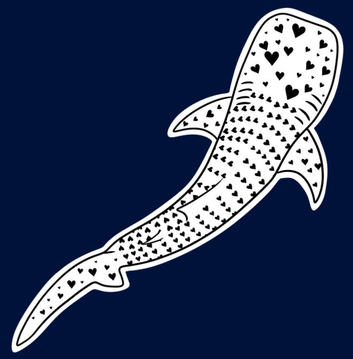
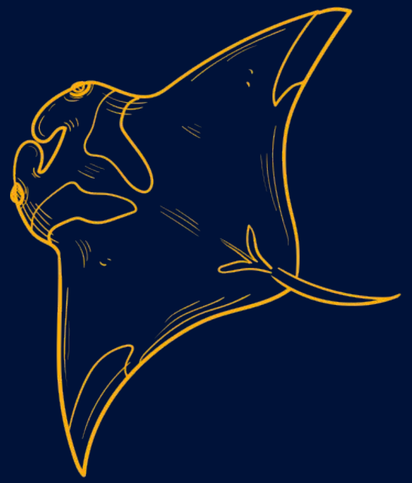
What Makes a Shark a Shark?

AIM:

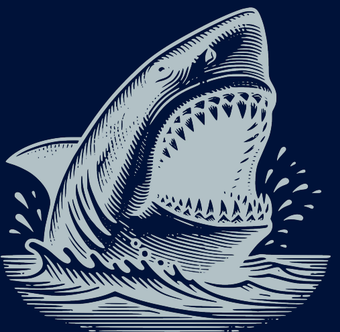
What characteristics make sharks unique from other fish, and how do these features help them survive in their marine environment?

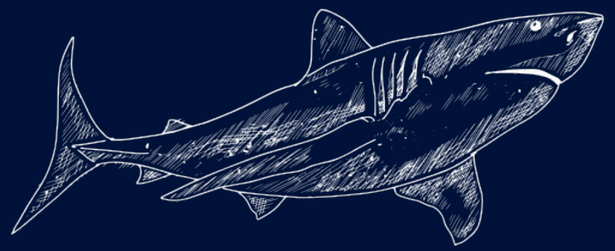




Do Now:

Write down three things you know (or think you know) about sharks. What makes them different from other fish like tuna or goldfish?





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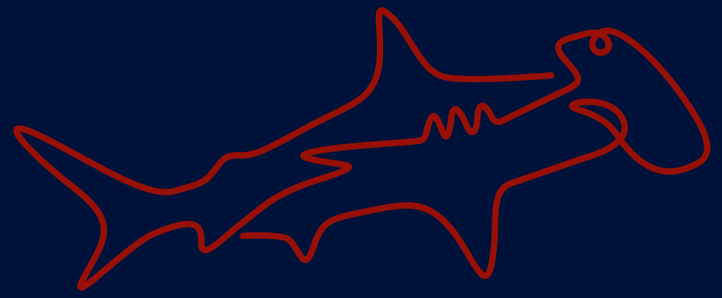

NGSS Standards

- HS-LS1-1: Structure and function in living organisms
- HS-LS4-1: Evidence of common ancestry and diversity
- HS-LS2-6: Biodiversity and stability in ecosystems

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Objectives

- Identify major anatomical features that define sharks
- Explain how a cartilaginous skeleton, large liver, and lack of swim bladder affect buoyancy
- Recognize adaptations like dermal denticles, multiple gill slits, and electroreception
- Distinguish sharks from bony fish

Key Features That Define Sharks

A. Cartilaginous Skeleton

- Sharks have no bones—skeleton is made entirely of cartilage
- Cartilage is lighter and more flexible than bone
- Allows sharks to be fast and agile swimmers

B. No Swim Bladder → Negative Buoyancy

- Bony fish (like salmon) have a gas-filled swim bladder to stay afloat
- Sharks lack this structure and are negatively buoyant—they sink if not swimming

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Key Features That Define Sharks

C. Large, Oil-Filled Liver

- To compensate for lack of swim bladder, sharks have a massive liver filled with low-density oil (squalene)
- Provides some lift, helps with buoyancy, and stores energy

D. Heterocercal Tail

- Upper lobe of tail is longer than the lower lobe
- Helps push the shark upward as it swims, offsetting its negative buoyancy

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Key Features That Define Sharks

E. Dermal Denticles ("Skin Teeth")

- Shark skin is covered with tiny, tooth-like scales
- Reduces drag and turbulence, making swimming more efficient
- Helps resist parasites and abrasions

F. Multiple Gill Slits

- Sharks have 5–7 gill slits on each side (bony fish have only one gill opening with an operculum)
- Water flows directly over gills—many must keep moving to breathe (ram ventilation)

Key Features That Define Sharks

G. Reproduction

- Internal fertilization (males have claspers)
- Diverse reproductive methods:
- – Oviparous (lay eggs, e.g., horn sharks)
- – Ovoviviparous (eggs hatch inside female, e.g., sand tiger sharks)
- – Viviparous (live birth with placenta, e.g., hammerheads)

H. Replaceable Teeth

- Teeth are not embedded in jawbone—attached by soft tissue
- Constantly replaced: rows of teeth move forward like a conveyor belt
- Some sharks shed thousands of teeth in a lifetime

Advanced Sensory Adaptations

- Lateral line detects vibrations in water
- Ampullae of Lorenzini: specialized pores on snout that detect electric fields (used to find hidden prey)
- Acute sense of smell and hearing

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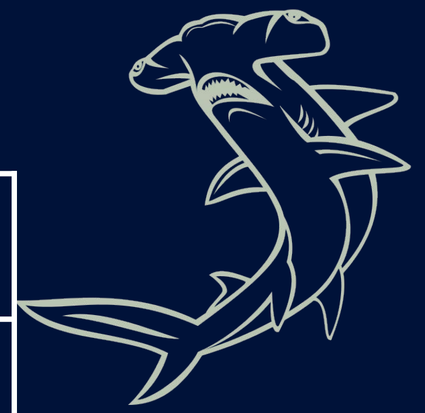
The Early Origins of Sharks – Devonian Period



Feature	Sharks	Bony Fish
Skeleton	Cartilage	Bone
Swim bladder	Absent	Present
Gill Openings	5-7 Slits, No Openings	1 Gill Slit Covered by Operculum
Skin	Dermal Denticles	Scales
Teeth	Replaceable, Multiple Rows	Fixed in Jaw, Limited rows
Fertilization	Internal (With Claspers)	Usually External
Buoyancy Strategy	Oil-Filled Liver	Gas-Filled Bladder

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