U3A Port Fairy

Sea Foam

Joan Powling

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What is sea foam and why does it occur?

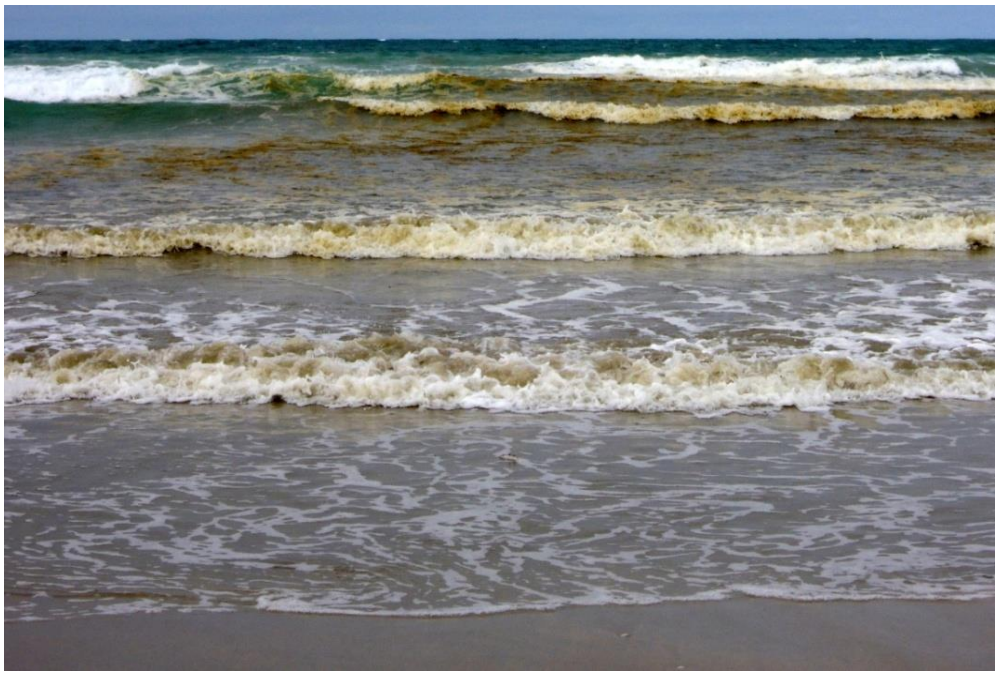
***Sea foam**, **ocean foam**, **beach foam**, or **spume** is a type of **foam** created by the agitation of seawater, particularly when it contains higher concentrations of dissolved organic matter (including proteins, lignins, and lipids) derived from sources such as the offshore breakdown of algal blooms.*

In Port Fairy in mid October the occurrence of a large amount of foam on the East Beach prompted queries as to its origin and whether it was harmful or not.

Firstly…..a little diatom revision

Cast your mind back to April this year. If you recall, an explanation of the causes and composition of the brown sludge on East Beach was provided. If you have forgotten what was said, or misplaced the article, here is a brief recap:

The brown sludge is a bloom of a tiny diatoms (diatoms are single-celled algae that live in houses made of glass. They are the only organism on the planet with cell walls composed of transparent, opaline silica).

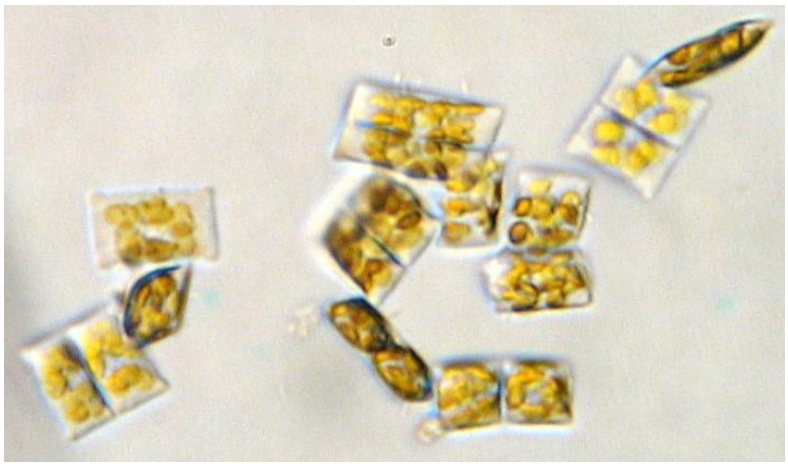


A sludgy diatom bloom on East Beach, April 2020

This diatom's environmental requirements are such that it only grows in the surf zone, that part of a wave where the foam is formed in extreme turbulence. If you look at the water just out to sea or between the wave and the beach you will see that it is quite clear of brown material.

April is roughly the time of the year that it turns up usually after or during wild and windy weather.

The diatom is called *Anaulis australis* and is only 20 microns (a micron is 0.001 mm) in width and about half that in length. It appears to have a hinge mid cell and has been reported from Surfers Paradise (the lowest latitude sighting in the literature), South Australia, Tasmania and South Africa.



Magnifications of the square and rectangular diatoms *Anaulis australis*.

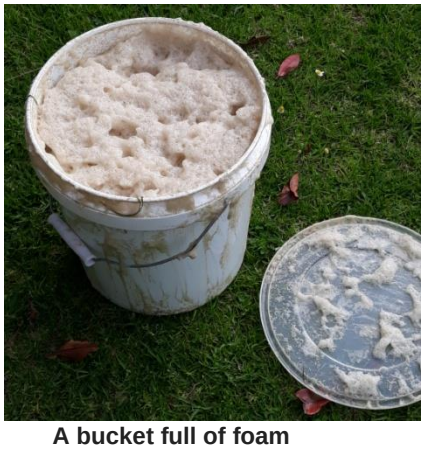
The good news is that, while it is not pretty, the sludge is apparently not harmful to humans.

