

## ECOLOGY

# A Slimy Invader Blooms in the Rivers of Patagonia

Biochemist William Horvath was the first to sound the alarm. A Patagonian guide to kayakers from all over the world, Horvath was taking U.S. clients on the pristine Futaleufú River in Chile last year when he saw something that stopped him cold. In the water there “appeared to be toilet paper,” he says. Afraid of hepatitis, the kayakers turned back. Horvath decided to investigate. After ruling out pollution from a local water-treatment plant, he sent samples to the U.S. Geological Survey (USGS) in Fort Collins, Colorado. USGS ecologist Sarah Spaulding determined that it was natural material: the mucilaginous stalks of the algae known as *Didymosphenia geminata*, or Didymo.

The discovery caused a stir, as Didymo is unwelcome wherever it blooms. It forms large colonies of brownish slime that cling to vegetation and streambeds, extending leathery trailers into the current. Known to hikers as “rock snot,” it is established in several Northern Hemisphere locations—including in Canada and the eastern United States, Europe, and Asia. But it was not seen in the Southern Hemisphere until 2004. That’s when Didymo appeared in New Zealand; it has now spread to more than 40 watersheds in the country’s South Island. In 2010, to the dismay of naturalists and Chile’s tourism industry, it gained a foothold in Patagonia.

A single water drop is enough to carry the diatom into new territory. The nontoxic organism is the only large-scale invasive species known in oligotrophic freshwater environments—those poor in phosphates, nitrates, and organic matter. It is capable of completely covering riverbeds with up to 20 centimeters of gunk, sometimes blocking water intakes for hydro plants and degrading fish breeding habitats.

After Didymo’s presence was confirmed in the Futaleufú River, Brian Reid, a limnologist at Chile’s Center for the Research of Patagonian Ecosystems (CIEP) based in Coyhaique, in the Aysén Region, organized a survey in June of other rivers whose habitat, configuration, and stability made them potential reservoirs. Massive blooms of Didymo were confirmed in two spots within the Chilean Patagonia watershed, the Espolón River (a tributary of the Futaleufú) and Cea



**Coming to Chile?** The invasive alga *Didymosphenia geminata* recently swept through New Zealand’s South Island.

Creek; a macroscopic amount was found in the Cochrane River, part of the Baker Basin. Researcher Viviana Sastre of the Universidad Nacional de la Patagonia in Argentina reported a limited Didymo bloom in the Grande-Futaleufú River, which flows through Argentina and Chile.

In October, a joint report by CIEP, the National Fisheries Service, and the Bureau of Water Management (DGA) identified three common factors in blooms: They occur in stable rivers downstream from lakes, near a main road that offers recreational access, and downriver from sources of nutrients such as waste treatment plants and fish farming operations. The link to nutrient sources does not jibe with earlier analyses. Historically, before its expansion in the United States and New Zealand, it was found in clean waters and places that weren’t significantly impacted by humans—mostly in high latitudes and high elevations. Spaulding, who went to Chile in July to study the blooms, says, “We still don’t understand why it is spreading so rapidly.”

The propagation of *D. geminata* may be unstoppable, although officials in Chile have launched a massive effort to halt it. Since June, a permanent committee of state offices, research centers, and tourism operators has

been coordinating fieldwork and educating communities on how to limit its spread. In October, authorities declared the Espolón and Futaleufú rivers “plagued areas” and the Simpson River as threatened.

Pallaor V. Sundareshwar, an associate professor of atmospheric sciences at the South Dakota School of Mines and Technology in Rapid City, who inspected the blooms in Chile last summer with Spaulding, says researchers plan to determine through DNA analysis whether Didymo in Patagonia is the same type detected in New Zealand and North America. Next they want to compare the environmental aspects of water in the affected regions. And Sundareshwar hopes they will be able to “solve the mystery of how *Didymosphenia* came to Chile, what it is doing, and why is it blooming.” He adds: “Maybe if we are lucky we will be able to figure out how to control it.”

Sample takers themselves can be a problem, says Jorge O’kuinghtons of DGA. They’re being trained in procedures for disinfecting gear and instruments. Training tourists and fishers will be more difficult. The immediate objective is to hold the line and prevent Didymo’s expansion to other rivers on Patagonia and to the north of the country. “We are facing a threat to the primary patrimony of regional tourism products,” says Fabien Bourlon, director of the Patagonian Center for Scientific Tourism.

The campaign has focused on prevention for a simple reason: “There is no effective and proven method that allows the eradication of Didymo” but also leaves the ecosystem intact, explains Manuel Martínez, an aquaculture engineer who is coordinating regional efforts to intercept the algae. Biocides can kill many organisms and have been ruled out.

Three years ago, Spaulding warned in a paper that “rivers in the southern hemisphere are particularly at risk” to invasion and degradation by new species. The 2007 analysis, co-authored with conservationist Leah Elwell, said that environmental protection agencies in Australia, Argentina, Chile, and Peru should be aware of the “urgency of implementing decontamination procedures” to keep travelers from bringing in invasive species like Didymo. Chile did not move rapidly. Regional authorities hope it’s not too late to restore the reputation of Patagonia’s rivers as the most pristine on Earth.

—PATRICIO SEGURA

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