# Marine Fishes

10

# Fish of The World

- 515 families in fish classification
- Nine large fish families, each with >400 species, contain~9300 species
- 64 families are monotypic (i.e. only contain one species)
- 151 families have only one genus.

- Successor of the waters.

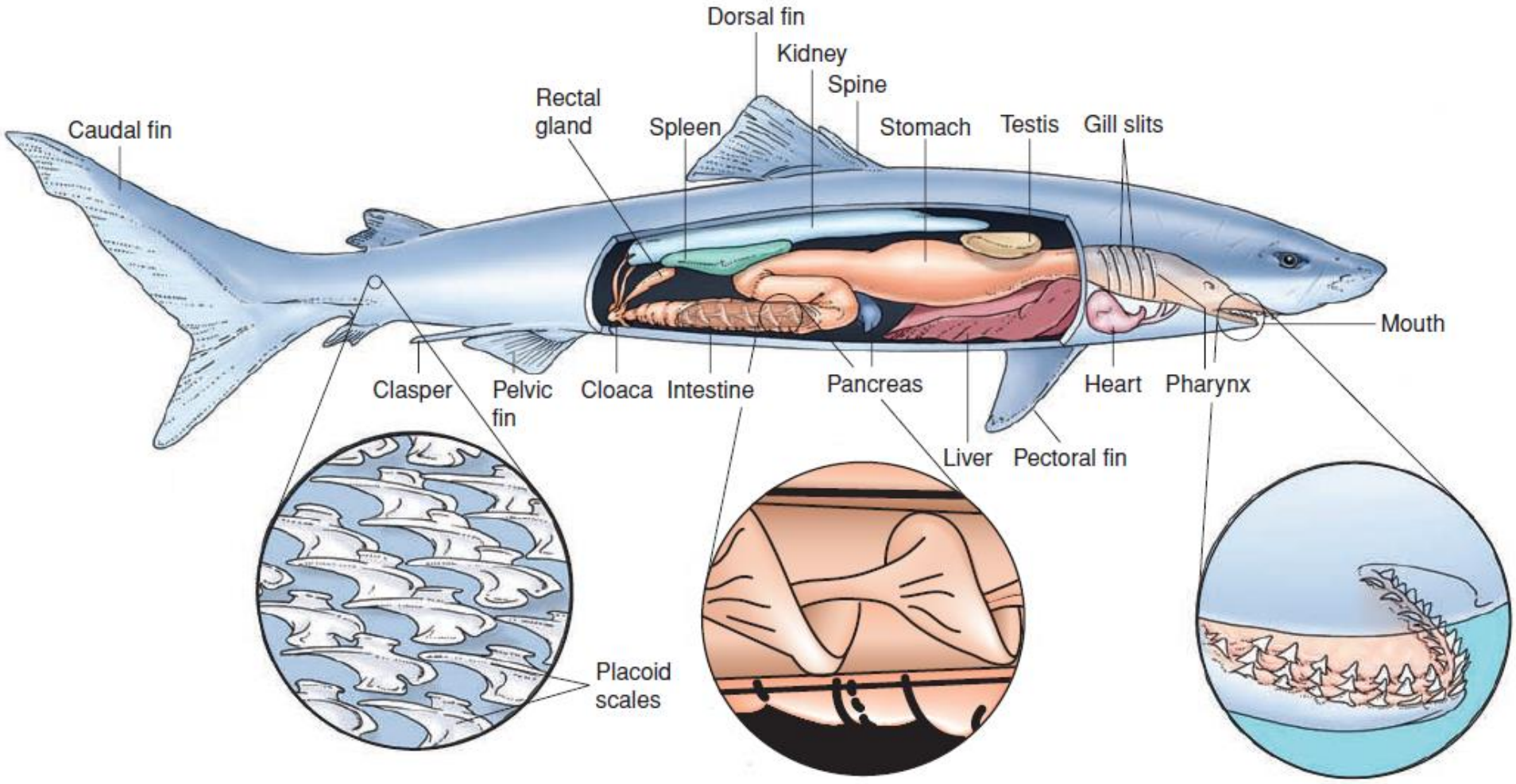
# Jawless Fishes

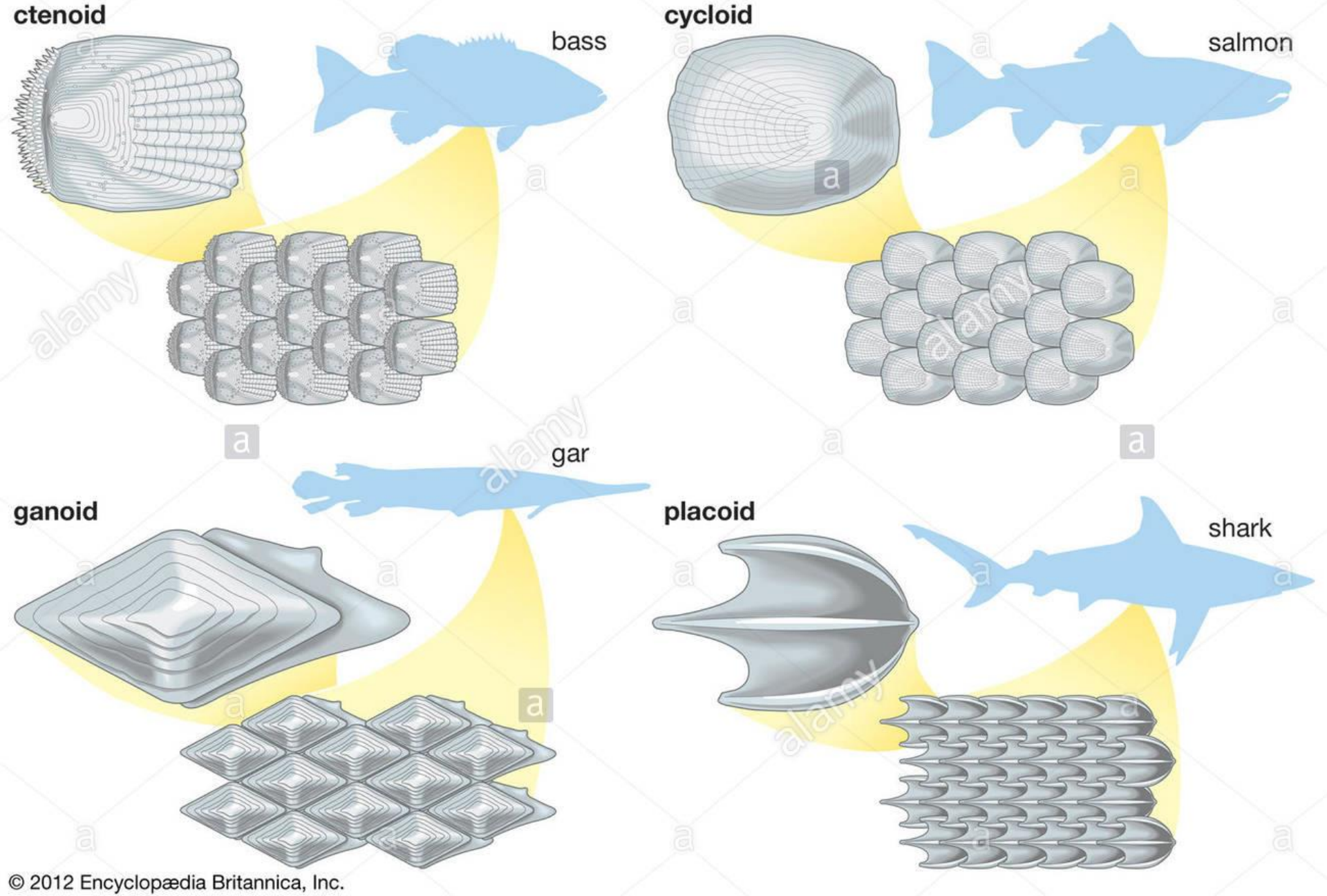
- Hagfish and lampreys are jawless fishes that lack both paired appendages and scales.

