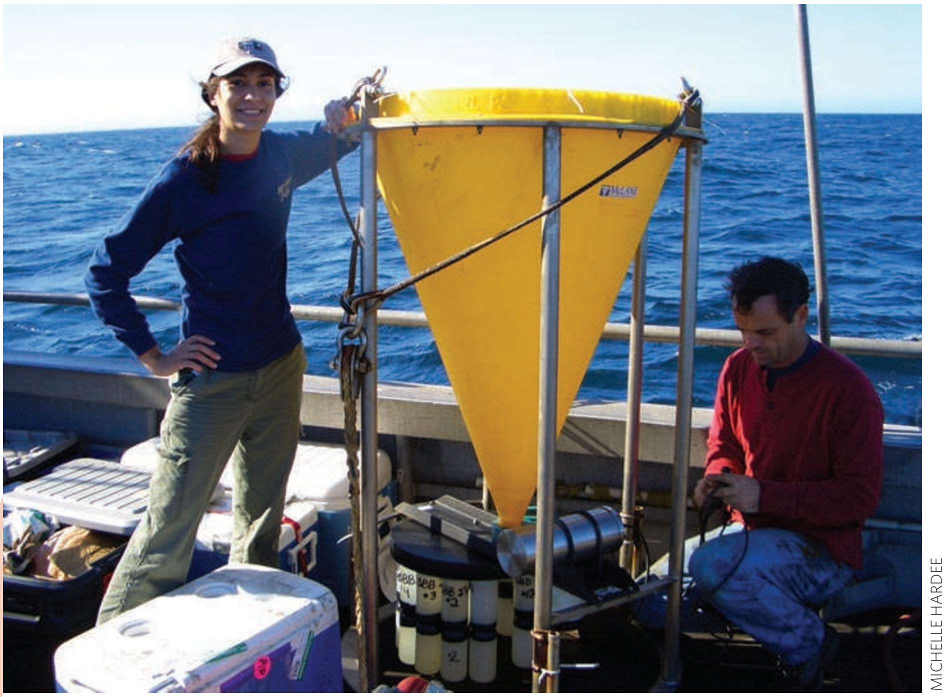
Tracking toxins

Emily Sekula-Wood and colleagues held their breath as they waited for results to rise up from the depths of the coastal ocean off California.



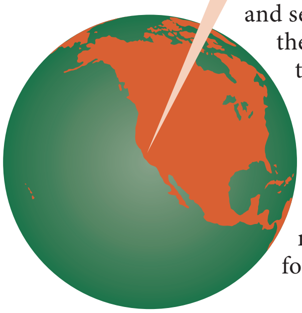
Emily Sekula-Wood and Eric Tappa prepping the sediment trap before sending it to the bottom of the Santa Barbara Basin.

What was the objective of the work?
The marine diatom *Pseudo-nitzschia* produces the neurotoxin domoic acid. Blooms of this alga are held responsible for the high concentrations of domoic acid found along the west coast of the United States, which have resulted in beach closures, shellfish poisoning and mass mortalities of marine animals. However, it was not clear to which extent *Pseudo-nitzschia* blooms influence organisms in the deep ocean. Some researchers have suggested that any toxin not taken up by organisms in the upper ocean will be photo-degraded. We wanted to see whether domoic acid sinks below the sunlit zone, where it could influence deep-water and sediment-dwelling organisms.

Why did you choose this particular location for the fieldwork?
Southern California was an obvious choice, as toxic *Pseudo-nitzschia* blooms and marine mammal poisoning are common here. The Santa Barbara and San Pedro Basins were especially ideal, as sediment-trap programmes had already been established by researchers at the universities of South Carolina and Southern California.

What sorts of samples were you after?
To get a handle on the amount of domoic acid transported to depth, we collected detritus using sediment traps moored at ~550 and 800 m depth. At the surface we collected monthly seawater samples. Using these samples we were able to measure the amount of toxin, and the abundance of *Pseudo-nitzschia* cells, in the surface and deep ocean.

Any low points?
The coastal waters along our research site are often frequented by marine mammals and seabirds. Normally, these wild creatures take flight when approached by scientists. But during toxic *Pseudo-nitzschia* blooms, it is not uncommon for sea lions to become highly aggressive towards humans; indeed, we had several close encounters when sampling during toxic blooms. This behaviour is thought to result from domoic acid poisoning. Worse still, some animals can suffer seizures and in some cases become entirely comatose and die during bloom periods. Seeing how tiny algae can have such a profound effect on sea lion behaviour and physiology only strengthened our commitment to this research.



What was the highlight of the expedition?
When your scientific equipment (in this case a sediment trap) has been sitting at more than 500 m depth for the past six months, there's always the chance that something will go wrong. On each cruise, we held our breath the moment we sent the signal to release the sediment trap from the anchors. As we waited for the trap to float back to the surface we would compete to see who could spot it first. The highlight was seeing the bright yellow float pop-up at the surface and thinking "Yes! We got it!"

Did the trip give you any ideas for future research projects?
Yes! We are thrilled with the results of the project and our new insights into the biogeochemical cycling of natural toxins. We are now expanding our research in the Santa Barbara Basin by adding a second sediment trap — at 150 m depth — to investigate the loss of toxin as particles sink. Also in the planning stages is a transect of cores — from the low oxygen centre of Santa Barbara Basin to the coast — to examine domoic acid retention in bottom sediments and the effect of oxygen concentration on toxin preservation. Hopefully this work will inspire other algal-bloom researchers to think of toxin cycling and longevity in new ways.

This is the Backstory to the work by Emily Sekula-Wood and colleagues, published on page 272 of this issue.