

Making the paper

KENNETH L. SMITH JR

Migrant icebergs are hot spots of ocean production, enhancing export of organic carbon to the deep sea.



Ken Smith at sea (foreground).

Icebergs have been a fascination to Ken Smith since his first oceanographic cruise to the Antarctic over 30 years ago. Approaching from the north by ship, these drifting islands of ice were the first visible vanguard of the ice-shrouded continent, appearing in many configurations from large tabular shapes to pinnacles. On many subsequent cruises, he observed a preponderance of seabirds around icebergs and wondered what else they were home to. "I always thought that these magnificent ice sculptures with their large underwater mass would be havens for marine life," he says.

Some years later, Smith and his postdoctoral student at the time, Ron Kaufmann, placed a series of upward-looking acoustic arrays in the northwest Weddell Sea to image the pelagic communities associated with the advancing and receding of the seasonal pack ice. On recovering the arrays, the images from one revealed that a large iceberg had drifted over in clear water free of pack ice. "It was immediately obvious from the acoustic data that something of interest was going on," says Smith. They found that there was a significant increase in the acoustic backscatter from zooplankton and nekton in the water immediately surrounding the icebergs compared with the open water some distance away. This was the first evidence that there was an enhanced

community of such organisms associated with these drifting islands of ice, which could increase productivity in the Southern Ocean as well as the export of organic carbon to the deep sea.

Smith assembled a national group of colleagues interested in icebergs during 2000 and together, over the next few years, they wrote several unsuccessful proposals to the National Science Foundation (NSF) asking for funding to conduct a multidisciplinary study of these drifting islands in the Southern Ocean. Eventually, however, he was successful in obtaining a small grant for exploratory research from the NSF to take a group of researchers to the Weddell Sea on a single cruise. Bringing together a range of experts in a variety of disciplines from MBARI, USD, USC and UCSD, the cruise departed from the southern tip of Chile on 27 November and was able to study two free drifting icebergs in the northwest Weddell Sea before returning to the same port on 27 December 2005.

"I was really surprised that our early results confirmed our suspicions that icebergs have an important influence on the neighbouring pelagic ecosystem," says Smith. Over the following year, the team met a number of times to develop an iceberg ecosystem scenario that fitted with these results. Eventually, this effort led to a collaborative paper published in *Science* (doi:10.1126/science.1142834; 2007). Smith and his colleagues have now secured renewed funding from the NSF to continue these preliminary iceberg studies in greater detail over the next three years. The hope is to finally resolve the importance of icebergs, from the drawdown of carbon dioxide during photosynthesis to the sequestration of particulate organic carbon into the deep sea.

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