MOSS ANIMALS INVADE LAKE COCHITUATE

(Article, photos and chart by A. Richard Miller.)

The lakeshore beside our home is blessed with a sandy beach, and we've been swimming in its shallows every summer for decades. We watch the fish watching their fish nests, and we clear the junk that floats down from the public beach at the far end of Middle Pond. In July 1997, for the first time, our facemasks gazed upon an unusually large, jelly-like deposit on a waterlogged stick. We guessed it was some animal's egg mass, perhaps about to produce many tadpoles or baby fish. Soon we spotted more of the same, here and there, all lying about the same distance from shore in about three to four feet of water. Intrigued, we took a piece of a smaller mass, complete with its encircled twig, up to the house for closer examination.

Jill Miller (in her "Not Playing with a Full Duck" T-shirt) displays a middle-sized example.

We looked, we guessed, we measured, and we used a pocket microscope. We e-mailed and Web-browsed for information, and we found it. Not fish eggs, not frog eggs, not insect larvae. They are ***Bryozoa***, literally ***moss animals***. Specifically, we have ***Pectinatella magnifica***, each clump of which can grow to larger than a human head. We can hardly wait.

What's a Bryozoan?

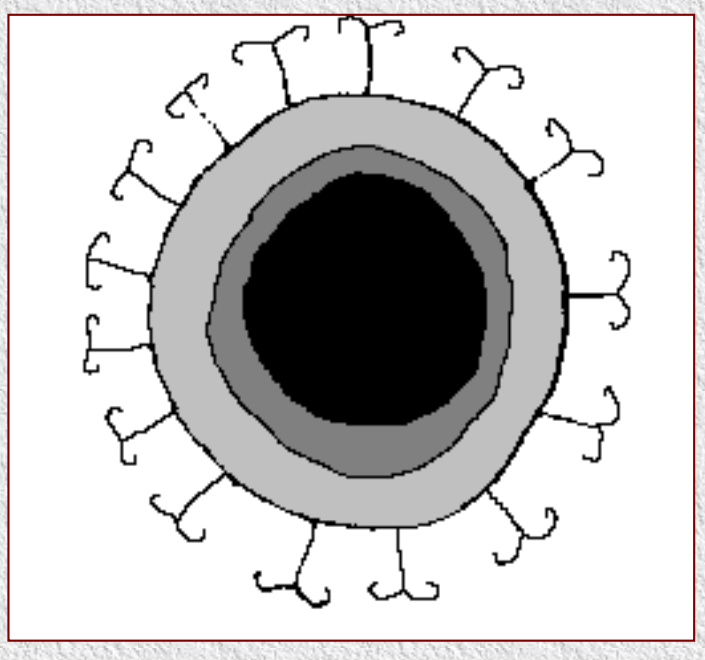
Our libary has many books on invertebrate biology, and they all discuss Bryozoa. Bryozoa are underwater colonies of tiny, colonial animals which, like sponges, filter water for their food. Unlike sponges, they don't leave us a handy elastic structure after they die. Worldwide, there are over 3,500 species of bryozoa, but only about 50 of these species inhabit freshwater. The species we have here, ***Pectinatella magnifica***, is distributed at least east of the Mississippi River and was identified in Massachusetts as early as 1866. It has recently been reported as far away as Japan. Although it is not obvious in most years, this year it has been spotted in other Massachusetts ponds and lakes, indicating that something is causing it to grow toward its maximum size.

P. magnifica grows larger than most other species, but has less external form -- just a coating of firm jelly along a branch or stone, and a semi-visible set of pea-sized shapes just under a tough outer skin. Its characteristic ***lophophores***, the visible portions of the actual animals, poke their tiny stems out into the water and wave petals to guzzle water and water-borne nutrients. When disturbed, they all pop back into the jelly in unison.

Jill holds that same ***P.magnifica*** specimen. Its supporting twig broke easily, and split the mass open to expose its transparent jelly.

