The Arctic Sea Ice Refuge

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Abstract: As global warming reduces the summer sea-ice in the Arctic Ocean, ecosystems which require perennial ice are likely to survive longest in the region immediately north of Canada and Greenland. Models and satellite data indicate that summer sea ice will persist longer in this region than any anywhere else in the Arctic. Analysis of models and satellite data indicate that this natural refugium relies on locally created sea ice, as well as drifting ice that forms originally over the central Arctic. Depending on future changes in melt patterns and sea ice transport rates, the Siberian shelf seas may also be a source of ice to this region.

An integrated, international system of monitoring and management of this sea ice refuge, along with the ice source regions, has the potential to maintain viable habitat for ice-associated species, including polar bears, for decades into the future.

Potential Pressures on the Refuge and its Ice Shed

- Oil/Gas/Mineral Production
- Transportation
- Contaminants

Changes in Optimal Polar Bear Habitat

Projected changes in the spatial distribution and integrated annual area of optimal polar bear habitat for 2050. Map shows the cumulative number of months per decade where optimal polar bear habitat was either lost (red) or gained (blue).

Optimal Polar Bear Habitat Criteria:
- > 50% ice concentration (winter)
- < 200 km to 15% ice concentration (summer)
- < 200 km from shore
- < 1000 m water depth

From Durner et al., 2009
Ecological Monographs

Management Approaches?

World Heritage Sites are the property of the state on whose territory the site is located, but their preservation is in the interest of the international community. Nominated sites must be of "outstanding universal value" and meet at least one of ten criteria:

III. "to bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared";
V. "to be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change";
X. "to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation."

Out of total of over 800 sites there are currently 31 World Heritage sites which include marine areas, including the Galápagos Islands and the Great Barrier Reef.

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