Phylum Cordata

The Vertebrates:

• Internal skeletons

• have a spinal cord protected by a backbone

• Fish, amphibians, reptiles, birds & mammals
The Fish

Live in water – duh!

Gills for gas exchange

Fins for locomotion

Skeleton made of cartilage or bone

Most covered by scales

Cold-blooded – body temp. depends on environment
3 classes of fish

1. **Jawless fish** - Agnatha
   - Oldest group – very primitive
   - Scale-less skin
   - Some parasitic / some scavengers
   - Circular mouth with fleshy teeth
   - Skeleton made of cartilage
   - Examples: lamprey & hagfish
Hagfish & Lamprey

Gill slits

Circular mouth
LAMPREY

PARASITIC LAMPREYS ATTACHED TO THE OUTSIDE OF THEIR PREY FEEDING ON TISSUE AND BLOOD SUPPLIES.
LAMPREYS
LAMPREY MOUTH

CIRCULAR MOUTH WITH FLESHY TEETH TO GRIP PREY
FISH WOUND FROM LAMPREY
HAGFISH

HAGFISH SOMETIMES FEED ON LARGE DEAD ANIMALS SUCH AS A WHALES. THEY FEED FROM THE INSIDE OUT!
HAGFISH
3 classes of fish

2. Cartilaginous fish - Chondrichthyes

- Skeleton made of cartilage
- Sharks, rays, skates
- All are predatory except 4 species!
Blacktip reef shark – Belize 2015
The 4 exceptions are filter feeders

1. Whale sharks – warm shallow water

THE LARGEST FISH IN THE SEA!!!
WHALE SHARK WITH DIVER
WHALE SHARK FEEDING
WHALE SHARK WITH DIVER
The 4 exceptions are filter feeders

2. Basking sharks – cold shallow water

THE SECOND LARGEST FISH IN THE SEA!!!
BASKING SHARK FEEDING
The 4 exceptions are filter feeders

3. megamouth shark – cold deep water
MEGAMOUTH SHARK
MEGAMOUTH SHARK
MEGAMOUTH SHARK
The 4 exceptions are filter feeders

4. manta ray – warm shallow water
MANTA RAY
Manta Ray video 1:42
3 classes of fish

3. **Bony fish** - **Osteichthyes**

- Skeleton of bone
- Most numerous of fish species
- Greatest variety in shape & feeding habits
THIS MUST BE THE LARGEMOUTH BASS FISHERMEN TALK ABOUT!
Body parts of fish
Get ready to draw a fish!!!
1. Caudal fin - tail fin
Used for forward motion and acceleration
2. Dorsal fin & 3. Anal fin

**Singular fins**

*Used to prevent rolling/tipping*
4. Pectoral fin & 5. Pelvic fin

paired fins (left & right)
Used to balance, stop & turn
Snapper – Belize 2015
6. Spines  Used for protection
Some contain poison sacs
7. Operculum  Covers & protects gills  Not found in sharks
8. Lateral line
Sensory canals used to detect changes in water pressure around the fish (similar to human ear)
<table>
<thead>
<tr>
<th>TRAIT</th>
<th>CARTILAGINOUS</th>
<th>BONY</th>
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<tbody>
<tr>
<td>EXAMPLES</td>
<td>SHARKS, RAYS, SKATES</td>
<td>EEL, GROUPER, GOBY</td>
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**COMPARISON OF CARTILAGINOUS & BONY FISHES**
# COMPARISON OF CARTILAGINOUS & BONY FISHES

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<tbody>
<tr>
<td>SKELETON</td>
<td>CARTILAGE</td>
<td>BONE</td>
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![Diagram of cartilaginous and bony fish skeletons](image-url)
### Comparison of Cartilaginous & Bony Fishes

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<tr>
<td>Swim Bladder</td>
<td>Absent – Oil filled liver provides buoyancy</td>
<td>Present – Air filled sac for buoyancy</td>
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BUOYANCY DEVICES

SHARK LIVER

FISH SWIM BLADDER
Tarpon – Belize 2015
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<tr>
<td>FERTILIZATION</td>
<td><strong>INTERNAL</strong> – HAVE FEW LARGE YOUNG IN LIFE TIME</td>
<td><strong>EXTERNAL</strong> – LAY THOUSANDS OF SMALL EGGS</td>
</tr>
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SHARK EGG CASES & YOUNG
BONY FISH EGGS

EGGS LAID ON ROCKS

EGGS HELD IN MOUTH

BUT MOST EGGS DRIFT AWAY AS PLANKTON
**COMPARISON OF CARTILAGINOUS & BONY FISHES**

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<td>SCALES</td>
<td><strong>PLACOID</strong> – SPINY EMBEDDED IN SKIN</td>
<td><strong>GANOID</strong> – PLATELIKE</td>
</tr>
<tr>
<td></td>
<td><strong>CTENOID &amp; CYCLOID ARE FLAT, FLEXIBLE, OVERLAP</strong></td>
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FISH SCALES

- Placoid
- Ganoid
- Ctenoid
- Cycloid
COMPARISON OF CARTILAGINOUS & BONY FISHES

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<th>Trait</th>
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<tr>
<td>Gills</td>
<td>No operculum</td>
<td>Have operculum to cover/protect gills</td>
</tr>
<tr>
<td></td>
<td>Have gills slits</td>
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## COMPARISON OF CARTILAGINOUS & BONY FISHES

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<td>FEEDING BEHAVIOR</td>
<td>ALL ARE PREDATORS (FOUR EXCEPTIONS)</td>
<td>GREAT VARIATION IN FOOD SOURCES</td>
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- **Feeding Behavior**
  - Cartilaginous fish: All are predators (four exceptions).
  - Bony fish: Great variation in food sources.
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<tr>
<td>FINS</td>
<td>RIGID AND UNSEGMENTED</td>
<td>FLEXIBLE AND SEGMENTED</td>
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**COMPARISON OF CARTILAGINOUS & BONY FISHES**
# Comparison of Cartilaginous & Bony Fishes

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<tr>
<td>Teeth</td>
<td>Not fused to jaw - replaceable</td>
<td>Fused to jaw - irreplaceable</td>
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![Cartilaginous Fish](image1.png)

![Bony Fish](image2.png)