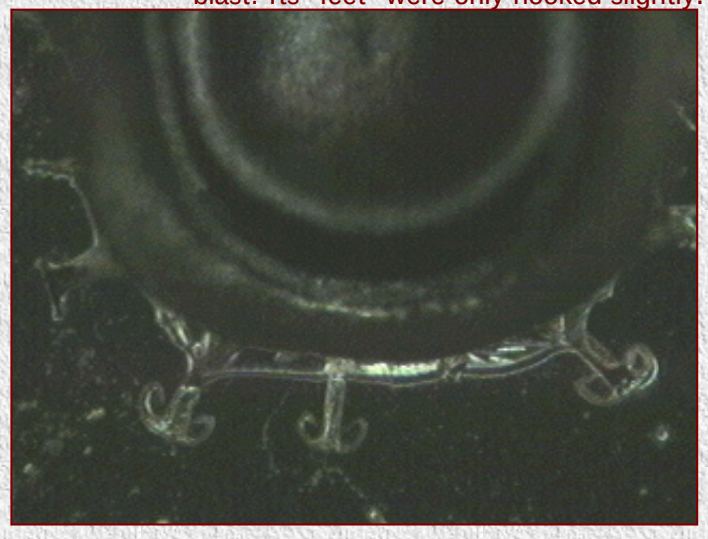
Click here to see some close-up views.

Imbedded in the jelly are an incredible number of tiny black dots. Under our 30-power pocket microscope (Radio Shack's tiny and useful illuminated one, at about $10), each of these blossoms into a delicate circular ***statoblast***. Picture an egg, sunnyside-up, round but not spherical, with a uniform and narrow ring of egg-white and, radiating out from that, fifteen delicate legs each with a pair of slightly hooked, opposing legs at its end. The "yolk" is black, the "white" tan, and in over half of the samples we observed there's another inner ring of gold. Neat!



Jill's microscope sketch of a ***P.mag.*** stato-blast. Its "feet" were only hooked slightly.

This statoblast is a ***cyst***, similar to an egg or spore. ***P.mag.*** requires warm water; it will die and dissolve -- jelly and all -- as the lake water cools in the fall. Then the statoblasts are released, their "whites" inflated like tiny inner tubes, and may show up on shore looking like windrows of brown powder. Those bristling hooks are ready to hitch a ride on any passing dog or duck, to show up in another pond. And next summer, one of these millions of statoblasts can grow a new colony.



Marco Kaltofen, of Boston Chemical Data Corp., created this microphotograph of one of our ***P.mag.*** statoblasts. During the posing session, heat and/or drying caused its toes to curl.

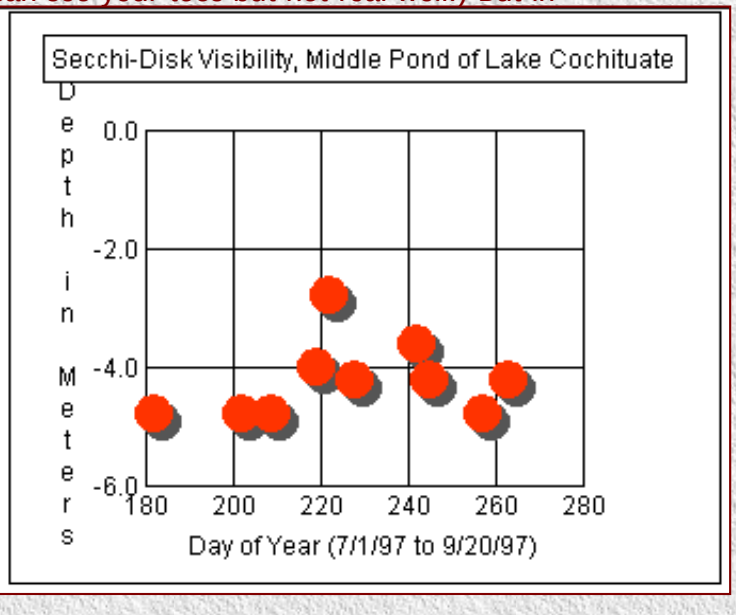
Click here to see more ***P.mag.*** statoblast microphotographs, by Gen-yu Sasaki in Japan.

Good or Bad?

Should we worry? Or rejoice? These good questions do not yet have clear answers. One saltwater bryozoan, which can coat North Sea fishermen's nets when they're hauled aboard, is famous for causing a major skin irritation: Dogger Bank Itch. (Just saying that makes me scratch.) But our new neighbor, ***Pectinatella magnifica***, has no such criminal record. At least one textbook illustration shows a bare-handed fellow holding a big sample of it, and we're assured that that's okay. Bryozoa have only recently been getting major scientific study, and some freshwater varieties are thought to be useful indicators of water quality.
P. magnifica is said to like water which is eutrophic (that is, it wants to find food in the water) but it doesn't exist in water which is contaminated. So maybe, just maybe, we should be grateful that it's thriving here.

