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A quiet menace

A microscopic organism called a bryozoan might be behind the clogging in your golf irrigation system.

Timothy S. Wood and Michael Lore

Two surprises greeted Ivan Hyso in his first month as an assistant superintendent at Mountain Vista Golf Course in the Sun City development in Palm Desert, Calif.

The first was discovering root-like material clogging dozens of sprinkler heads. Unless the clogs were removed daily, the sprinklers could not be fully shut off. Flushing the lines helped some, but only briefly. The problem persisted even after installing inline screens. Removing handfuls of the spongy, brown material kept the maintenance staff from other important tasks.

The second surprise came after he sent the root-like material for analysis. Turns out these were not roots; it was not even plant material. The stuff was actually an animal, and it was growing inside his irrigation system.

“They told us we had bryozoans,” Hyso says. “I had never heard of them.”

Often mistaken for displaced tree roots or other plant materials, a microscopic animal called a bryozoan can sometimes be responsible for the clogging of golf course irrigation systems. Photos courtesy of Bryo Technologies.

An old plague

The animals known as bryozoans have been a nuisance since the early days of public water systems. Clinging to pipeline walls, they form a dense network of branching tubules. Water flowing through the system carries the microscopic food particles on which the animals thrive. When conditions get crowded, pieces of the bryozoan network break off and are swept away. In Philadelphia and Boston during the late 19th century, chunks of living bryozoans would often emerge from water faucets into the basins of surprised residents. This eventually prompted the installation of the nation’s first sand filtration systems.

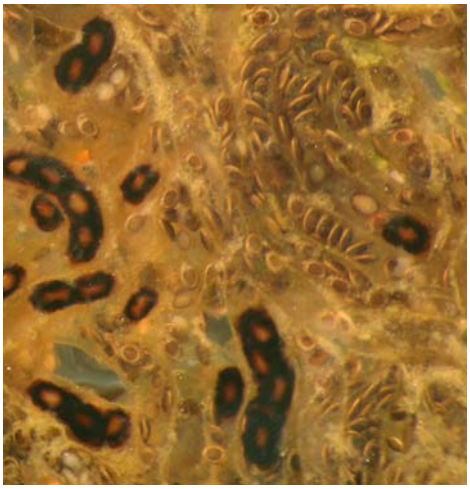
Today, bryozoans continue to plague any place where water is drawn continuously from a lake, river or canal. Natural targets include irrigation systems, water treatment plants, industrial cooling sites and even decorative fountains.

Cases of bryozoan fouling are diverse and widespread. In one water treatment utility serving a U.S. city, the pipeline from the nearby reservoir holds an estimated 6 tons of bryozoans during the seasonal peak. A Midwestern electrical generating plant recently found a bed of bryozoans more than 2 feet thick lining the walls of its cooling water intake structure. And a municipal wastewater treatment plant in the Southwest collects and hauls away truckloads of bryozoans every week.

These are significant problems, and yet they are widely misunderstood. Often the situation is seasonal and managed with intensive cleaning. The fouling material is typically dismissed as “algae” or “moss.” However, there is always an economic cost to this cleaning, and it can be very expensive.

Beauty in the beast

At a microscopic level, the bryozoan network resembles a garden of tiny flowers. Scientifically the flowers are known as “zooids.” Although physically connected, each zooid captures its own food with a crown of silvery tentacles. The zooid also has its own muscles, digestive tract and even a tiny brain. About 20 bryozoan species occur in the U.S., of which only four are responsible for most pipeline fouling problems. Different sets of species are problematic in Europe and Asia.



Tim Dunning runs a busy pond management business near Dayton, Ohio. “I often come across bryozoans,” he says. “Normally they are not a problem, but sometimes they really get out of control.” When and why that happens is not entirely clear.

The key to bryozoan survival lies in their production of remarkable seed-like statoblasts.

Bryozoans are a natrual part of any healthy freshwater community, but become a nuisance when they find their way into areas like municipal water supply stations or irrigation systems. The spongey, brown material is often found lining the walls of pipes, covering rocks in ponds and, in some cases, floating on the top of water bodies.

These tiny, dormant capsules contain the next generation. They survive freezing, drying and harsh chemicals. They can pass unharmed through the digestive tracts of birds, turtles and fish. Statoblasts have been known to remain dormant for many years. When conditions are right, they will germinate and produce new networks of bryozoans.

