Lake Erie Fish

Three Classes of Fish

Jawless Fish — *Agnatha (Ag•NATH•a)*

This class is the most primitive and oldest of the three. They include the hagfish and the lamprey. Because these fish have no jaws, they use their mouths to filter their food or they use their mouths to suck the blood of other fish. The most common agnaths in Lake Erie are the non-native sea lampreys.

Sea Lamprey

Cartilaginous Fish – *Chondrichthyes (Kon•DRIK•the•eez)*

Sharks and rays make up this second group of fishes. Like the jawless fish, these fish have no bone, only cartilage. However, this group is more advanced than the agnaths because they have paired fins and jaws. The only cartilage fish in Lake Erie are the lake sturgeons.

Lake Sturgeon

Bony Fish — *Osteichthyes (OS•tee•IK•the•eez)*

The third and most advanced class of fish is the true bony fish. This group includes fish like the yellow perch, walleye, and smallmouth bass. Unlike the agnaths, the bony fish have jaws. The bony fish differs from the Chondrichthians because bony fish skeletons are made of both bone and cartilage. One important adaptation of many bony fish is the swim bladder. This sack above the stomach acts like a balloon, enabling the fish are able to stay at any depth without moving.

External Anatomy of a Bony Fish

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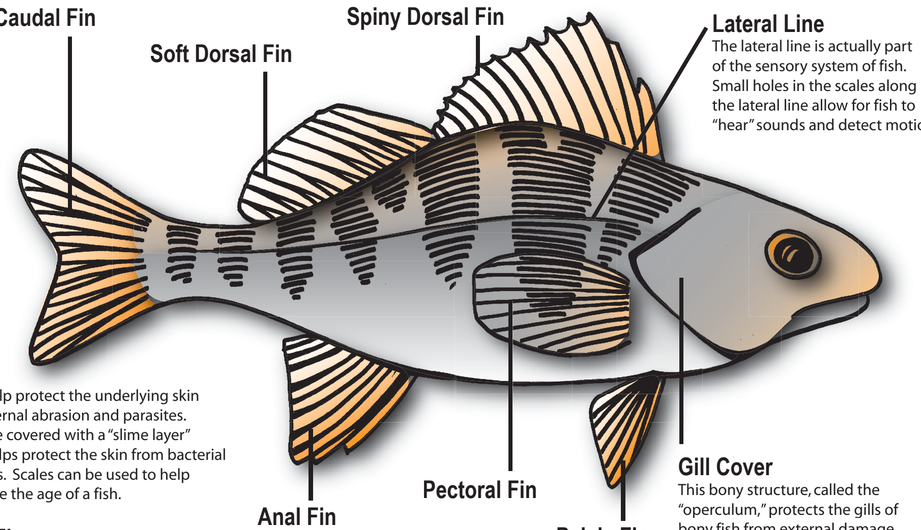


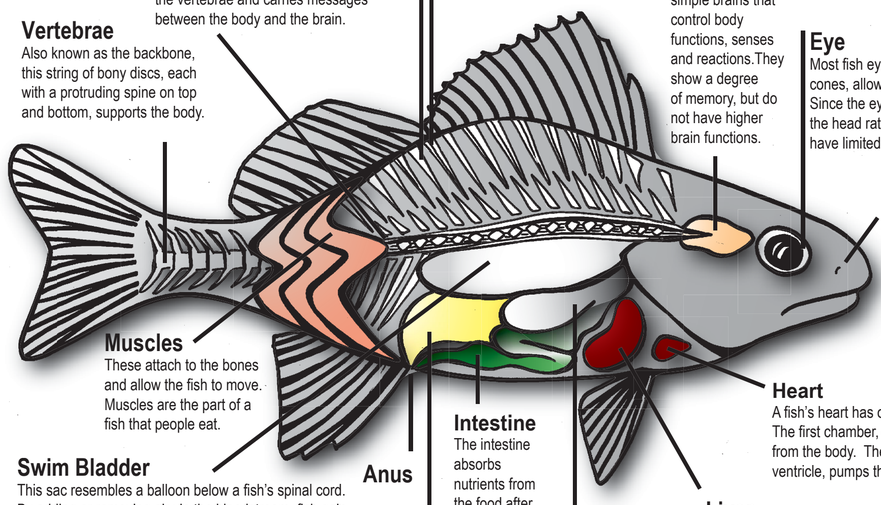
Lateral Line
The lateral line is actually part of the sensory system of fish. Small holes in the scales along the lateral line allow for fish to "hear" sounds and detect motion.

