FISH270

Lecture 3

4 processes that shift alleles - causing Evolution

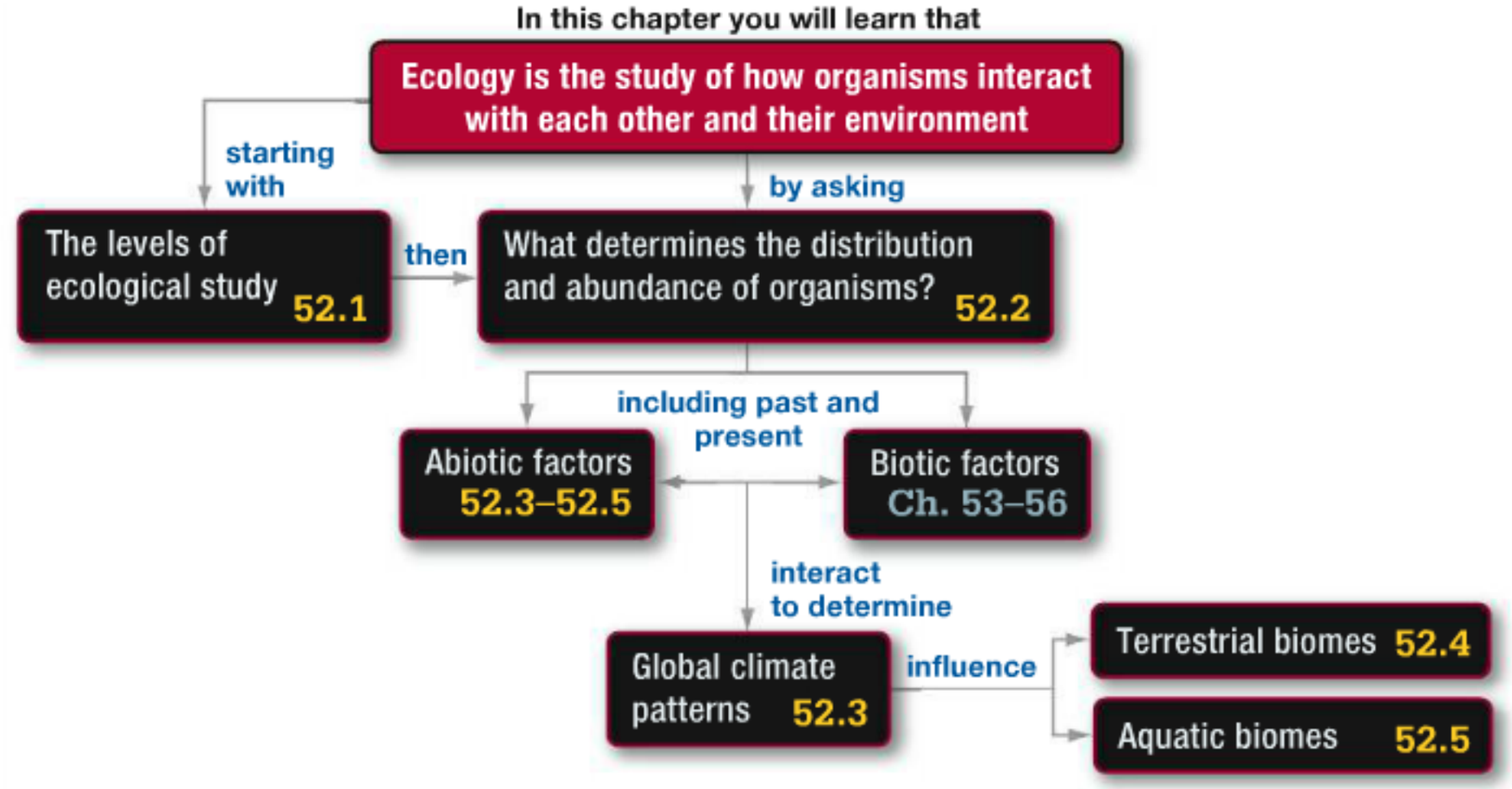
- Natural Selection
- Genetic Drift
- Mutation
- Gene Flow

Environment

Ecology

Review

52 An Introduction to Ecology



SUMMARY TABLE 52.1 Five Main Levels of Ecological Study

Level	Sockeye Salmon Example
Organismal ecology How do individuals interact with each other and their physical environment? Salmon migrate from saltwater to freshwater environments to breed	
Population ecology How and why does population size change over space and time? Each female salmon produces thousands of eggs. On average, only a few offspring will survive to return to the same stream to breed	
Community ecology How do species interact, and what are the consequences? Salmon are prey as well as predators	
Ecosystem ecology How do energy and nutrients cycle through the local environment? Salmon die and then decompose, releasing nutrients that are used by other organisms	
Global ecology How is the biosphere affected by global changes in nutrient cycling and climate? Worldwide populations of salmon are affected by climate change	

Aquatic Biomes

(b) Blue wavelengths dominate underwater.

