

Fairy Shrimp

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We thank the Of Pools and People team for contributing the science, photography, and figures for this presentation.....

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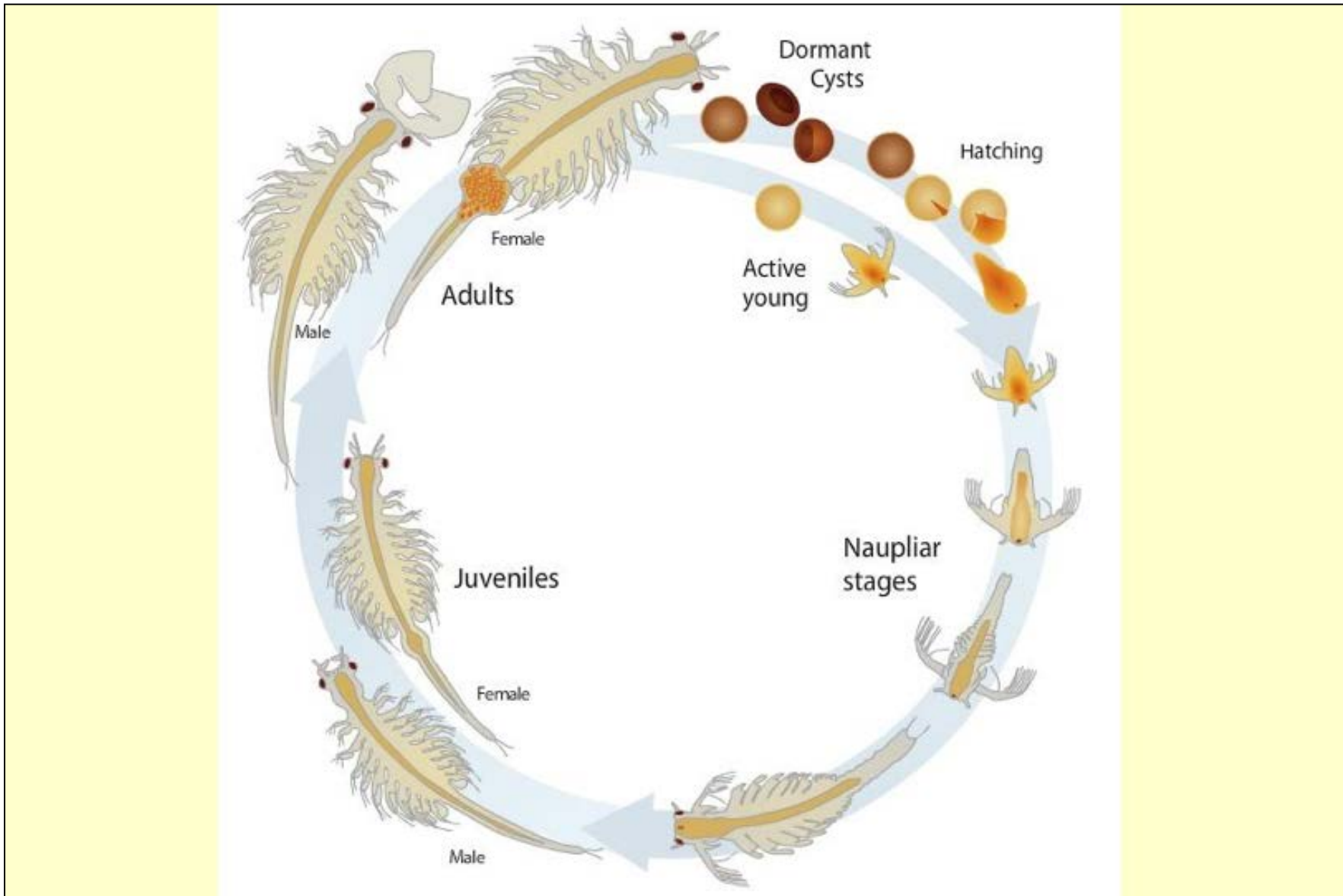


Information on fairy shrimp for the Vermont Center for Ecostudies: *In New England, at least two species of fairy shrimp are found inhabiting vernal pools—the Vernal Fairy Shrimp (Eubbranchipus vernalis) is fairly widespread in southern New England, while further north it is replaced by the Knob-lipped Fairy Shrimp (E. bundyi). This reddish-orange fairy shrimp is most often seen in early spring, shortly after ice-out. Although little is known about the distribution and abundance of the Knob-lipped Fairy Shrimp in Vermont and New Hampshire, anecdotal evidence suggests that they prefer larger pools located in relatively undisturbed forest to roadside pools or other “disturbed” habitats.*

After fertilization, fairy shrimp eggs—technically called cysts—settle to the bottom of the pool where they enter a state of diapause. Resistant to desiccation, the cysts remain in the sediment throughout the summer when most vernal pools dry up. Cysts (which are fully-developed embryos) provide a great advantage over eggs when an organism lives in a quickly disappearing habitat like a drying vernal pool. The embryo can emerge as soon as conditions are right for hatching, which tend to be specific for each species (or even population), including a narrow temperature range with sufficient light and oxygen levels, combined with low osmotic conditions. In addition, studies of some fairy shrimp species have demonstrated reduced hatching success when cysts are not exposed to pool-drying and/or freezing temperatures. This may explain why, after being present in a given pool for several years, fairy shrimp may “disappear” for a year or two, only to suddenly reappear one spring for no apparent reason.

