnerable = facing a high risk of extinction in the wild in the immediate future

Data deficient = not enough information available to make a determination of status

Distribution

- As a consequence of their food and habitat requirements, adult sea turtles are unevenly distributed throughout the circumglobal tropical and subtropical seas.
- While most species are widely distributed, Kemp's ridley is restricted to the Gulf of Mexico and the flatback turtle is endemic to the Australian continental shelf.
- Foraging occurs over a wide range, and on the relatively shallow continental shelf areas.
- The present distribution of the breeding sites has been largely affected by historical patterns of human exploitation. The only substantial breeding colonies left today are those that have not been permanently inhabited by humans or have not been heavily exploited until recently.
- In Malaysia, breeding sites of sea turtles can be found in Sabah, Sarawak, Terengganu, Pahang, Johor, Melaka, Perak and Penang.

Leatherback Turtle



SWOT, 2015

Green Turtle

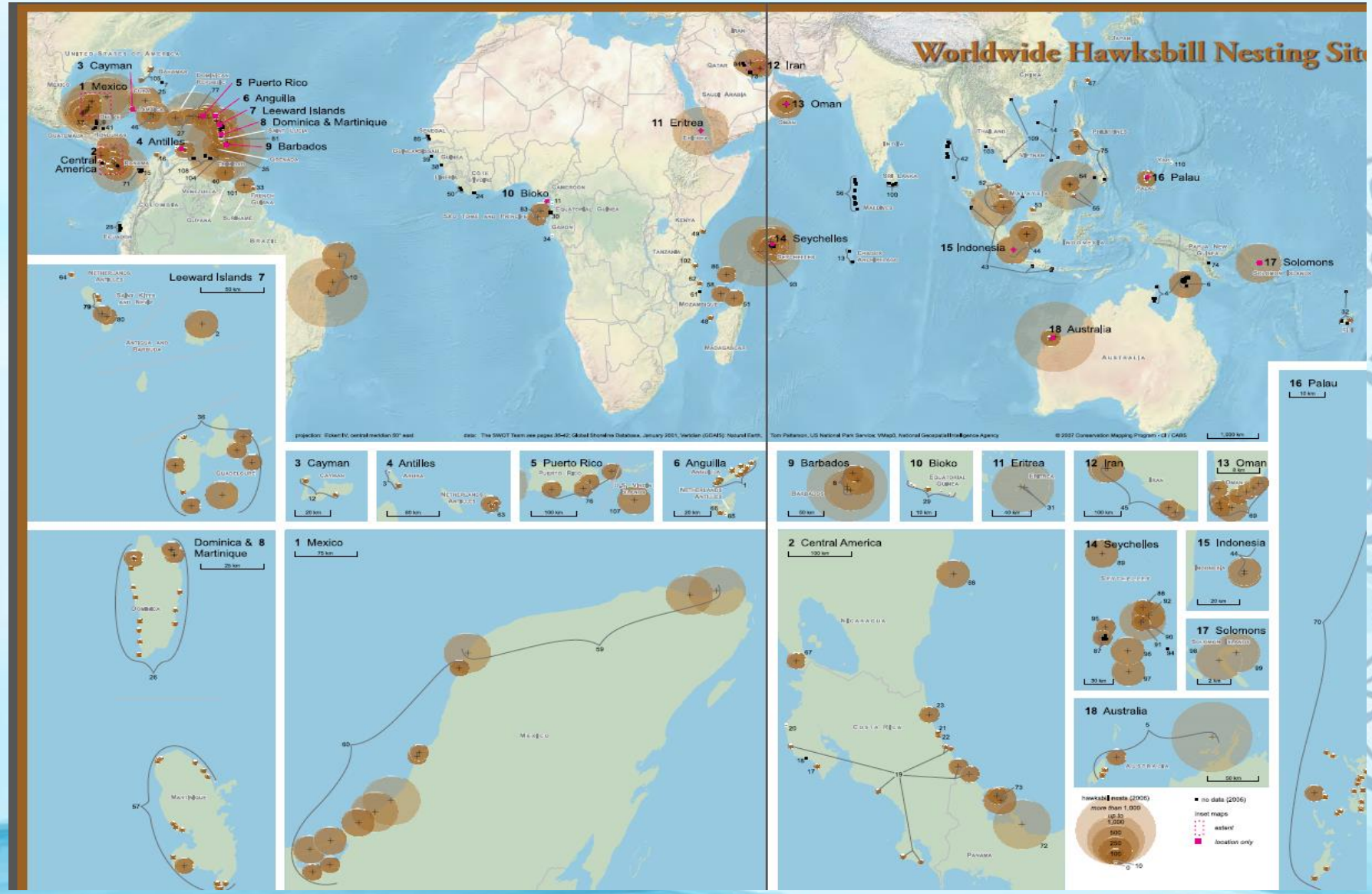
Chelonia mydas

Penyu Hijau/

SWOT, 2015

Hawksbill Turtle

Penyu sisik/ karah



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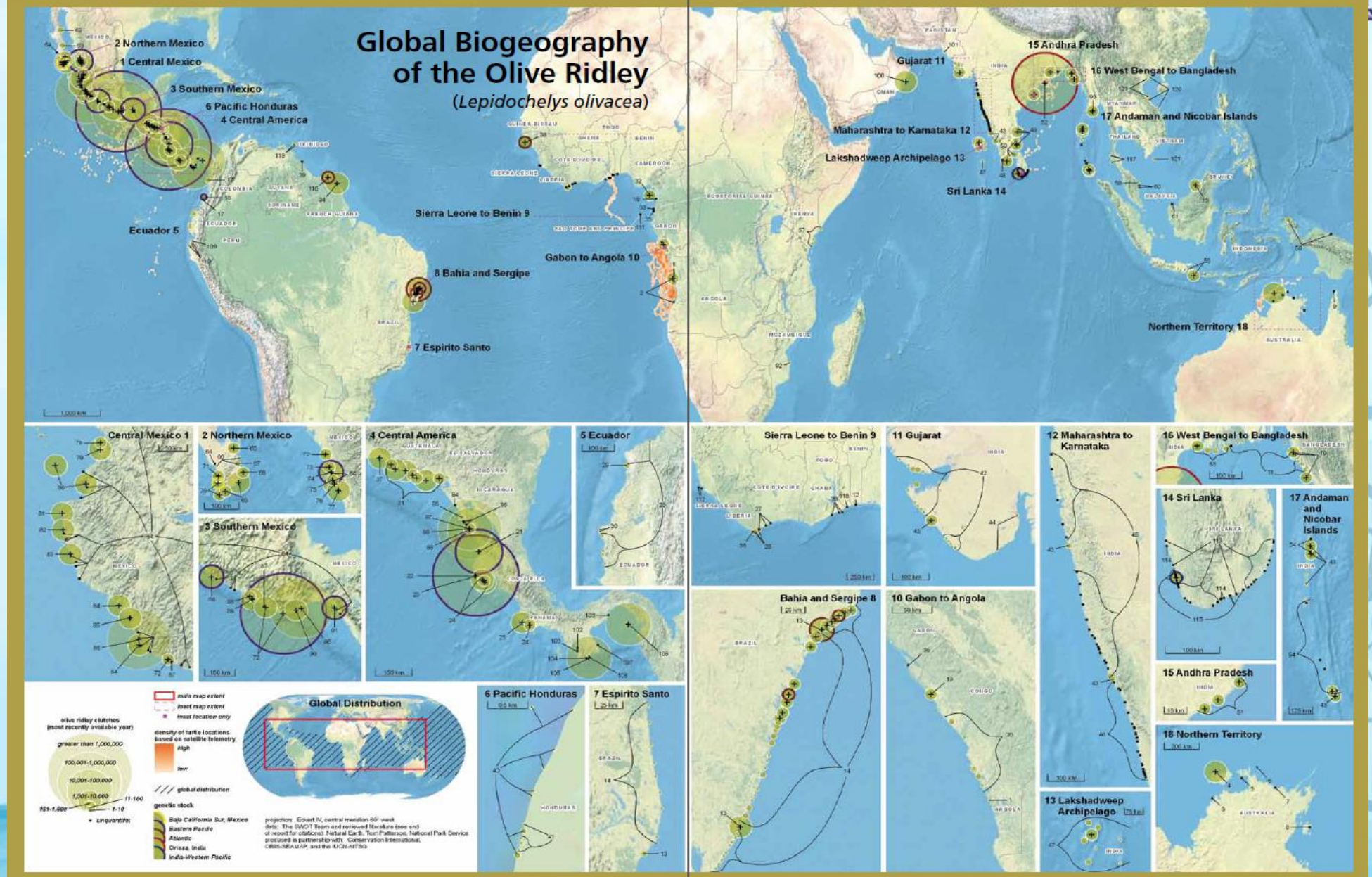
Olive ridley



