



WILDLIFE AND GLOBAL WARMING

Navigating the Arctic Meltdown



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SPECTACLED EIDERS

The spectacled eider is truly a breed apart. A diving duck named for its distinctively “spectacled” appearance, the eider spends much of the year in places so remote that its wintering grounds were only discovered in 1999, with the help of space-age satellite tracking. With its American population decimated by poisoning from ingesting lead shot, the eider was listed as a threatened species in 1993. Now global warming poses an additional peril to this unique bird, with the potential to alter both the eiders’ breeding and wintering habitats.

A RARE BIRD

The spectacled eider is a medium-sized sea duck, slightly smaller than a mallard, but with a stockier appearance. Males have a white back, a black breast and belly, a thick orange bill and a green head, offset by large white eye patches bordered in black—the characteristic “spectacles” that give the bird its name. The female is a drab, speckled brown, with less distinct tan spectacles.

Each winter, the world’s entire population of spectacled eiders gathers to feed in a small area of the Bering Sea southwest of Alaska’s St. Lawrence Island. Several factors combine to make this area one of the most productive marine ecosystems in the world, and a haven for diving ducks. Currents bring nutrient-rich waters from the north

Pacific; more nutrients are flushed into the shallow seas by Alaska’s great river systems. These nutrients nourish algae and microscopic plants called phytoplankton, which grow in huge numbers in the shallow waters. Algae are then eaten by tiny animals called zooplankton, which in turn serve as food for larger animals. Particles of food, dead algae and nutrients “rain” down onto the sea floor, feeding a huge array of clams, crustaceans and marine worms throughout the year.

Winter winds blowing across St. Lawrence Island drive sea ice away from the coast, creating “persistent polynyas,” a matrix of openings in the drifting ice through which the birds can dive to reach food on the sea floor 120 to 300 feet below. The polynyas constantly move and re-form, allowing



A pair of spectacled eiders in flight over Alaska (above). The threatened ducks rely on wetland-covered areas such as Yukon Delta National Wildlife Refuge (left) for breeding. Warmer temperatures hasten the drying of these wetlands.

the birds access to continually changing areas of the sea floor. The eiders' wintering area is centered above a gently sloping basin with underwater openings at its north and south ends. This particular basin is unique in the Bering Sea. Researchers from the U.S. Geological Survey speculate that the openings funnel water and nutrients into the basin, and the basin's shape creates a range of undersea habitats that maximize the variety of creatures available as food. Currents also send frigid waters to the bottom, creating a "cold pool" near the sea floor that persists into summer. That cold pool prevents most fish from feeding on the bottom, leaving the food available to warm-blooded marine mammals and birds such as the eider that make short feeding dives into the frigid water.

In spring the eiders disperse to one of three breeding areas: the north slope of Alaska along the Beaufort Sea, the western coast of Alaska between the Yukon and Kuskokwim river deltas, and the north coast of Siberia. These breeding areas are characterized by a mix of salt marshes, freshwater ponds dotted with small islands, wet meadows, low ridges and mounds of earth-covered ice. Eiders dabble and dive in the ponds for insects, small crustaceans, snails, clams and vegetation.

The eiders nest near water on shorelines, peninsulas or small islands. Females build the nest, first hollowing out a bowl-shaped depression, then filling it with dry grasses

and other plants. After laying her clutch of eggs, the female blankets them with an insulating layer of down—soft, warm feathers pulled from her breast. (The famed "eider down" used in luxury quilts is collected after the nesting season from the spectacled eider's larger and more widespread cousin, the common eider.) Male birds depart the breeding grounds after the eggs are laid, playing no role in incubating or raising the ducklings. The ducklings hatch after incubating about 24 days, and can walk, swim and feed within a day or two. They are fully grown and ready to migrate to the wintering grounds after about two months.

After breeding, spectacled eiders gather on shallow ocean waters just off the Alaskan and Siberian coasts for their fall molt. Molting is a one- or two-month-long period when eiders gradually shed old feathers and grow new ones, during which the birds are mostly unable to fly. Because they can't fly to escape threats during molting, spectacled eiders are vulnerable to entanglement in fishing gear or refuse. Oil or fuel spills pose an additional threat, because the flightless birds gather in small areas. Eiders depart from molting areas in September and October to return to their wintering range south of St. Lawrence Island.

Spectacled eiders face several perils. The Yukon-Kuskokwim Delta breeding population declined from 47,740 breeding pairs in the mid-1970s to 1,721 in 1992, leading to the spectacled eider's 1993 listing as threatened under the U.S. Endangered Species Act. A chief culprit in this 96 percent drop was poisoning from ingesting lead shot that had accumulated in pond sediments in their breeding grounds—a legacy of more than a century of intensive waterfowl hunting. The birds accidentally ingest the pellets while rooting through the sediments for grit and stones to aid digestion. Females with ducklings are most vulnerable because they spend longer periods in these ponds. According to one study, female ducks exposed to lead had a 34 percent lower chance of survival to the next year than those not exposed to lead. Another cause of population decline may be foxes and large gulls, which

prey on eggs and young. Populations of these predators have increased in parts of the birds' breeding range due to a reliable food source from human garbage, particularly in areas on Alaska's North Slope where oil drilling occurs.