# Hagfish

# Lampreys

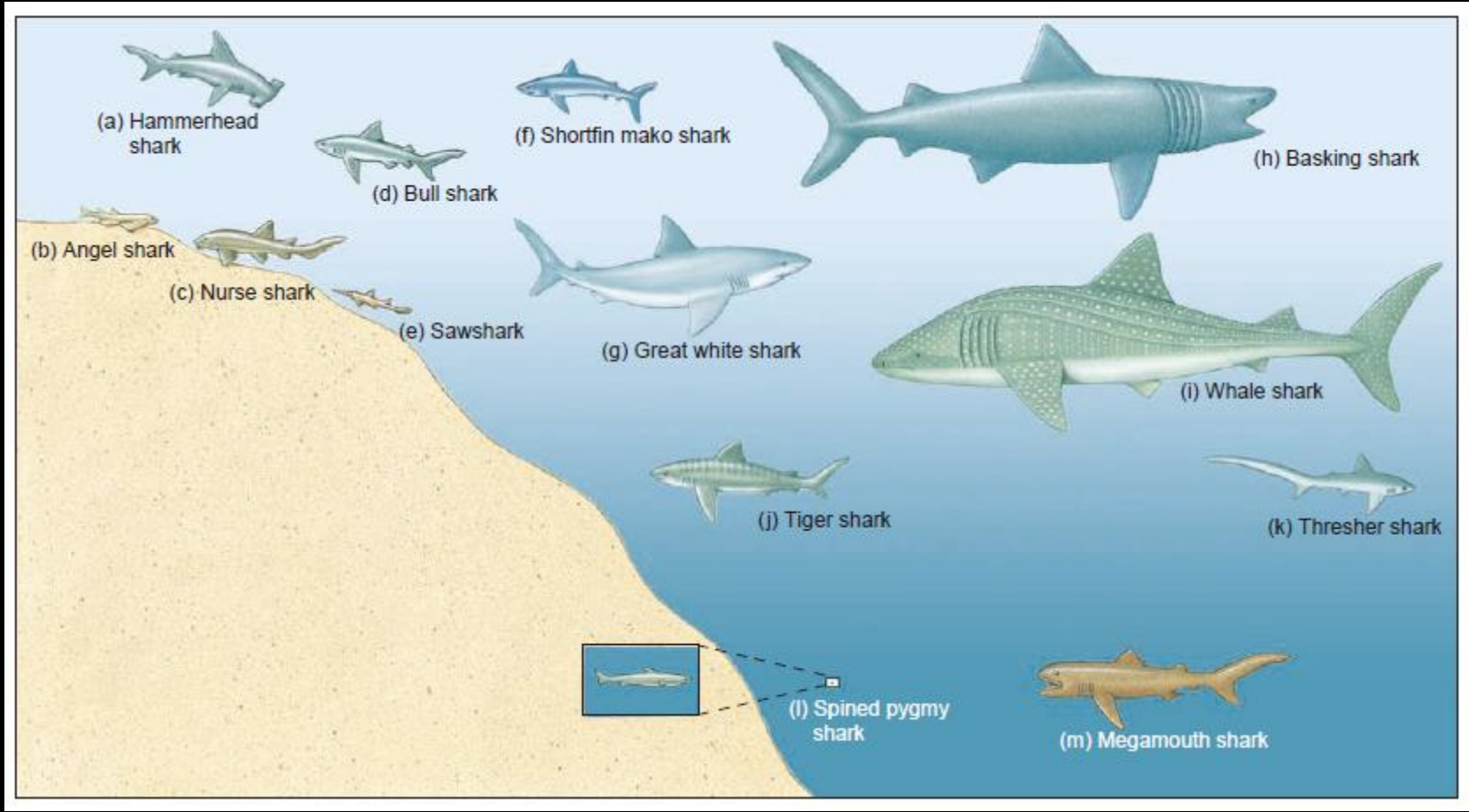
# Cartilaginous Fishes





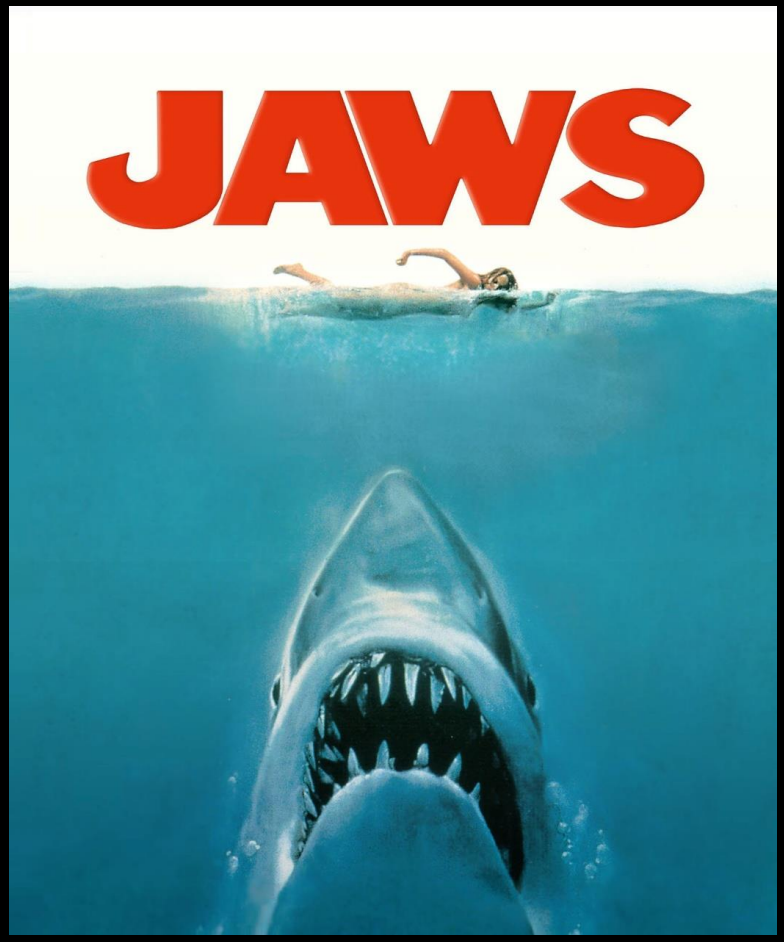
# Cartilaginous Fishes

- Cartilaginous fishes can be divided into two major groups, the holocephalans (chimaeras, or ratfish) and the elasmobranchs.
- The elasmobranchs have evolved into two general body forms, the typically streamlined bodies of sharks and the dorsoventrally flattened bodies of skates and rays.


(a) Hammerhead shark
(b) Angel shark
(c) Nurse shark
(d) Bull shark
(e) Sawshark
(f) Shortfin mako shark
(g) Great white shark
(h) Basking shark
(i) Whale shark
(j) Tiger shark
(k) Thresher shark
(l) Spined pygmy shark
(m) Megamouth shark

