Kitikmeot Sea Science Study (K3S)

How do tides, currents, and mixing affect the Kitikmeot Sea marine ecosystem?

Key messages

- The Kitikmeot Sea is a dynamic marine ecosystem influenced by inputs from regional rivers and larger current systems throughout the Arctic Ocean.
- Tidal forces mix the water column in the narrow, fast-flowing straits of the Kitikmeot Sea, which shapes the marine ecosystem and sea ice patterns.
- In winter, mixing action contributes to thin ice or open water in the straits known as '**winter holes.**'
- In summer, mixing delivers nutrients to the surface and supports diverse seabed communities, we call these areas '**summer gardens.**'

What we do

A team of researchers from Canada, the USA, and Norway is gathering baseline data on how water and nutrients circulate in the Kitikmeot Sea and how this affects the marine ecosystem. Researchers collect water and seafloor samples and take measurements from aboard the *R/V Martin Bergmann* in the summer. During the rest of the year, researchers use instruments secured to the ocean floor to measure currents and water properties. These measurements are focused on the narrow and shallow straits of the Kitikmeot Sea.

What we've learned and why it matters

There are faster currents in narrow marine straits throughout the Kitikmeot Sea caused by tides forcing water through the gaps between islands. These currents help to mix the water column and bring nutrients to the surface. This mixing supports plant growth and the marine food web. Inside these passages, soft corals, sea cucumbers, clams, and kelp species take advantage of these nutrients and food particles.

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Kitikmeot Sea: a unique marine environment

The Kitikmeot Sea is a unique marine environment in the Arctic due to three main features:

Nutrient-rich deep water

Ocean currents deliver salty, nutrient-rich deep water to the Kitikmeot Sea from other basins in the Canadian Arctic Archipelago. Without sunlight, these dissolved nutrients cannot contribute to plant growth that feeds the rest of the food web.

Freshwater input from rivers

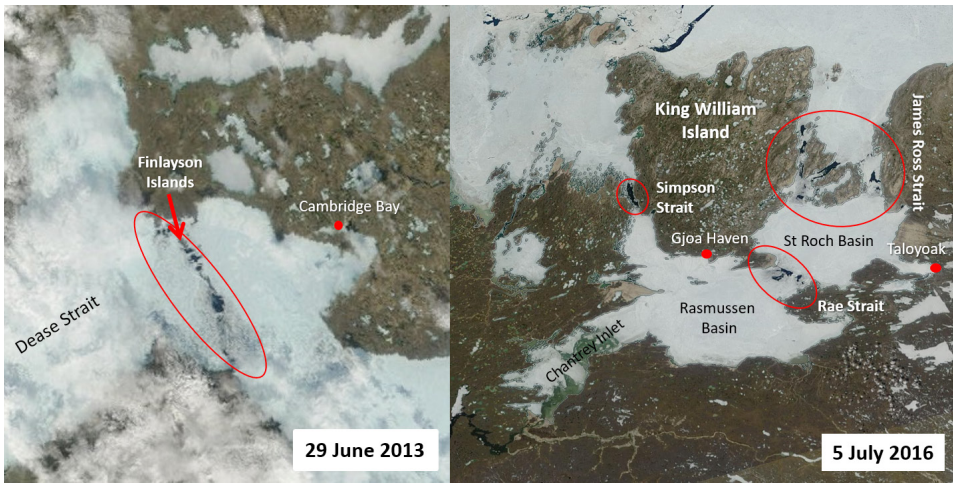
Rivers in the Kitikmeot region deliver massive amounts of freshwater into the Kitikmeot Sea. As freshwater is less dense than salt water, input from these rivers remains at the surface.

Restricted water flow

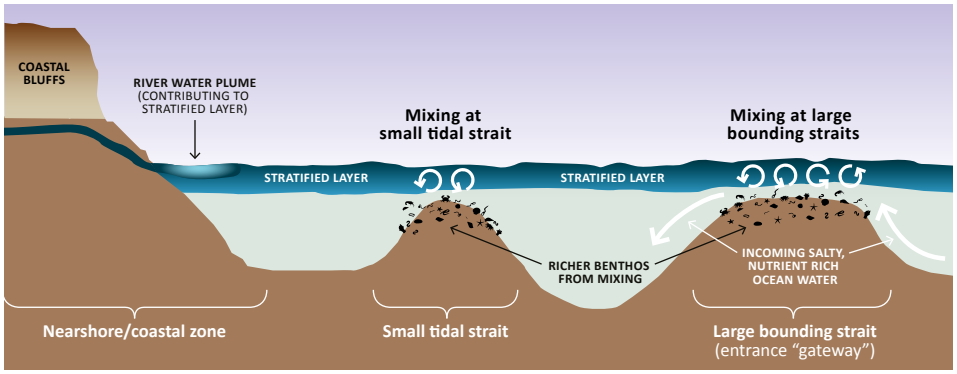
The seabed in the bounding straits of the Kitikmeot Sea is relatively shallow (no more than 30 metres deep), which limits the exchange of water between the Kitikmeot Sea and other Arctic Ocean basins.

Outside the passages, brittle stars and small marine worms subside on the left-overs. These summer gardens may be important feeding sites for fish or seals. More information on how these straits influence the biological productivity of the greater Kitikmeot Sea region is needed.

In winter, observations by residents and high-resolution satellite imagery show that these same narrow passages are prone to thin ice and early ice breakup, making them dangerous places for winter travel. These winter holes are caused by warmer water, which is brought to the surface by this mixing process due to the tides.



This satellite view shows springtime 'winter holes' created by tidal mixing in the narrow straits: a) Finlayson Islands near Cambridge Bay, NU; and b) Chantrey Inlet, Rassmussen Basin, and St Roch Basin near Gjoa Haven, NU (https://worldview. earthdata.nasa.gov/).



This simplified diagram describes water circulation in the Kitikmeot Sea. Mixing in shallow areas brings salty nutrient-rich deep water to the surface support-ing a diversity of ocean life.

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