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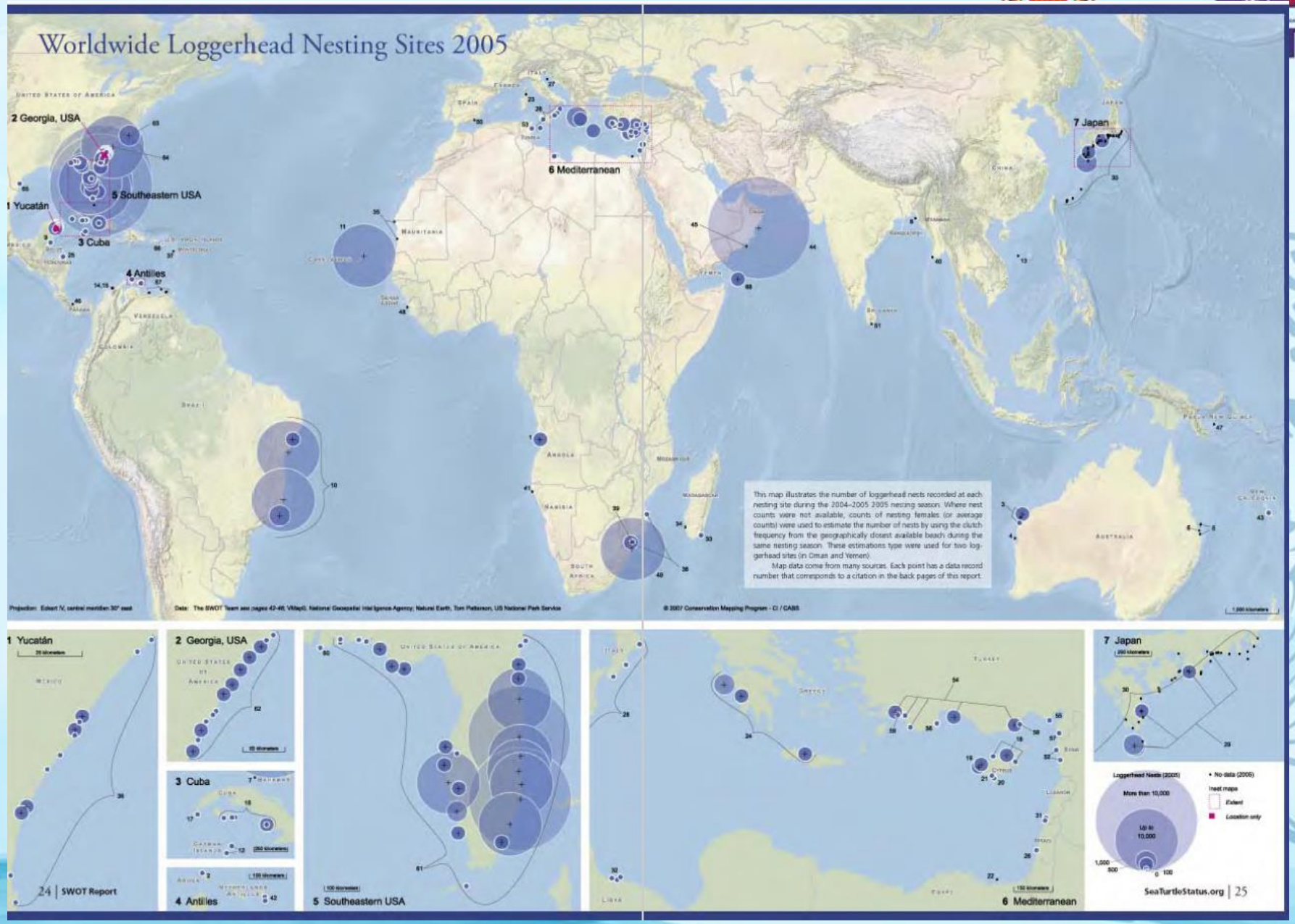
Loggerhead