# Sharks

# Shark Attacks on Humans




# Great White Shark

# Tiger Shark

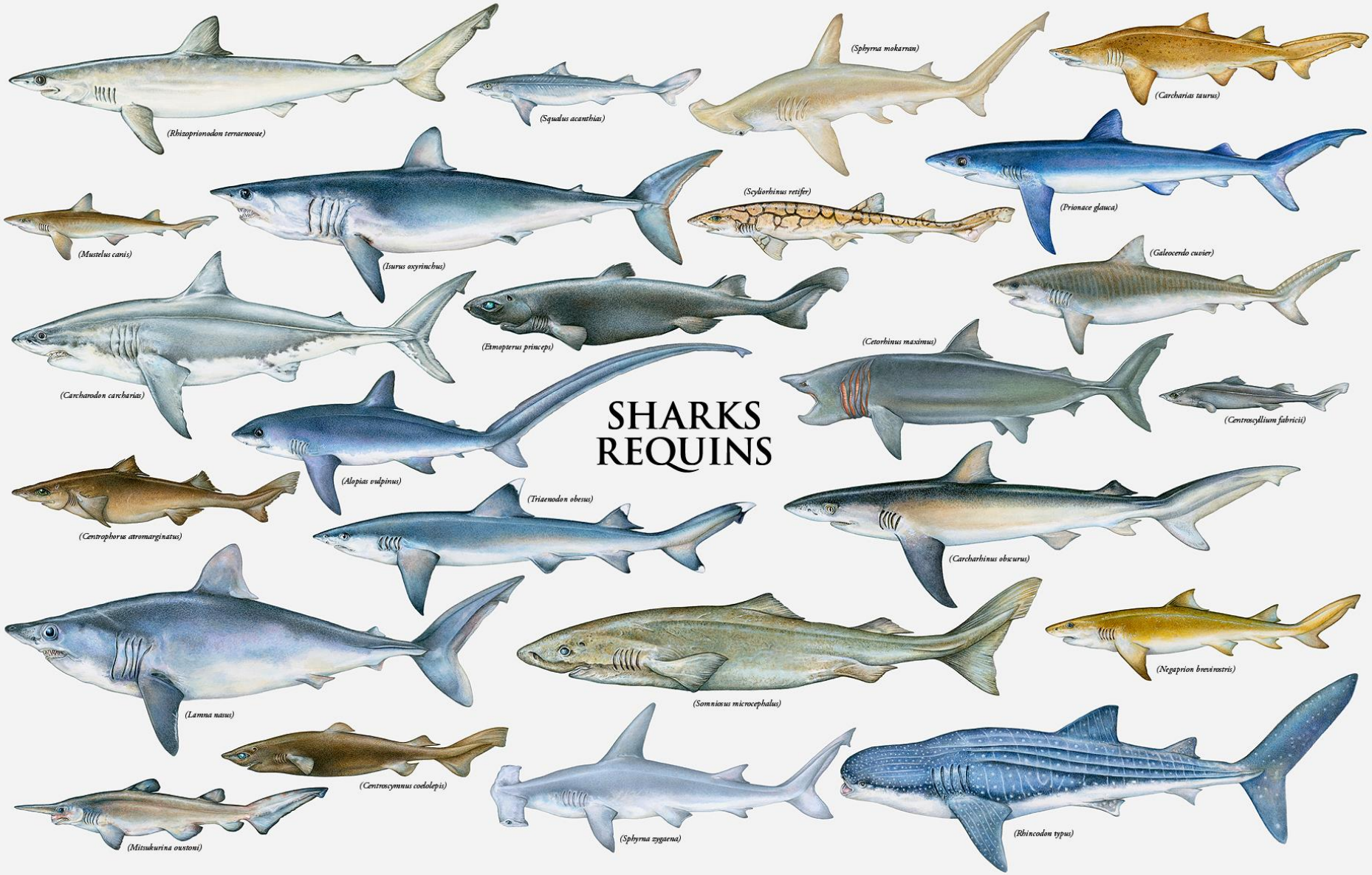
# Bull Shark

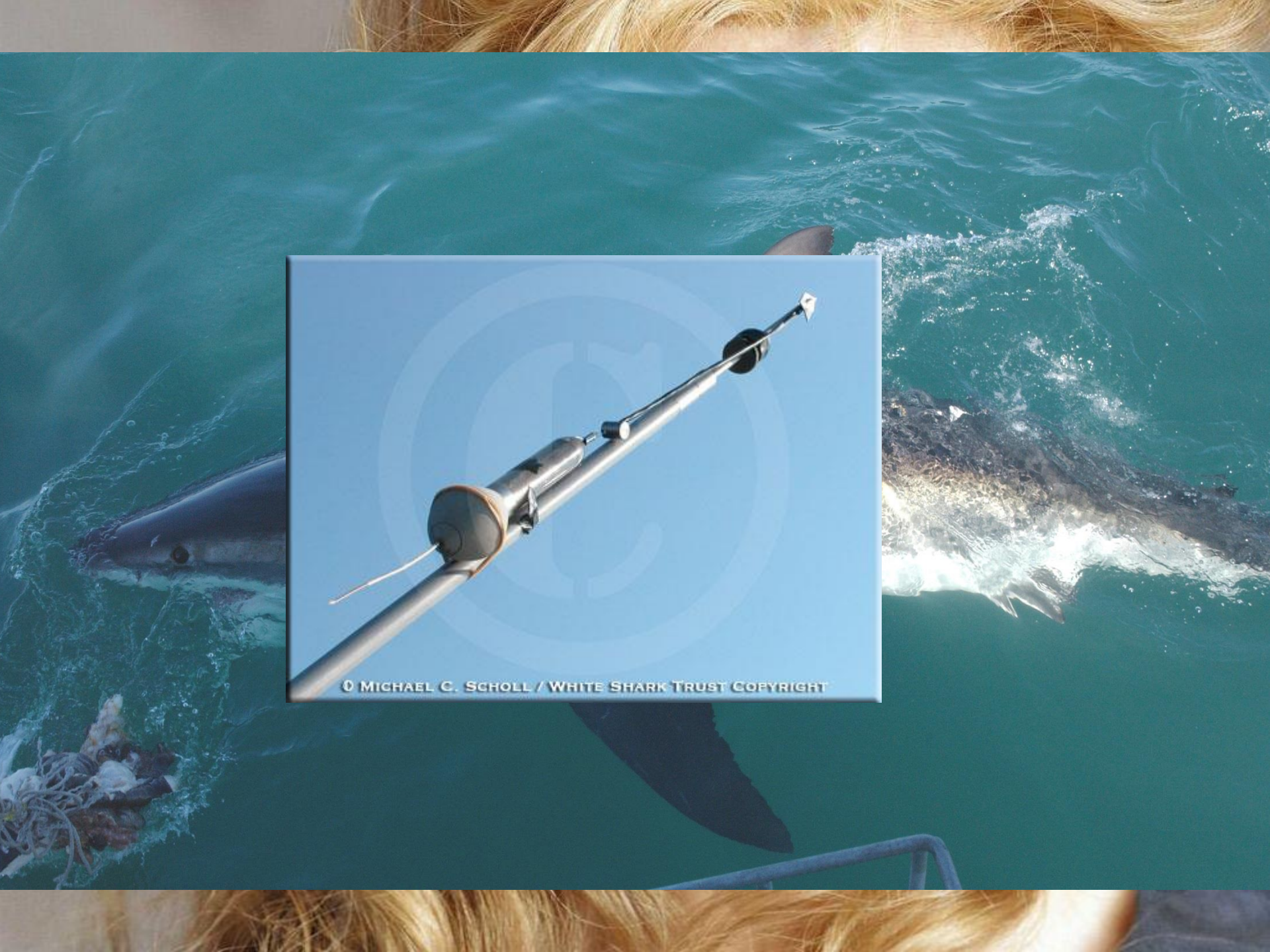
# Scalloped Hammerhead Shark

# Blue shark

# Whale Shark

# Greenland Shark


SHARKS
REQUINS
(Rhizoprionodon ternaenovae)
(Squalus acanthias)
(Sphyrna mokarran)
(Carcharias taurus)
(Mustelus canis)
(Isurus oxyrinchus)
(Scyliorhinus retifer)
(Prionace glauca)
(Galeocerdo cuvier)
(Etmopterus princeps)
(Carcharodon carcharias)
(Cetorhinus maximus)
(Centrascyllium fabricii)
(Alopias vulpinus)
(Triaenodon obesus)
(Centrophorus atromarginatus)
(Carcharhinus obscurus)
(Lamna nasus)
(Somniosus microcephalus)
(Negaprion brevirostris)
(Centroscymnus coelolepis)
(Sphyrna zygaena)
(Mitsukurina owstoni)
(Rhincodon typus)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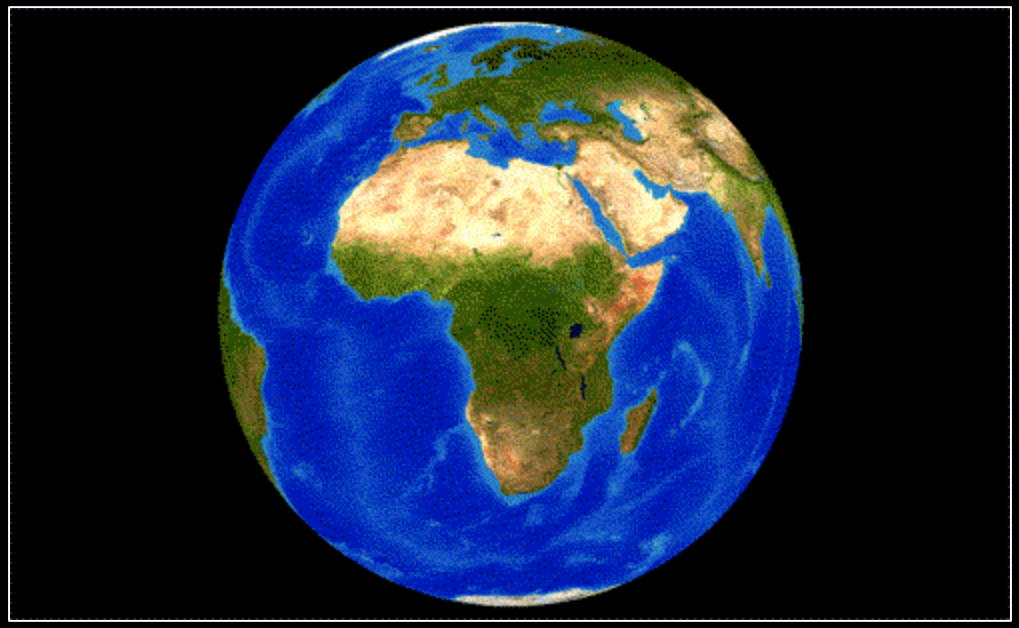
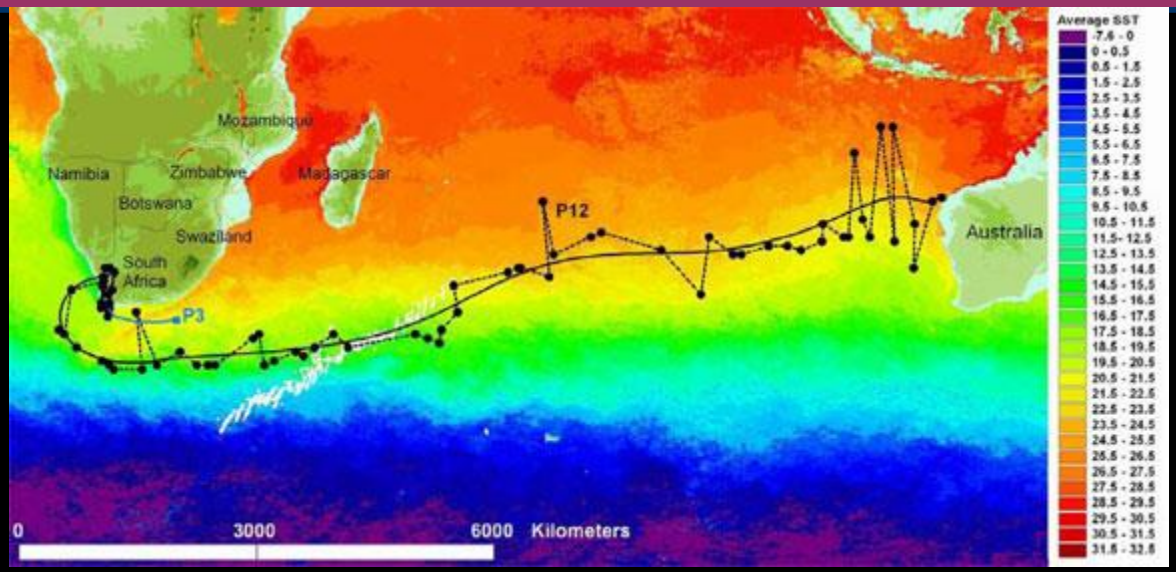
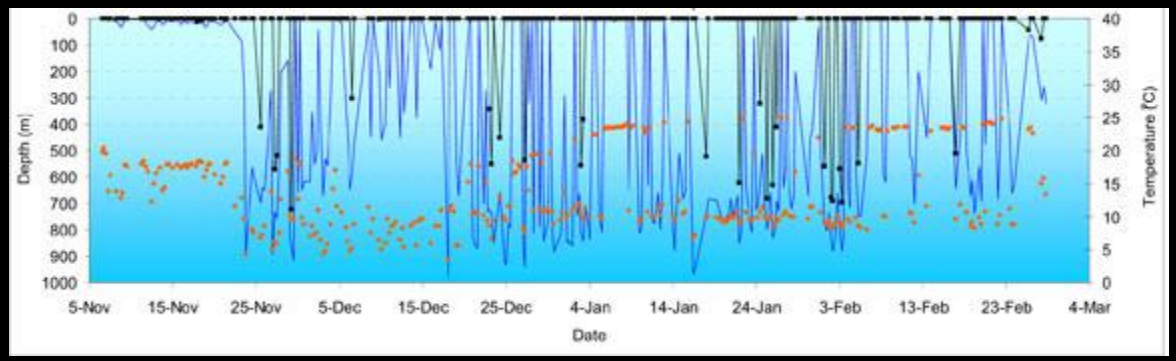
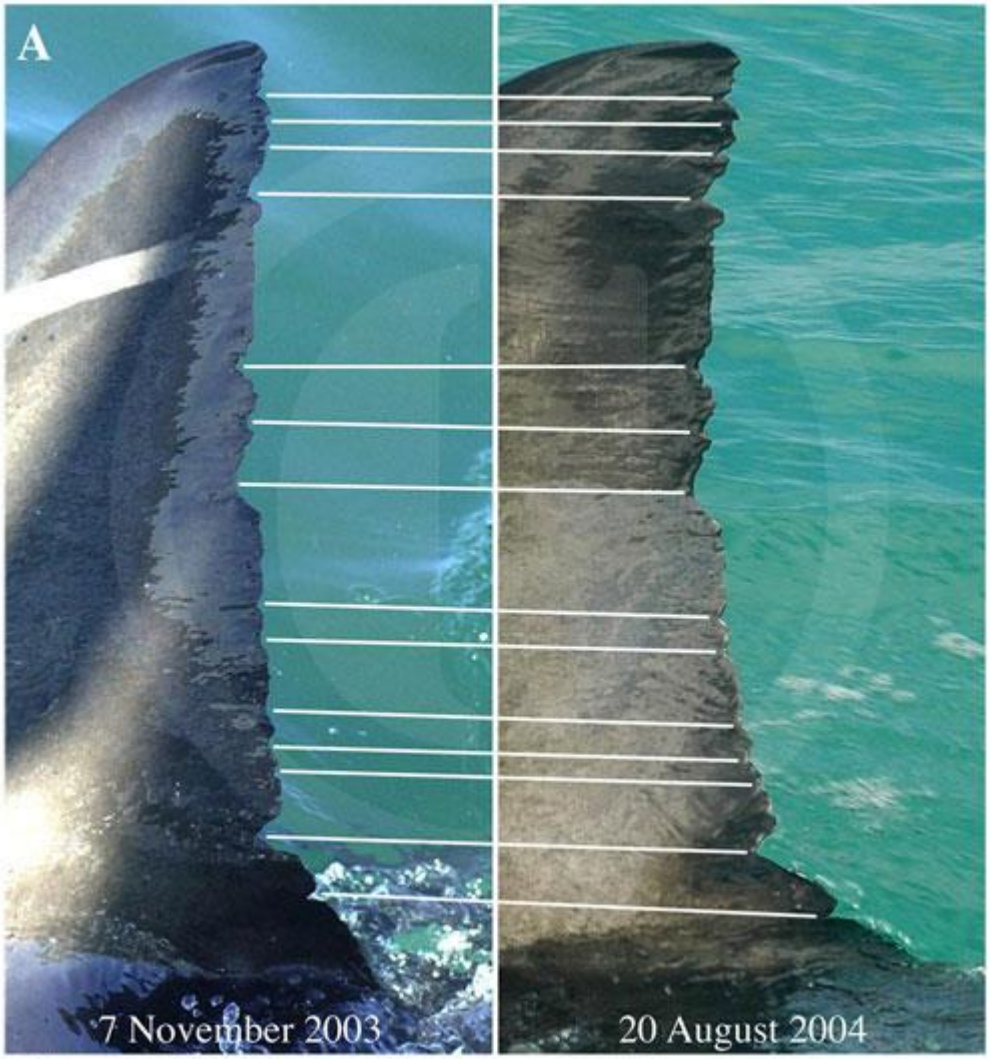
# Great White Transoceanic Migration



