

What would you do if you found Nitrogen missing from a set of sealed pond water samples?  
That was how I discovered a nitrate guzzler in my sample set in 2020 !



# N2O Greenhouse Gas

CAN A SINGLE MICROBE CONTROL IT?

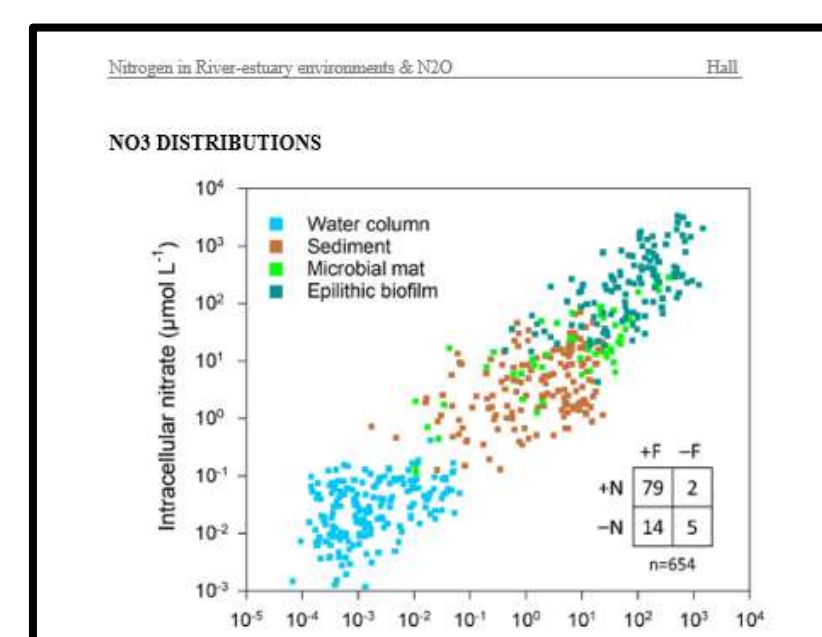
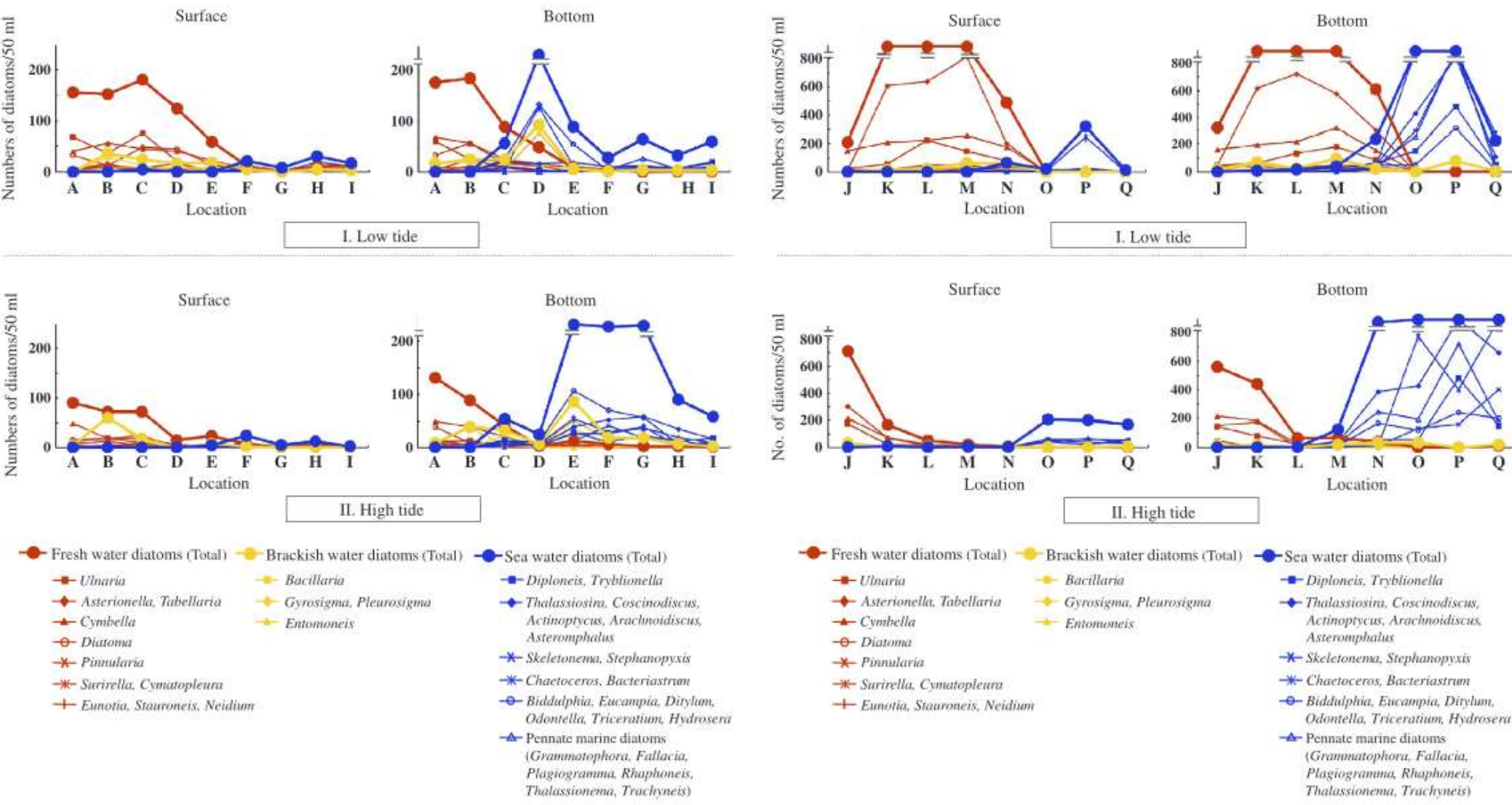
THE DIATOM:

