Marine Animals-Key Ideas

* Animals are active, multicellular organisms incapable of synthesizing food.

* The invertebrates and vertebrates are grouped by similarities in external appearance and internal architecture into phyla.

* All vertebrates belong to the phylum Chordata. The most abundant and diverse vertebrates are the fish.

* Invertebrates are generally soft-bodied organisms lacking a rigid internal skeleton. Many possess a hard outer protective covering.

* Each marine phylum has developed a set of adaptations, characteristics that allow it to survive in its environment.

The Origin of Animals

Between 2 billion and 400 million years ago, photosynthetic autotrophs changed the composition of the atmosphere, making the evolution of animals possible.
Invertebrates are soft-bodied animals. Many invertebrates have a hard protective covering (e.g., snails or lobsters). There are at least 33 phyla of invertebrates, and most of these phyla are represented among marine life.
Invertebrates

The clam, snail, and squid are examples of the phylum Mollusca and class: Bivalvia (clam), Gastropoda (snail), and Cephalopoda (squid).

The Chordates

Chordata is the most advanced animal phylum. All chordates have, at some time during development, a notochord.

In some chordates the notochord is lost during development. These are the invertebrate chordates.

Most chordates (about 95%) retain the notochord in some form. These are the vertebrate chordates.

Both invertebrate and vertebrate chordates are represented in ocean environments.
Vertebrate Evolution and Classification

One proposed family tree for the vertebrates and invertebrate chordates.

Cartilaginous Fishes
Commercial Bony Fishes

Deep Sea Fishes
The Problems of Fishes

Movement, shape and propulsion - fish must be able to move through water, which is 1,000 times denser and 100 times more viscous than air

Maintenance of level - fish tissue is usually denser than the surrounding water, so fish must have a system to keep from sinking

Gas exchange - the problem of extracting oxygen from water

Osmotic considerations - fish need a system to maintain proper salt levels in their bodies

Feeding and defense - competitive pressure among a large number of fish has caused a wide variety of feeding habits to evolve

How body shape affects movement.
Osmotic Considerations

Osmoregulation in freshwater and saltwater fishes.

Depletion of fishes at various depths
Repeated Cycles of Overshoot and Collapse
Peruvian Herring, Sardine, and Anchovy Catch

Anchovy Catch of Peru and Ecuador

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**Marine Reptiles**

Marine reptiles are ectothermic, breathe air with lungs, have scales and relatively impermeable skin, and are equipped with special glands to maintain salt balance. Marine reptiles include:

- Sea turtles
- Marine crocodiles
- Sea snakes
Marine Reptiles

Marine Birds

Only 270 of the known species of birds qualify as seabirds. Seabirds have salt excreting glands to eliminate salt taken in with their food. There are four groups of seabirds:

**Tubenoses** - this group includes the albatrosses and petrels

**Pelicans** - this group includes relatives of the penguins that have webbed feet and throat pouches

**Gulls** - these birds are found along the shore, where they scavenge for food.

**Penguins** - these birds have lost the ability to fly, but are excellent swimmers
Marine Mammals

**Cetacea** – porpoises, dolphins and whales

**Carnivora** - seals, sea lions, walruses and sea otters

**Sirenia** – manatees and dugongs
Sea Cows

Figure 16.3
A few of the marine mammals of the Order Cetacea. Suborder Mysticeti (*mystidos* = unknowable) whales are known for having no teeth and instead use baleen for filter feeding.

A few of the marine mammals of the Order Cetacea. Suborder Odontoceti (*odontos* = tooth) whales are known for being active predators who use teeth for feeding. The toothed whales search for food using **echolocation**, a biological equivalent to sonar.
Echolocation

Marine animals have evolved effective adaptations for capturing prey, avoiding danger and maintaining thermal and fluid balance with their environment.

(above) An example of echolocation, used by toothed whales to locate their prey.