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Melting ice gives birth to a strange New World

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Herds of sea cucumbers on the move, fields of sea squirts and forests of glass sponges. These were just some of the fantastic sights scientists captured on an underwater expedition to a remote region of Antarctica.

Marine biologists made a unique inventory of lifeforms on a part of the seabed that had been sealed off for thousands of years by massive ice shelves before they suddenly broke up. Waves of colonising plants and animals quickly moved in to exploit the new habitat which had opened up after a region of ice a third of the size of Belgium had disappeared and let in daylight and oxygen.

“This is virgin geography,” said Gauthier Chapelle of the International Polar Foundation in Brussels. “If we don’t find out what this area is like now after the collapse of the shelf, and what species are there, we won’t know in 20 years’ what has changed, and how global warming has altered the marine ecosystem.”

More than 50 scientists from 14 countries spent 10 weeks making the first comprehensive biological survey of the seabed underneath the Larsen A and Larsen B ice shelves, which disintegrated in 1995 and 2002 respectively.

They collected specimens of an estimated 1,000 species, including 15 shrimp-like amphipods that are probably new to science, including one 4-inch specimen that is the biggest of its kind. They also found four species of coral-like organisms called cnidarians, one of which was a new type of sea anemone, found living on the back of a sea snail’s shell.

A remotely controlled submersible took pictures of animals called glass sponges, growing in dense patches in the Larsen A area. By the Larsen B ice shelf, fast-growing gelatinous sea squirts moved in.

“These ice shelves collapsed due to regional warming,” said Dr Julian Gutt, who led the expedition from the Alfred Wegener Institute in Bremen, Germany.

“For the first time, we have the opportunity to study life in such an area. The break-up of these ice shelves opened up huge, near-pristine portions of the ocean floor, sealed off from above for at least 5,000 years and possibly up to 12,000 years in the case of Larsen B.”

Another surprise finding was the ability of deep-sea lilies – along with their relatives, the sea cucumbers and sea urchins – to adapt to the relative shallows of the Larsen seabed. Normally, these lilies are found at depths of 2,000 metres.

The scientists also saw minke whales and rare beaked whales moving close to the edge of

the pack ice that had been exposed by the lost ice shelves, said Dr Meike Scheidat, a German scientist on the team.

"It was surprising how fast such a new habitat was used and colonised by minke whales in considerable densities. They indicate that the ecosystem in the water column changed considerably."

One overwhelming conclusion from the expedition was that the marine ecosystem was in a state of flux after the changes in the space of just 10 years. "The collapse of the Larsen shelves may tell us about impacts of climate-induced changes on marine biodiversity and the functioning of the ecosystem," Dr Gutt said. "Until now, scientists have glimpsed life under Antarctica's ice shelves only through drill holes. We were in the unique position to sample wherever we wanted in the marine ecosystem considered one of the least disturbed by humankind anywhere on the planet."

The Larsen shelves were attached to the Antarctic peninsula, one of the fastest-warming regions, with temperatures 2.5C higher than 60 years ago. Since 1974, some 13,500sq km of ice shelves, which are attached to the mainland but float on the sea, have disintegrated in the Antarctic peninsula. Scientists fear more ice-shelf disintegration could lead to the rapid loss of glaciers and ice sheets from the continental mainland, and a consequent rise in global sea levels.

Dr Gutt said one question the scientists wanted to answer is whether the massive movements of ice was detrimental to the life-forms on the seabed. "During the disintegration of the shelves, many icebergs calved, and the question arises whether grounding icebergs only devastate life at the sea floor or whether such disturbance contributes to a high biodiversity.

"Iceberg disturbance was much more obvious north of the Larsen A and B areas where icebergs typically run aground. At depths of 100 metres, we saw fresh ice scour-marks everywhere and early stages of marine life recolonisation but no mature community. At about 200m, we discovered a mosaic of life in different stages of recolonisation."

The scientists also found small clusters of dead clamshells littering a dark area of the seabed which was probably the site of a mineral-rich "cold seep", spewing methane and sulphide, which had fertilised the region then petered out and starved the surrounding life-forms.

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