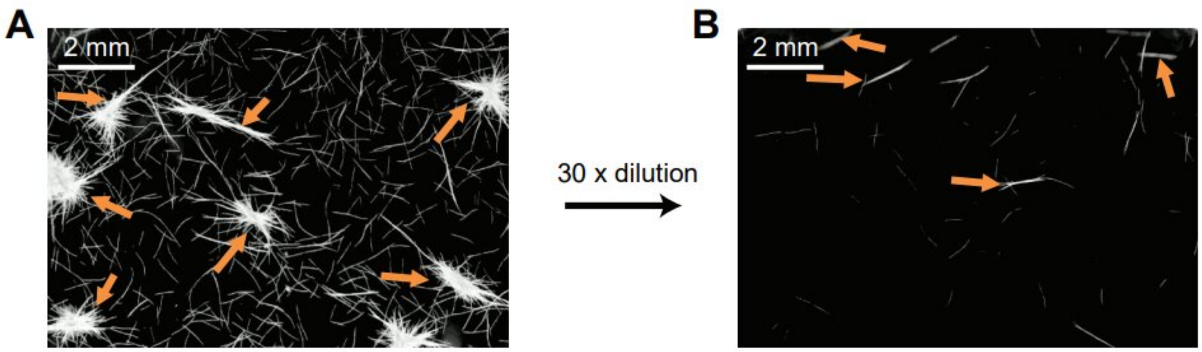
Movement of filaments of Trichodesmium and their interactions with other filaments help form aggregates

May 26 2023, by Bob Yirka



Puffs emerge at high filament densities. A, In our aggregation experiments, a variety of aggregate shapes emerged at high filament densities (71.2 filaments/mm^2), including puff- and tuft-like arrangements. B, After 30× dilution of the same cultures (2.4 filaments/mm^2), tight bundles (tufts) dominated, and puff-like aggregates only formed upon encounters among bundles. Credit: *Science* (2023). DOI: 10.1126/science.adf2753

A team of environmental engineers at ETH Zurich's Institute of Environmental Engineering working with a colleague from the University of Luxembourg has found that the movement of individual gliding filaments of Trichodesmium and the way they interact with other filaments helps them to form aggregates. In their study, published in the journal *Science*, the group studied how samples of Trichodesmium in their lab reacted to environmental events such as bright light.

Trichodesmium is a type of bacterium that is plentiful in the oceans. Groups of them are unique in that they can join together to form structures, such as filaments several hundred cells long. Such filaments can exist as standalone entities or they can bunch together with other filaments, creating larger structures, many of which resemble pom-poms or tufts of hair. Trichodesmium are also valuable to ocean life because they are responsible for fixing most of the nitrogen that provides compounds used to survive by other plants.

In this new effort, the research team noticed that little research has investigated the means by which Trichodesmium interact and bind together. To learn more, they collected several specimens and brought them back to their lab for study.

One of the first things the team learned is that individual strands can, at times, glide along the length of another strand. And when they reach the ends of a strand, they can reverse direction. In many instances, both strands engaged in gliding and both reversed direction to maintain contact. The research team also found that when strands bunch together, the reversals tended to happen more often, helping to keep them bunched together.

The researchers also found that the strands could react quickly to changes in light intensity—they tended to bunch quickly when suddenly exposed to light and loosened when the light was removed. They suggest that in a natural setting, this could be a response to cloud movements changing light intensity. The team also found evidence that the tightness of a bunch could be related to buoyancy, allowing a bunch to sink lower into the water, when need be, such as when nutrient levels changed.

More information: Ulrike Pfreundt et al, Controlled motility in the cyanobacterium Trichodesmium regulates aggregate architecture, *Science* (2023). DOI: 10.1126/science.adf2753