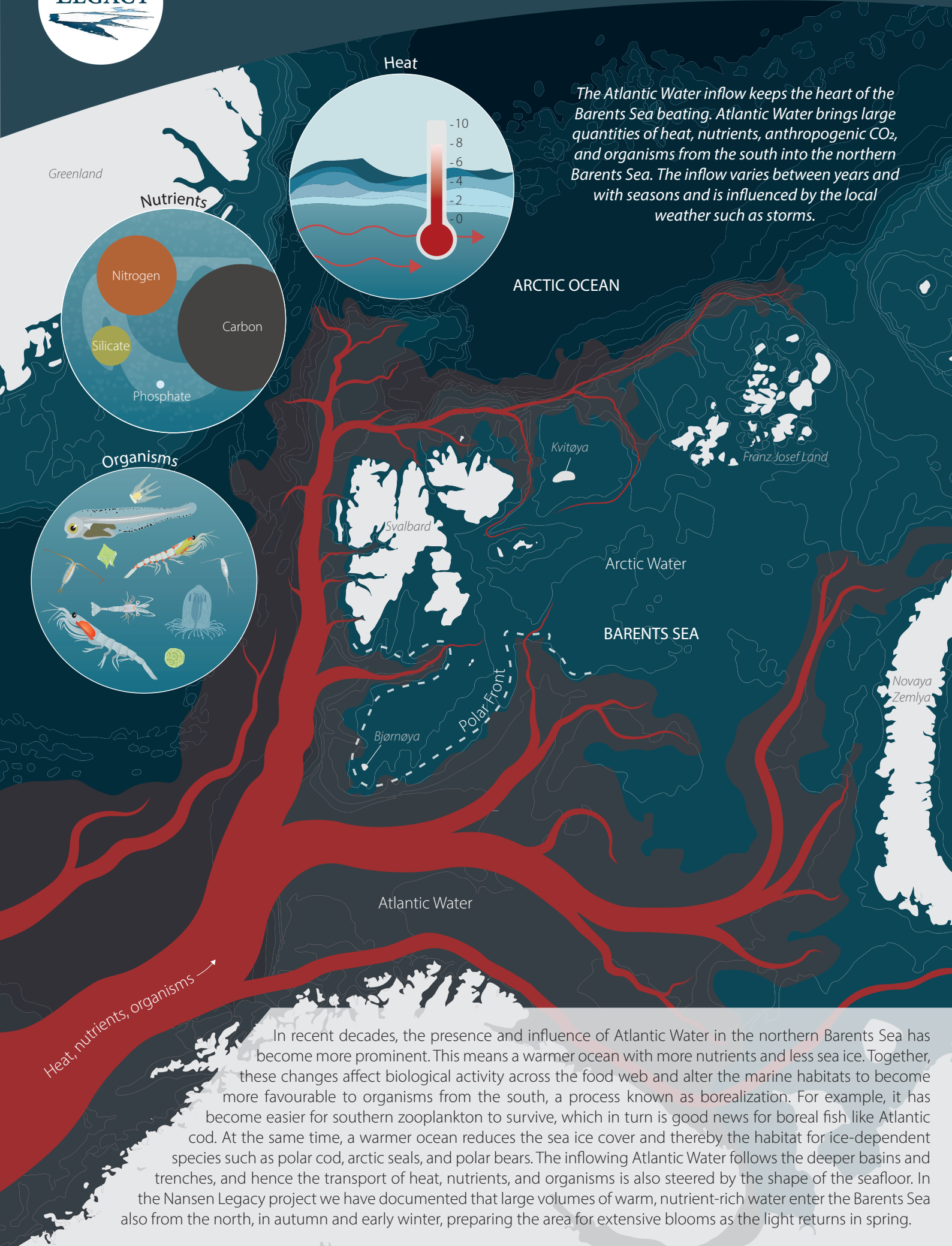




Atlantic Water inflow

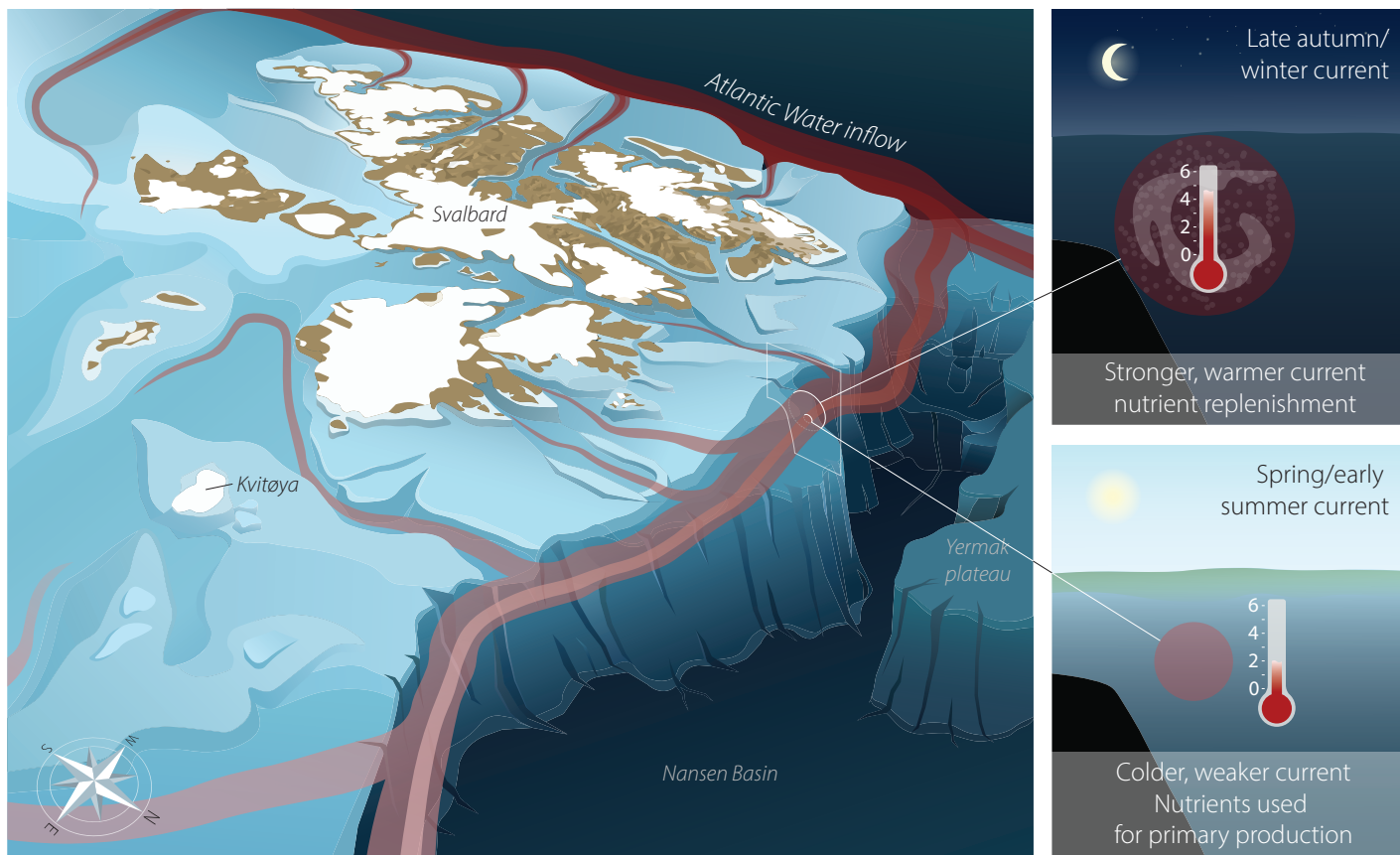


The Atlantic Water inflow keeps the heart of the Barents Sea beating. Atlantic Water brings large quantities of heat, nutrients, anthropogenic CO₂, and organisms from the south into the northern Barents Sea. The inflow varies between years and with seasons and is influenced by the local weather such as storms.

