

# GETTING THE MEASURE OF SEA ICE

Scientists from eight nations will sail from Hobart to the sea ice zone east of Casey station (110-130°E) in August, as part of Australia's contribution to the International Polar Year.

Over 55 days the multi-disciplinary sea ice voyage, jointly organised by the Australian Antarctic Division and the Antarctic Climate and Ecosystems Cooperative Research Centre, will investigate the links between sea ice physics, sea ice biology and the pelagic (open ocean) food web in the region, during early spring. This is the time of year when longer daylight hours cause the snow and sea ice to melt, and biological activity in the ice and underlying water to rapidly increase.

The scientific team will study processes on the ice surface, as well as within and under the ice, using a suite of cutting-edge technologies. These include airborne laser altimetry, snow radar, and a remotely operated vehicle (ROV) equipped with multiple sensors to study the environment directly under the ice.

The sea ice around Antarctica is important for a number of reasons. Firstly, it helps to drive global

ocean circulation. When the sea ice forms, salt is excluded from the ice crystals, making the surface ocean waters denser and driving vertical circulation. To understand how this process might be affected by climate change we need to know whether the amount of ice that forms each year is changing. This means we need to know the thickness of the ice and the snow cover that sits on top of it.

Two new sophisticated airborne systems – helicopter laser altimetry and snow radar – will be employed to provide data from which we can calculate the thickness of both the ice and its snow cover. This will be the first time these two systems have been used over Antarctic sea ice, and the data we collect will help validate information received from new satellite sensors.

Surface measurements of the properties of the ice and snow cover will also form an integral part of this research programme, and scientists will measure snow and ice density and thickness on drifting ice floes, and conduct experiments and analyses in special freezer laboratories on the ship.

Sea ice also plays an important role in structuring Antarctic marine ecosystems and in the biogeochemical cycles of the Southern Ocean. It serves as a platform for marine mammals and birds, and provides a substrate for ice-associated communities consisting of various organism groups such as bacteria, algae and metazoans (larger, multi-cellular animals). In terms of biomass, these communities are



Sea ice cores will be used to determine many properties of the ice, including its crystal structure, salinity and the composition of algal communities within it.

generally dominated by algae, and their production accounts for up to 25% of overall primary production (photosynthesis) in ice-covered waters.

Sea ice communities provide an important food source for pelagic herbivores – such as krill and other zooplankton – during winter and early spring, when food supply in the water column is very low. Krill, a key species of Antarctic marine ecosystems, have been observed feeding on sea ice microbial communities, but it is still not known whether this is a major food source throughout the winter and over their entire geographic range.

The research team will use optical sensors on the ROV to measure the amount of algae on the bottom of the sea ice. A specially designed trawl net will also be used to sample the environment directly under the ice and will provide live krill that can be used for physiological experiments in the ship's laboratories.

The sampling programme will be complemented by an extensive sea ice coring and drilling programme, which together will increase our understanding of the physical and biological processes in the Antarctic sea ice zone and their effects on Antarctic climate and marine ecosystem function.

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*The Sea Ice Physics and Ecosystem Experiment will investigate links between sea ice physics, sea ice biology and the pelagic food web.*