FIGURE 52.18 Light Is Limited Underwater.

DATA: Saffo, M. B. 1987. *BioScience* 37: 654–664.

Aquatic Biomes

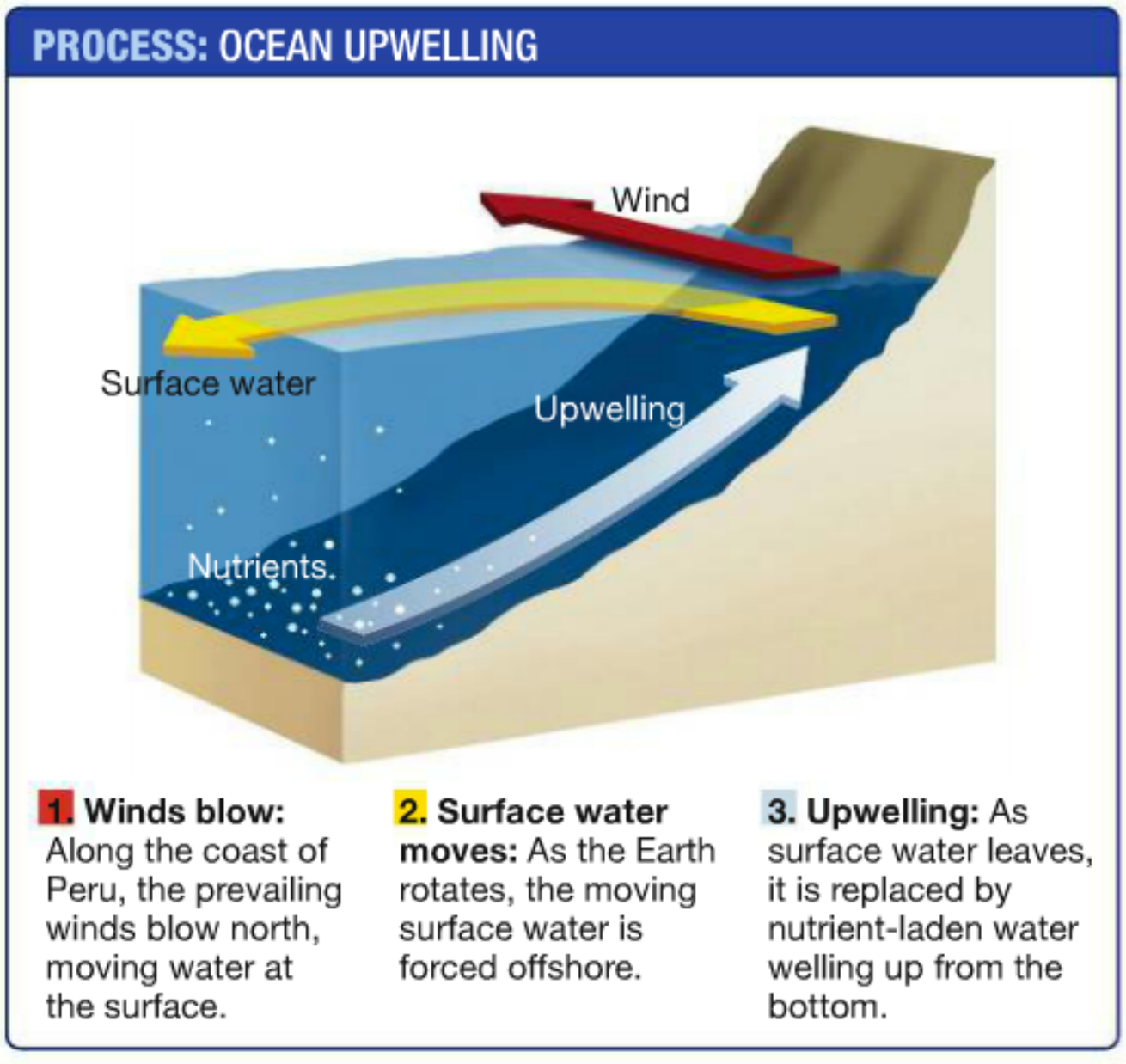


FIGURE 52.19 Ocean Upwellings Bring Nutrients to the Surface.

