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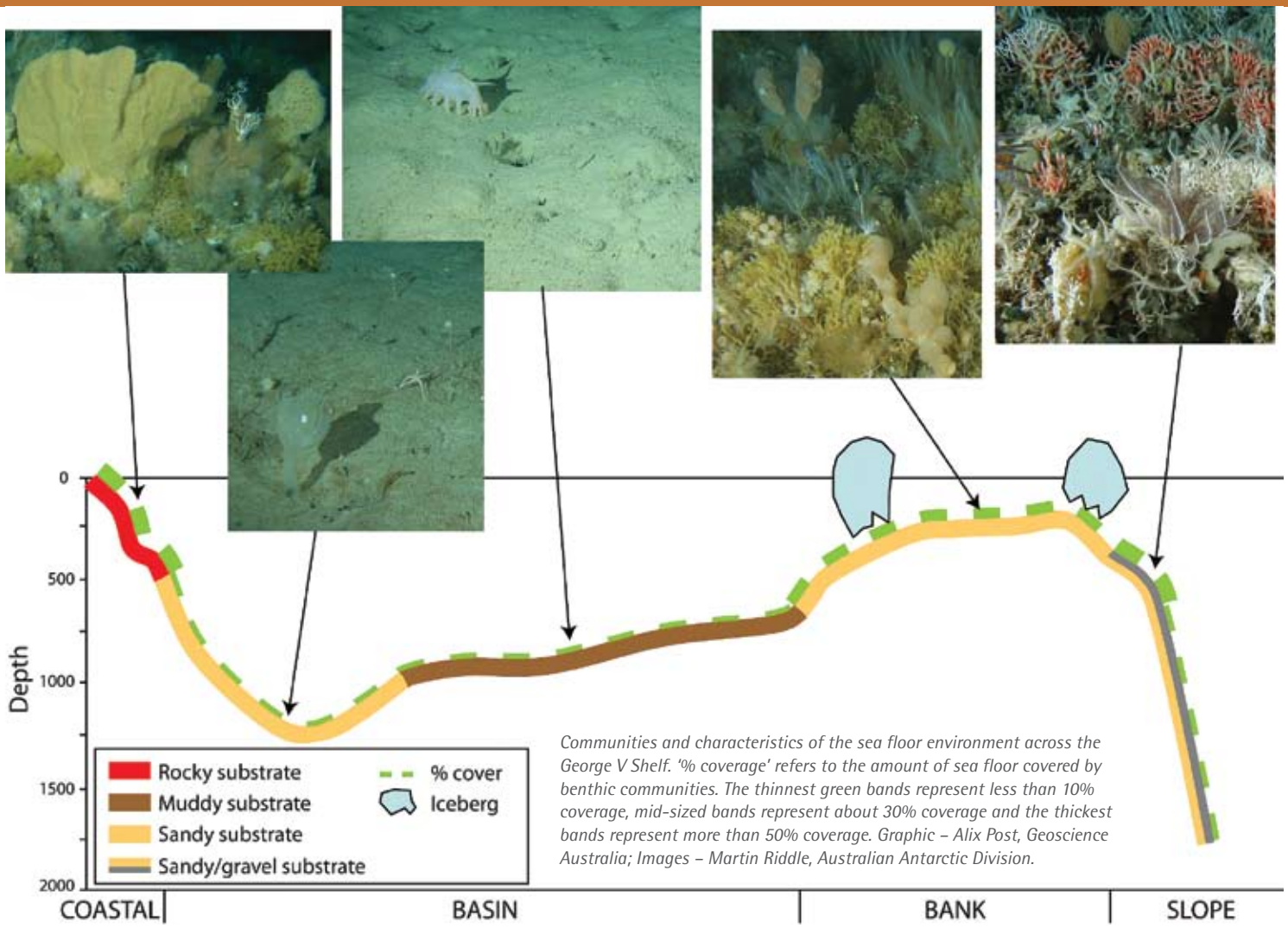


Communities and characteristics of the sea floor environment across the George V Shelf. '% coverage' refers to the amount of sea floor covered by benthic communities. The thinnest green bands represent less than 10% coverage, mid-sized bands represent about 30% coverage and the thickest bands represent more than 50% coverage. Graphic – Alix Post, Geoscience Australia; Images – Martin Riddle, Australian Antarctic Division.

SHEDDING LIGHT ON THE SEA FLOOR

In 2007–08 scientists from Australia, Japan and France set out to survey the marine life and habitats in the region adjacent to Terre Adélie and George V Land in East Antarctica (*Australian Antarctic Magazine* 14: 2-13, 2008). The Collaborative East Antarctic Marine Census (CEAMARC) – part of Australia's contribution to the International Polar Year – aimed to understand the processes that have lead to the evolution and survival of marine life existing in the region today, so that scientists can predict how these organisms may respond to future climate-related changes in their environment. Scientists involved in the census are now finalising the collation and analysis of data and the following pages (13-18) provide an insight into some of the results. The team aims to publish its findings as a series of papers in a special volume of a scientific journal in late 2010.

A vast proportion of life that dwells on the sea floor has never been seen by human eyes. This is a fascinating problem for marine scientists, but concerning for the marine managers who need to know what is living on the sea floor, and where it is located, so that communities which are unique or vulnerable to human activities can be protected.