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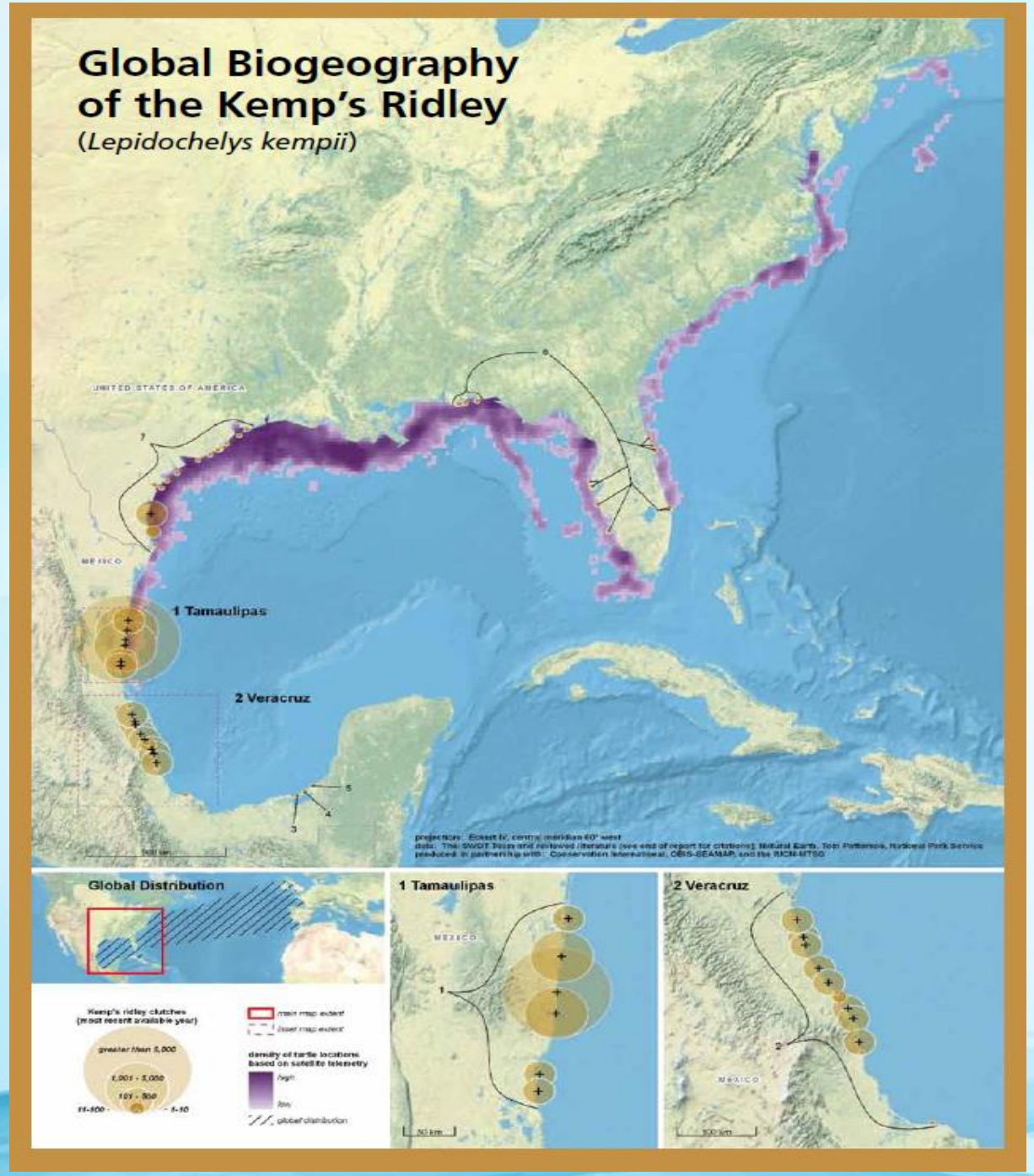

