

comment & analysis

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MORE INFORMATION NEEDED TO PREVENT FUTURE OUTBREAKS

The science behind the fish deaths

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Up to 600 tonnes of fish from 55 farms here have been lost because of an algal bloom in recent weeks. A plankton bloom last year cost 53 farms about 500 tonnes of fish.

Senior Minister of State (National Development) Maliki Osman told Parliament last week that the Agri-Food and Veterinary Authority (AVA) will help farmers develop contingency plans to reduce losses in future episodes. The AVA will not impose a minimum production requirement on affected farms this year, he added.

Dr Maliki, who was speaking dur-

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Dead marine life washed up ashore along Pasir Ris Beach two weeks ago. TODAY FILE PHOTO

ing the annual session to scrutinise his ministry's budget, also pointed out the need to better understand the science behind the phenomenon, adding that the AVA is working with various agencies — the National Environment Agency, National Parks Board, water agency PUB and the National University of Singapore's Tropical Marine Science Institute — to study the relationship between plankton blooms and fish deaths.

This is a timely announcement.

Episodes of plankton bloom have occurred in Singapore since 2009, but there is still a dearth of science — at least in the public domain — on this natural occurrence, leading to unanswered questions.

For instance, were the causes of fish deaths in the West Johor Strait off Lim Chu Kang (which occurred two weekends ago) and the East Johor Strait off Pasir Ris (which occurred three weekends ago) different? How have the plankton bloom episodes over the years, and species involved, differed? Is a more sophisticated system of water monitoring needed?

Contributing factors suggested by the public, such as the damming of Punggol Waterway and lack of water flow due to the Causeway, also deserve answers.

WHAT WE KNOW SO FAR

The AVA has said preliminary findings point to the *Karlodinium veneficum* species of algae behind the East Johor Strait bloom. But some nuances in the narrative that farmers who suffered the heaviest losses did not take precautionary measures early enough need fleshing out.

The authority sent an alert to farmers on Feb 16 and 17 informing them of elevated plankton levels and advised them to deploy canvas bags, harvest their fish early to cut losses and transfer stock to unaffected areas.

Farmers said the early warning was good. Many had canvas bags ready to be deployed on their farms, as well as emergency plans such as towing their farms away from the affected areas. But the devil is in the timing and execution of measures.

"It's quite easy to plan, but difficult to do it ... You can put fish in canvas bags for a few days, but you'd have to know a few days beforehand (to do so) and you can't have so much fish," one farmer said.

Signs displayed in this episode were also different from last year's, fish farmers told TODAY. Low dissolved oxygen levels were blamed in last year's bloom, but it was not a

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factor this time, going by their own tests, they said. Some professed not to know very much about harmful algal blooms.

Marine expert Lim Po Teen of the University of Malaya said different responses are needed for different algae species. Physical barriers such as canvas bags are futile if they are not set up before the bloom hits, he said.

Some algae species irritate fish gills, causing the gills to be covered with mucus and the fish gasp for air near the water surface and suffocate. For these species, filtration of water and aeration tend to be helpful, said Associate Professor Lim.

But other algae species (most dinoflagellates) produce some form of neurotoxins that directly kill fish and aeration will not help in these situations, he said. "It is crucial to know what we are dealing with. If we cannot confirm what is the cause of fish kills, then we are not ready to manage it."

Experts also said that while aquaculture in areas with regular harmful algal blooms can be precarious, the negative impact can be mitigated with improved monitoring and predictive capabilities.

The AVA said it routinely surveys water temperature, pH, salinity and dissolved oxygen around farming areas, encourages farmers to notify it of unusual fish or water conditions, and provides early alerts. But it did not say if the routine readings are shared with farmers.

Singapore could look at the monitoring programmes used by the aquaculture industries in New Zealand (done by private research agencies with costs covered by the farmers) and Japan (done by fishery cooperatives and the local government), suggested Assoc Prof Lim.

Some mitigation options suggested in scientific literature include remote sensing to detect chlorophyll-a (a specific form of chlorophyll used in oxygenic photosynthesis) and other algal pigments in the water, said Dr Angela Capper of James Cook University's College of Marine and Environmental Sciences.

"Molecular approaches are a progressive tool playing a key role in the identification of harmful algal bloom species. Satellite and predictive modelling based on a range of ... parameters including climatic conditions and sea-surface temperatures also assist with the implementation of mitigation strategies," she said.

PSI FOR WATER?

Perhaps, what the authorities have done with air quality data can be replicated for water quality. Pollutant Standards Index readings are publicly available online and air-quality reporting was improved last year. With better and readily available data, farmers with an appetite for more information, and researchers and marine enthusiasts — who have been tirelessly doing shore walks to monitor dead fish — would benefit.

Timely consumer alerts would

“The food-fish farming industry, while relatively small, deserves an appropriate injection of research and capital if the commitment is to keep it afloat. The public ought to be better informed about the food they eat and challenges facing those who supply that food.”

also inform the public and prevent rumour-mongering during plankton blooms.

The AVA has informed the public that fish samples from affected farms do not contain marine biotoxins and that fish harvested from local farms are safe to eat, but the public should also know causes of the fish deaths, the plankton species identified, whether it is safe to play in waters near affected areas and what developments to expect.

The closed-containment aquaculture systems being developed will be part of the solution, although a farmer said it may be too costly to use for the entire duration of the fish's life and that the flesh of fish farmed in open waters is better.

The food-fish farming industry, while relatively small, deserves an appropriate injection of research and capital if the commitment is to keep it afloat.


The public ought to be better in-

formed about the food they eat and challenges facing those who supply that food.


On-the-ground efforts of marine enthusiasts ought to be complemented by academic research and findings that are openly shared.

Clearly, we need more science in the public domain to make progress on fish-kill episodes so that when the next plankton or algal bloom occurs in Singapore waters, fish farmers will be better equipped to cope.

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