It doesn't produce N2O

Nobody knows its chemistry

It might come from thermal vents

Graphs of abundance show overlap of species in both fresh and salty/brackish waters.



Stief, P. et al (2022) 'Intracellular nitrate storage by diatoms can be an important nitrogen pool in freshwater and marine ecosystems', Nature Communications: Earth and Environment

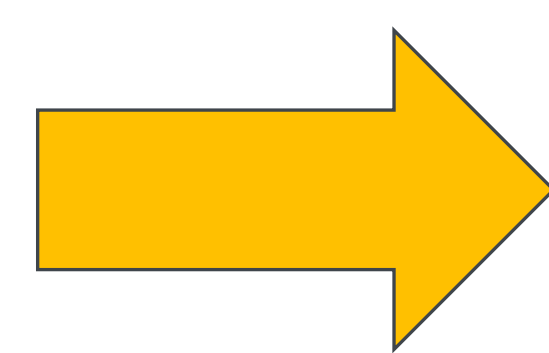
Importantly, diatoms possess the major shareholding of nitrate in rivers that fuels N2O!

Silica snowflakes form from cooling dissolved silica – maybe a snowflake started the first silica life form. Maybe the first diatoms formed from molecular sieves, produced by crystallization.

Everything about diatoms is alien. Yet like plants, they store nitrate in their vacuoles. Nobody outside marine science, it seems, knew that for over 40 years. But now we know they store the majority of NO3 in river environments too, after a marine scientist measured diatom nitrate in both freshwater rivers.<sup>+</sup>

What else? They break down NO3 and emit NH3. But that's only the beginning:

They buffer nitrates and protect habitats  
They feed dinoflagellates & eat bacteria  
They produce 40-80% of our Oxygen.



I think we can use them to clean up metals and reduce N2O! ++

**DIATOMS HOLD MOST OF THE NITRATES OUTSIDE THE WATER FLOW**

**NOVEL FINDINGS IN NITRATE STORAGE MECHANISMS**

From intracellular nitrate storage, by diatoms can be an important nitrogen pool in freshwater and marine ecosystems

Figure 17: The amount of NO3 stored in diatom cell vacuoles was measured in a global study at sites in Australia, New Zealand, the Americas, Greenland, Africa, the United Kingdom, Europe/Central Europe and Eurasia, at freshwater and marine locations<sup>68</sup>.

An excerpt from the 2022 breakthrough research by Stief et al appears at right: NO3 in diatom vacuole storage versus dissolved river NO3 was quantified in a global study of 117 water bodies.

NO3 filled diatom (McCarthy)

<sup>+</sup> 1. The breakthrough that moved the world forward: Stief, P. et al (2022) 'Intracellular nitrate storage by diatoms can be an important nitrogen pool in freshwater and marine ecosystems', Nature Communications: Earth and Environment <sup>++</sup> 2. The step we now take, to use that information:



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