Since there is always a risk that a dry spring would not fill a pool long enough for fairy shrimp to complete their reproductive cycle, they have evolved a unique bet-hedging strategy to avoid extirpation. In any given year, only a portion of the previous year’s cysts will hatch, resulting in a “bank” of dormant eggs that can last for decades, possibly even centuries! One study of vernal pool sediments reported 1,000 cysts per square foot, of which only 3% hatched during any given flooding event. Such bet-hedging ensures that it would take a long series of false starts and unfavorable conditions to empty the cyst bank that rests below the leaf litter.

In our region, Eubbranchipus eggs hatch in late winter or early spring as well-developed larvae called “metanauplii”. After several molts (instars), they add appendages and, over the course of 1-2 weeks, gradually mature into adults with the full complement of 11 pairs of feathery legs. Adult male bundyi appear to patrol territories, waiting for receptive females to approach them. Mature females, which tend to remain hidden in the leaf litter, can be recognized by paired egg sacs located just behind their feathery legs, while mature males appear to have enlarged heads due to the presence of clasps—modified antennae used to grasp females during mating.



Fairy Shrimp life cycle. From the Vermont Center for Ecostudies: *The adult life cycle is fleeting—lasting only 1-3 weeks. Once the water temperature approaches 60 degrees F, usually by mid- to late-May, fairy shrimp populations decline rapidly. As oxygen levels decline and predators, such as dragonfly and salamander larvae, increase in both abundance and size, conditions become increasingly inhospitable for these slow-swimming crustaceans. Vernal pools are critical components of healthy forest ecosystems in the Northeast, and fairy shrimp—which spend their entire lives in these tiny wetlands—are indicators of vibrant, unpolluted systems. Do yourself a favor and visit a vernal pool in your neighborhood this spring. If you're lucky, perhaps you'll become acquainted with these intriguing crustaceans.*

Note the female carries a sac of developing eggs (called a cyst) on her abdomen just behind the feathery appendages which are used for locomotion. Males can be

differentiated from females based on the large “claspers” (modified antennae) on top of their heads which they use to hang on to females while mating.

Interested in helping to document fairy shrimp and other invertebrates in breeding pools?



https://beta.citsci.gmri.org/project/vernal_pool_macroinvertebrates/

Fairy shrimp species distribution and breeding sites are underreported. See if you can help by engaging your schools or communities in this effort to fill in these gaps. See this website , or, if the link changes, just google the Gulf of Maine Research Institute to get an update on the status of these citizen science programs. Maine in particular is lacking in data on vernal pools with fairy shrimp and species distributions.



Their coloration is thought to vary based on the color of the zooplankton that they eat.



Fairy shrimp can utilize the more ephemeral pools with shorter hydroperiods (holding water for as little as 6 weeks). This floodplain pool in Orono fills with overbank flooding in the early spring and in many years dries too quickly for wood frog and salamander eggs to hatch and successfully develop, but year after year the pool has provided habitat for large numbers of fairy shrimp. This photo was taken on April 27th, note the leaves are not yet fully emerged.



By June 10th, when this photo was taken the pool is dry with water stained leaves still visible in the deeper depressions. Eggs (called cysts) from female fairy shrimp are scattered throughout this pool basin mixed in with the leaf litter, drying and waiting for winter to freeze, and then rehydrate prior to hatching the following late winter/early spring.



Fairy shrimp can be very difficult to spot in a pool.

Their coloration often blends very well with the underlying vegetation and detritus on the pool bottom. Polarized sunglasses help a lot to cut the glare on the pool surface but then you need to stand still and watch for the slightest bit of movement within the water column. There are many fairy shrimp within this photo but the only ones that really stand out are the ones that have a cloudy spotted salamander egg mass behind them (for contrast). Their light colored “V” shaped tail is often helpful as they are often in contrast to a dark pool bottom.



Putting a light-colored pan, clipboard, or frisbee underneath the fairy shrimp provides contrast and you quickly see how many can be congregated within a small area.



In this pool, a scoop with a net produced fairy shrimp that are orange-ish in color as well as much darker mosquito larvae. People sometimes mistake swimming mosquito larvae for fairy shrimp.



Mosquito larvae on left and fairy shrimp on right. Mosquito larvae curl up and “wriggle” within the water column, or sometimes can be seen suspended vertically from the water surface. Fairy shrimp move around on their backs and appear to be almost constantly in motion.