

Faith Coleman

Dear ECR committee members,

I write to you as a submission to your inquiry regarding the South Australian *Karenia mikimotoi* bloom.

The bloom, while initially thought to be a single species, is now made of several *Karenia* species (a natural part of bloom maturity), with the full range of species present subject to great debate. The taxonomic uncertainties around this genus are vast and (apart from differentiating from the highly toxic *Karenia brevis*) are probably of limited practical immediate use when discussing the formation, impacts and management of the bloom. The species mix will be of more use in the future when discussing new thresholds for species of concern, and for comparing this bloom to future blooms.

The cause of this bloom is clearly the effect of a record-breaking marine heatwave, with two previous (but milder) hazardous inter-gulf blooms likely triggered as a result of previously record-breaking marine heatwaves in 1982 and 2013. There is also a clear relationship between mixotrophic dinoflagellate blooms and marine heatwaves in other parts of the world, as these extreme events cause ecological distress, releasing the organic nutrients and encouraging bacterial growth, which is the preferred food sources for this clade of species when in a rapid growth phase (blooming). These organic or regenerated nutrient sources are not generally consumable by other groups of phytoplankton. These other groups of phytoplankton are at an ecological disadvantage during these events, particularly in our oligotrophic (low nutrient) waters. I can provide you with evidence of these statements; however, I suspect others will have already done so.

While long-term aspects such as poor land management, dredging, pollution, historic overfishing and habitat removal are likely to have reduced long-term resilience of our marine habitats to these types of events since European colonisation, the impacts of climate change are the most evident and apparent trigger for this particular bloom.

The socioeconomic impacts of this bloom have been extensive; however, the community's response to this bloom has been heartening. Individual and community concern regarding the impacts on our precious marine ecosystems, along with our community's willingness to learn and change in an attempt to protect this key aspect of South Australia's identity and

sense of self, has given me hope that there is the political will and willingness to address the twin crisis of climate change and biodiversity loss, at a state and national level.

The South Australian and Commonwealth governments have been slow to respond. The messages now being broadcast are mixed, focused on economics and are often reactionary. Some of the current official narratives are out of tune with those that have been the voices of this issue since it was first observed, who, even when their income has been threatened, have almost universally prioritised their concerns about the long-term health of the marine environment over their short-term economic concerns.

Those who have been out on the water, documenting the impacts, and those who were (in many cases still are) leading the science in the public sphere have been poorly recognised and integrated within the current government monologue. With the increased unpredictability of the climate, this alternating “Nothing to see here” and “Move aside, the Government is here to save the day” approaches to wicked, adaptive issues are becoming less and less effective, meaning that all levels of political power (including community) need to become more comfortable with collaboration and uncertainty.

All of these things are symptoms of being entirely unprepared. As an elderly academic mentor said, who rang me when he heard of this bloom in interstate media “it is funny, Faith – It is as if we [as scientists] have so long been saying that these events will happen, that decision makers completely missed it, when we started saying ‘it’s here.’”

The various governments' lack of preparedness and slow response to community distress has led to a range of conspiracy theories, which could have been avoided with some well-timed responses to community concerns. However, it has a silver lining. This lag in response gave the community the incentive to explore how much power the Australian public has been handing over to agencies, expecting our public sector to know and do everything. When shown how to do it themselves, many within the impacted communities decided that they were perfectly capable of collecting their own data, forming their own networks of knowledge with independent scientists and collectively deciding the most appropriate ways forward, for themselves.

There is very little that can be done with a bloom this size, once it is here, however, there are a range of things we can do to minimise impacts, ensure people feel heard, build more resilient futures and prevent future blooms.

1. We need to stop approving new fossil fuel facilities, reduce domestic consumption of fossil fuels and invest in ways to draw down on greenhouse gases already polluting our atmosphere.
2. We need to be entirely transparent with government-collected data.
3. We need to encourage our public servants to take risks and lean into their work being the catalyst and facilitator of collective change, rather than the gatekeepers of knowledge.

4. We need to provide some form of support for those science professionals at the forefront of these health and environment related issues, who (time and time again) ring the bell on events such as this, months in advance, invest significantly of their own resources, help support communities in distress, often run their own businesses at a loss, then see government agencies consume all the research and response funding, when the issue is finally taken seriously.
5. We need to collectively monitor and publicise the impacts of marine heatwaves and phytoplankton health, enabling us to provide rapid responses to community concerns regarding our marine zone, separate from aquaculture and aquaculture specialists.
6. We need to put a plan in place for the next marine heatwave-related bleaching event, fishkill or hazardous bloom, at a national level. If this means a national response plan for marine heatwave impacts or hazardous algae bloom-specific legislation, that is what it means; however, simply encouraging bloom or marine heatwave preparedness among and between the states should be a matter of priority.
7. As a key on-ground strategy, we need to spend an annual sum of approximately half a billion dollars per year (roughly 0.5% of our annual Australian Road budget) on marine habitat restoration over the next decade. This aquatic restoration work needs to focus on building ecological resilience, increasing the value of coastal fisheries, reducing coastal sand movement, providing nature-based solutions to sea level rise issues, sequestering carbon, and, most importantly, reducing the frequency and intensity of forecasted hazardous marine dinoflagellate blooms. This endeavour would also provide employment for impacted coastal industries, help facilitate a substantial increase in coastal fisheries productivity, enhance ecotourism and aesthetic values, potentially halve sand-carting budgets, and directly address the root cause of the issue.

In summary, I believe that we owe it to the hundreds of businesses impacted and the millions of dead sea creatures, to use this horrendous disaster as a learning opportunity and a springboard toward a brighter, more productive and more ecologically harmonious future. I would really appreciate your help in making that happen.

Yours truly,

Faith Coleman.