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Was didymo here all along?

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Photo / File / Lynda Feringa

A new study by North American researchers has posed the suggestion that river-fouling didymo may not have been introduced to New Zealand, but was here all along.

But New Zealand scientists have cast doubt on the assertion, and back the widely-held view that the troublesome algae was brought here.

The microscopic pest, which can be spread by a single drop of water, was first reported in New Zealand 10 years ago, in the Lower Wairau River, and is now found in more than 150 South Island rivers.

So-called "rock snot" is especially worrisome in trout rivers because it affects the insects they eat, and under New Zealand law, people are legally obliged to prevent the spreading of didymo.

A study, led by Dartmouth College and published in the journal BioScience, suggested the algae had been native to much of the world for thousands of years, but conditions promoting visible growths were absent or rare.

It suggested recent worldwide blooms of didymo are caused by a native species responding to changing environmental conditions rather than by accidental introductions by fishermen, or the emergence of a new genetic strain, as has been widely believed.

"Nuisance blooms have been reported in rivers worldwide and have been hastily attributed to introductions," the researchers state.

"However, evidence indicates that blooms are probably not caused by introductions but, rather, by environmental conditions that promote excessive stalk production by this historically rare species."

Didymo blooms were hastily attributed to human introductions or the emergence of new genetic strain because the absence of evidence was used as evidence of absence in many locations, the study's lead author Professor Brad Taylor said.

"Even in locations where rock snot had been recorded a century ago, this information was either ignored or the idea of a new genetic strain was adopted."

Algal blooms are often caused by excessive phosphorus and other nutrient inputs, but didymo bloomed because phosphorus was low.

When nutrients was rare, the algae produced long stalks that extended the cell into the water above to access nutrients, creating thick mats covering the river bottom.

"The paradox of didymo blooms in low-nutrient rivers is not really a paradox at all," Professor Taylor said.

"However, the idea that low phosphorus can cause an algal bloom is hard for people to accept because we are all taught that more nutrients equal more algae."

The study explained that other algae and bacteria responded similarly to low nutrients, but rock snot blooms were unprecedented, making this organism a good sentinel of what could be the new norm in many pristine rivers worldwide.

The new research suggested rock snot blooms had become more common because of climate change and other human-caused environmental changes that were decreasing phosphorus to levels that promote the formation of didymo blooms in many remote, otherwise pristine rivers worldwide.

New Zealand scientists have read the new findings with interest, but were not convinced the pest had naturally evolved here.

NIWA freshwater ecocolgist Dr Cathy Kilroy said a response to environmental change was a "highly likely" explanation for the expansion of didymo blooms in the Northern Hemisphere.

But she believed that in New Zealand, didymo was an introduced pest.

Research in New Zealand demonstrated that that didymo blooms were caused by low dissolved phosphorus concentrations, she said.

But while the new study referred to processes that could and did lead to declining phosphorus in North American streams, there was no evidence that those processes apply to New Zealand streams, Dr Kilroy said.

"There has been no sign of a general decline in phosphorus in rivers, even in undeveloped catchments."

The South Island rivers presently affected by didymo had very low phosphorus long before the discovery of the first didymo blooms in 2004, and the subsequent rapid spread of didymo in the South Island indicated transport by humans.

"My view is that the expansion of blooms in the Northern Hemisphere starting in the late 1980s meant that didymo became much more common; ever increasing international travel meant that it was inevitable that cells would eventually find their way to New Zealand.

"Once the cells were here, the many low-phosphorus waterways in South Island provided perfect habitat for blooms."

She agreed that high phosphorus levels explained why no didymo blooms had occurred in any North Island river.

"Failure to detect even a single didymo cell - despite continued surveillance - is more puzzling," she said.

"It seems likely that a combination of environmental factors, such as temperature and water chemistry, prevent the long-term survival of didymo in North Island waters."

Dr Marc Shallenberg, a zoology research fellow at the University of Otago, said as didymo hadn't been previously reported from New Zealand waters, it was assumed that didymo invaded the country and rapidly proliferated, as many other invasive exotic organisms have done.

"The take home message of the article seems to be that environmental conditions - and possibly recent changes in these conditions - play an important role in blooms of didymo and in the proliferation of species," he said.

"This is a sensible message and won't ruffle feathers with scientists.

"However, the authors have written their paper in a way that appears to suggest that didymo blooms only occur in response to changes to environmental conditions and not at all to recent invasions."

While their attempt to downplay the importance of invasion biology was provocative, it was not convincing, he said.

Landcare Research phycologist Dr Phil Novis said the study's assertion that didymo was not a recent introduction to New Zealand was "problematic".

"In my view, this is vulnerable to two potential errors: treating the dispersal of didymo like that of any other microbe, and treating New Zealand, with its isolation and human history, as a continental country."

Dr Novis said microbial biogeography - the study of distribution patterns of microbial species - was a minefield because it was impossible to prove conclusively that a microscopic species was not present in a given country.

"However, didymo is unusual. It is a very large, easily recognised diatom, and paradoxically it is known to be very sensitive to drying.

"This sensitivity precludes the long-distance dispersal that would have been required to transfer the species to New Zealand in pre-human times.

"The authors concede that didymo has been known for some time in areas where it does not bloom.

"If it was not overlooked in those areas, why so in New Zealand, when widespread and extensive sampling of river periphyton has taken place here for decades?"

Dr Susie Wood, a senior scientist at the Nelson-based Cawthron Institute, described the study as a "compelling article" but also believed that didymo was a recent introduction.

While it had been demonstrated in New Zealand that not all problematic species are necessarily new introductions, research by multiple agencies across suggested this is not the case with didymo in New Zealand, she said.

"As the authors state - there is no fossil or confirmed historical records of didymo in New Zealand.

"Whilst the recent blooms in the Northern Hemisphere might be a sign of environmental change rather than a new introduction, I still believe that the evidence from Zealand, including the way in which it spread across South Island rivers, suggests that it was a recent introduction."

- NZ Herald