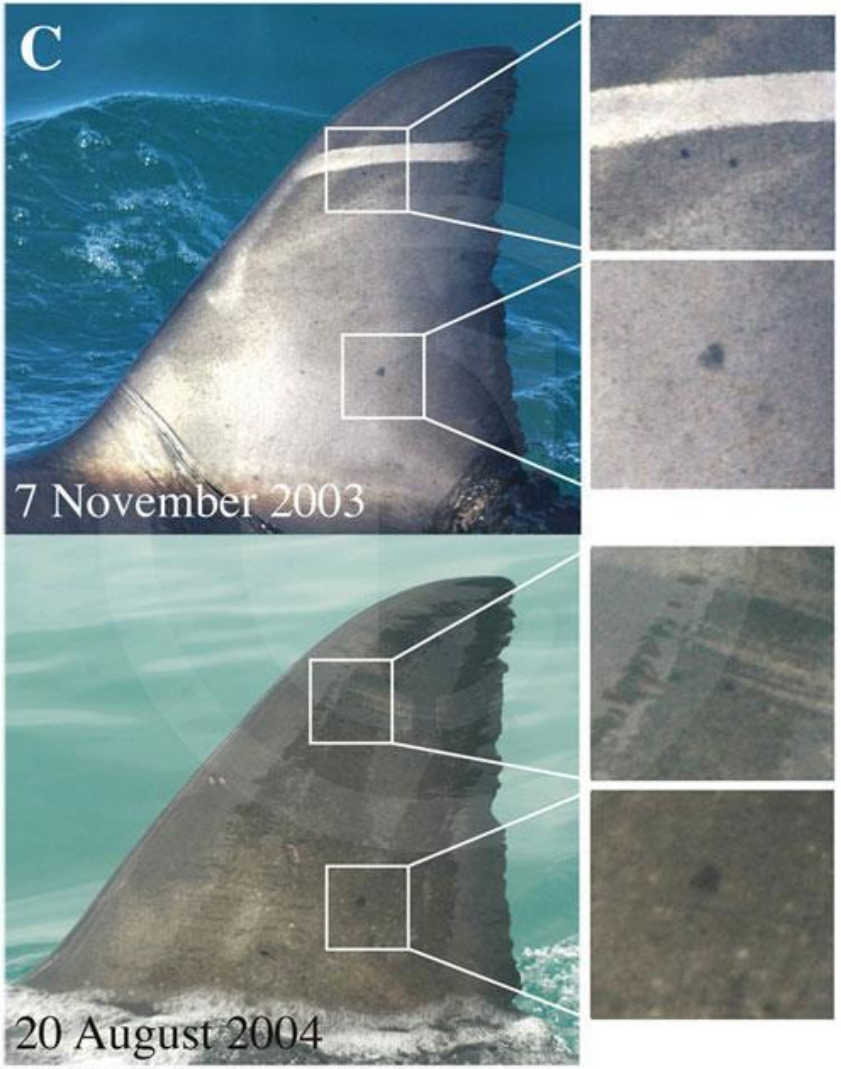
# Breaking records



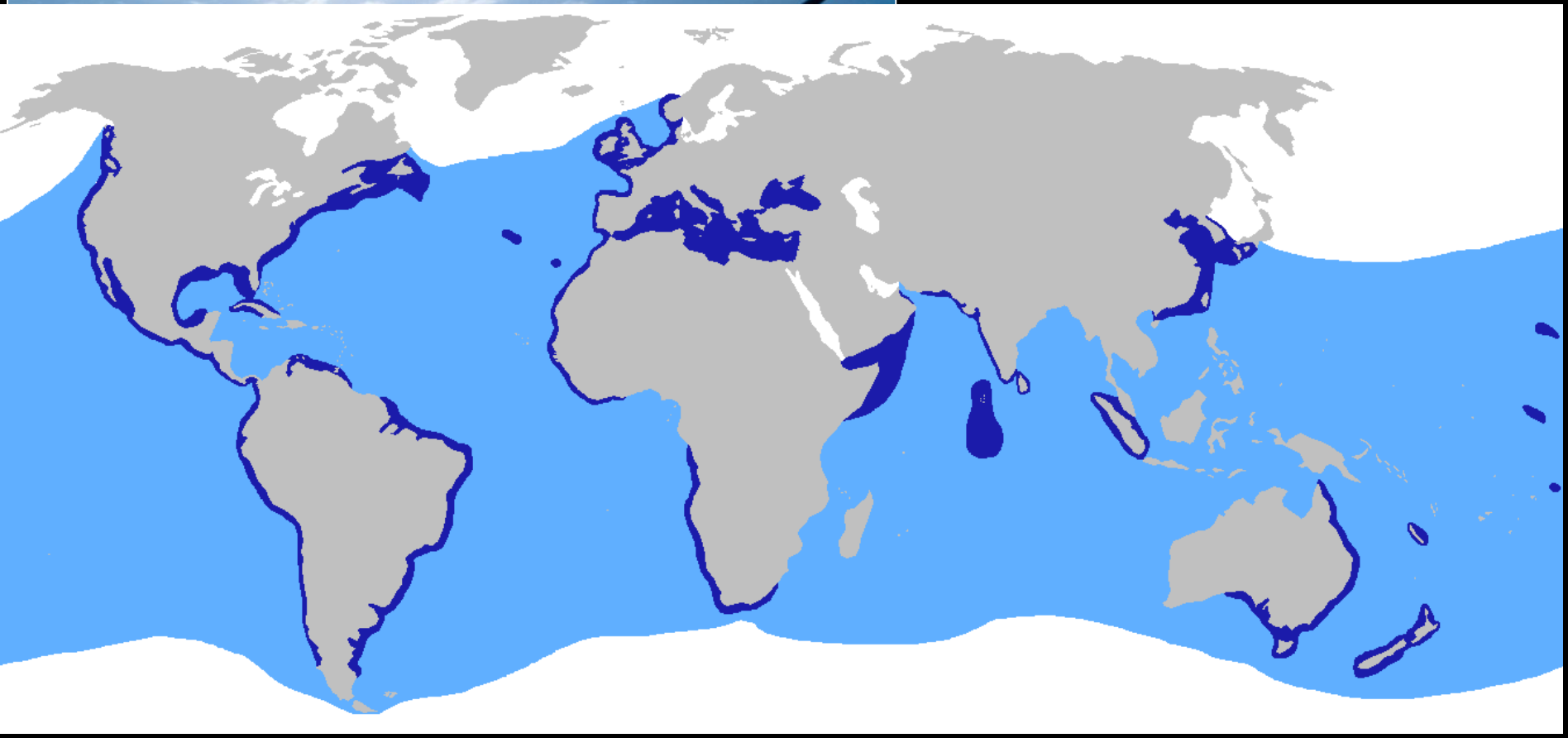







# The oceanic sharks



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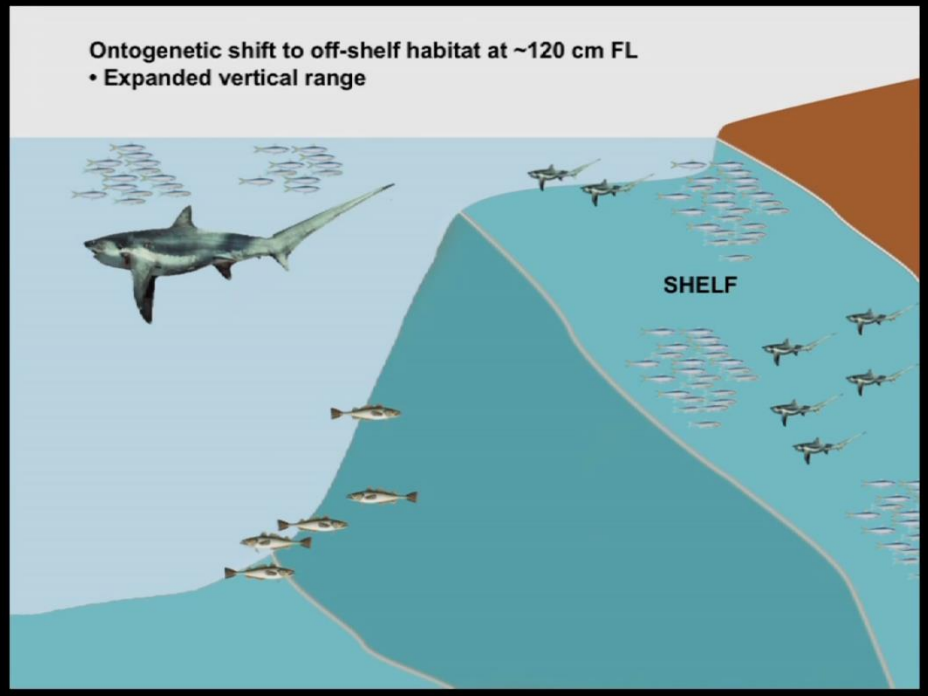
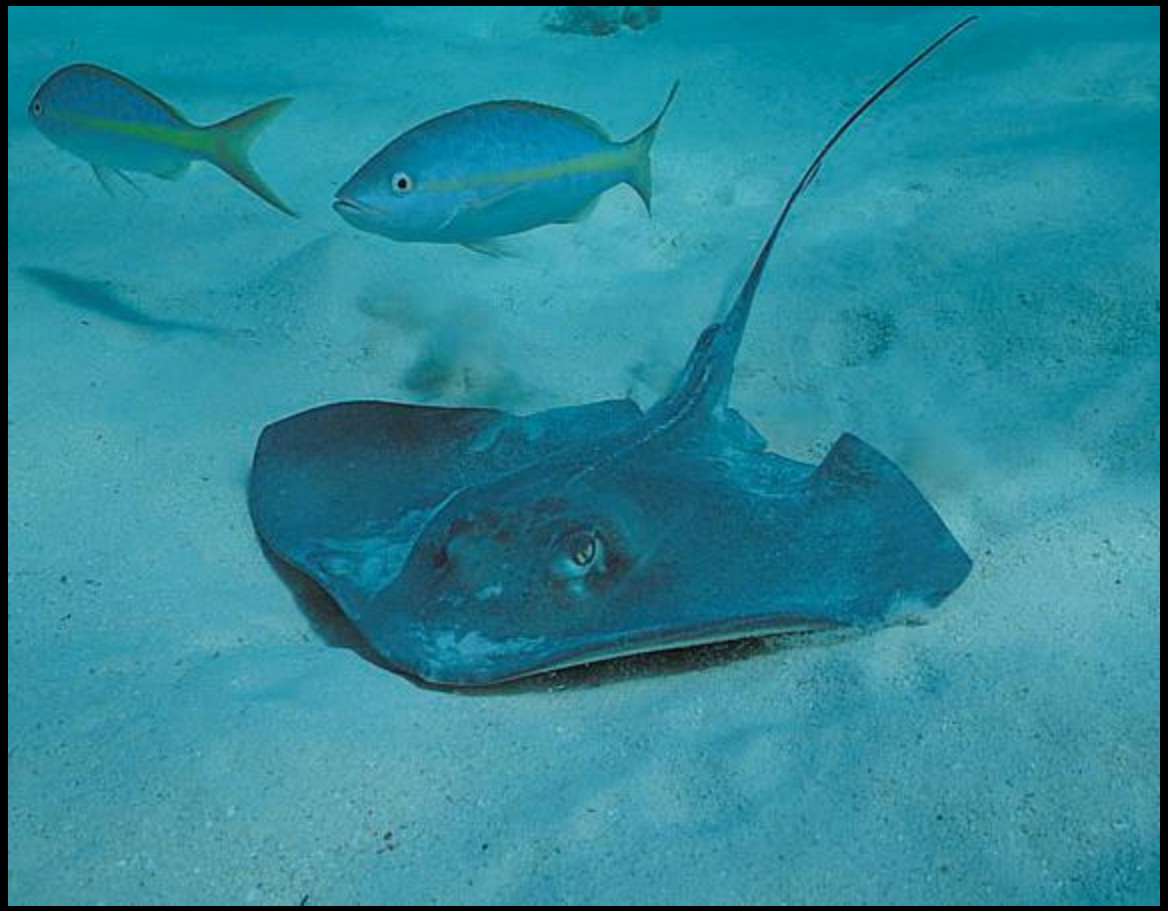