Something else was different in our lake in the summer of 1997: the water was much clearer than usual. We measure this with a Secchi disk, a 40-cm.-diameter disk painted white on two opposing quadrants, black on the other two. You drop it on a marked line, until you can't see it in the murky depths, then bring it back just until you see it again, and read the line markings. 2 meters of Secchi-disk visibility would normally be good here in the summertime. (That is, if you dangle your feet down, you can see your toes but not real well.) But in this 1997 summer, we were reading 4.8 meters week after week up to early August, when it dropped to 4.0 meters on August 7th, then 2.8 meters on August 10th, back up to 4.2 meters on August 16th, 3.6 meters on August 30th and 4.2 meters on September 2nd.

Date of Measurement	Day of Year	Depth in Meters
07/01/97	182	-4.8
07/21/97	202	-4.8
07/28/97	209	-4.8
08/07/97	219	-4.0
08/10/97	222	-2.8
08/16/97	228	-4.2
08/30/97	242	-3.6
09/02/97	245	-4.2
09/14/97	257	-4.8
09/20/97	263	-4.2



Why such outstanding clarity? An unusual drought left us without any rain from June 15th until a major rain on August 9th. That must have greatly reduced the amount of water running downstream into the lake, and we postulated that there was a corresponding lack of the fine silt which takes days to settle out. Also, there would be less new nutrient introduced, and that would grow less algae in the water. Hence, we thought, the unusually clear water.

But if the lake is extra-clear, it should not be sufficiently eutrophic for this bryozoan. Maybe the bryozoa are making it clear! This bryozoan is a filter-feeder. Could there be enough of these colonies to filter a significant amount of particles out of the lake water and into their gelatinous masses? The bryozoologists think that could be the explanation. If so, we might want to encourage ***Pectinatella magnifica*** to proliferate, as a natural way to clean up the water despite our region's less environmentally-minded citizens. We'll remove these underwater colonies from the little section of shore where we swim. Then, perhaps, we'll tenderly resettle them alongside, to keep up the good work!

The *Pectinatella* News

We took the first two photos above on August 21st, 1997. The ***Pectinatella magnifica*** specimen's twig broke then, breaking open the jelly mass. The specimen still appeared healthy, so we returned it to its spot on the sandy lakebed.

On Jill's August 30th survey, she again looked at this specimen and observed no remaining lophophores on the jelly surface; just a thin green covering, probably an alga. The water had cooled slightly, but was still pleasant for swimming. Cooling end-of-season water temperature, the crack in the jelly, or something else? The many other colonies disappeared about the same time, so we suspect that normal water cooling caused them to dissipate and release their statoblasts.

Summer 1998 did not have the very-clear water. Although we still found ***P. magnifica*** in the lake, it was not at our beach and other sites were smaller than in 1997. Perhaps the unusually dry start to 1997's summer contributed to the increased growth.

Summer 1999 : The rainfall again has been unusually low, and the water clarity has again been high. (6/19, 3.4 m.; 7/3, 3.2m.; 7/29, 4.0m.; 8/17, two days after a rare 1" rain, 4.4m.; 9/2, 4.0m.; 9/5, 4.3m.) We finally spotted ***P. magnifica*** again near our beach, on 7/30; one egg-sized, egg-shaped blob on the end of a stick poking up from the bottom. Others, also moderate in size, are reported elsewhere in the lake.
We now think the low summertime rainfalls in 1997 and 1999, combined with lawn-watering restrictions, kept upstream residents from investing in chemical fertilizers. Less fertilizer, and less rain run-off to move it downhill into the lake, would reduce in-lake nutrients and probably are the main contributors to our improved water clarity.

Summer 2000 : (7/8, 4.0 m.; 8/27, 3.0 M., no ***P. magnifica*** yet sighted.)
000830: Albert Oller reports at least 15 P. magnifica in the Charles River in nearby Needham, Ma.: "They are almost as big as footballs."

Resources

E-mail from the experts: Byron Backus, Bill Banta, Tim Wood.
Links: The Bryozoa Home Page
Introduction to the Bryozoa (U.Cal./Berkeley) and Lophophores (U.Cal./Berkeley)
The Secchi Disk - What Is It?
Secchi Depth as a Water Quality Parameter
Lake Cochituate and Cochituate State Park
Library: Look up ***Bryozoa*** in books on Invertebrate Zoology, Pond Life, etc.

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Please E-mail your feedback on this Webpage to Dick and Jill Miller at TheMillers@millermicro.com