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Kemp's ridley

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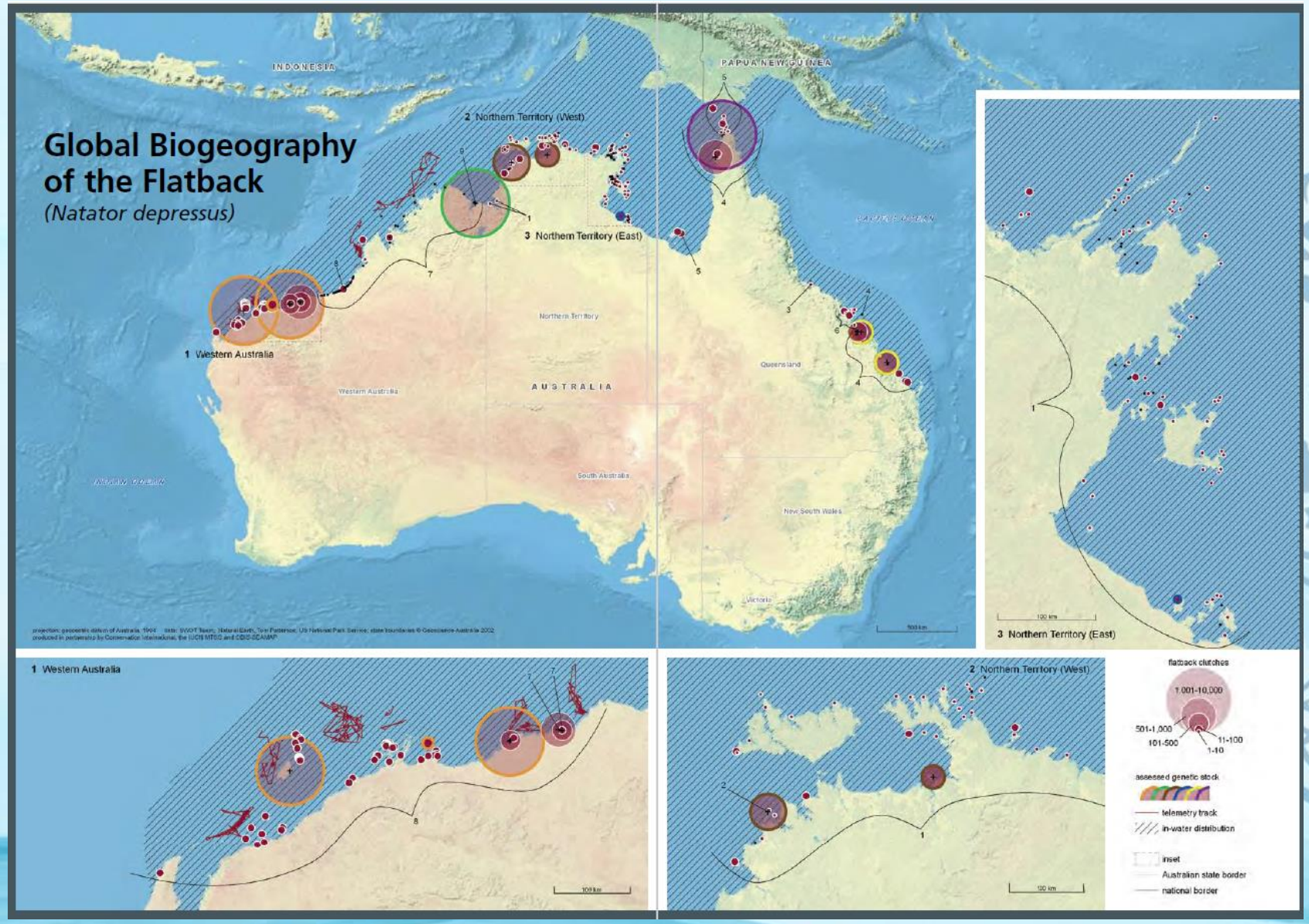
Flatback



