

Lesson 3: Fish Life Cycle

Activity: Diagram fish life cycle.

Grade level: 4-8

Subjects: Science, social studies

Setting: Classroom

Duration: 50 minutes

Key Terms: Fry, life cycle, life history, spawn, yolk sac

Objectives

After participating in this activity, students will be able to:

- Name stages of the fish life cycle
- Diagram progression from egg, larval fish, fry, juvenile, adult
- Describe two general animal reproductive strategies
- Contrast the reproductive strategies of at least two Great Lakes fish

Summary

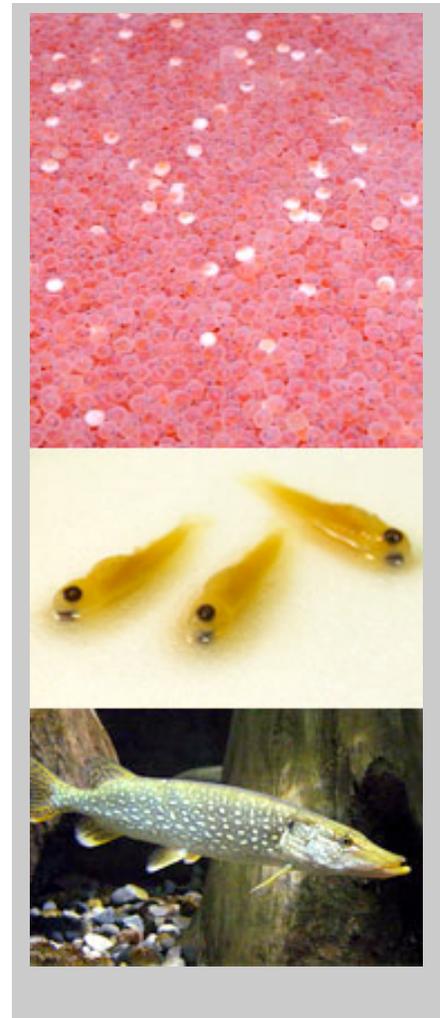
Like all animals, fish need to survive and grow large enough to reproduce. Fish that survive to spawn use a range of strategies to ensure successful reproduction.

Background

Each fish species has a unique reproductive strategy and favors certain habitats for spawning and for early development of their newly hatched young. Many Great Lakes fish can be found in shallow water during part of their life cycle. Many species use shallow waters of lakes or rivers as spawning habitat either in the spring or fall. Some, such as northern pike, prefer wetlands with aquatic vegetation. Others such as lake whitefish prefer shallow reefs, which provide rich areas for food and rocky structure to protect the eggs and later the fry.

Fish life cycles vary among species. In general, however, fish progress through the following life cycle stages:

- **Eggs:** Fertilized eggs develop into fish. Most eggs do not survive to maturity even under the best conditions. Threats to eggs include changes in water temperature and oxygen levels, flooding or sedimentation, predators and disease.
- **Larval fish:** Larval fish live off a yolk sac attached to their bodies. When the yolk sac is fully absorbed the young fish are called fry.
- **Fry:** Fry are ready to start eating on their own. Fry undergo several more developmental stages, which vary by species, as they mature into adults. Young fish are generally considered fry during their first few months (during their first few months to less than one year in some species).
- **Juvenile:** The time fish spend developing from fry into reproductively mature adults varies among species. Most fish do not survive to become adults. Threats to survival



include fluctuations in water temperature, changes in oxygen levels, competition for habitat, and predators.

- **Adult:** When fish are able to reproduce, they are considered adults. The time it takes to reach maturity varies among species and individual fish. Fish with shorter life spans reach maturity faster. For example, female round gobies mature in approximately one year and live for two to three years. Lake sturgeon can live from 80-150 years, but females don't reach maturity until they are approximately 25 years old.
- **Spawning:** Female fish release eggs into the water (either into the water column or into a nest) and male fish fertilize eggs by releasing milt. Not all eggs are fertilized. Some fish spawn each year (or every one or more years) after reaching maturity, while others spawn only once and then die.

Materials and Preparation

Paper or Electronic Methods:

1. Paper: large, white and colored paper. Matt board or construction paper may also be useful. See materials from Unit 3, Lesson I, with fish cards.
2. Classroom computer with Internet access, and illustration software.

Examples: Inspiration, Adobe illustrator*, Microsoft PowerPoint *Note – example provided was created in Adobe Illustrator. Please send us feedback about which software would be the most useful in your classroom.

See: *Fish Life Cycle Worksheet* and *Reproductive Strategies* fact sheet.

