

Ocean acidification adds to Arctic climate change

Nancy Bazilchuk

The acidity of the Arctic Ocean is on the rise, mirroring a worldwide increase of 30% found in surface ocean waters over the past 200 years and posing a host of challenges for an already stressed ecosystem, according to a new study, *Arctic Ocean Acidification Assessment*, released by the Arctic Monitoring and Assessment Programme. The primary driver behind the Arctic Ocean's increasing acidity is the absorption of carbon dioxide (CO₂) emitted to the atmosphere by human activity, as per the report.

The 60 scientists who coauthored the report also warned that the decreased pH will almost certainly result in substantial changes in Arctic marine ecosystems, with unknown consequences for economically important fish stocks and the livelihoods of indigenous people who depend on them.

But it's too early to tell exactly how the changes will play out, particularly



P. Kelley/US Coast Guard

Decreases in the Arctic Ocean's summer ice cover increase the amount of open water available to absorb CO₂, which accelerates acidification.

because of variations in other environmental factors in the region, including the loss of summer sea-ice cover, increased freshening of surface water from melting ice and land runoff, and increasing seawater temperatures.

Even the "simple" matter of increased acidity is not simple at all, says Howard Browman, a marine ecologist and principal research scientist at the Norwegian Institute for Marine Research (Bergen) and the lead author of the report's chapter on biological effects. "When people think of ocean acidification they imagine

melting skeletons, but higher CO₂ levels in the oceans can affect a range of physiological processes."

Some species will adapt while others will not, Browman adds, but elsewhere there may be surprises. As an example, Browman points out that although cold-water corals will be able to cope with increased acidity, the dead coral substrates that they grow on will tend to dissolve.

Results from experiments with cod, herring, and Alaska walleye pollock suggest that these species have the ability to adapt to changing conditions, because they produce millions of eggs with highly variable phenotypes and genotypes. This range of variation means that "some individuals will have characteristics that will be well matched to the environment they find themselves in", explains Browman. "Their life histories have evolved to include a lot of bet-hedging strategies."

The report was prepared at the request of the Arctic Council, an intergovernmental forum for the eight countries that contain Arctic territories, for consideration at their May meeting. ■

Ecological flow of the Ganges under threat

DC Sharma

Just how much water should be allowed to flow in the pristine Himalayan stretches of the Ganges River has become a bone of contention between the Government of India and environmental groups. Several hydroelectric power projects constructed in the river's upper reaches and tributaries have already affected its flow regime. Environmental and religious groups have opposed construction of new projects while also calling for decommissioning of existing ones. An Inter-Ministerial Group, set up by the Government in an attempt to resolve the dispute, recently recommended that new hydropower projects may be allowed if 20% to 50% of seasonal-dependent natural flows are retained. Furthermore, the

group has suggested that existing and new projects alike should be redesigned to optimize energy generation during periods of high discharge.

Environmental advocates and experts argue that establishing an arbitrary limit on water flow is unscientific and does nothing to restrict the development of new hydroprojects. "Having adversely hit aquatic diversity in India, dams not only cause hydrological changes and result in poor flows but also obstruct species migration, submerge habitats, and trap sediments. The mere fixing of a limit on environmental flows will not solve all of these problems", points out Himanshu Thakkar (South Asia Network on Dams, Rivers and People, New Delhi, India). Historically, project developers have tended to split large hydroprojects into smaller ones in order to garner fiscal benefits and

escape stringent environmental regulations while ignoring the dams' cumulative impact on the river, according to Sunita Narain (Centre for Science and Environment, New Delhi). Consequently, Narain suggests that national norms on ecological flow and minimum distance be maintained between hydroprojects on any river stretch.

The Ganges was accorded status of a "National River" in 2008, but no steps have been taken since then to ensure its conservation. Indeed, two large projects close to the river's headwaters in the Himalayas were suspended but have yet to be decommissioned. "We need a river conservation law to prevent tinkering with the flow of the river, as well as to counteract downstream pollution and encroachments over its floodplains", adds Hemant Dhyani (Ganga Ahvaan, Haridwar, India). ■