Scales
Scales help protect the underlying skin from external abrasion and parasites. Scales are covered with a "slime layer" which helps protect the skin from bacterial infections. Scales can be used to help determine the age of a fish.

Fins
All fish have fins that can differ in size and shape between species. Fins aid in balance and provide a means of mobility through the water. The number of spines or rays on fins can be used to help in identification between similar species.

Gill Cover
This bony structure, called the "operculum," protects the gills of bony fish from external damage. Some species, such as sharks, do not have a hard, protective operculum.

Internal Anatomy of a Bony Fish



Spinal Cord
This long, thick nerve runs through the vertebrae and carries messages between the body and the brain.

Spines These small bones allow the fins to be raised and lowered.

Brain
Fish have small, simple brains that control body functions, senses and reactions.They show a degree of memory, but do not have higher brain functions.

Vertebrae
Also known as the backbone, this string of bony discs, each with a protruding spine on top and bottom, supports the body.

Eye
Most fish eyes have both rods and cones, allowing them to see colors. Since the eyes are on the sides of the head rather than the front, fish have limited depth perception.

Nostrils
A fish has two nostrils on each side. Water flows in one nostril, across cells that detect scent, and out the other nostril. This gives most fish a very good sense of smell.

Muscles
These attach to the bones and allow the fish to move. Muscles are the part of a fish that people eat.

Heart
A fish's heart has only two main chambe The first chamber, or atrium, receives blood from the body. The second chamber, or ventricle, pumps the blood to the gills.

Swim Bladder
This sac resembles a balloon below a fish's spinal cord. By adding or removing air via the bloodstream, fish gain buoyancy, suspending in the water without sinking or floating.

Anus

Intestine
The intestine absorbs nutrients from the food after it has left the stomach.

Liver
The liver stores the energy that is produced as fish digest their food. It also helps filter the blood.

Ovary/Testis
Ovaries, in females, produce eggs and are often yellow in color, while testes, in males, produce sperm that fertilizes the eggs. These organs appear shrunken during much of the year, but become swollen as spawning time approaches.

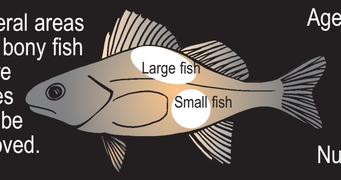
Stomach
The stomach is a very elastic pouch; some fish can swallow other fish almost as large as themselves. The stomach produces very strong acids that can digest whole fish or the shells of crayfish and small snails and clams.

Bony Fish Characteristics

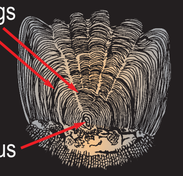
Scales tell the age of a fish

The age of some bony fish can be determined by observing a scale under a microscope. The center of the scale, called the focus is where growth begins. As the fish grows, small rings called circuli, will develop like rings on a tree. A fish's scales however grow many rings each year. The rings are far apart during the summer when the fish is growing fast. They're very close together during the winter when the fish's growth stops. To determine the age of a fish, count the tight ring groupings (winter seasons).

General areas on a bony fish where scales may be removed.