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Major Nesting Sites of Sea Turtles in Malaysia

Department of Fisheries Malaysia, 2015

Unique Characteristics

- Air breathing reptiles
- Long maturation time : 20-50 years
- Natal homing
- Nest-site fidelity
- High productivity – several hundred eggs laid per nesting season
- Long-distance breeding migrations (nesting & foraging grounds)
- Long-lived animals
- Temperature-dependent sex determination

Life Cycle

- All seven species of sea turtles reproduce on beaches around the world and share a common life cycle with minor variation.
- Once mature (about 20-50 years), sea turtles migrate from distant feeding grounds to different nesting areas. Once the males and females arrive, they mate for a period of 1- 2 months. After mating, the males return to the foraging grounds and the females take 2-4 weeks to emerge on the beach and lay the first clutch of eggs.
- The number of egg clutches laid during a breeding season varies within and between species. Female green turtles can lay up to 10 clutches in a breeding season at intervals of 9 to 14 days, with mean clutch size of 100 eggs.

Life Cycle

- Hatchlings will emerge after two months of egg incubation. There is no parental care of eggs or hatchlings.
- Incubation period, incubation success and hatchling sex ratio is determined by nest temperature. Higher temperature will produce mainly female and cooler temperature will produce male hatchlings.
- Upon emergence, hatchling will crawl the beach and will swim non- stop for 2-5 days (swimming frenzy).
- They will be carried by ocean currents into oceanic pelagic habitats. While in the pelagic habitat, all species are carnivorous, feeding on a wide range of macro-zooplankton. The hard-shelled turtles remain in the oceanic environment for a few years before they return to coastal waters where they change to a benthic feeding life history phase with diet varying with species.
- Nothing is known during the first 10 years of their life. Scientist called it the ‘Lost years’

Life Cycle

- After some years of pelagic life, older juveniles of most species are thought to recruit to neritic habitats, where they complete their development.
- Juvenile will shift from one foraging ground to another
- Adult: will be a resident to a particular foraging ground
- Satellite telemetry has demonstrated that adult green turtles often travel open-ocean distances of 1000-2000 km between their nesting and foraging areas.
- At the following reproductive season, they migrate back to their nesting area (2-8 years interval).

Importance of Sea Turtles:

- Sea turtles played an important roles in maintaining the health of the world's oceans. They migrate thousand of kilometers and take decades to mature, hence it serve as an important indicators of health of coastal and marine environment on both local and global scales.
- However, sea turtles have been exploited by humans since time immemorial for food and other commodities. In Peninsular Malaysia, sea turtle eggs are still sold at markets as there is still no legislation to ban the commercial sales of turtle eggs. Commercial fishing, loss of nesting habitat, pollution and climate change are among the threats pushing sea towards extinction.