The beauty of this reproductive strategy lies in two slightly different types of statoblasts — the “free type,” which floats at the water’s surface, and the “attached type,” which is cemented firmly in place beneath the bryozoan network and remains attached long after the growing season has passed. Most pipeline bryozoans ensure their reproductive success by producing vast numbers of both statoblast types.

So where did they come from?

Often a golf course with decades of trouble-free irrigation is suddenly plagued with bryozoans. Where do they come from so suddenly and how do they get into the system? The answer to the first question is fairly simple: the culprits are usually geese or ducks. Bryozoans travel by air from pond to pond, their dormant statoblasts clinging to feathers or carried in the gut of waterfowl. Floating statoblasts can also arrive by water flowing from a river, canal or other similar source.

How bryozoans actually find entry into the irrigation lines is often less clear, especially if there is a good water filtration system in place. However, free statoblasts will pass right through filtering screens with mesh sizes larger than 200 microns. Once inside the system, they lodge in crevices, at pipe fittings and around valves and screens. After germination, the network begins to spread, generating new statoblasts and eventually reaching all parts of the system.

Attacking the problem Unlike most weeds or pond algae, bryozoans cannot be controlled with a single generic strategy. Much depends on the exact species involved, the time of year, the source of water, the size of the system,

Treatment plans for bryozoans vary. Cleaning can be an effective short-term solutgion, but seldom removes all of the organisms. Chemical treatments are also available, but must be carefully applied and timed, since incorrect applications can actually encourage the growth of bryozoan communities.

geographic location and even the local weather.

Most courses plagued by bryozoans are, understandably, looking for quick results. That usually requires some form of chemical treatment. However, take extreme care not to damage the healthy turf and soil biology. The general rule is this: the longer the chemical exposure time, the more effective the result and less risk of collateral damage. When used properly, the active chemical is completely consumed during treatment, and only a harmless solution is flushed from the system afterward.

The timing of treatment is critical. Dormant statoblasts can easily resist most chemicals, including strong acids, heavy metals and commercial pesticides. In fact, harsh chemical exposures often have the opposite result and stimulate statoblast germination several days after the application. Therefore, the most effective treatments are applied at a time when statoblasts have already germinated and few new ones are being produced. Such windows of opportunity arrive naturally twice each year in the northern U.S. and once in the South. An alternative is to apply a series of mild treatments one to two months apart.

Treatment options

An early client of our company, Bryo Technologies (bryotechnologies.com), was a golf club in southwestern Ohio. By the time we were brought in to assess the situation, the entire irrigation system was infested with bryozoans. The same species also covered rocks lining a large pond from which unfiltered water was drawn, and floating statoblasts in the pond were so abundant they formed what appeared to be a brown scum at the water surface.

At that time, the client was unwilling to invest in a sophisticated water-filtration system. Our recommendation was simply to remove the rocks from the pond. With nothing to grow upon in the pond, the bryozoans disappeared. A single chemical treatment to the irrigation system then fixed the problem entirely. Mild chemical treatments are still administered each season as a precaution.

In many instances, organic treatments are also possible, but they require more time. For example, a diluted organic tea held captive in the irrigation system will reduce oxygen to a level that kills the bryozoans. The system is then flushed before decay products have a chance to build up. This method requires detailed knowledge of pipeline volume and temperature. Unfortunately, it is seldom effective against statoblasts.

A promising organic method to kill statoblasts involves flushing the lines with diluted soil extract and nutrients, then draining the system completely. This introduces fungi capable of neutralizing both free and attached statoblasts. Under ideal conditions, at least one month of contact time is required. The longer the system remains idle, the more effective the treatment.

After the treatment

We are often asked what to expect following a bryozoan treatment. Will all the bryozoans detach at once and plug up the filters, or will it happen gradually in bits and pieces? It seems to depend mostly on the bryozoan species. In some cases, the results are immediate and dramatic. More often, however, the fouling problem subsides over a period of about one week.

Meanwhile at Mountain Vista, Hyso has become something of a bryozoan expert. He easily recognizes bryozoans and has a long-term control strategy in place. When a fresh outbreak occurred recently in an adjoining irrigation system, he was able to manage it himself.

The bottom line is this: Like dragonflies and water lilies, bryozoans are a normal part of any healthy freshwater community. Although seldom recognized, they are common residents of golf course ponds. But when they venture into places where they do not belong, the results can be costly and inconvenient. Today's superintendents need to remain vigilant and know-ledgeable so these pests can be recognized at the first signs of trouble.

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