

Culturing *Daphnia*

Live Material Care Guide

Background

These small, laterally compressed “water fleas” are characterized by a body enclosed in a transparent bivalve shell. Their flat, transparent bodies make *Daphnia* an ideal organism for beginning biology exercises and experiments.

Daphnia move rapidly in a jerky fashion. They have large second antennae that appear to be modified swimming appendages and assist the four to six pairs of swimming legs. During the spring and summer, females are very abundant. Eggs generally develop through *parthenogenesis* (a type of asexual reproduction), and may be seen in the brood chamber (see Figure 1). In the fall, males appear, and the “winter eggs” are fertilized in the brood chamber. These eggs are shed and survive the winter. In the spring, the fertilized winter eggs hatch into females. Female *Daphnia* can be recognized by the curved shape of the end of the intestine and the presence of a brood chamber. In the male, the intestine is a straight tube. Many of the internal structures (including the beating heart) can be observed using a compound microscope.

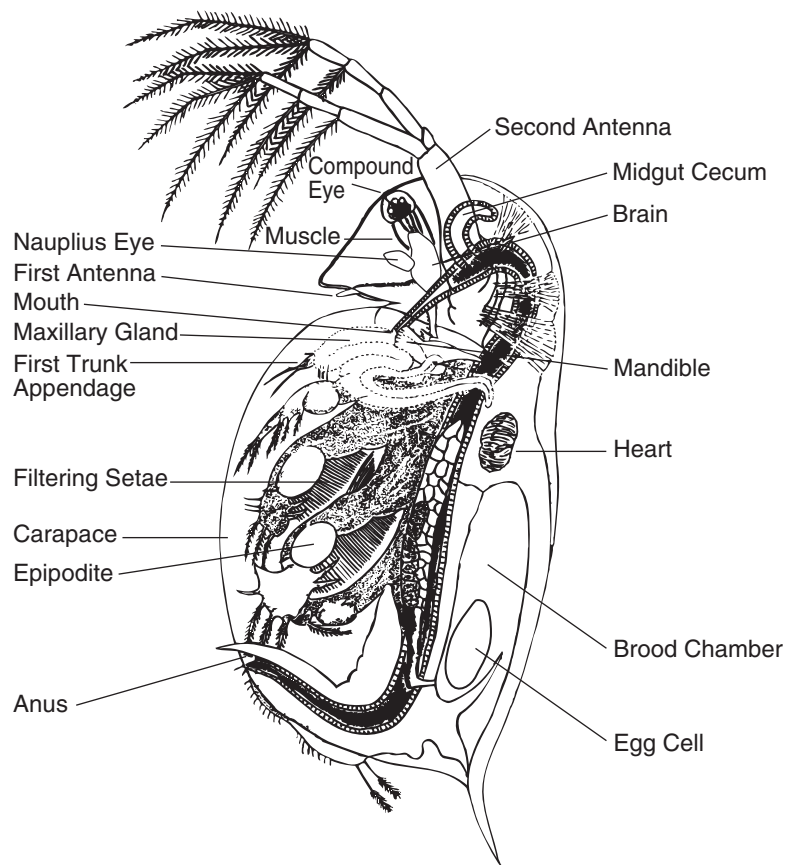


Figure 1. *Daphnia*

Culturing/Media

The most critical environmental factor to successfully culture *Daphnia* is temperature, which should remain close to 20 °C (68 °F). Higher temperatures may be fatal to *Daphnia* and lower temperatures slow reproduction.

Daphnia flourish best in large containers, such as large, clear plastic or glass jars. Fill the container with pond or spring water and allow to sit undisturbed and uncovered for several days before adding the *Daphnia*. Allowing the container to sit undisturbed permits the escape of gases that may be harmful to *Daphnia*. Do NOT aerate a *Daphnia* culture—the air bubbles will collect under the *Daphnia* and force them to float to the top of the culture where they will die.

Place the jars in strong sunlight and inoculate them with non-filamentous algae, such as *Chlorella*, *Euglena*, or *Chlamydomonas*. The algae could be from an ongoing algae culture (available from Flinn Scientific), from a “green water” aquarium, or from a pond. After the algae culture has been standing for 2–3 days and the water looks “green,” introduce the *Daphnia*. Completely submerge the container with the *Daphnia* into the larger culture jar to release the *Daphnia* into their new environment.

If soupy “green water” is available from an aquarium or other source, a cupful should be added to the cultures about every other week. A thick, distilled water suspension of hard-boiled egg yolk or yeast may also be used if algae sources are not available. Add just enough egg or yeast suspension to turn the water slightly cloudy (about a spoonful of liquid suspension). The culture water should clear again in about a day as the *Daphnia* feed. Add more suspension only after the water has cleared again to prevent buildup of yeast or egg in the bottom of the culture jar. Keep feeding schedules consistent and avoid overfeeding.

Harvesting populations regularly keeps the cultures viable. A large culture of *Daphnia* is likely to last for several months. Ultimately, metabolic waste will begin to accumulate in the culture and pH changes in the water will adversely affect the viability of the *Daphnia* population. Starting a new culture monthly, using *Daphnia* from the original culture, is advised. Set up a fresh culture jar and remove *Daphnia* from the old culture using a net. The residue on the bottom of the culture is likely to contain *Daphnia* eggs. If cultures are not being kept long term, *Daphnia* may be used as fish food.

Tips

- The number of *Daphnia* will vary over time as the population responds to varying conditions in the culture chamber. Watch for any clouding from bacterial blooms or film developing on the top of the water which might prevent gas exchange.
- *Daphnia* are used as pollution indicators in water environments. They are very sensitive to environmental changes and have been used to study the LD₅₀ of different chemicals. The transparent body makes their internal organs visible and of high educational value to students. Heartbeat experiments to observe the effects of common chemicals (aspirin, caffeine, etc.) are classic.
- Depression slides or well chambers are the best way for viewing single *Daphnia* and allows long-term viewing of *Daphnia* without any physical damage to the organism.
- Wide-stem pipets are best for transferring *Daphnia* from the culture jars to slides. Transferring individual *Daphnia* can be tricky, but with practice it becomes routine. It is easy for a *Daphnia* to get caught in the bulb of the pipet. Rapid working of the pipet usually frees the *Daphnia*.
- Allow students to study the internal structures first using a prepared microscope slide.

Disposal

Daphnia cultures may be disposed of according to Flinn Suggested Biological Waste Disposal Method Type IV. Please consult your current *Flinn Scientific Catalog/Reference Manual* for proper disposal procedures.

Materials for *Culturing Daphnia* are available from Flinn Scientific, Inc.

Catalog No.	Description
LM1107	<i>Daphnia</i> , Small, 30
LM1109	<i>Daphnia magna</i> , 30
LM1111	<i>Daphnia</i> , Culture Kit, 30
LM1043	Chlorella, 30
LM1039	Euglena, 30
ML1378	Depression Slides, Single
AP2253	Wide-stem Pipets

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.