

Lago De San Ignacio, Baja California -

The season of migration has come again to the warm blue waters off the coast of Mexico. Mother gray whales are nursing their newborn calves, plumping them up for the 6,000-mile trip next month to summer feeding grounds in the Arctic.

This migration, one of the longest of any of the world's wild mammals, has gone on for thousands of years. Increasingly, the watery voyage raises questions about how the changing climate is affecting species that live in the Arctic, the part of the world transforming most dramatically from humanity's greenhouse gas emissions.

As ocean and atmospheric temperatures rise, the gray whales - and other Arctic dwellers like the walrus, polar bear, ice seal and Arctic fox - are making their way in an unknown warming world. Their habitat and food supply are shifting as a result of warmer waters and shrinking sea ice. But little is known of that food chain. Even less is known of how it will shift as the climate changes. And that represents a worrisome gap in basic science, say scientists meeting at a State of the Arctic conference in Miami last week.

The teeming waters are among the richest in the world yet the least studied because of difficulties overcoming months of dark days and impassable frozen seas. Arctic scientists say they've just

begun to document the polar cap's biological diversity. They don't know how the animals are responding to global warming, where they're feeding, how their icy habitat has been affected or how the ecosystem's food web has changed. The researchers want to fill crucial data gaps so that they can advise how best to safeguard the wild Arctic. Protection is crucial, they say, as the Northwest Passage begins to open year round and increasing access offers new chances for development. Nations, including the United States, are clamoring to exploit oil and gas resources, rich fish supplies and tourist and commercial vessel trade.

The pack ice is melting earlier and forming later. In the last three years, the sea ice's extent - the ocean area in which a defined minimum of sea ice can be found - was at its lowest in the 30-year satellite record.

Plankton, crustaceans and fish, all food for wildlife, reproduce at the dynamic edge of the sea ice, where it floats over shallow near-shore waters. When that edge moves off the continental shelf into deep open ocean waters, the productivity drops off and the marine organisms that feed larger wildlife are out of reach, scientists say. And that's a problem for the gray whales swimming today in the haven of Baja's waters. The whale's favorite fatty marine crustacean, the amphipod,



beluga whale smiling for the camera

has declined in the Bering Sea feeding grounds over the last 30 years as currents in the North Pacific Ocean warmed and sea ice gradually melted and thinned. Whales with their babies are forced to swim through the Bering Strait and fan out in the Arctic Ocean searching for a substitute food supply. They're heading in greater numbers to the Chukchi and Beaufort seas in the Arctic Ocean and even congregating off Barrow, scientists say. In recent years, say scientists at the National

Oceanic and Atmospheric Administration, these baleen whales that typically sift out little crustaceans from the bottom are now eating mysid shrimp and even krill in ocean waters. They have to eat tons more of them to make up the lost mass of fatty amphipods. "It's like replacing steak with vegetables," said one researcher. Whale experts are hopeful. The grays are opportunistic feeders, they say, which makes them better candidates to adapt to the changing climate. Their ancestors date back more than one million years and have already survived extreme geologic changes.

But adaptation takes time, and the whale's population has already dipped from roughly 26,000 to 17,000. Scientists link the swift transformation of the Bering Sea ecosystem to the decline, and don't know yet if eating a wider diet is enough to stabilize the population. Putting around San Ignacio Lagoon in a seven-person skiff, biologist Steven L. Swartz greeted passing whales with "Hola, ballena." Swartz co-directs the Ecosystem