# Skates and Rays



# Skates and Rays

团扇鳐

圆梨头鳐

# Skates and Rays

电鳐

# Skates and Rays

# Skates and Rays

# Skates and Rays

# Skate and Ray

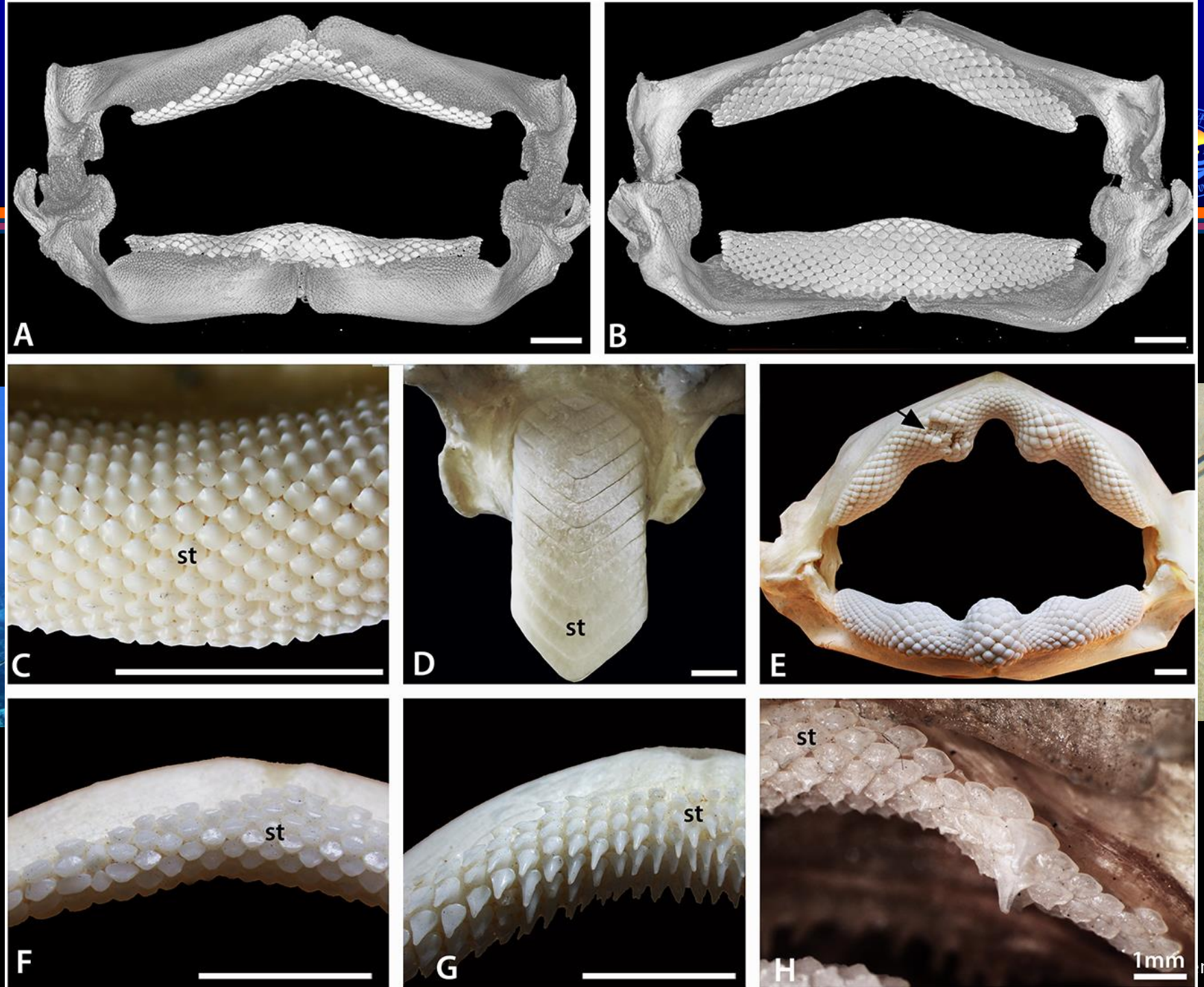
# What are Manta Rays?

## Elasmobranchs: 1050 species

500 species of sharks

550 species of rays





A
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# What are Manta Rays?

Mobulidae

Mobula Rays (9 species)

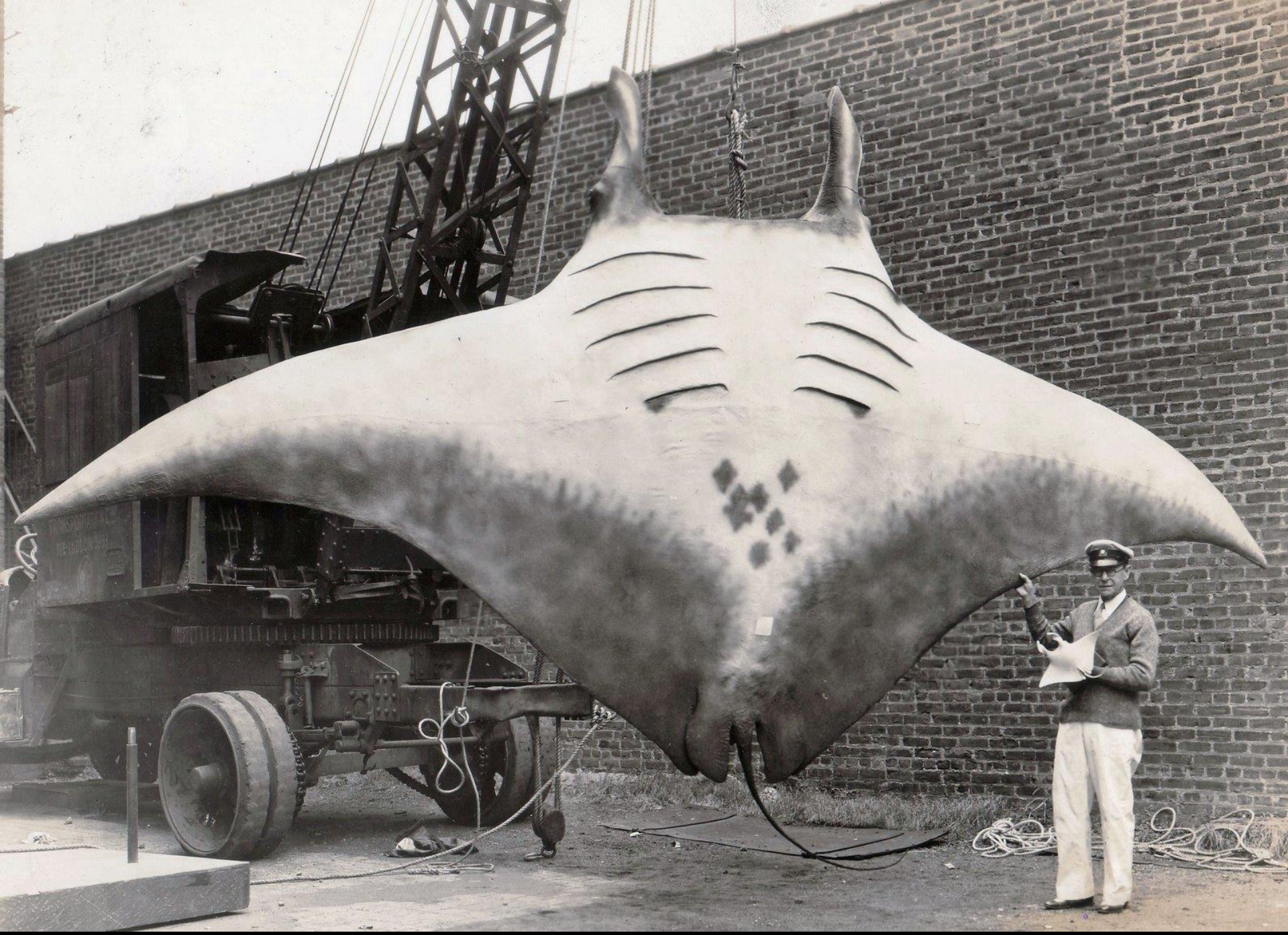
Manta Rays (2+ species)

