Unusual Delta algae bloom worries researchers

September 7 2015, by Ryan Sabalow, The Sacramento Bee

On a sunny August afternoon, a team of federal researchers cut a circuitous path through the heart of California's Sacramento-San Joaquin Delta doing real-time monitoring of water quality. Again and again, they made the same disturbing observation: tiny flecks of green goo that they recognized as a serious new threat to the stressed estuary.

With two 150-horsepower outboard motors roaring on the back of their 26-foot research boat, they powered through a maze of river channels, sloughs and flooded islands in the central Delta. All the while, a pump at the back of the boat sucked in water, funneling it to a sophisticated water analysis device. Every so often, the team would stop and siphon water into plastic jugs and glass vials to take back to the lab for further study.

Mile after mile, and stop after stop, the team found the bright green particles drifting beneath the boat's hull. It was microcystis, a type of blue-green algae that in high concentrations can produce toxins deadly to fish and people.

In what researchers suspect is another troubling side effect of the state's epic drought, the Delta is exploding with algae particles that in intensified concentrations could pose a substantial threat to the central hub for California's vast water delivery network.

The algae bloom is not limited to the central Delta. Peter Moyle, a fisheries biologist with the University of California, Davis, said his team also found microcystis in the water during a separate research trip

several river miles away in the north Delta.

"We've never seen anything quite like it," Moyle said. "We're not quite sure what's going on."

Moyle is among the foremost experts on the Delta's most imperiled species, the nearly extinct Delta smelt. He said his team didn't find any fish kills, which would have been a sign the bloom had grown toxic.

A broad range of scientists - from UC Davis, state water agencies and federal research groups - are monitoring the Delta algae bloom. The fear is that it could worsen before the winter rainy season or come back bigger next year should California endure a fifth year of drought.

While the research is in the early stages, the scientists say this particular microcystis bloom is likely caused through a combination of factors, all related to the unusually warm and languid water flows that have accompanied California's drought.

In non-drought years, large algae blooms typically don't have time to form in the Delta, because the particles are flushed out to sea and diluted. This summer, there's far less water flowing into the Delta from upstream reservoirs, creating warm, slow-moving currents that blue-green algae prefer. The low flows also mean nutrients from sewage, fertilizer and other pollutants released from cities, farms and industrial sites upstream could be more concentrated, contributing to the unusual bloom.

In higher concentrations, some types of blue-green algae can produce neurotoxins and cause skin rashes or stomach sickness. For now, the researchers said, the blooms in the Delta remain at moderate concentrations and the risk posed to humans appears minimal. Nor is there a direct threat to the urban drinking water supply, because the

bloom hasn't grown thick enough to clog water intakes or overwhelm the treatment plants that remove toxicity.

Last year, a massive bloom of a similar type of algae in Lake Erie prompted officials to temporarily shut down the drinking water supply in Toledo, Ohio. A bloom of that level in the Delta could be devastating for the state.

About 25 million people from Napa to San Diego depend to some degree on fresh water diverted from the Delta, along with about 3 million acres of irrigated farmland. Half of all the freshwater runoff in California travels through the estuary, which also provides critical habitat to several threatened and endangered fish, including its namesake smelt.

"The fact we're seeing increased prevalence of microcystis blooms should be a cause for concern, because those can be directly toxic to the fish that we're trying so desperately to save," said Brian Bergamaschi, a biogeochemist with the U.S. Geological Survey who captained the 26-foot research vessel.

Bergamaschi and other researchers are trying to pinpoint an exact cause of the bloom. He questions whether a new state-constructed salinity barrier inside the Delta may be playing a role.

This spring, state officials installed a $28 million stone dam on the False River, which branches off the San Joaquin River near Oakley. It's intended to help keep Pacific Ocean saltwater from pushing deeper into the estuary, which could make Delta water too salty to drink or use on crops. Crews plan to remove the barrier in October.

"They stuck in this drought barrier, and that's kind of completely changed flows," Bergamaschi said. He noted that during his team's sampling run they found the largest microcystis concentrations nearest

the barrier on the freshwater side of the dam.

In most years, when saltwater begins to encroach deeper into the Delta, state and federal water managers repel it through a combination of efforts: turning off the massive pumps that suction water from the Delta for export to farms and cities; and releasing more water into the Delta from upstream reservoirs.

This year, pumping for water exports is at less than 10 percent of normal. Water managers also have limited cold flows out of Shasta Dam in a desperate attempt to protect an endangered salmon run. They've been draining the Folsom and Oroville reservoirs to make up the difference.

Paul Marshall, who heads the Bay-Delta Office for the state Department of Water Resources, said that without the barrier blocking the saltwater, dam managers would need to release an additional 969 million gallons each day from upstream reservoirs to keep the salinity levels in check.

"What the barrier is really doing is it is accomplishing with rock what we'd normally do with extra flow," Marshall said.

Marshall acknowledged the barrier could be a factor in concentrating the algae, particularly on days when the winds are pushing currents that direction. Still, he said wind gusts from a different direction could push the algae to other places, so it's hard to say how much the barrier is contributing to the problem without more data.

Bergamaschi's team will continue to collect such data, in hopes of preventing a bloom recurrence in future years. He is working in concert with NASA scientists, who are using satellite imagery and other technology to identify patterns in the Delta ecosystem that may be contributing to the algae blooms.

But researchers said there is little they can do about the current bloom, except watch and wait and hope it doesn't cause a massive fish kill. In the best case-scenario, flows in the Delta will get colder and faster with more releases from the dams and winter rains, killing the algae or flushing it out to sea.

"Once you get a big bloom, you really can't do anything about it until it's over," said Moyle, the UC Davis researcher. "It has to run its course. We have to hope it doesn't develop to anything bigger than it is right now."