

Dealing

Calling for a new social change to combat invasives

We have entered a new era where aquatic invasive species are clearly one of the greatest threats to our fisheries. The invasive alga "didymo" is just one of the countless creatures that can alter our streams forever. Many invasive species have been unintentionally transported to areas where their natural predators do not exist. We are transporting, both intentionally and unintentionally, creatures around the globe at an incredible pace with our improvements in transportation and successful global economy. There is plenty of convincing evidence that our favorite activities are spreading aquatic invasives to new locations. Invasive species can cling to our felt-bottom wading boots, boat trailers and float tubes. My message is simple and not one of reproach or gloom, but rather one that gives anglers something to rally around and succeed at. A more proactive social action is what is needed here. All anglers who love their favorite pastime must recognize that by cleaning off your gear every time you return from a day on the river or lake, you will help protect our fisheries. Make gear cleaning part of your ritual, just as you clean out the cooler and gear bag at the end of the day. We have the power to be responsible. Join the Federation of Fly Fishers in our Clean Anglers Pledge to help reduce the spread of aquatic invasive species with our sport!

*– R.P. Van Gytenbeek
FFF Chief Executive
Officer/President*

Distribution of *Didymosphenia geminata*

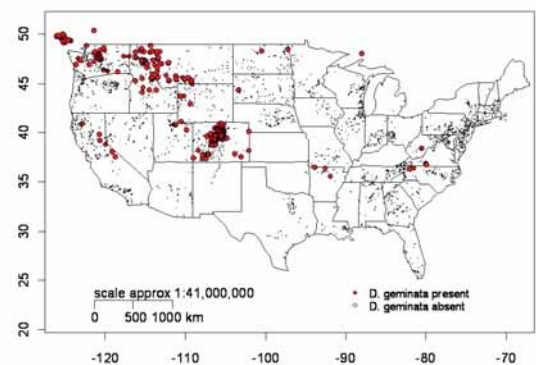


Chart courtesy Sarah Spaulding USGS and EPA

Thick blooms of didymo cover the rocks of this once pristine river of the South Island of New Zealand.

Photo courtesy Fish and Game New Zealand

The points on the map define locations of confirmed occurrences of *Didymosphenia geminata*, including blooms and microscopic presence.

with ‘Didymo’

By Leah C. Elwell

Lurking in your favorite fishing stream is the latest menace to our fisheries: rock Snot.

Formally called *Didymosphenia geminata*, or “didymo,” this aquatic invasive species is threatening streams across the United States. The first time I saw what many cells of this algae could do to a stream in a wildlife agency video, my jaw dropped. Thick carpets covered all the boulders, and chunks and strands of algae tissue were floating downstream. *This can't be good for all the macro invertebrates that rely on the rocks for habitat, I thought immediately, and also not good for the fish that rely on them for food.* Then, I started to hear reports from anglers who were fishing in the stuff, how their day of fishing was frustrating and uneventful. Most of the time their line was covered in chunks of the algae and casts were fouled. Naturally, I was filled with questions. How did this thing get here? Why is it a problem all of a sudden? What, if anything, could we do?

This single-celled organism is gaining attention in rivers around the world. Didymo has been documented in many places across North America historically; only recently it has been expanding its range and increasing in density.

Basic biology

Didymosphenia geminata is a diatom, which is a single-celled alga. Diatoms cell walls are made of silica (SiO_2) and they can be found in almost every freshwater and marine aquatic habitat. If you have ever used “diatomaceous earth” to kill unwanted pests in your garden, you have sprinkled the microscopic, razor-sharp silica of diatoms. In streams and lakes, the single didymo alga cell is fairly innocuous and actually beneficial in aquatic ecosystems. When it secretes its stalk to attach to stream surfaces the trouble begins.

We usually think of algae as being slimy stuff on rocks, but didymo is different. It feels like wet wool to touch, not slimy at all. To identify didymo you must be a professional, or at least have a high-powered microscope and an identification book. If you do find mats

that fit the didymo description, you can mail a sample to the U.S. Geological Survey for positive identification (see information bottom of first paragraph, page 27).