# What are Manta Rays?

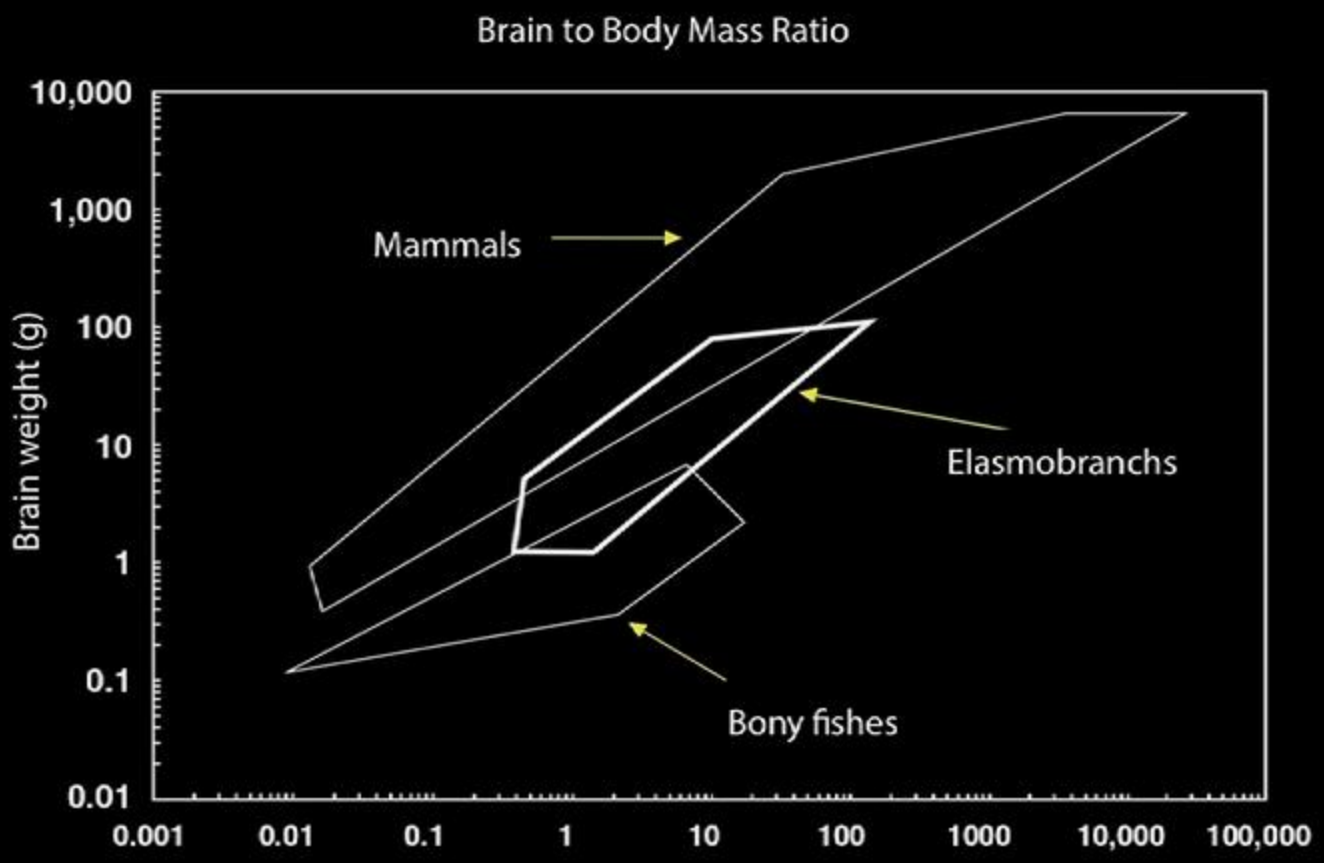

Reef manta
*Manta alfredi*
阿式前口蝠鳐

Oceanic manta
*Manta birostris*
双吻前口蝠鳐


OCEANIC MANTA RAY HOVERS OVER A CLEANING STATION IN MISOOL, RAJA AMPAT.