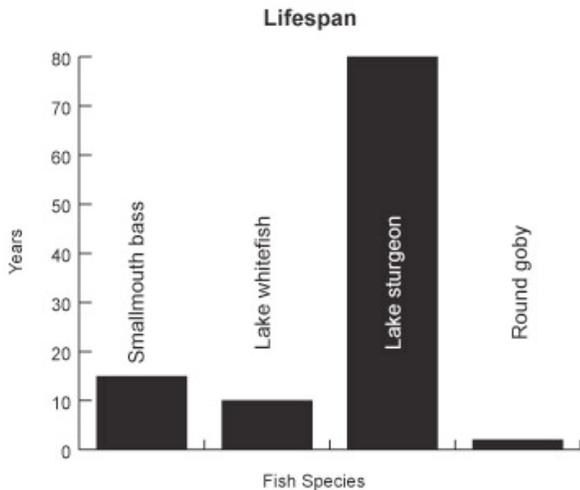
Note: See Fish Life Cycle Worksheet and other materials at the end of this lesson (supplemental materials).

Procedure

1. Explain how, just like all animals, fish have a basic task — to reproduce. Discuss the basic fish life cycle.
2. Describe the two major reproductive strategies of animals. Contrast fish reproductive strategy with human reproductive strategy.
3. Describe spawning strategies used by Great Lakes fish. See the *Reproductive Strategies fact sheet*.
4. Create student groups and help each group select a Great Lakes fish.
5. Groups use the Internet or visit the library to learn more about the life cycle and preferred spawning habitat of their chosen fish.
6. Groups illustrate the fish's life cycle using software or classroom materials. See the *Fish Life Cycle Worksheet*.

Extension

Students hone charting skills using the data from the Reproductive Strategy Chart (see bottom of *Reproductive Strategy Worksheet*) to create a simple bar chart (electronically using Excel or on paper). The objective for this activity is to encourage students to consider how to present data by creating a chart. An example of a bar chart is below:



Source

FLOW Development Team

Acknowledgements

Jim Diana, Professor of Natural Resources, School of Natural Resources and Environment and Associate Research Scientist, Center for Great Lakes & Aquatic Sciences, University of Michigan College of Literature Science and Arts; and graduate students from Professor Diana's 2007 course, Biology and Ecology of Fishes.

Assessment & Standards

See separate document: FLOW_Assessment_GLCE.pdf

FLOW Feedback

Please take 10 minutes to provide us with your feedback.

Go to: <http://www.miseagrant.umich.edu/flow/flow-feedback.html>

Supplemental Materials: FLOW Unit 3, Fish

Lesson 3 - Fish Life Cycle Documents:

- Fish Life Cycle Worksheet
- Reproductive Strategies fact sheet

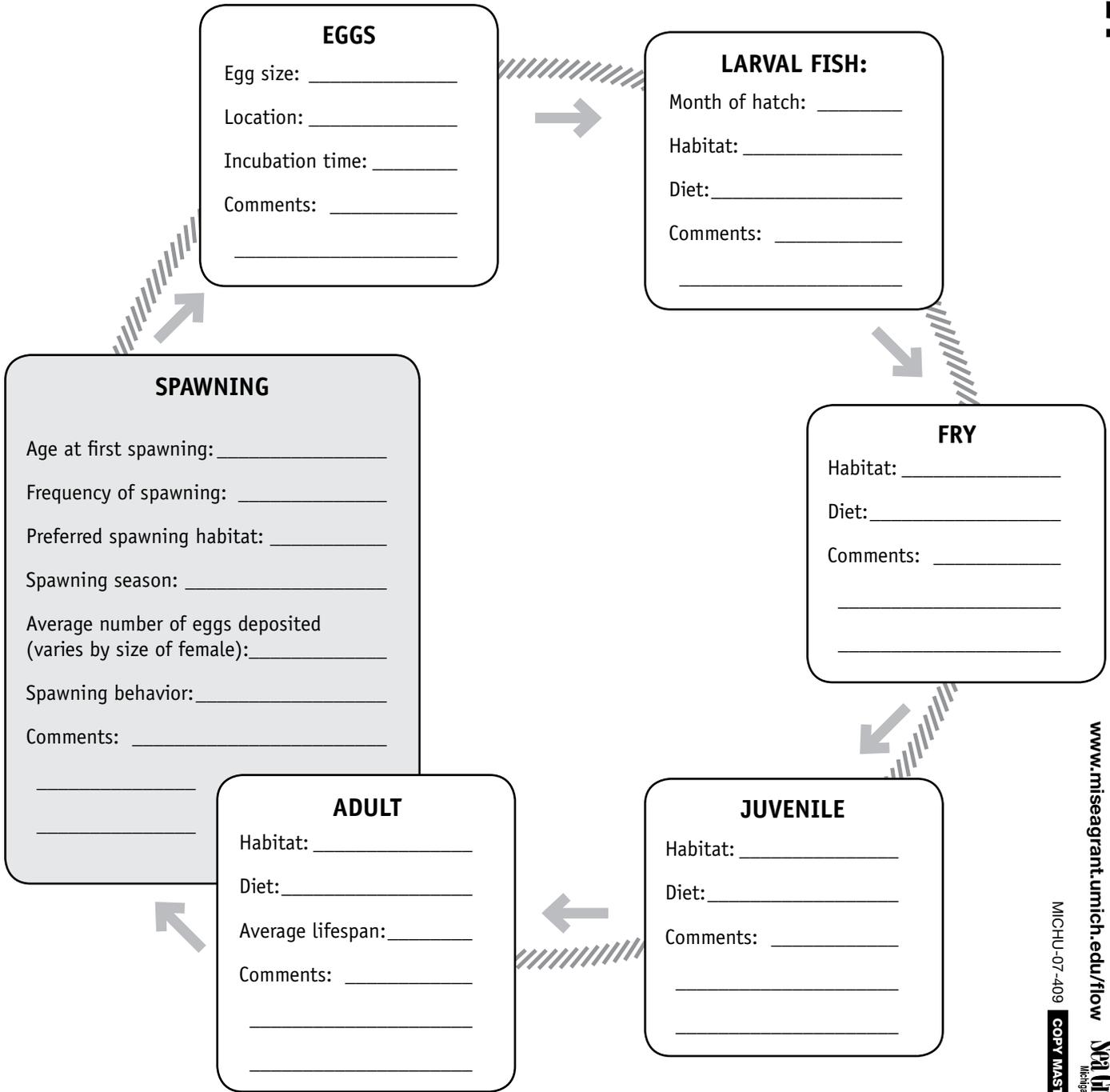
Also see documents from Lesson 1:

- Fish Characteristics Fact Sheet
- Great Lakes Fish Family Cards and Generic Fish Graphic
- Dichotomous key: Great Lakes fish families



Sketch or picture of fish

Name of Fish: _____



REPRODUCTIVE STRATEGIES

In general, animals use one of two basic reproductive strategies. They may produce:

- Limited numbers of offspring, reproduce infrequently, and invest significant nutritional resources and time to ensure a high probability of survival for each offspring (e.g., humans, elephants);
- Massive quantities of offspring, reproduce more frequently, and invest hardly any time or resources in any one offspring (e.g., fish).

EXAMPLE REPRODUCTIVE STRATEGIES OF GREAT LAKES FISH

While Great Lakes fish typically produce eggs in mass quantities, the number of eggs and amount of energy invested into each egg varies by species.

- **Smallmouth bass:** Female smallmouth bass produce eggs in the spring. Males build nests in shallow gravel areas near a rock or log for shelter and guard the fertilized eggs. After smallmouth bass hatch and emerge from the gravel, they form balls up to three feet in diameter containing hundreds of fry. The male continues to guard his offspring as they begin to move apart and wander farther from the nest until the fry are so far apart that guarding is no longer possible.
- **Lake whitefish:** Lake whitefish are open water fish but spawn near shore in the fall. Spawning takes place at night close to the surface and is very active. Male and female fish sometimes leap out of the water during spawning. Eggs fall to the bottom and remain there until hatching in the spring. Winter ice cover may help keep wind from stirring the bottom and covering the eggs with sediment. Removal of natural bedrock such as in the creation of shipping channels is thought to interfere with lake whitefish spawning.
- **Lake sturgeon:** Lake sturgeon have a slow reproductive cycle and spawn only once every four years on average. Fast flowing water is best for sturgeon. Lake sturgeon compete with power companies for habitat because high gradient (steep), fast flowing sections of rivers are also good places to produce hydro-electric power.
- **Round goby:** Female round gobies spawn repeatedly from April to September. Males build nests and guard their eggs and young, but most die soon after spawning. Round gobies are an invasive species that presumably arrived in the ballast water of vessels coming into the Great Lakes. They can tolerate degraded water quality and are able to withstand low oxygen concentrations for several days. They compete with native species for spawning habitat.

The chart below compares the reproductive strategies of four Great Lakes fish.

Notice the differences in lifespan, age at first spawning, and spawn interval among these fish. Round gobies have a shorter lifespan but reproduce several times per year. Lake sturgeon live longer but reproduce less frequently.

eggs per pound than lake sturgeon. However, lake sturgeon eggs are much bigger than lake whitefish eggs. In relation to lake whitefish, lake sturgeon tend to invest more energy and time in fewer offspring with the goal to ensure a high probability of survival for each.

Also notice the differences in egg size and number of eggs produced. Lake whitefish produce a greater number of

	Smallmouth bass	Lake whitefish	Lake sturgeon	Round goby
Lifespan	15 years	10 years	80-150 years (female)	2-3 years (female)
Age at first spawning	5-7 years (female)	2-8 years	24-26 years (female)	1-2 years (female)
Spawn interval	Every year	Every 2-3 years	Every 4-6 years (female)	Many times per year (female)
Egg size	1.2 - 2.5 mm diameter	~2.3 mm in diameter	2.7-3.5 mm diameter	~3 mm in diameter
Number of eggs	~7000 per pound	8000-16000 per pound	4000-6000 per pound	80 - 600 (goby weigh <1 pound)