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TITLE: Mass fish deaths: Lab test sheds further light on algal bloom

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POSTED: 04 Mar 2015 07:39

URL: <http://www.channelnewsasia.com/news/singapore/mass-fish-deaths-lab-test/1693212.html>

TODAY reports: A commissioned laboratory test suggests *Gymnodinium mikimotoi* - a species of algae that is not known to cause any effect to humans - is behind the deaths.

SINGAPORE: Laboratory tests of a seawater sample taken off Pasir Ris have zeroed in on the type of algae that [wiped out massive quantities of farmed and wild fish](#) in recent days.

The species of algae behind the mass fish deaths off Pasir Ris likely belongs to the *Gymnodinium* group. It is suspected to be *Gymnodinium mikimotoi*, according to the experts at DHI Water & Environment, but the exact species can only be confirmed through further genetic tests. *Gymnodinium mikimotoi*, also known as *Karenia mikimotoi*, is [not toxic to humans](#), but has been associated with massive kills of wild and farmed fishes in Japan and Korea.

[TODAY commissioned the laboratory test on Tuesday](#) (March 3) using a water sample provided by a fish farmer operating off Pasir Ris. The sample was taken last Saturday when most affected fish farmers reported the sudden deaths of their stocks.

The test showed concentrations of the algae at 88,529 cells per millilitre – a “very, very high” concentration, according to Dr Hans Eikaas, head of environmental technology and chemistry at DHI, a not-for-profit group offering consultancy and water-modelling services.

Concentrations above 10,000 cells per millilitre are considered a full algal bloom by any international standard, he said. Seawater in normal conditions contain 200 to 300 cells per millilitre and comprise 100 or more different plankton species. Dr Eikaas said the algae bloom was the main cause of the fish deaths, with the algae likely clogging up the gills of the fish.

But ammonia in the seawater probably magnified the scale of fish deaths. Ammonia is a waste product of fish, and is also produced when bacteria decomposes organic matter without oxygen. More ammonia is produced when water is warm, and when there is more organic matter, such as when algae dies. In gas form, it is toxic to fish and can cause convulsions and death, said Dr Eikaas.

Water rich in ammonia and nitrogen is advantageous to algae in the *Gymnodinium* group. Warm water, which the Republic has seen in recent weeks, also stresses fish out. These factors mean “multiple blows” dealt to the marine life, Dr Eikaas said.

“I would assume ammonia building up could have caused sub-lethal toxicity to the fish – mainly, their gills get inflamed. Then algae doubles every 24 hours ... (and the deaths) appear like a sudden event,” he explained. The algae would have taken about a week to bloom to the level shown in the lab test, he added.

If the suspected species is indeed the *Gymnodinium mikimotoi*, [the algae is not known to cause any effect to humans](#) who have eaten affected fish, Dr Eikaas said. Associate Professor Lim Po Teen of the University of Malaya's Institute of Ocean and Earth Sciences said nutrient-rich coastal waters from human activities are believed to be the triggers of algal blooms.

Another source of the problem is the introduction of algae species through ships' ballast water. Efforts to mitigate harmful algal blooms so far include setting up perimeters at aquaculture farms and reduced feeding of farmed fishes, he said.

Dr Eikaas said the recent harmful algal bloom is a natural occurrence that is almost impossible to prevent, but with a monitoring system and simulation forecasting programme, it is not impossible to get a heads-up on. "With regular daily monitoring, we should have had several days' lead time on this," he said.

According to the Smithsonian National Museum of Natural History in the United States, *Gymnodinium mikimotoi* is associated with recurring blooms off the coasts of Japan and Korea and are associated with massive fish and shellfish kills. Blooms have also been reported in Australia, Denmark, Norway and Scotland.

Farmers contacted on Tuesday said they have spent recent days clearing dead fish from their farms. Some expressed hope that the [Agri-food and Veterinary Authority](#) would provide financial assistance, while others said they would relocate if given the chance.

Fish farmer Simon Ho said his entire stock of over 30 tonnes of silver pomfret was wiped out. Marine Life Aquaculture chief operating officer Frank Tan said the company's offshore operations lost 120 tonnes of four-finger threadfin and sea bass. The company had previously identified two sites – near the Southern Islands and Pulau Tekong – as possible areas to move to, but Mr Tan said that with different conditions such as bigger tidal waves, a move would entail a change of operations and re-investment.

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