

Section 9

Freshwater Jellyfish Monitoring Protocol

Citizen Lake Monitoring Network



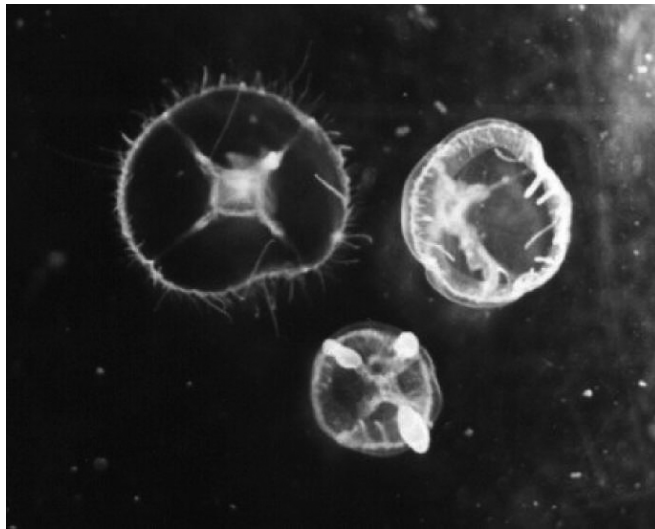
Several adult freshwater jellyfish (*Craspedacusta sowerbii*) in the medusa stage.
Photo by Sharon Milstead

Much of the information for this chapter was compiled by Sandy Engel.
Additional data is from: <http://www.jellyfish.iup.edu/index.html>



Freshwater Jellyfish in Wisconsin: Biology and Spread

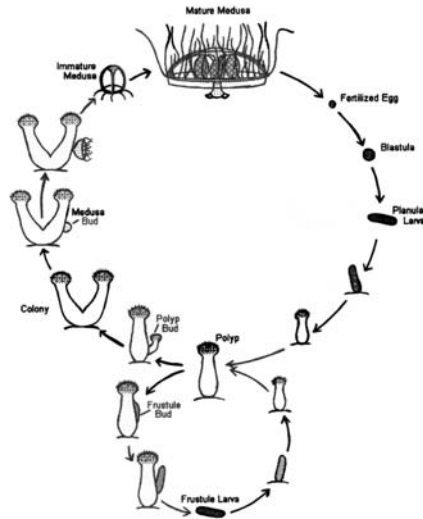
The freshwater jellyfish found in Wisconsin are one of several species of *Craspedacusta* native to China. Two species (*C. sowerbii* and *C. sinensis*) live in the Yangtze River—the world's third longest river and one so vast it makes the Wisconsin River seem like a trout stream! In China, male and female medusae form from spring until fall and congregate in quiet reaches of the river. The frequent occurrences of these bisexual swarms are one reason why these jellyfish are thought to be native to China. Freshwater jellyfish were first reported in North America as early as 1884. Sightings in Wisconsin date to 1969. Much more remains to be learned about these fascinating creatures. Although they probably evolved from estuarine species, themselves descendents of ocean jellyfish, almost nothing is known about the evolution of freshwater jellyfish. That's because jellyfish leave no fossil records.



[Photo from www.jellyfish.iup.edu/](http://www.jellyfish.iup.edu/)

Freshwater Jellyfish Biology

Freshwater jellyfish exhibit a varied life cycle. It comprises three primary stages: egg, polyp, and medusa. Two kinds of larvae and a cyst stage also form.



Female Medusae (top) produces **Eggs** (arrow, top right). These are fertilized by the sperm of a male medusa (not shown), each egg hatches into a tiny, flat larva called a **planula**. It swims for a few days before settling down on an underwater plant, log, rock, or piece of sediment. The planula then becomes a **polyp**. The polyp looks like a miniature hydra without tentacles. Like hydra, the polyp does bear stinging cells (nematocysts) to stun prey. The tiny polyp soon forms a bud (bottom left) near its base that stays attached and develops into a second polyp, forming a polyp colony. The two polyps are identical twins, having formed asexually. Soon, the twins form yet more fixed buds, which become polyps that also stay attached and expand the polyp colony. After a few weeks, the colony has as many as 2-10 (sometimes 12) polyps—all so small you'd need a hand lens or, better yet, a microscope to study them. Now and then, jellyfish polyps form a second kind of bud (bottom): a detachable bud. Each of these side buds develops into a tiny, cigar-shaped larva called frustule larvae. The larva frees itself from its parent polyp and either crawls a few inches away or is carried off by water flow. It then settles down to become itself a polyp . . . one that forms fixed buds to produce a new colony of polyps. So far, our life cycle involves asexual reproduction: polyps forming buds that become either attached polyps or larvae that detach to become a new polyp colony.