Didymo is a versatile alga. It's found at temperatures between 32 degrees and 80 degrees F, and can grow in slow moving, shallow waters

the invasive blooms have been in rivers and usually in the tail waters of regulated rivers, but didymo can be found in both lakes and non-regulated rivers as well. When blooms of didymo happen, they can visually cover from 20 percent up to 95 percent of the substrate. The first nuisance bloom of didymo in North America was

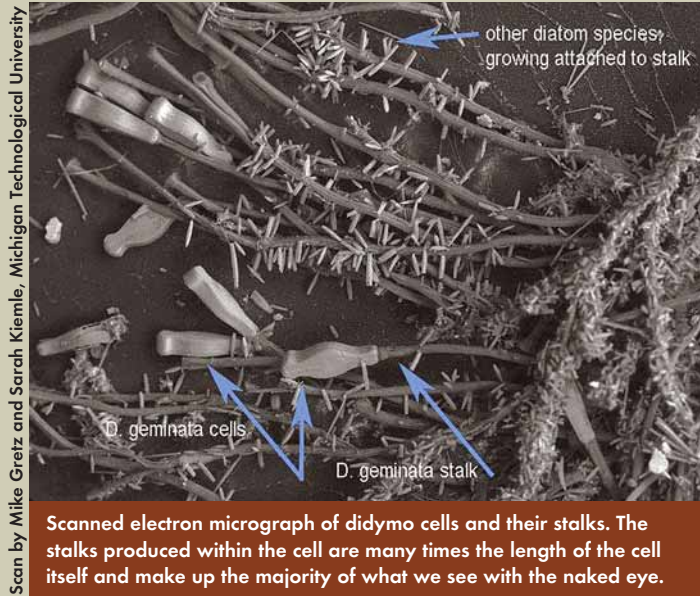
documented on Vancouver Island in 1988. In 2003, the South Island of New Zealand became the first recorded location in the Southern Hemisphere, and at this new location, didymo created massive invasive blooms.

Nuisance and invasive blooms refers to both the historic documentation and the impact of didymo on the aquatic ecosystem.

Nuisance species are those that have been previously recorded at a location and now growth is beyond historic record. Invasive species are those that can take over a new habitat where they have not been previously found. Typically, invasive species have a negative impact on the other species in the community, and can also have a negative impact on the local economy.

For those of you who have seen didymo blooms firsthand, it is easy to visualize the descriptions of excessive algae growth. The difference between “excessive” didymo growths in different locations has also been dramatic. Extreme examples of didymo growth can be viewed on a video created by the New Zealand Game and Fish at www.fedflyfisher.org/conDidymo.php

Other locations across North America have experienced excessive algal growth, but not of the same magnitude as locations in New Zealand. Places in North America that have experienced blooms of didymo include the American Fork River, California;

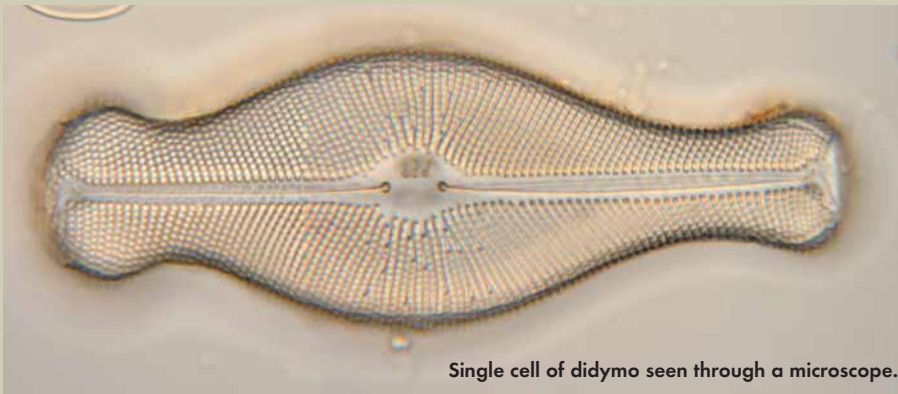


Scan by Mike Gretz and Sarah Kiemle, Michigan Technological University

as well as waters with greater depth and swift currents. The nutrients in the water also determine where you will find didymo. The puzzling thing about didymo is it doesn't act like most algae; it blooms in waters with very low levels of nutrients. Most algae blooms, like red tide for example, bloom with excessive amounts of fertilizers and high nutrients. Max Bothwell of Environment Canada has made some interesting observations of didymo in some Vancouver Island streams. In upstream reaches with low nutrients, didymo growth was plentiful, but in reaches downstream from water treatment discharge (i.e. high nutrients) didymo growth was less and included a more diverse algae community.