Importance of Sea Turtles:

1. Maintaining habitat (Seagrass bed, coral reefs & nesting beach)

- Green turtles are herbivores animals that eat seagrass. When green turtle graze, they increase the productivity and nutrient content of seagrass blades. In Malaysia, Lawas Sarawak (Brunei Bay) and Sabah (Sulu Sea and Celebes Sea) are excellent examples of the importance of green turtles on the health of seagrass bed.

Importance of Sea Turtles:

1. Maintaining habitat (Seagrass bed, coral reefs & nesting beach)

- Hawksbill turtle has a beak –like mouth, which enable them to forage on a variety of marine sponges. By doing this, they change the species composition and distribution of sponges in coral reef ecosystems. By removing sponges from reefs, hawksbills allow other species, such as coral, to colonize and grow. Without hawksbills, sponges are likely to dominate reef communities, further limiting the growth of corals and modifying the structure of coral reef ecosystems. Through the selective foraging behaviour, hawksbills impact the overall diversity of reef communities.

Importance of Sea Turtles:

1. Maintaining habitat (Seagrass bed, coral reefs & nesting beach)

- When female sea turtles lay their eggs on sandy beaches, they introduce nutrients and energy into the beaches. Sea turtle eggs that hatched return to the sea as hatchlings, leaving some nutrients on the beach in the form of eggshells and embryonic fluid. The eggs that fail to hatch are consumed by predators (eg. Monitor lizards, ghost crabs)or the eggs are penetrated by roots, enabling plants to absorb the nutrients.

Importance of Sea Turtles:

Maintaining a balanced food web

- Leatherbacks, the largest sea turtle species, get their energy and nutritional needs from a jellyfish. Because of it large size and migrating across entire oceans, leatherbacks rely on large concentrations of jellyfish. As significant consumers of jellyfish globally, leatherbacks play a pivotal ecological role as a top jellyfish predator. Declines in leatherback turtle populations along with declines in other key predators, such as some commercially valuable fish species, could have repercussions for jellyfish population control. The increase of jellyfish is detrimental to the recovery of fish stocks since jellyfish prey on fish eggs and larvae.

- Sadly, the leatherbacks in Malaysia is considered locally extinct. Because leatherbacks consume large amounts of jellyfish, declines in leatherbacks could further shift species dominance from fish to jellyfish.
- Other sea turtle species that consume jellyfish are loggerhead and green turtles.

Importance of Sea Turtles:

Maintaining a balanced food web

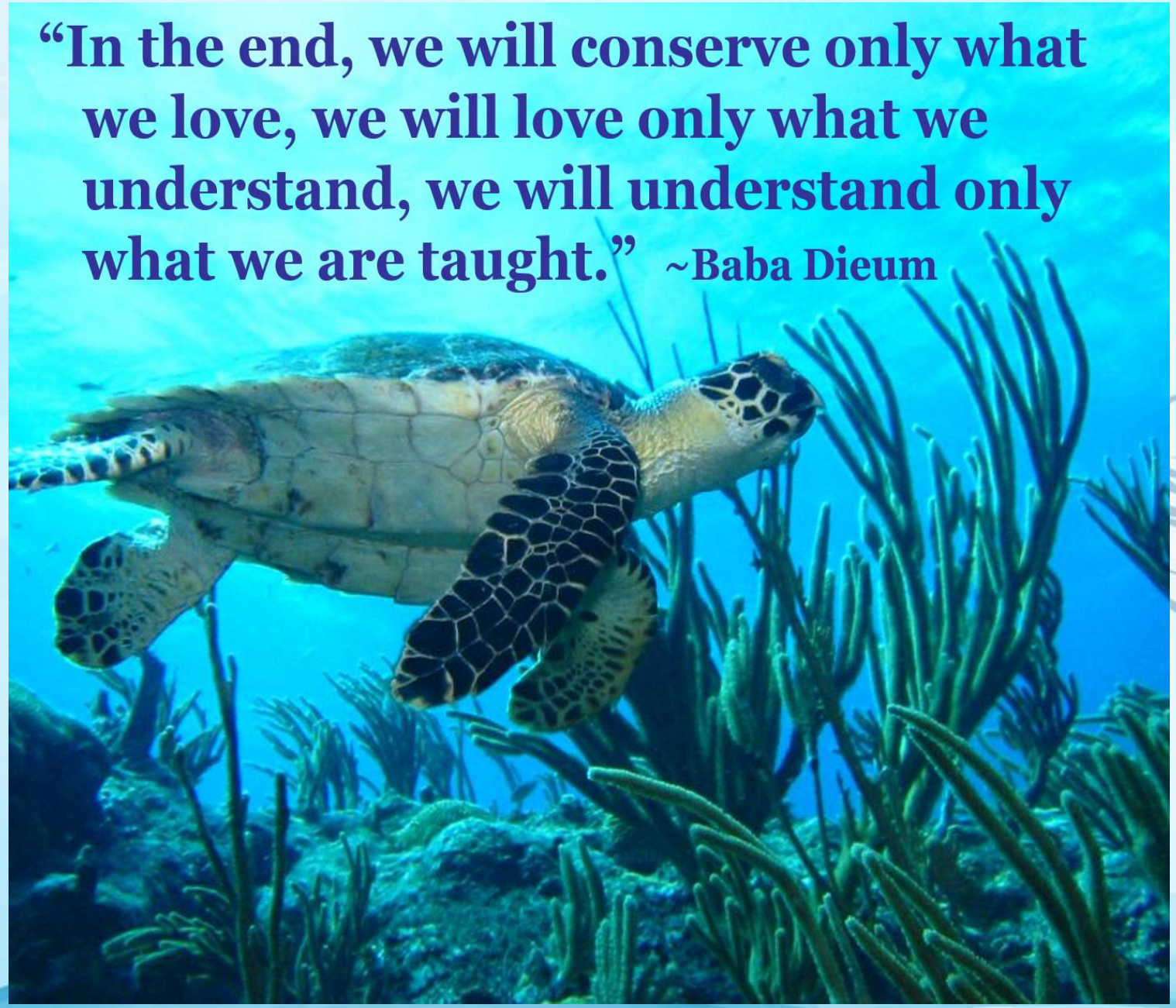
- **By carrying around barnacles, algae and other similar organisms known as epibionts, sea turtles provide a food source for fishes and shrimps. Other fish species, also establish "cleaning stations" for sea turtles to visit. With outstretched limbs and a raised head, sea turtles expose their bodies, offering a meal to fish and shrimp. This behaviour not only feeds smaller organisms, but also benefits sea turtles by reducing drag and keeping their skin and shells clean.**
- **Some species obtain their diet strictly from epibionts found on sea turtles.**
- **Like many marine organisms, sea turtles are most vulnerable to predation as eggs, hatchlings and juveniles. A long list of terrestrial animals – ants, crabs, rats, raccoons, foxes, coyotes, feral cats, dogs, mongoose and vultures – are known to dig up unhatched nests. The eggs provide a nutrient-rich source of food for these predators. As hatchlings emerge from the nest, they provide another feeding opportunity for natural predators, which includes a variety of seabirds.**

Importance of Sea Turtles:

Tourism, Education and scientific research

- **Major source of income activities that provide opportunities for employment and information services, as well as other economic gains. A less apparent value is as ecological resources. These reptiles are unique components of complex ecological systems. Because they migrate thousands of kilometres and take decades to mature, turtles serve as important indicators of health of coastal and marine environments on both local and global scales.**
- **In other words, conserving sea turtles means protecting both turtle populations and the seas or coastal areas they live in.**

"In the end, we will conserve only what we love, we will love only what we understand, we will understand only what we are taught." ~Baba Dieum



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