# Manta Intelligence



# Manta Reproduction

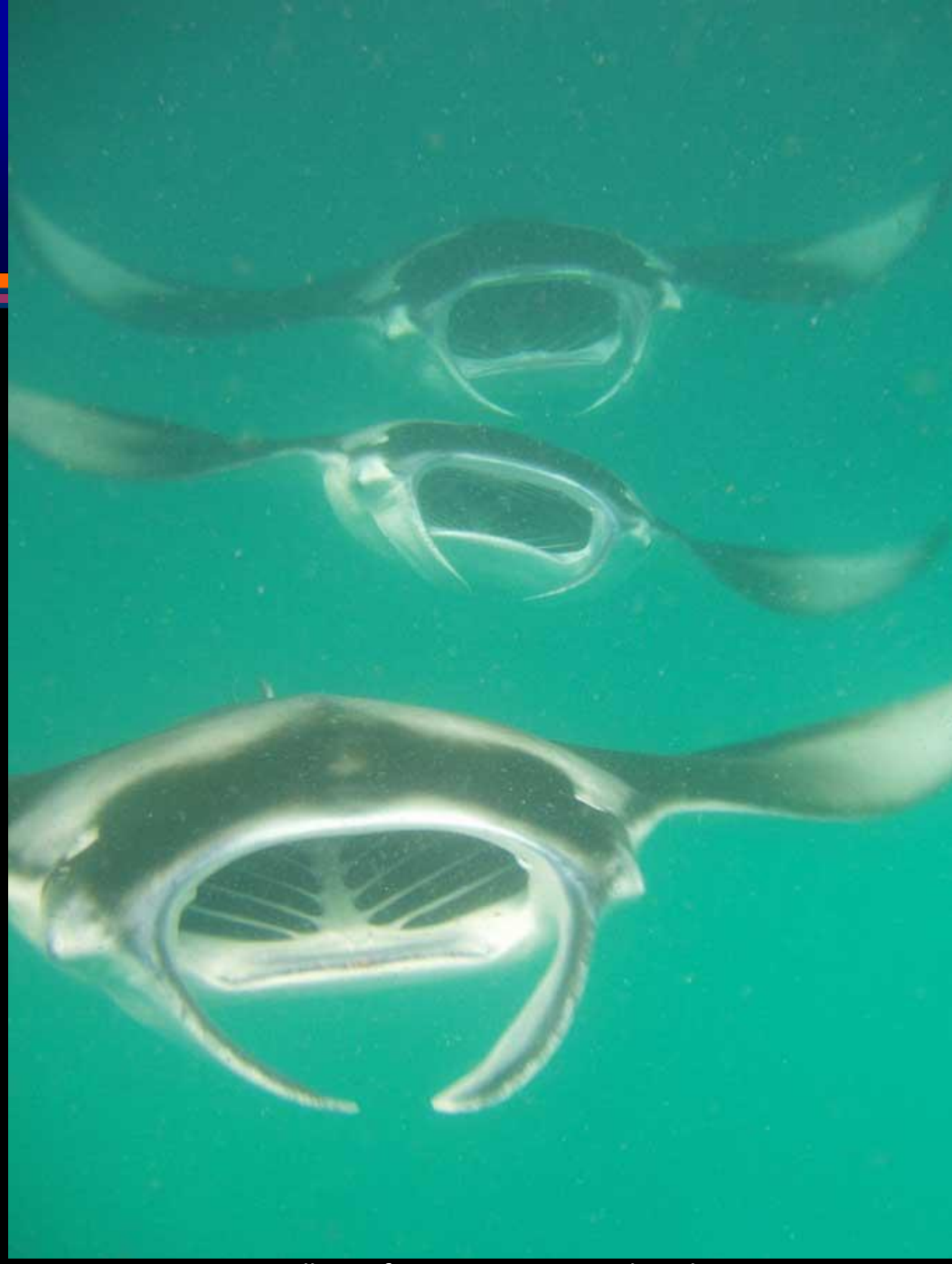


© Guy Stevens | MANTA TRUST


FEMALE MANTA RAY


MALE MANTA RAY
Claspers

# Manta feeding

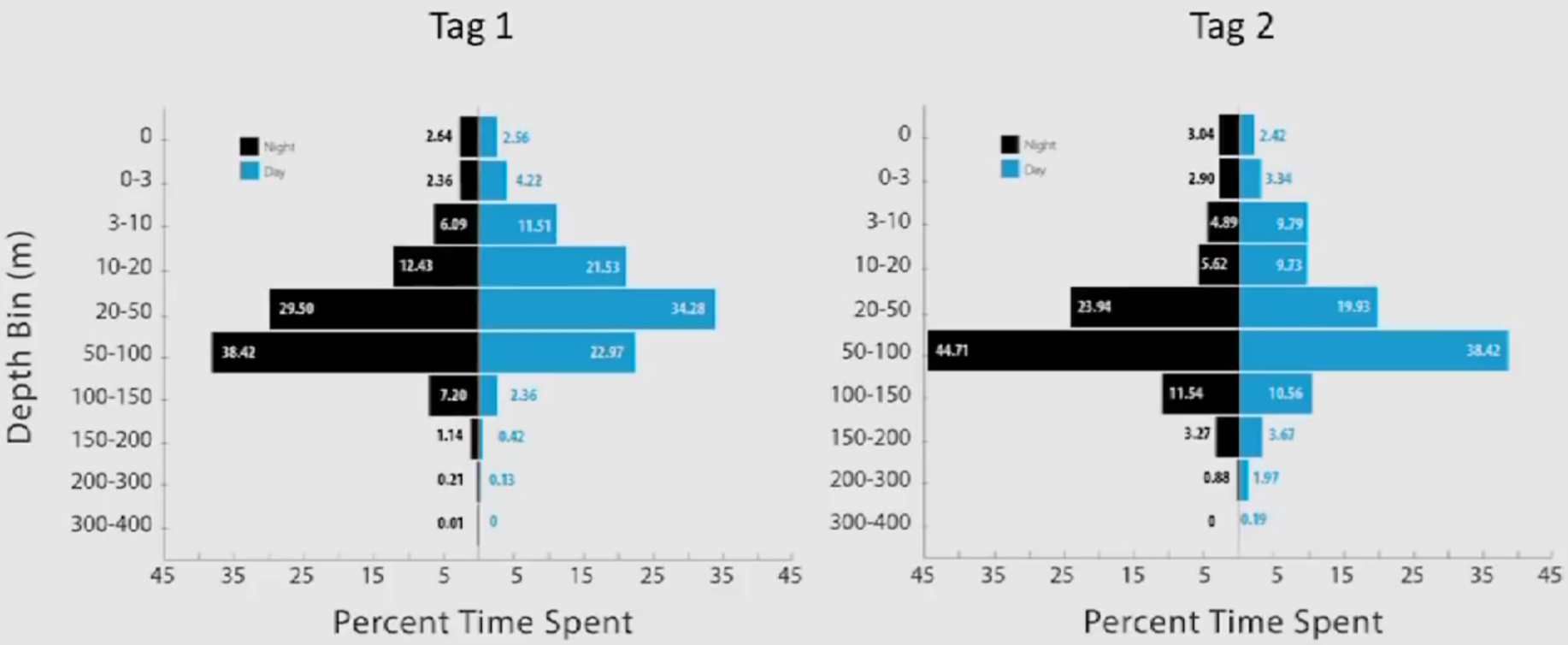


# Manta predators


# Manta predators


© MANTA RAY OF HOPE

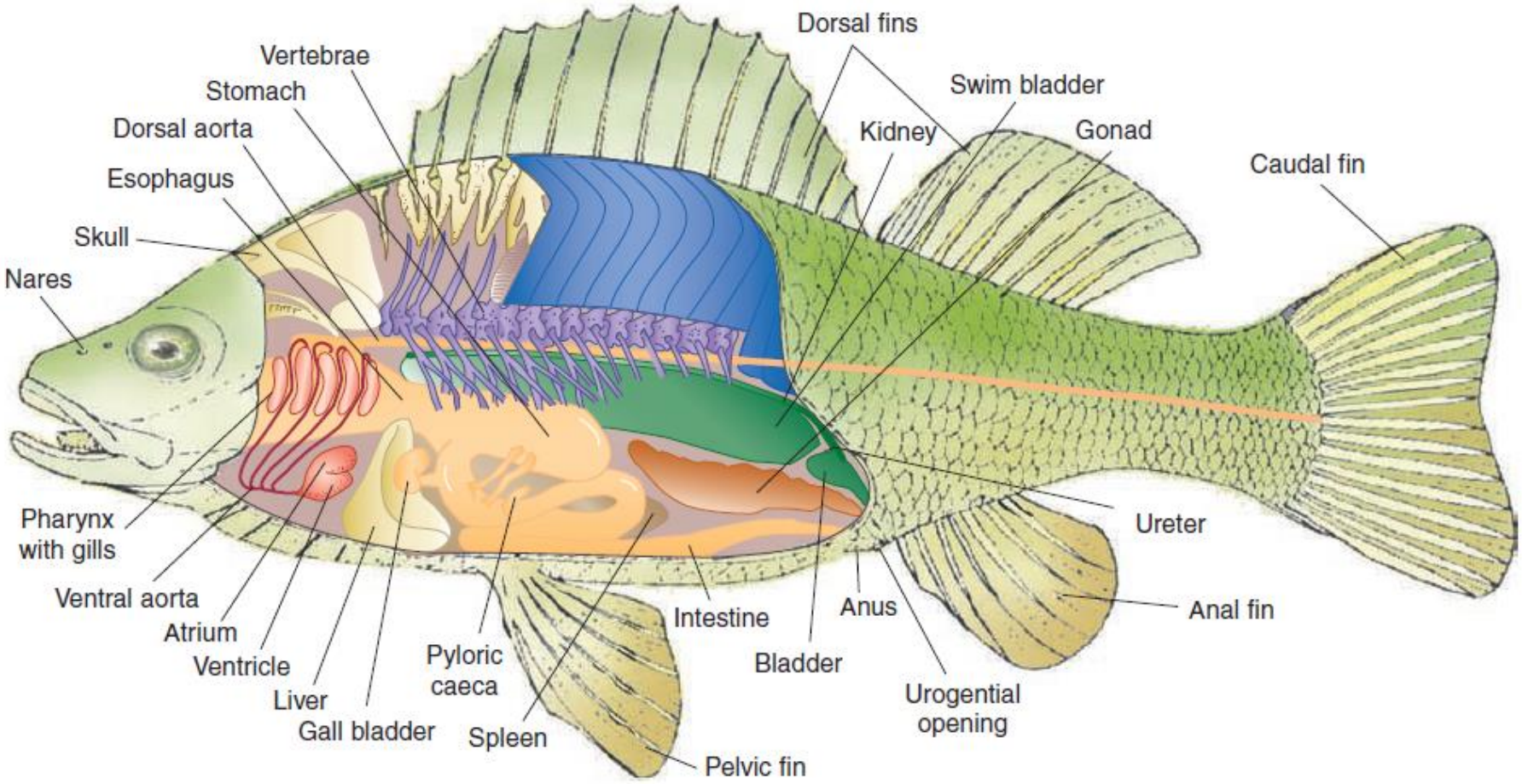
# Manta depth selection



# Evidence of Bottom Feeding?

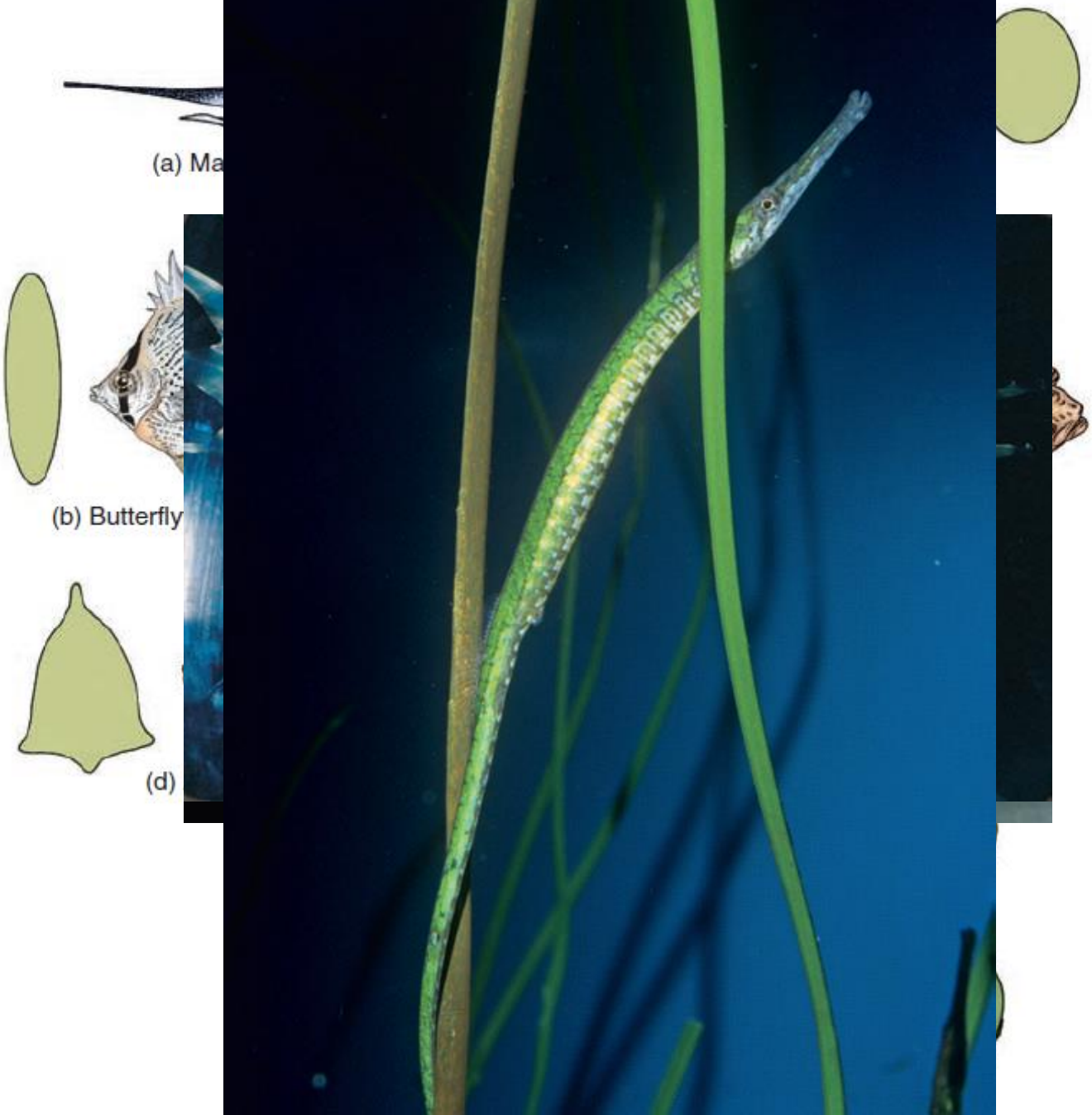
# Chimaeras

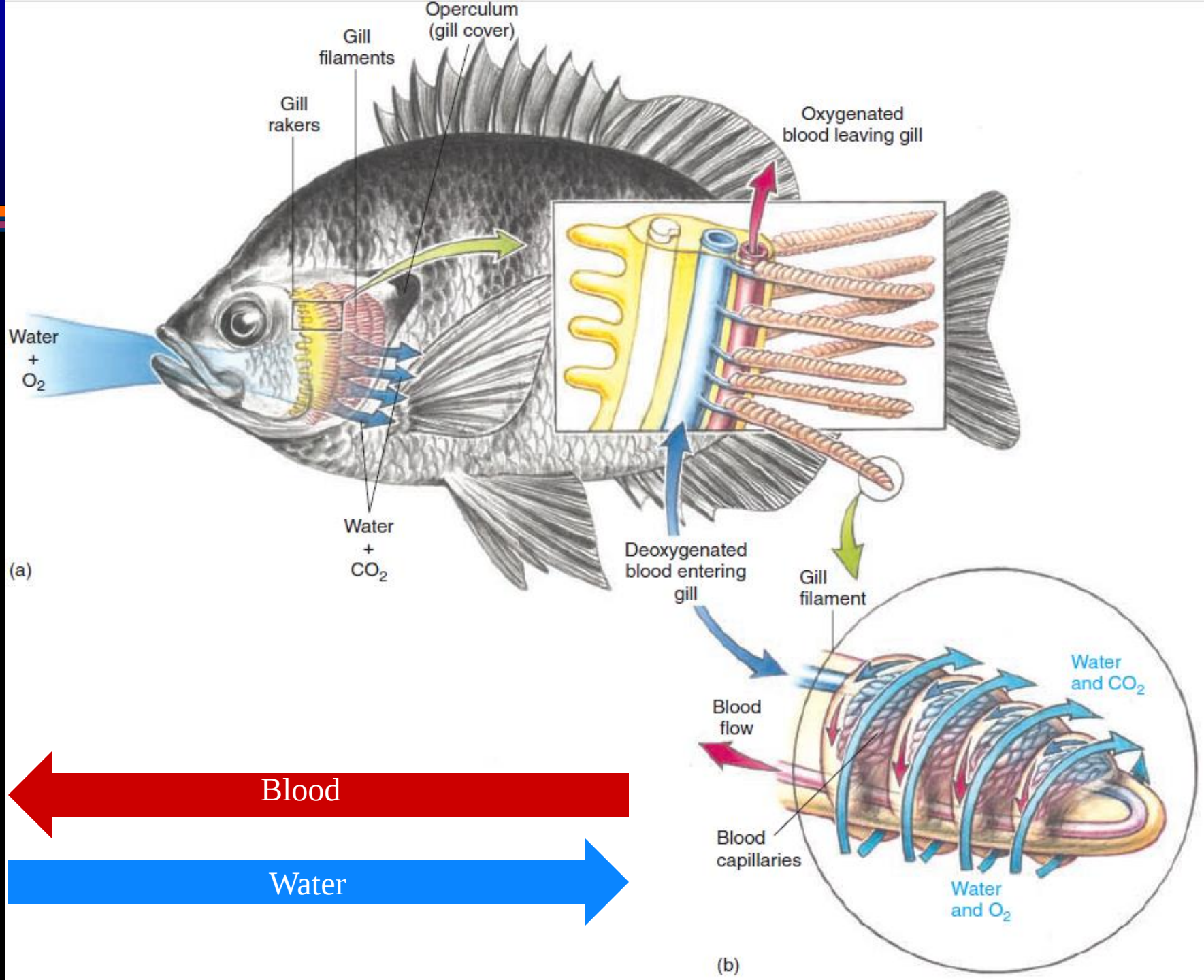
# Ray-Finned Fishes



# The Biolo

- Fishes have d
  challenges of
- Body shape:
- Coloration an




Operculum
(gill cover)
Gill
filaments
Gill
rakers
Oxygenated
blood leaving gill
Water
+
$O_2$
Water
+
$CO_2$
(a)
Deoxygenated
blood entering
gill
Gill
filament
Water
and $CO_2$
Blood
flow
Blood
capillaries
Water
and $O_2$
(b)
Blood
Water

# How do Sharks Breathe?

# Osmoregulation

- Sharks, skates, and rays solve this problem by retaining enough urea and trimethylamine oxide (TMAO) in their blood and body fluids to either balance the solute concentration of seawater or become slightly hypertonic to it.
- Species such as the bull shark (*Carcharhinus leucas)* have the ability to enter freshwater by reducing the levels of these nitrogenous wastes in their body fluids.
- Ray-finned fishes excrete negligible amounts of urine because they need to retain as much water as possible.