Aquatic Biomes

Aquatic Biomes > Freshwater > Lakes and Ponds

Lakes and ponds are distinguished from each other by size. Ponds are small; lakes are large enough that the water can be mixed by wind and wave action. Most natural lakes and ponds occur in high latitudes—they formed in depressions created by the scouring action of glaciers thousands of years ago.

Water depth Biologists describe the structure of lakes and ponds by naming zones, some of which overlap (**FIGURE 52.21**).

- The **littoral** ("seashore") **zone** consists of the shallow waters along the shore, where flowering plants are rooted.
- The **limnetic ("lake") zone** is offshore and comprises water that receives enough light to support photosynthesis.
- The **benthic ("depths") zone** occurs at the substrate.
- Regions of the littoral, limnetic, and benthic zones that receive sunlight are part of the **photic zone.**
- Portions of a lake or pond that do not receive sunlight make up the **aphotic zone.**

Aquatic Biomes > Freshwater > Wetlands

Wetlands are shallow-water habitats where the soil is saturated with water for at least part of the year. They are usually distinguished from terrestrial habitats by the presence of "indicator plants" that grow only in saturated soils.

Aquatic Biomes

Aquatic Biomes > Freshwater > Streams

Streams are bodies of water that move constantly in one direction. Creeks are small streams; rivers are large streams.

Water depth Most streams are shallow enough that sunlight reaches the bottom. Availability of sunlight is usually not a limiting factor for organisms, except when turbidity is high.

Water flow and nutrient availability The structure of a typical stream varies along its length. Where it originates at a mountain

Aquatic Biomes > Freshwater/Marine > Estuaries

Estuaries form where rivers meet the ocean—meaning that freshwater mixes with salt water. In essence, an estuary includes saline marshes (from slightly to highly saline) as well as the body of water that moves in and out of these environments. Salinity varies with **(1)** changes in river flows—it declines when the river floods and increases when the river ebbs—and **(2)** with proximity to the ocean. Salinity has dramatic effects on osmosis and water balance (see Chapters 38 and 43); species that live in es-

Aquatic Biomes

Aquatic Biomes > Marine > Oceans

Oceans form a continuous body of salt water and are remarkably uniform in chemical composition. Regions within an ocean vary markedly in their physical characteristics, however, and have profound effects on the organisms found there.

Water depth Biologists describe the structure of oceans by naming zones (**FIGURE 52.22**).

- The **intertidal** ("between tides") **zone** consists of a rocky, sandy, or muddy beach that is exposed to the air at low tide but submerged at high tide.
- The **neritic zone** extends from the intertidal zone to depths of about 200 m. Its outermost edge is defined by the end of the **continental shelf**—the gently sloping, submerged portion of a continental plate.
- The **oceanic zone** is the "open ocean"—the deepwater region beyond the continental shelf.
- The bottom of the ocean is the **benthic zone.**
- The intertidal and sunlit regions of the neritic, oceanic, and benthic zones make up a **photic zone.**

52.5 Types of Aquatic Biomes

- Salinity, water depth, water flow, and nutrient availability are key factors determining types of aquatic biomes.
- Aquatic biomes include lakes and ponds, wetlands, streams, estuaries, and oceans.
- Humans are affecting aquatic biomes by physically altering them (such as by damming a river), by changing their chemistry (such as by polluting and causing ocean acidification), and by changing species compositions (such as by introducing invasive species).

✔ **You should be able to explain why the open ocean is similar to the desert, and why it is not.**

- **How organisms adapt and successes in different aquatic environments: Introduction to functional adaptations to the environment**:

o Respiratory adaptations (aquatic vs. terrestrial, anoxia, etc.)
o Osmotic adaptations (osmotic/ionic regulation, differences in fresh sea water/terrestrial ecosystems, etc.)
o Light adaptations (photoreception, pigments, circadian rhythms, bioluminescence, etc)
o Thermal adaptation (endothermic vs. exothermic, polar vs. tropical)
o Electromagnetic and gravitational adaptations (electroreception, electrogenesis, adaptation to hydrostatic pressure, air bladder, etc)
o Reproductive adaptations (sexual vs. asexual, internal vs. external, r/k strategies, etc)
o Defensive adaptations (simple –swimming and hiding- and complex tactics –spines, chemicals-)
o Feeding adaptations
o Locomotion adaptations