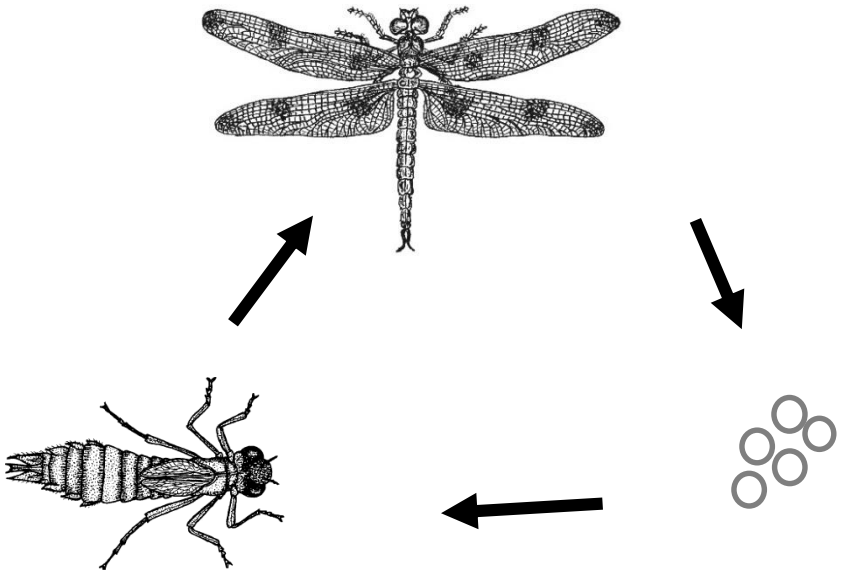
Life Cycles:
Egg, Nymph, Adult!



National Mississippi River Museum & Aquarium
Environmental Education Curriculum

Target Grades:	K – 5
Key Words:	Life Cycle, Metamorphosis, Native Species, Exoskeleton, Nymph
Subject Area:	Life Science* (IA Core: I.2.1, I.2.2, and I.5.1)
Duration:	30 minutes – 60 minutes

Title: *Life Cycles: Egg, Nymph, Adult!*

Program presented on site at Museum or as an Outreach

Summary:

Many animals go through impressive changes as they grow from an egg to adult. The life stages of an amphibian will be explored. Also, many insects we have in and around the Mississippi River system go through life changes that take them from water to the air (mayflies and dragonflies), from underground to trees (cicadas), from a chrysalis to a winged creature (monarch butterflies). Explore the life cycles of these amphibians and insects in this hands-on program. Program may include a close encounter with a live frog or salamander.

Objectives:

To either introduce or give students more information on animal life cycles that include a stage where the animal looks nothing like the adult; a larval or nymph stage. To understand the process of metamorphosis by providing examples of amphibians and insects. To spark an interest in student observation of the life stages of amphibians and insects in their natural habitat, which may be in their own backyard.

***Iowa Core Standards covered by this program:**

Primary (K-2)

I.2.1: Understand and apply knowledge of the characteristics of living things and how living things are both similar to and different from each other and non-living things.
I.2.2: Understand and apply knowledge of life cycles of plants and animals.
Intermediate (3-5)
I.5.1: Understand and apply knowledge of organisms and their environments, including: structures, characteristics, and adaptations of organisms that allow them to function and survive within their habitats; how individual organisms are influenced by internal and external factors; and the relationships among living and non-living factors in terrestrial and aquatic ecosystems.

Group Size: 20-40

Background for Educators:

Amphibians are animals that lead a "double life," living part of their lives in water and part on land.

Amphibians include frogs and salamanders. **Native species** include: tiger salamander, bull frog, leopard frog, gray tree frog,

These animals go through metamorphosis (period of change) during their life cycle. Eggs must be laid in the water. Hatch from eggs as tadpoles (larval stage) and have gills. The tail shrinks and is absorbed back into the body (in frogs), legs sprout from the sides, and lungs begin to develop. At this time, they are able to leave the water and go onto land.

Mississippi river mayflies (locally known as "fishflies") are insects that spend 99% of their lives in water. As larva, they live in a U-shaped burrow within the top layer of soil under river water. When the river water warms up in the middle of summer, their bodies begin to undergo a huge change. They swim to the top of water and shed their exoskeleton and emerge as an adult mayfly. At this point they enter the air and land environment. Adult river mayflies live only 2-3 days, such a short time that they do not need to eat so they do not have mouths. The adult mayflies come together in big swarms to mate. The females lay their eggs on the top of the water surface. When the eggs hatch, the young larval mayflies will swim to the soil under the water and build a U-shaped burrow where they will stay for the next 362 days. The adults will live only until their energy is used up or they get eaten by a predator (fish, birds, etc.).

A **dragonfly** has a life span of more than a year. The dragonfly life cycle consists of three stages; egg, nymph, and adult. Most of the life cycle of a dragonfly is lived out in the nymph stage underwater in a lake or pond. After

two dragonflies mate, the female dragonfly will lay her eggs on a plant in the water. Dragonfly nymphs hatch from the eggs. Dragonfly nymphs live in the water while they grow and develop into adult dragonflies. This portion of the dragonfly life cycle can take up to four years to complete. Once the nymph is fully grown, it will complete the metamorphosis into an adult dragonfly by crawling out of the water up the stem of a plant. The nymph will shed its **exoskelton** onto the stem of the plant. Once the dragonfly leaves its exoskeleton it is an adult dragonfly. The adult dragonfly will hunt for food and begin to look for a mate. Once the dragonfly finds a mate, the female will find a body of calm water that will be a good place to lay her eggs, and the life cycle of the dragonfly begins all over again. Adult dragonflies live about two months. A few dragonflies native to the Mississippi River System include:

Common Green Darner
Anax janius

Common Baskettail
Epithecia cynosura

River Cruisers
Macromia sps.