# Buoyancy Regulation

- Sharks sink if they stop swimming because their bodies are denser than seawater. They compensate for this problem by maintaining large quantities of an oily material called squalene in their livers.
- Most ray-finned fishes, with the exception of some pelagic species, bottom dwellers, and deep-sea fishes, use a gas-filled sac called a swim bladder.

# Feeding in Fish

- All cartilaginous fishes are *carnivores*.
- Ray-finned fishes can be *carnivores*, *herbivores*, *detritivores*, or *omnivores*.

# Feeding in Fish

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# Adaptations to avoid predation

# Reproduction

- *Oviparity*
  Eggs are shed into the water and embryos develop outside the mother's body. This mode is the most commonly observed in ray-finned fishes.
- *Ovoviviparity*
  Fertilization is internal and eggs hatch within the mother's uterus where they are nourished by yolk stored in the egg. This is the most common mode observed in sharks.
- *Viviparity*
  Either the young directly attach to the mother's uterine wall or the mother's uterus produces "uterine milk" that is absorbed by the embryo.

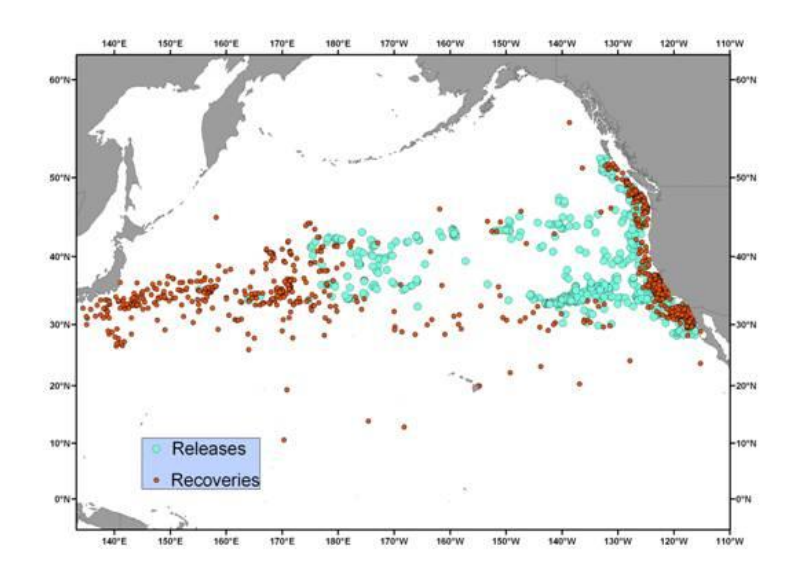
# Shark Reproduction

# Reproductive strategie

- Pelagic Spawners
- Benthic Spawners
- Brood Hiders
- Guarders
- Bearers
- Hermaphroditism

# Fish migrations

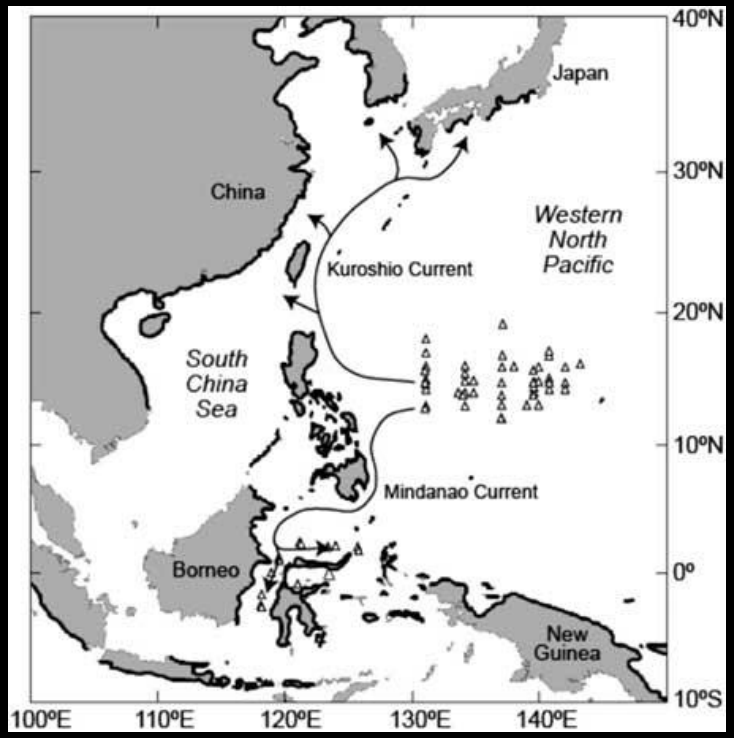
- Migratory movements of marine fish are common and may occur daily or seasonally. Daily migrations are usually associated with feeding and predator avoidance.
- Seasonal migrations of marine fish are usually associated with spawning, changing temperatures, or feeding.




# Fish migrations

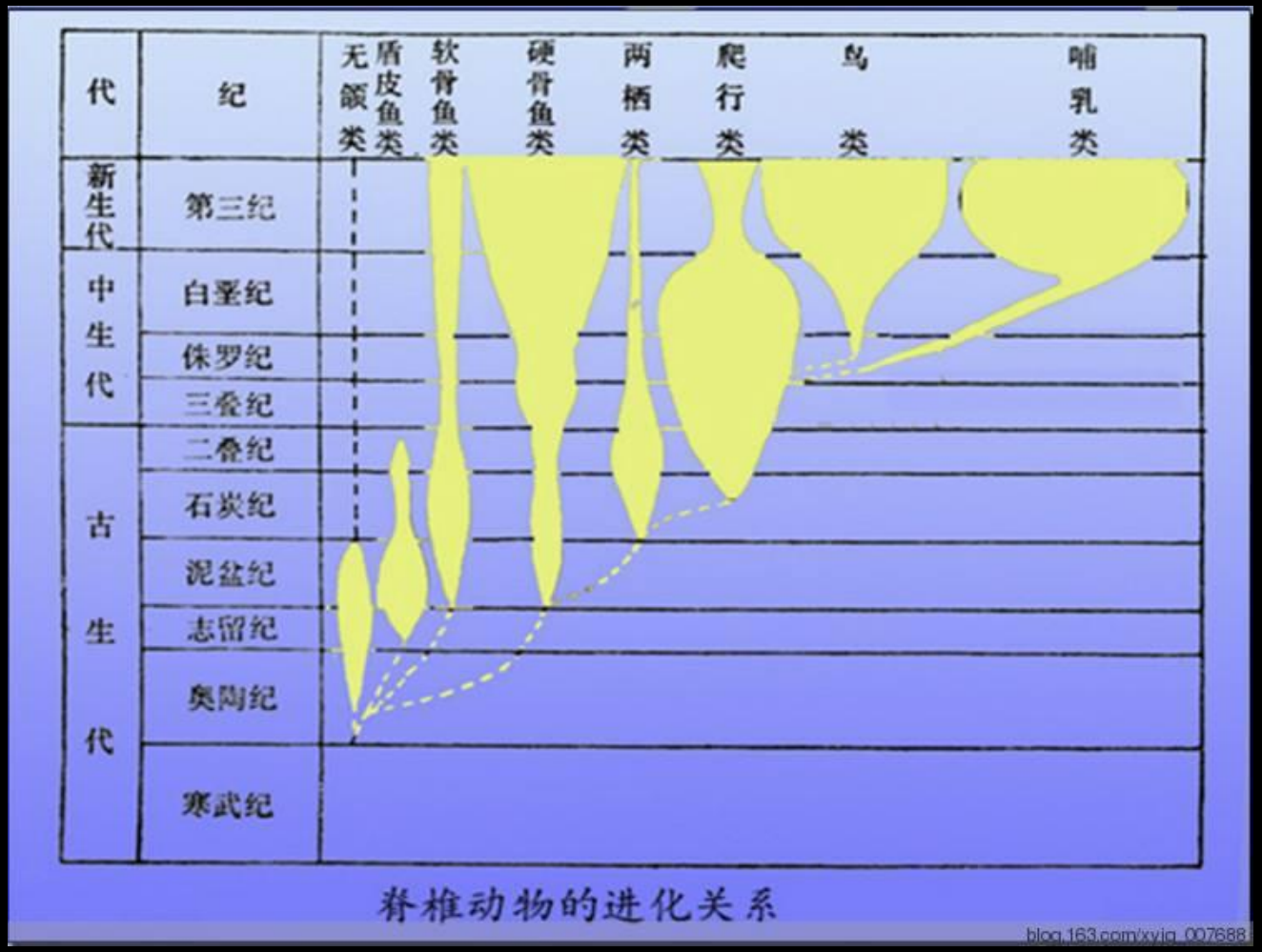
- Some fish species move between freshwater and saltwater for a purpose other than reproduction. Young mullets (*Mugil cephalus),* for example, spend part of their time in freshwater or estuaries. But as adults, they live most of their life in the ocean and spawn there. Fishes that move from freshwater to seawater to spawn are said to be *catadromous*, whereas those that move from seawater to freshwater to spawn are *anadromous*.

# Fish migrations




*Anguilla japonica*

*Oncorhynchus*


代
纪
无颌类
盾皮鱼类
软骨鱼类
硬骨鱼类
两栖类
爬行类
鸟类
哺乳类
新生代
第三纪
中生代
白垩纪
侏罗纪
三叠纪
古生代
二叠纪
石炭纪
泥盆纪
志留纪
奥陶纪
寒武纪
脊椎动物的进化关系
blog.163.com/xyjq_007688

# Points

Lamprey and hagfish lack

A. Paired fins
B. Tails
C. Jaws
D. Mouths
E. Both a and c

The skeletons of sharks and rays are composed of

A. Bone
B. Cartilages
C. Soft tissue
D. Fluid
E. Cellulose

Shark's teeth are actually modified

A. Cartilage
B. Fins
C. Ctenoid scales
D. Placoid scales
E. Gill supports