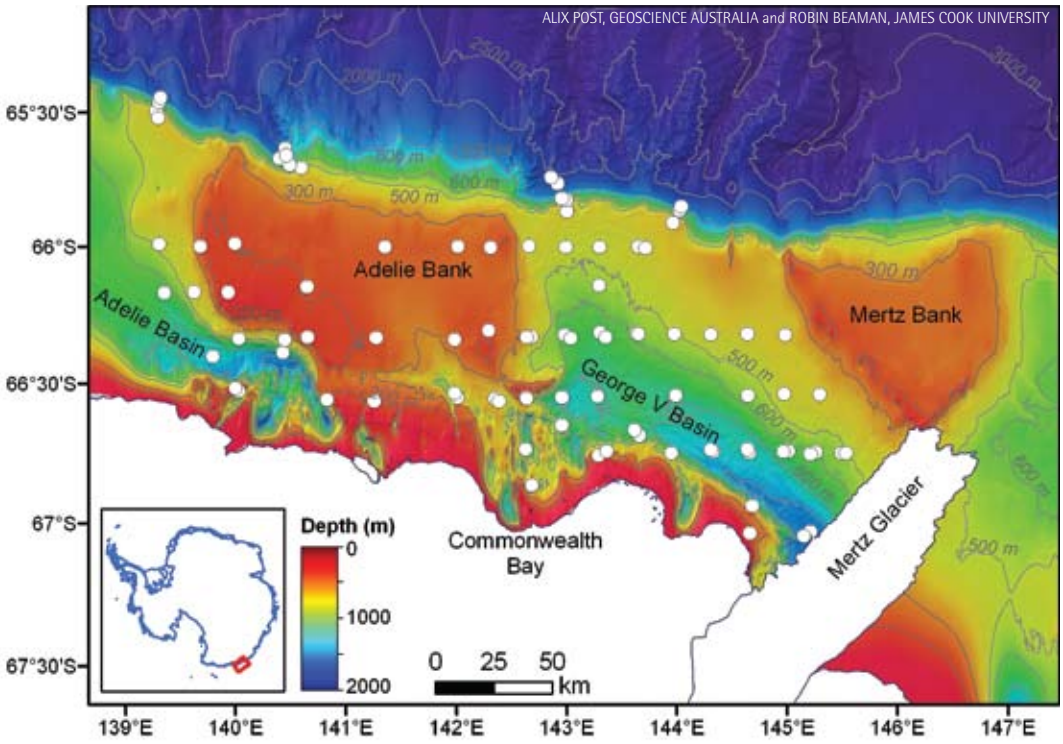
Scientists working aboard the *Aurora Australis* during the 2007–08 Collaborative East Antarctic Marine Census voyage were determined to unlock the secrets of these 'benthic' (sea floor) communities in the George V Shelf region off East Antarctica. Using underwater video and still cameras, we collected 15 hours of video footage and 1800 still images of benthic animals living at depths ranging from 140 m to more than 2000 m. This imagery revealed a vast array of organisms and communities, including deep-sea corals, which are so unique and fragile that they were immediately protected as 'Vulnerable Marine Ecosystems' by the Commission for the Conservation of Antarctic Marine Living Resources (*Australian Antarctic Magazine* 15: 19, 2008). We have since viewed and interpreted all of the footage to work out where different organisms live, and why they live there.

To do this we recorded the types of animals we could see in the footage and characteristics of the physical environment, such as the nature of the sea floor sediments (mud, sand, gravel, pebbles, cobbles, boulders), the sea floor relief (flat, low, moderate, high), and sea floor features such as iceberg scours, ridges and ripples. This process allowed us to build up a picture of what is living on the sea floor and the types of environments the animals live in.

A detailed bathymetry (depth) model and the sediment samples collected during the voyage also helped us to understand how the benthic communities related to the different environments within the study area. These datasets reveal that the George V Shelf is far more complex and rugged than was previously thought. The expansion and flow of ice streams across the George V Shelf during past glaciations has created deep glacial basins extending to 1200 m. Shallow (200–250 m) outer shelf banks mark the edges of the expanded ice streams, and rugged nearshore depressions were created by the advance of smaller glaciers (below). The deep glacial basins have since been draped with thick, muddy sediments. The shallow banks, in contrast, are prone to erosion and iceberg scouring and generally have only a thin cover of sandy sediments.

The differences in depth and sediment type between the basins and banks creates distinct environments for the sea floor animals. We found that benthic communities varied according to water depth, the type of sediment and the sea floor relief. The deep basins with their thick sediments, for example, have high numbers of mobile animals that forage in the sediments for food, while the shallow banks have high numbers of stationary animals that attach to the hard substrates commonly found there (figure on page 13).

So far, this analysis has revealed the way in which sea bed communities are governed by environmental properties, but these communities represent only one layer of this marine ecosystem. Australian, Japanese and French researchers are currently analysing samples collected from the sea surface and the water column to look at the distribution of 'pelagic' communities. Our aim is to combine these datasets to gain an understanding of the entire marine ecosystem, from the sea surface to the sea floor, and to start to explore how the ecosystem as a whole responds to environmental conditions. By understanding where different communities in this ecosystem occur and the interactions between them, we will be able to better protect the biota on this Antarctic shelf.



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More information

A.L. Post, P.E. O'Brien, R.J. Beaman et al. Physical controls on deep water coral communities on the George V Land slope, East Antarctica. *Antarctic Science* (in press) http://journals.cambridge.org/repo_A74VLUIs

Above: Map of sampling locations. White dots show the location of underwater video and still image transects.

Below: Oblique view across the George V Shelf through the deep Adélie Basin, across the rugged nearshore depressions and shallow Adélie Bank. The Adélie Basin is one of the deep basins carved out by ice streams during previous glaciations.