Cicadas live underground as **nymphs** for most of their lives, feeding on sap from roots. In the final nymph stage, they construct an exit tunnel to the surface and emerge. They then molt (shed their exoskeleton) for the last time and emerge as adults. After mating, the female cuts slits into the bark of a twig, and into these she deposits her eggs. The eggs hatch into nymphs that drop to the ground, where they burrow. Most cicadas go through a life cycle that lasts from two to five years.

A **Monarch Butterfly** life cycle (one generation) last about 6-8 weeks. The four stages of this butterfly's life cycle are egg, caterpillar, chrysalis, and butterfly. It grows inside the egg for about 4 days. After hatching the young caterpillar feeds on the leaves of milkweed plants. It grows as a caterpillar for about 2 more weeks. Then the caterpillar's build a chrysalis and spends about 10 days inside as it transforms into an adult butterfly. After hatching from the chrysalis the adult butterfly lives 2 - 6 weeks.

November/January – Fourth generation adult monarchs hibernate in Mexico and southern California.
February/March - Fourth generation adult monarchs reawaken, become active, find a mate, begin the flight northward and lay their eggs and then die.
March/April -the 1st generation monarchs are born and die after laying eggs (second generation). Life span of 6-11 weeks.
May/June - the 2nd generation is born and die after laying eggs (third

generation). Life span of 6-11 weeks.
July/August - the 3rd generation is born and die after laying eggs (fourth generation). Life span of 6-11 weeks.
Sept/Oct - the 4th generation is born. The adults of this generation migrate south and live 6-8 months in Mexico or Southern California.

Materials Needed:
Rockin' Reptiles and Awesome Amphibians presentation trunk.

Live amphibian(s) provided by the Living Collections department.

Images of Mississippi River mayfly mass emergences and life cycle. Jar of dried mayfly adults & exoskeletons.

Dried dragonflies (nymph and adult) Dragonflies preserved in acrylic.

Photos of cicada shedding exoskeleton. Life cycle diagrams. Video of cicada shedding exoskeleton (if projector is available).

Map of monarch butterfly migration. Monarch butterfly lifecycle poster. Live monarchs in different life stages (if available). Adult monarch preserved in acrylic.

Procedure:
Present a background to students on the life cycles of amphibians and insects that go through metamorphosis. Talk about the life cycle of amphibians and some of the listed insects. Show diagrams, pass around props to illustrate metamorphosis and the life cycle of each animal. Let the students closely view and touch any live amphibians and preserved insects that are available.

Evaluation: teacher evaluation, student questions and reactions to the program.

Additional resources:
http://www.dragonfly-site.com/dragonfly-life-cycle.html
http://www.monarch-butterfly.com/
http://www.monarchbutterflyusa.com/Cycle.htm
http://freeassociationdesign.wordpress.com/2013/08/23/migration-of-landscapes/

Extensions:
Lead a walk around the National Mississippi River Museum & Aquarium's wetland during a time of year when some of these animals can be observed in the wild.

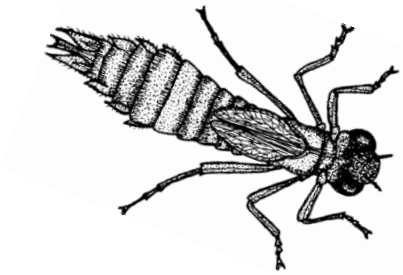
Attached coloring sheet of dragonfly lifecycle can be sent home with teachers.

Dragonfly craft can be part of program upon request.

Related programs available at the National Mississippi River Museum & Aquarium:
Wet 'N Wild

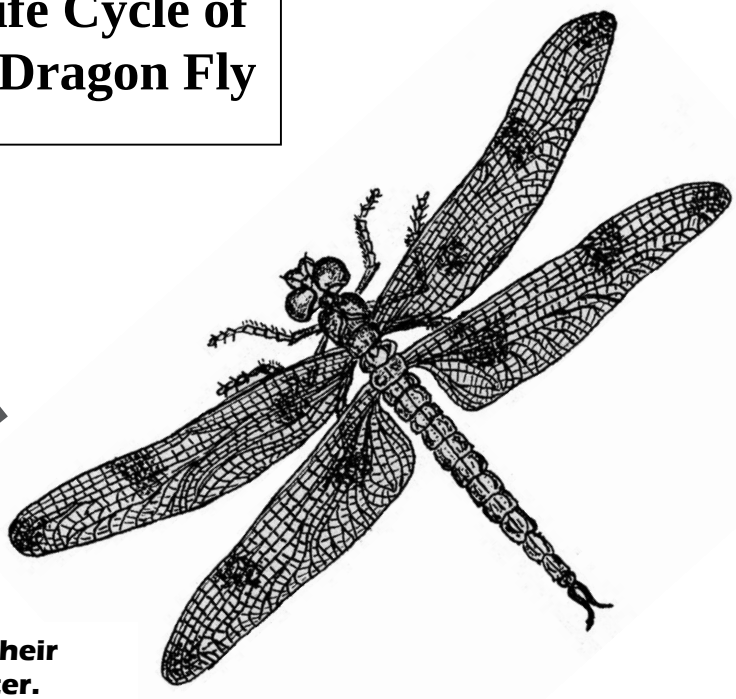
Credits:
Michelle Kilgore - National Mississippi River Museum & Aquarium

Life Cycle of a Dragon Fly



Towards the end of their life cycle, nymphs climb out of the water and on to a plant. Their exoskeleton splits and the adult dragonfly emerges.

The eggs hatch. Most of the life cycle is spent as a larval nymph. Nymphs use internal gills to breathe in the water where they hunt small prey.



Adult dragon flies lay their eggs in or near the water.