

Chondrichthyes

I. Cartilaginous fish

- Sharks
- Ray's
- Skates

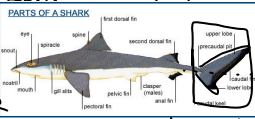


II. Sharks

External Anatomy

1. Nostrils/Nares

- ↳ smell
- ↳ extremely powerful sense of smell
- ↳ hunting sense → because chemicals travel great distances



2. Eye

- ↳ sharks have excellent vision
- ↳ sharks have rods + cones → sharks see in color
- ↳ Nictitating membrane → protects transparent eyelid during feeding
- ↳ Pupils that dilate → allows them to see in dim light

3. Ampullae of Lorenzini

- ↳ freckles along the ventral side of the snout
- ↳ detect weak electrical signals

4. Mouth

- ↳ ventral
- ↳ teeth (always sharp)
- ↳ conveyor belt of teeth
- ↳ TONGUES → highly sensitive TASTE

5. Spiracles ≠ NOSTRILS

- ↳ holes that allow for gas exchange
- ↳ connect to the gills

6. Gill Slits

- ↳ 5-7 gill slits
- ↳ NO gill cover (operculum)

7. Fins

- ↳ Pectoral Fins → oriented differently "airplane wings" provides lift

- ↳ Pelvic Fins → " " → make shark ⇒ CLASPERS

- ↳ Dorsal + Anal
- ↳ Caudal Fin ⇒ Asymmetrical Heterocercal → forces the shark downwards

8. CLASPERS vs CLOACA

- Reproductive structures
- Claspers → ♂ (2 claspers)
 - Cloaca → ♀

9. Counter-shading

- ↳ difference in coloration (grey scale) from dorsal + ventral sides
- ↳ camouflage

10. Denticles

- ↳ scales
- ↳ teeth-like

Head



Tail

⑤ Internal Anatomy

① No Swim Bladder

② Enlarged Livers

↳ Squalene oil

↳ lessens the density

③ Reproductive Structures

i. Claspers = ♂

↳ directly transfer sperm into the female

↳ COPULATION

Spawning
vs
Copulation

ii. Cloaca = ♀

↳ receives the sperm

↳ where fertilization occurs (internal)

④ Development

i. Oviparity → egg layers (external)

ii. Viviparity → live births w/ an umbilical cord

iii. Ovoviviparity

↳ live births

w/ internal eggs

NO UMBILICAL CORD

III. Shark + Human Interactions

a) Shark Attacks

avg. 7 deaths per year

75-150 attacks per year

400 shark species

only ~20 have ever attacked

80-85% of the time, attacks involve only 1-2 bites (exploratory bite)

99% of the time, rescuers are not attacked

Reasons for attack

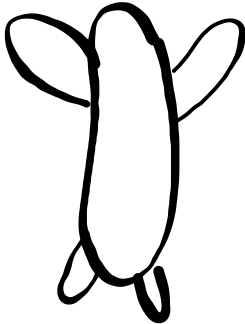
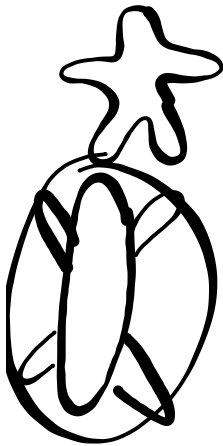
NOT FOOD!!

Mistaken identity

Territoriality

Competition

"ROGUE"



b) Human encounters

avg. Kill 100,000,000

1) Finning million sharks

2) Accidental "By-catch" per year

* Apex Predators

↳ maintains ecosystem stability

IV. Top "10" Deadliest Sharks

10) Lemon Shark

- ↳ viviparity - live births
- ↳ 8 ft long
- ↳ change color (camouflage)
- ↳ eyelids (nictitating membrane)

9) Blue Shark

- ↳ marathon swimmers
- ↳ stream-lined, hydrodynamic

8) Hammerhead

- ↳ expanded head
- ↳ ↑ S.A.; ↑ A.S.L.; ↑ sensitivity to electrical signals
- ↳ schooling sharks

7) Sand Tiger Shark

- ↳ always found in aggregations
- ↳ ovoviviparity

6) Grey Reef Shark

- ↳ complex ear

5) Short-fin Mako



4) Oceanic White-tip

- ↳ smell (olfactory bulbs are enlarged)

3) Tiger

- ↳ "garbage can" of the ocean

2) Great White

- ↳ 20-25 ft long

1) Bull Shark

- ↳ S.W. + F.W.

V. How sharks hunt

① Sound / Smell

- ↳ travel farther underwater
- ↳ 5x faster/farther
flashing (low-pitched)

② Vision

w/in 75-100ft

keying in on bright colors

③ Ampullae of Lorenzini

- ↳ sense electrical signals

④ Touch

- ↳ bump or rub the side of the body

⑤ Taste

- ↳ final sense used

↳ determines whether the attack will continue

- ↳ "exploratory bits"