Blooms in North America

Historic records of stream surveys include didymo in waters throughout the United States, Canada and Eurasia, although it was considered rare. All of



Single cell of didymo seen through a microscope.

Kootenia River, Montana; Rapid Creek, South Dakota; White River, Arkansas; Deer River, Alberta, Canada; and numerous rivers on Vancouver Island, British Columbia, Canada.

Impacts of didymo trouble in Rapid Creek, South Dakota

In Rapid Creek of western South Dakota, the brown trout fishing is some of the best in the United States with trout productivity at 25.0 grams of brown trout biomass per square meter. In the last several years, the once age-class balance fishery has become dominated by juveniles and very few adults can be found. Coincidentally, the decrease in brown trout correlates with the presence of didymo. Beginning in 2002, invasive didymo growth in the stream began spreading in a 20-mile stretch of river. The growth of didymo is patchy in this stretch; in some spots it covers as much as 95 percent of the substrate, and others 20 percent. Jeff Shearer with the South Dakota Game and Fish claims that “although there is no direct evidence that didymo caused the decline in brown trout, the

fishery is not the same since blooms of algae began.”

Jim Hawke, FFF Black Hills Flyfishers club president, who lives on the algae-infested creek has seen changes in the fish population first-hand. He and his wife have lived on Rapid Creek for 15 years, often spending summer evenings unwinding on the banks of the water casting to rising fish. “In the past, within a few minutes one of us would catch a trout. Now, we are just practicing our casting and mending, because we are not going to catch anything,” says Hawke, wistfully. It is not just the fishing on Rapid Creek that has changed. Hawke’s neighbors, who irrigate their lawns and crops from the creek, are now cleaning out their pumps two times a day, where before didymo blooms, cleaning out the pump would happen a couple times each summer.

Vancouver Island, British Columbia

The first documented nuisance blooms of didymo in North America happened in 1988 on Vancouver Island. Researcher Max Bothwell of Environment Canada began his investigation of these blooms thinking that the cause of new growth was from a large-scale environmental change. After examining stream factors, such as change in temperature, nutrients and hydrologic regime over a 15-year period, he found no discernable change that could link didymo growth to changes in the environment. Other unknown factors could be causing these changes in growth, and research is under way to tease these factors out.

The pattern of didymo spread was recorded when blooms first began in Vancouver Island. As new

areas were found infested with didymo, another activity was also increasing in the area. Biologists noted that an increase in recreational activity to these relatively rural streams overlapped with the new locations of didymo. It seems pretty reasonable that water recreation activities are spreading didymo – boats and gear have been implicated as major vectors in the introduction of other invasive creatures to new locations across the world. The international research community has initiated research to determine how different gear or activities spread didymo.

Response to the threat

In May, 2006, the Federation of Fly Fishers (FFF) co-sponsored with the EPA an International Symposium on *Didymosphenia geminata*. It was held in conjunction with the Western Division American Fisheries Society meeting in Bozeman, Montana, and was a great success. The meeting was attended by scientists, resource managers, consultants, state, federal and tribal agencies that hailed from across the United States and abroad. Scientific presentations, a field trip to an affected river, a laboratory identification session and a roundtable discussion were the main features of the meeting.

This forum brought a diverse group of people together to begin tackling the management of and education on didymo. You can view the abstracts from the symposium presentations at www.fedflyfishers.org/conDidymo.php. The meeting resulted in important collaborative relationships and the development of several helpful outreach tools: a public document “white paper” describing didymo, and an international information flyer to warn countries that their waters are at risk.

The FFF continues to provide information on didymo with up-to-date information on our Web site, presentations and a forthcoming publication with Sarah Spaulding of the U.S. Environmental Protection Agency (EPA) on the basic biology and impacts for the public to learn more. Spaulding of the EPA and U.S. Geological Survey works around the clock identifying samples sent to her from around the United States. The accurate identification of didymo is



Didymo covers approximately 50 percent of substrate in this image from Rock Creek, Utah.

critical at this time to help both scientists determine its distribution and managers to focus resources. There are other algae blooms that can resemble didymo blooms. Report suspected growths of didymo by collecting a small sample (put a pinch of the material in a vial with ethanol or dried in a folded business card). Label samples with the date, latitude and longitude (accurate site information). Send reports and samples to: Dr. Sarah Spaulding; U.S. Geological Survey; 999 18th St., Suite 300; Denver, Colorado 80202 USA; Email: sarah.spaulding@usgs.gov.