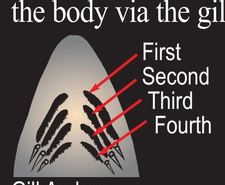
Age Rings



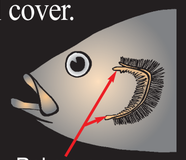
Nucleous

Gills enable fish to breathe underwater

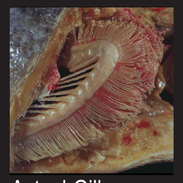
Fish breathe using gills that pull dissolved oxygen out of the water. Gills are composed of four white, bony gill arches located on each side of a fish's head. As the water flows across the gill and through each gill arch, oxygen goes into the blood. At the same time, carbon dioxide goes into the water and out of the body via the gill cover.



Gill Arches



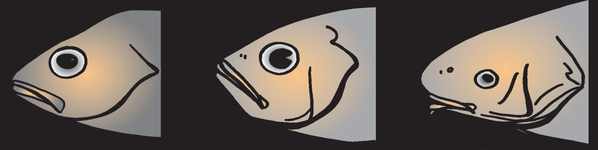
Rakers on upper and lower limbs



Actual Gill

The position of the mouth will determine where a fish will find food

The type of mouth a fish has can tell us where they feed and what types of food they eat. Fish with mouths located on the end of their snout have terminal mouths. Because of this position, yellow perch and walleye can adapt to feed anywhere within the lake. Fish with mouths located above their snouts however have superterminal mouths. This mouth position allows fish to feed more effectively at the water's surface, feeding on surface organisms. Fish with mouths located below their snouts like common carp have subterminal mouths and feed along the bottom of the lake.

