

LONG-HIDDEN SEABED

New and unusual seabed life, hidden by the Larsen A and B ice shelves for thousands of years, has been revealed by the first marine voyage of the Census of Antarctic Marine Life – the lead Antarctic biodiversity project for the International Polar Year, coordinated by the Australian Antarctic Division.

The ice shelves, which collapsed 12 and five years ago respectively, covered about 10 000 square kilometres of seabed in the Weddell Sea off the Antarctic Peninsula. When an ice shelf collapses it allows light, phytoplankton, zooplankton, and the sea floor animals that feed on this plankton, to return to the region. The return of this flora and fauna, however, is often disturbed by the scouring of icebergs born from the ice shelf collapse. The disintegration of the Larsen A and B ice shelves therefore provides an opportunity to observe the little-known environment under the shelves, and its inhabitants, and to follow the different steps in the recolonisation process.

Using sophisticated sampling and observation equipment, 52 marine scientists from 14 countries onboard the German research vessel *Polarstern*, studied the physical ocean properties and the region's flora and fauna, from the surface waters to the sea floor – up to 850 m deep.

The research was conducted over 10 weeks between November 2006 and January 2007 and involved: investigating early recolonisation stages and the impact of iceberg scouring on biodiversity; sampling and analysing unknown communities and their physical environment; and assessing the effects of present and future climate-induced changes on marine life.

'The break-up of these ice shelves opened up huge, near pristine portions of the ocean floor, sealed off from above for at least 5000 years, and possibly up to 12 000 years in the case of Larsen B,' said Dr Julian Gutt, a marine ecologist at Germany's Alfred Wegener Institute for Polar and Marine Research, and Chief Scientist on the *Polarstern* expedition.

'Until now scientists have glimpsed life under Antarctica's ice shelves only through drill holes. The collapse of the Larsen shelves may tell us about impacts of climate-induced changes on marine biodiversity and the functioning of the ecosystem. This knowledge is fundamental to understanding ecosystem function and will advance our ability to predict the future of our biosphere in a changing environment.'

Using a Remotely Operated Vehicle – an underwater robot equipped with video cameras – the team found that sea floor sediments in the Larsen zone ranged from bedrock to mud and harboured a variety of fauna. There was less iceberg scouring damage than expected, and in shallower depths to about 220 m, scientists observed a surprising richness of species.

'Iceberg disturbance was more obvious north of the Larsen A and B areas, where icebergs more typically



In the area of the Larsen A ice shelf scientists found these large, slow-growing glass sponges, which must have existed before the disintegration of the ice shelf in 1995.

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LIFE UNCOVERED

run aground,' Dr Gutt said. 'In those outer areas, at depths of about 100 m, we observed fresh ice scour marks everywhere and early stages of marine life recolonisation, but no mature communities. At around 200 m depth we discovered a mosaic of life at different stages of recolonisation.'

Among the surprises was an abundance of deep sea lilies, sea cucumbers and sea urchins at 200 m depth. These animals are more commonly found at around 2000 m where resources are scarce – conditions similar to those under an ice shelf.

Apparent newcomers to the region included dense patches of fast growing sea squirts, which likely colonised the Larsen B area after the ice shelf broke in 2002. In contrast, very slow-growing glass sponges were found at greatest density in the Larsen A area, where life forms have had seven more years to recolonise. Scientists believe a high number of juvenile glass sponges seen in the area probably indicate shifting species composition and abundance in the past 12 years.

Small clusters of dead clamshells found littering the ocean floor at 850 m depth, suggested the presence of a rare 'cold seep' – a sea floor vent spewing methane and sulphide. Seeps can create a temporary habitat for life in otherwise barren, inhospitable terrain, but when the seeps extinguish, the organisms that rely on them die.

Among hundreds of specimens collected, the team identified 15 potentially new species of shrimp-like amphipods, four new cnidarians (a group that includes corals, jelly fish and sea anemones)

and two new species of octopus. The animals will be examined in detail to confirm whether they are indeed new to science. New species will be entered into the Census of Marine Life Ocean Biogeographic Information System database (*Australian Antarctic Magazine* 10: 22) and its Antarctic counterpart, the Scientific Committee on Antarctic Research Marine Biodiversity Information Network (www.scarmarbin.be).

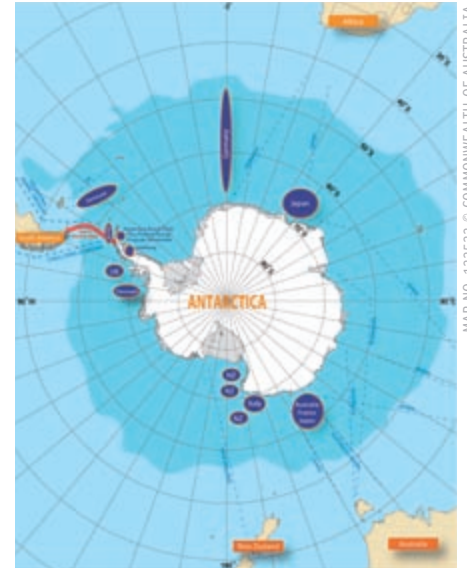
Fisheries investigations were also conducted during the voyage. Eighty-five hauls showed the biomass of two Antarctic cod species has increased since a survey in 2003, while stocks of Blackfin and Mackerel Icefish have decreased. These results will contribute to fish stock monitoring and assessment under the Convention on the Conservation of Antarctic Marine Living Resources.

Australian Antarctic Division Chief Scientist and Census of Antarctic Marine Life (CAML) leader, Professor Michael Stoddart, said the knowledge gained from the *Polarstern* expedition is just the 'tip of the iceberg'.

'Insights from this and CAML's upcoming International Polar Year voyages will shed light on how climate variations affect ice-affiliated species living in this region,' he said.

The Australian Antarctic Division will coordinate a further 13 voyages during the International Polar Year, including a joint Australian-French-Japanese expedition in early 2008.

Adapted from the Polarstern news release, 25 February 2007.



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This map shows the Census of Antarctic Marine Life voyages planned for the International Polar Year, and the countries undertaking the work. Dark blue areas denote benthic (sea floor) sampling. Dashed lines indicate areas where plankton in the open ocean will be sampled. Additional nations are providing historical data on marine biodiversity. All data will be incorporated into a database at www.scarmarbin.be.

More information and images can be found at: www.awi.de; www.caml.aq; www.coml.org; and www.cousteau.org/caml.html.



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The Remote Operating Vehicle was used to capture still images and video footage, and collect some samples, during the voyage.



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These deep sea cucumbers are abundant in the Larsen B area at depths of only 200 m. They are more commonly found at around 2000 m where resources are scarce – conditions similar to those under an ice shelf.



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This new Antarctic amphipod crustacean is nearly 100 mm long and belongs to the genus *Eusirus*.