
Short-head seahorse


Yellow-striped cardinalfish

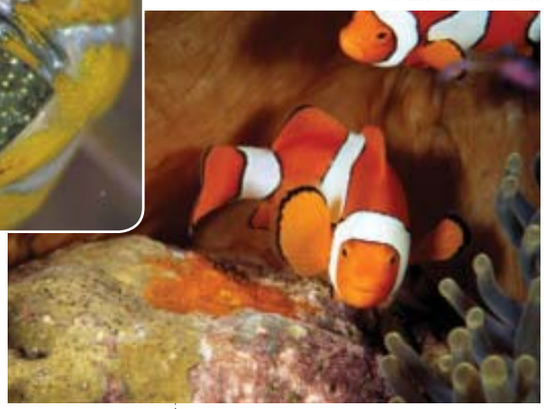

Clown anemonefish

Figure 4 Fishes reproduce in a variety of ways. Male seahorses store eggs in a special pouch until they hatch (left). Male yellow-striped cardinalfish carry eggs in their mouths to protect the eggs from predators (center). Clown anemonefish spawn and then guard their eggs (right).

Reproduction

Most fishes reproduce sexually through external fertilization. In a process called spawning, male and female gametes are released near one another in the water. Spawning may occur between two individuals, as with the clown anemonefish shown in **Figure 4,** or in large groups of males and females. Group spawning usually produces millions of fertilized eggs. Predators may eat many of these eggs and the resulting hatchlings, but the large number of eggs ensures that some individuals will survive.

In sharks, skates, and rays, eggs are fertilized inside the female's body. During mating, the male uses organs called *claspers* to insert sperm into the female. In most species, the eggs develop inside the female and the young are born live. These newborns are much larger than fishes that hatch from eggs. Because these offspring are large, they are less likely to be eaten by a predator.

Reading Check ***Describe the process of spawning.***

Section 1 Review

KEY IDEAS

1. **Discuss** the key characteristics found in all fishes.
2. **Describe** how fishes use their fins.
3. **Summarize** how countercurrent flow helps a fish obtain oxygen.
4. **Explain** why freshwater fishes excrete more urine than marine fishes do.
5. **Contrast** reproduction in sharks with that of most other fishes.

CRITICAL THINKING

6. **Predicting Outcomes** The gills of fishes are made up of fingerlike projections called gill filaments through which gases enter and leave the blood. Explain a likely outcome if the gills were instead made up of a single, flat membrane.

ALTERNATIVE ASSESSMENT

7. **Making Models** Make a model of a fish that illustrates how its body is adapted to living in an aquatic environment. Choose five structures necessary or helpful for an animal in a water environment, and label them.

Math Skills

Percentages Salmon return to spawn in the stream where they were hatched. During spawning, females lay from 2,000 to 10,000 eggs. The young salmon hatch and make their way downstream to the sea; most perish during this journey. A Canadian study reported that fewer than 1 percent of the hatchlings from each female survive to spawn. Ask them to calculate the approximate numbers of hatchlings that survive. ($2{,}000 \times 0.01 = 20$, and $10{,}000 \times 0.01 = 100$) LS Logical

Close

Formative Assessment

The kidney eliminates waste and regulates ____.

A. circulation (Incorrect. Circulation is regulated by the heart.)
B. ion and water balance (Correct! This is the role of the kidney.)
C. nerve impulses along the lateral line (Incorrect. The kidney is not a sensory organ.)
D. spawning behavior (Incorrect. Spawning is a reproductive activity.)

Answer to Section Review

1. Fish have gills, closed-loop circulation, an endoskeleton, and kidneys.
2. Fins help fish turn, dive and, or climb rapidly to move forward, backward, sideways, and up and down.
3. Water passes over the gills in one direction as blood flows in the opposite direction through the gills' capillaries. Oxygen diffuses into the blood over the entire length of the gill.
4. Freshwater fish take in a large amount of water from their environment due to the difference in water concentration. Excreting the excess water in the form of urine helps maintain their water balance. Marine fish lose water to their environment, so they do not have as much excess water to excrete.
5. Fertilization in sharks is internal; most other fishes have external fertilization.
6. The total surface area of the gills would be reduced and a fish with such a gill may not get enough oxygen to live.
7. Models will vary, but should include the streamlined shape of fishes; their muscular tails; paired fins to maneuver efficiently, secretion of mucus reduces friction; large eyes help them see predators and prey