In some years, especially during hot summers in Wisconsin, the polyp colony produces medusa buds (left, middle). Each of these top buds becomes either a male or female **medusa**. The developing medusa grows from nutrition supplied by the parent polyp. After a week or two, and still quite small, the medusa leaves home to become free swimming. Another five weeks are needed for the medusa to mature. When full grown, the medusa has a nearly transparent body called a bell that dangles long, hair like tentacles we all associate with jellyfish.

Sometimes just female medusae form. Sometimes just males form. Why jellyfish would produce swarms of same-sex medusae, a seeming waste of energy, still remains a mystery. Only rarely in North America and Europe do both male and female medusae appear together. The female medusae produce eggs. When fertilized externally by male medusae, the eggs hatch into planula larvae. These sexually derived juveniles then swim away and eventually settle on sediments, plants, or other objects. Here, each larva turns upright and becomes a polyp . . . the start of a new polyp colony.

So completes the jellyfish life-cycle. Although sometimes called an “alternation of generations”—asexual generations (polyps and frustules) alternating with sexual generations (medusae and planulae)—most of the time only asexual polyps are produced.

Both polyps and medusae feed on zooplankton. The polyps, hardly more than 1/8th-inch long, eat protozoans, rotifers, copepods, and water fleas. The medusae, pushing an inch across the bell, can use their tentacles to sting these same critters and capture even larger prey, such as water mites and insect midge larvae. Only rarely do they stun newly hatched fish fry.

The medusae live but a few weeks, release eggs, and die. The polyps can live from spring until fall, when they may roundup into **cysts**. Covered with a chitinous “skin” that encloses fairly dry cells, the cysts are able to survive drought and cold. In Wisconsin, the cysts survive on the bottoms of ice-covered ponds, lakes, and quiet river pools where the water is slightly above freezing. But the cysts are more than a winter resting stage. They are a vehicle for jellyfish to spread north of their home range and invade new waters.

Spread

Freshwater jellyfish were found outside of China in the 1500s. William Sowerby (1827-1906) found jellyfish medusae swimming in a large, water-lily tank at the Royal Botanic Gardens in Regent’s Park--then just outside London, England. Sowerby was the director of these private botanical gardens and thus in charge of their indoor and outdoor exhibits. He found the medusae, all males, among sediment and the root crowns of pickerelweeds--only three weeks after filling the water tank. Thinking they came from South America with the plants, he dubbed them Amazon jellyfish. The discovery came with much publicity and fanfare. Then, six weeks later, a curator’s worst nightmare struck: all jellyfish medusae vanished! (They did reappear in the same tank, though not every year.)

But where were the polyps? In 1884, mature jellyfish polyps were found in a water tank at Regent’s Park. That same year, immature polyps were found in a stream in Pennsylvania. More than forty years would pass before the two polyps—the bigger ones from England and the newly budded ones from America—would be united into one species.

How did these freshwater jellyfish get to London and Pennsylvania? The jellyfish probably landed at both locations as polyps or cysts attached to sediments, water plants, or fishes. The 1880s were the heyday of water gardens and carp stocking. Garden clubs

and aquarium societies in this Victorian Era were busy gathering the world's exotic plants and fishes for proud display and study. Soon the jellyfish made their way to other botanical societies, as well as to public and private aquariums in England, Europe, North America, South America, and Australia. Once again, plants and fishes provided a vehicle for polyps and cysts. Other jellyfish were flushed into lakes and rivers when aquariums were emptied, perhaps for cleaning or restocking with fish. Polyps and cysts, attached to river sediments, were swept downstream to new waters. Others may have arrived on the backs of turtles or the feet of water birds. Perhaps they even stuck to boats and boat motors.

After Pennsylvania, jellyfish progressively appeared in other states and provinces (appendix 11). By the time they were first sighted in Wisconsin, jellyfish had already been reported from 33 states, Hawaii (then a U.S. territory), and Washington DC. Their distribution in the United States now stretches to 47° N. latitude—well north of the Yangtze River, between 27° and 37° N. latitudes.