Heat, nutrients, organisms →

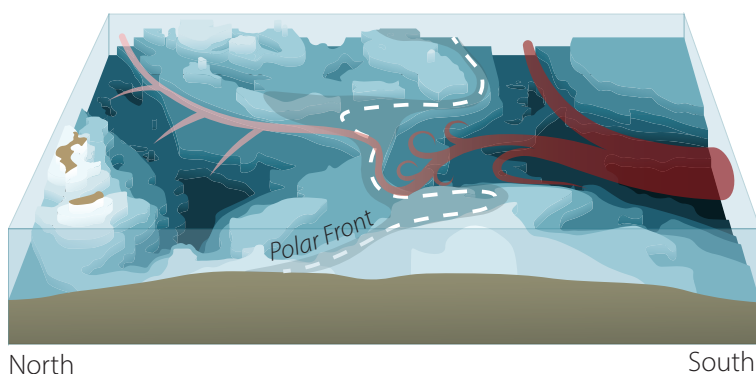
In recent decades, the presence and influence of Atlantic Water in the northern Barents Sea has become more prominent. This means a warmer ocean with more nutrients and less sea ice. Together, these changes affect biological activity across the food web and alter the marine habitats to become more favourable to organisms from the south, a process known as borealization. For example, it has become easier for southern zooplankton to survive, which in turn is good news for boreal fish like Atlantic cod. At the same time, a warmer ocean reduces the sea ice cover and thereby the habitat for ice-dependent species such as polar cod, arctic seals, and polar bears. The inflowing Atlantic Water follows the deeper basins and trenches, and hence the transport of heat, nutrients, and organisms is also steered by the shape of the seafloor. In the Nansen Legacy project we have documented that large volumes of warm, nutrient-rich water enter the Barents Sea also from the north, in autumn and early winter, preparing the area for extensive blooms as the light returns in spring.

Seasonality of Atlantic Water inflow north of Svalbard



North of Svalbard, the strongest inflow of warm Atlantic Water occurs in late autumn and early winter. This delays the onset of sea ice formation and provides new nutrients that can later be used by algae. By the time the sun returns, Atlantic Water inflow has diminished, and sea ice has covered most of the area, preventing phytoplankton from growing. When the sea ice melts in spring, a stable fresh surface layer is established, and phytoplankton growth explodes. The growth conditions for algae thus depend on the timing of the inflow and the onset of sea ice melting. Since both vary between years and across the region, it is hard for organisms that feed on phytoplankton to know when to be ready for the spring feast.

Atlantic Water crossing over topography into the Northern Barents Sea



When Atlantic Water reaches the Polar Front, it encounters fresher and less heavy Arctic Water. Much of the Atlantic Water then turns around and flows along the Polar Front, but some of it manages to flow across the shallower topography that separates the deeper basins and makes its way north of the Polar Front. Here, it helps refill the nutrient pool and maintains stratification by providing salty and heavy water below the surface layer.

RECOMMENDATIONS

Atlantic Water regulates the local climate, seasonality, and ecosystem in the northern Barents Sea. With continued global warming, both the inflowing Atlantic Water and the local atmosphere will continue to heat up. Less sea ice will therefore be forming in the area, and less sea ice and meltwater will arrive from the adjacent areas. This will fundamentally change the way water masses are layered and the seasonality of the northern Barents Sea. This region could become more similar to the well-mixed southern Barents Sea; smaller zooplankton could out-compete the larger Arctic ones, and Atlantic species will also become more dominant in the North. To enable a solid basis for future management of the area, we must continue to monitor the ocean environment and ecosystem, improve our understanding of the coupled physio-chemical-biological interactions, and provide up-to-date models of the whole system to produce future scenarios of climate and ecosystem change. The changes we are currently witnessing in the northern Barents Sea can be seen as a precursor for other regions of the Arctic Ocean where Atlantic Water is also becoming more prominent and as such it is an important area for building knowledge that has pan-Arctic relevance.