OK, back to the sea foam

After some wild and windy seas in mid-October large amounts of white foam were reported on East Beach. This happens from time to time on our exposed beaches so obviously we need to know what it is and why it occurs.

So, on 15th October, John collected a bucket full of sea foam from the beach then left to settle overnight. Then, a small sub-sample of the dirty brown liquid which had settled out was collected in a vial and sent to me for microscopic examination.

Sea foam on the East Beach

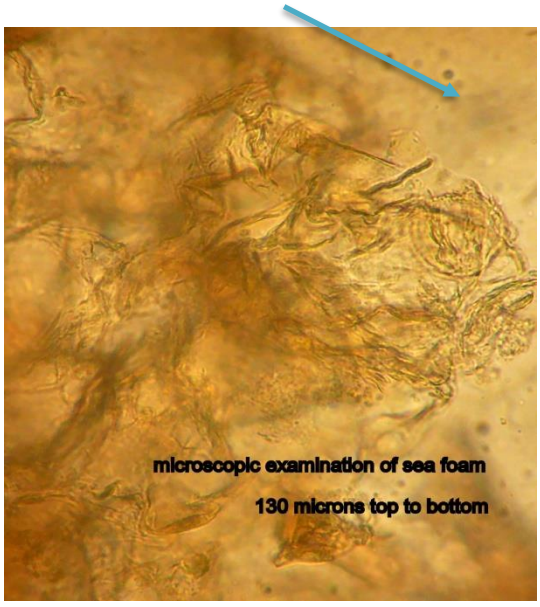


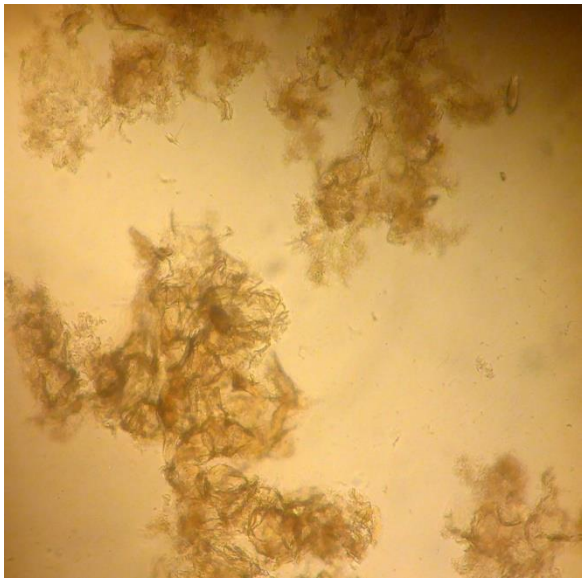
A bucket full of foam

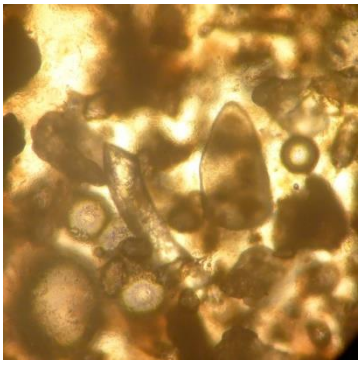
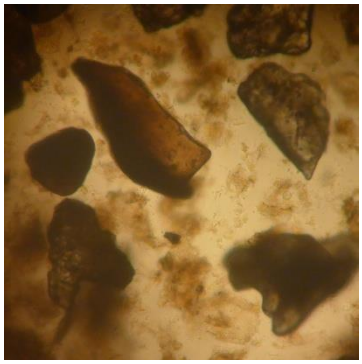
Settled liquid for examination

I had looked at this material once before, many years ago, and had found nothing recognizable. It was the same this time except for the presence of one or two (no more than that) of the diatoms responsible for the brown scums which have been reappearing along the East Beach for several months. The scums are a common occurrence along the coast line and have been for several years.

Microscopic examination (x400) of the settled foam sample revealed this amorphous mass, shown in the two pictures below. One surf diatom can hardly be seen in top right of right-hand photo and below (all pictures taken 20th October 2020).





Left x400: A solitary surf diatom (*Anaulis australis*) observed in foam sample; Centre x100: microscopic bubbles of air amongst sand and or other particles (it was difficult to get a clearer picture without squashing the air out of the bubbles); Right x100: mixture of solid grains and decomposing organic material (floc).

Conclusion?

So, it seems that while the surf diatoms are present in the foam it is more likely that the foam results from a mixture of dissolved organic material, much of which probably washed into the bay by the heavy rains that fell over the Moyne River catchment on 7 and 8 October 2020, and then roughly agitated by strong winds and wave action.

Some further reading

https://en.wikipedia.org/wiki/Sea_foam

The section on Sea Foam on Wikipedia is most comprehensive and is recommended reading in order to learn more. It is a global phenomenon and Australia has its fair share of sea foam events. Between August 2007 and July 2020, Australia features in a list of Notable Occurrences of Sea Foam, the most recent of which was in March 2017, at Sarina Beach in Queensland whipped up by Cyclone Debbie. The entry contains an interesting diagram explaining the difference between sea foam and sea spray formation.

The two photos below are from the web. The bottom image is from the Sunshine Coast in Queensland. Both seem to have a pinkish tinge as does the foam in bucket sample from East Beach.

Image from East coast of the USA
https://www.popsci.com/science/article/2012-11/fyi-what-causes-sea-foam-and-it-dangerous/

Image from Sunshine Coast, South-east Queensland

https://www.oceanwatch.org.au/latest-news/coastal-marine/what-is-sea-foam-and-why-does-it-happen/