In Wisconsin, jellyfish were first reported from a farm pond near Baraboo, in Sauk County. Wood ducks rather than fish or plants were thought to have carried the polyps or cysts to the pond. By October 2006, 26 years later, jellyfish had been reported from 40 water basins: 37 natural lakes, 2 dugout ponds, and 1 creek (appendix 11). These “jellyfish waters” vary in size from tiny ponds to lakes 9,842 acres (Lake Mendota) and 236 feet deep (Big Green Lake). Of the 40 basins, 70% are seepage lakes, lacking any surface inlet or outlet. More than 25% (10 drainage basins and 1 drained basin) do have a surface outflow, allowing jellyfish to escape downstream to other waters. The freshwater jellyfish has been found in a variety of water types. They have been observed in waters ranging from crystal clear rock quarries to soupy green farm ponds. Preliminary research indicates that waters high in chloride do not favor the appearance of the freshwater jellyfish.

Unlike a list of Eurasian water-milfoil lakes, these 40 Wisconsin water bodies may no longer have jellyfish! Almost all of the sightings have been of medusae, which are sporadic and soon disappear, sometimes never to be seen again. On the other hand, polyps tend to be more widespread than medusae, so Wisconsin could have more “jellyfish waters” than these tables indicate.

Monitoring

Agency staff does not have a formal monitoring program for Freshwater Jellyfish. If they see Freshwater Jellyfish while conducting lake monitoring, they send in the data to a central location for documentation. In 2007, we will be asking volunteers to look for the presence of Freshwater Jellyfish while they are recreating on Wisconsin Lakes.

Finding jellyfish in a pond, lake, or river slough can be an unforgettable experience! But keeping a "jellyfish watch" can become boring. That's because medusae--not to mention the microscopic polyps--occur sporadically and unexpectedly. Still, here are some tips for limiting your search.

In Wisconsin, look for jellyfish medusae during dry and hot summers. The sedentary polyps can form medusa buds in late May or early June, if the shallows warm rapidly during spring. The medusae emerge from these buds after a week or two and swim toward the water surface. Yet, the medusae are so tiny and transparent that hardly anyone--even a dedicated jellyfish watcher--would notice them. Only when fully grown, densely packed on the water surface, and perhaps yellowed with eggs do they draw attention. That typically happens, in Wisconsin, from early August to mid-September. The jellyfish will gently float or swim just below the surface of the water. They are easily seen by the naked eye. They often surface in large numbers called "blooms". Sunny days are especially good for spotting jellyfish. The medusae are restricted to a narrow band of 65-75 F. If the water surface of a lake becomes warmer than 75 F, as many of our lakes have during recent afternoons (and evenings), the medusae congregate in the lower epilimnion where they can find their preferred temperature range. Even with cooler weather, the medusae should stay around through August and even into September . . . but then only in certain lakes

Although medusae can swim in almost any type of water--big or little, shallow or deep, hardwater or softwater--they are not found everywhere. They have rarely been reported from bogs or marshes. Nor are they easy to spot in swift-flowing streams and rivers. Look for them in ponds and lakes with a mix of hard bottoms and soft sediments: places where polyps can attach yet not become smothered, and where the polyps have access to rotifers and other small prey. In large lakes, medusae may mob ("swarm") certain bays or shorelines. These are areas where their parent polyps are most common.

What should you do when you or someone else comes upon a swarm of medusae? Grab a jar or plastic bag and collect a small sample of the medusae. You can keep them alive for a few days in your refrigerator. They may live a bit longer in an aerated aquarium. You can also preserve a few medusae for later study and identification. Spoon-out some medusae from your jar or bag and place them in a small jar, such as a glass or plastic vial, containing 70% rubbing (isopropyl) alcohol. You can purchase the alcohol ready-made from pet shops, hardware stores, and department stores. Label the jar with the date, waterbody name, and specific site on the water where the medusae were collected. If you find what you suspect is a freshwater jellyfish, you should take the sample to a local DNR office for verification. See page vii for local contacts.

One word of caution. If you do find jellyfish medusae, you may become hooked into a life of jellyfish watching! You may even start searching lake beds in shallow water for the tiny polyps and their cysts, though you would need a dissecting microscope to search among samples of bottom gravel, sticks, plants, and sediments.