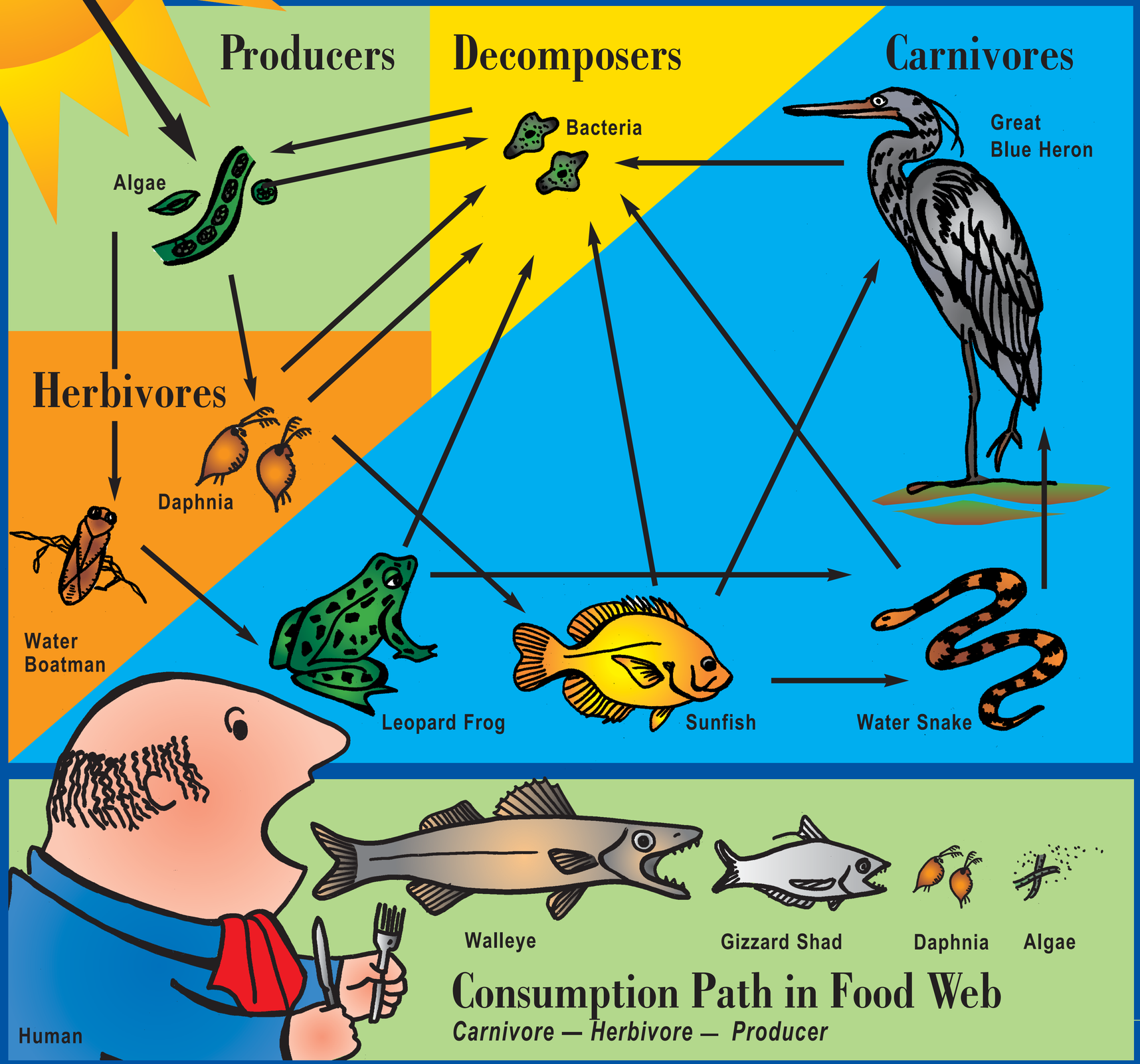


Terminal | Superterminal | Subterminal

Developed by Ohio Sea Grant College Program, The Ohio State University, 1314 Kinnear Rd., Columbus, Ohio 43212 • 614.292.8949 • *www.sg.ohio-state.edu:* Cindy Hayter Allison, Rosanne Fortner, Jill Jentes, Dave Kelch, Frank Lichtkoppler, Jeff Reutter, & Fred Snyder • *Images provided by Great Lakes Fishery Commission, Great Lakes Sea Grant Network, ODNR Division of Wildlife, Joe Tomelleri*

The Circle of Lake Life

Path of Energy in Food Web



Consumption Path in Food Web

Carnivore — Herbivore — Producer

A chain is made of connected parts called links. The terms "food chain" and "food web" describe the paths of energy flow between plants and animals in a natural community. A food chain is a simple diagram of who eats what. Each plant and animal stands for a link of energy in a food chain. Several food chains connected together make up a food web.

The sun is the first source of energy. Green plants use the sun's energy and nutrients in the soil to make their own food through a process called photosynthesis. Because green plants make their own food, they are called **producers**.

All other living things in a food chain are called consumers because they cannot make their own food. Consumers that eat plants to get their energy are called **herbivores**.

Consumers that eat other consumers to get their energy area called **carnivores** (meat-eaters).

Decomposers, usually bacteria or fungi, are a special group of consumers. They break down dead plants and animals, returning nutrients to the water, where they can be used by green plants.

Producers

PHYTOPLANKTON (Varies by season)
Blue-Green Algae, Green Algae, & Diatoms

Herbivores

ZOOPLANKTON
Rotifers, Cladocerans, Copepods, & Larvae of other animals

MACROINVERTEBRATES

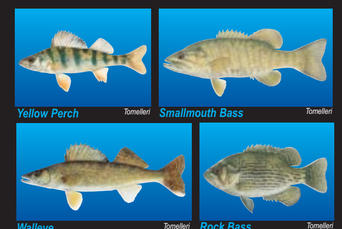
BIRDS

FISH

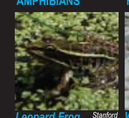
Carnivores

Some consumers eat both plants & animals.

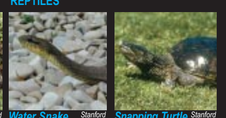
FISH



AMPHIBIANS



REPTILES



BIRDS

MAMMALS

Decomposers

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