Max Bothwell, leading algae researcher of Environment Canada, is

the effects of didymo in Rapid Creek.

The task force not only monitors the creek, but a similar enrichment experiment to alter algae growth in Rapid Creek is also in development. South Dakota Fish and Game are also working with South Dakota University to develop a research project that will help determine the impact of didymo growth on fisheries. A bioenergetics model of brown trout in didymo-affected streams will look at a variety of factors (flow, water temperature, food availability and trout respiration rates) as a method to tease out what will limit brown trout productivity. This bioenergetics model will help researchers determine the impact of

DIDYMO SPECIFIC CLEANING TECHNIQUES

CHECK: Before leaving a river, remove all clumps of algae and look for hidden clumps.

CLEAN: Soak and scrub all items for at least one minute in a 2 percent bleach solution, or 5 percent salt solution or dishwashing detergent.

DRY: If cleaning is not practical, after the item is dry to the touch, wait 48 hours before contact with another waterway.

The aquatic invasive species problem – time for a change in social action

We all have them, we all don't want them, but luckily we can all do something about them. Depending on where you live in North America, your favorite fishing spot might be affected by countless introduced invasive aquatic creatures. The invaders list is long and contains everything from Eurasian water milfoil, mitten crabs, snakeheads, nutria, mud snails, spiny water fleas to didymo.

Now, there won't be a test at the end of this article gauging your knowledge on every invasive species in your backyard, although that would be a good homework assignment, but rather a pledge to change the way you think and act. It is important for anglers to realize that we help spread these harmful creatures, but more importantly, we can help prevent their spread. The time has come to take responsibility for our actions as anglers and users of our most beloved resource. Make it routine, and clean your gear every time you return from a day of fishing. Join the FFF in our Clean Angler Pledge to be responsible anglers in reducing the spread of aquatic invasives. 🌙

Leah C. Elwell is conservation coordinator for the FFF. She lives in Bozeman, Montana.

THE CLEAN ANGLER PLEDGE "I am committed to being a responsible angler in the fight against aquatic invasive species. This commitment means that I will remove all plants, mud and debris from my gear, thoroughly clean all gear upon return from a day of fishing, never release any fish, plants or animals into a body of water unless they came out of that body of water, and I will tell others to do the same."

developing a pilot study that uses nutrient enrichment to control or reduce didymo growth. Parameters like nutrient levels, temperature and didymo growth will be measured. This method of enrichment mimics natural addition of nutrients to the stream as with anadromous fish carcasses.

Black Hills Fly Fishers, an FFF club actively involved in South Dakota, has been locally affected by didymo blooms. The Black Hills Flyfishers has been helping to get the word out by talking to the press and educating folks at every opportunity. Although the fishing is not what it used to be on Rapid Creek, Hawke and the troops from the Black Hills Fly Fishers have not given up. In fact they helped convince the regional South Dakota Game and Fish Department that maybe this algae problem was not related to the prolonged drought and needed their attention. "If someone does not take care of it, it could be an even bigger mess," says Hawke. "We still have hope. I think every bit helps." The club gave generous support to the International Didymo Symposium and has gathered a task force of regional researchers and agencies to combat

didymo blooms upon fish.

Visit the FFF Web site for up-to-date information on didymo in the months to come (www.fedflyfishers.org).

You have stepped in didymo. Now what can you do?

Take precautions to limit the spread of didymo from your activities. The best method is to thoroughly clean your gear among bodies of water, particularly in waters that are known to contain didymo. This means rinsing your waders, wading boots and float tubes in a solution that destroys the algae cells. You can use a solution of 2 percent bleach or 5 percent salt-water or dishwashing detergent.

There are some simple and easy precautions you can take to be a **responsible** angler.

- 1) **REMOVE** all dirt, plants and other materials from your gear or boat before you leave a body of water.
- 2) Thoroughly **RINSE** your gear or boat with clean water.
- 3) Thoroughly **DRY** your gear. Consider keeping two sets of wading boots, and alternate their use between drying.

- 4) **NEVER TRANSPORT** plants, animals or water from one body of water to another.
- 5) **NEVER DISPOSE OF** bait fish or fish parts in any body of water.
- 6) **FIND OUT** what invasives are in the waters you fish and recreate in.
- 7) **REPORT** illegal activities.