WARMING TRENDS

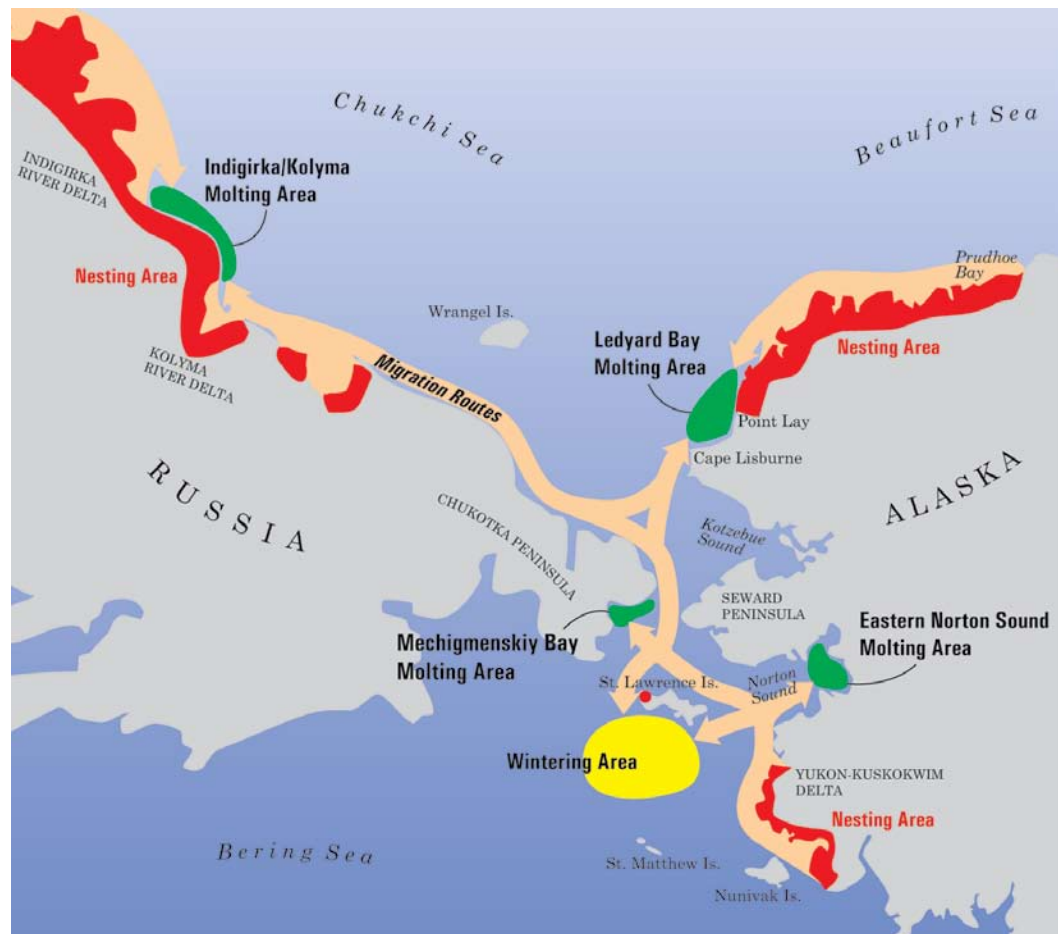
Spectacled eiders in America are already imperiled, and now face increased threats from the change wrought by global warming. The birds are vulnerable to the impacts of climate change on their winter range because they use a small area of the Bering Sea with special characteristics: a matrix of sea ice and persistent polynyas that create abundant and available food resources and convenient roosting sites.

Climate change is altering the ecosystem dynamics of this area. Increased air and sea temperatures thin the ice and cause it to retreat earlier. As open water replaces ice, the temperature of the water at the sea floor rises, shrinking the cold pool off the coast of St. Lawrence Island. Warmer temperatures allow fish that generally avoid the cold pool to move northward and feast in areas that have long been the exclusive province of warm-blooded animals such as the eider. Thus, ice retreat in summer brings competition for the eider's winter foods. "A change from arctic to subarctic conditions is underway in the northern Bering Sea," explains University of Tennessee scientist Jacqueline

Grebmeier. "The ice-dominated, shallow ecosystem favoring benthic communities and bottom-feeding sea ducks, such as spectacled eider, and marine mammals... is being replaced by one dominated by more pelagic fish."

Climate change also threatens the spectacled eider's nesting habitat. The Arctic coastal plain is dotted with innumerable small ponds and wetlands where breeding birds feast on aquatic insects. Warmer temperatures hasten the drying of these wetlands. Furthermore, warmer temperatures are melting permafrost. This permanently frozen ground underlies the tundra and prevents water from draining away, thus sustaining the wetlands. If permafrost melting continues, much of the eider's nesting habitat could dry out and become shrubland and forest. Even worse, widespread melting of permafrost will release massive amounts of methane, a greenhouse gas 20 times as potent as carbon dioxide, potentially creating a "runaway" warming of the globe. In addition, eider breeding habitat is threatened by climate-change-induced erosion. As climate change shrinks Arctic sea ice, coastal areas once protected by ice for much of the year are now exposed to damaging storm surges. Rates of erosion have doubled during the past 50 years along the Arctic coast of Alaska where spectacled eiders breed. In some places, half a mile of the coast has been washed out to sea.

Distribution of Spectacled Eiders



All of the world's spectacled eiders gather in a small area (yellow) of the Bering Sea each winter to feed. Several factors make this area a haven for diving ducks, but global warming is threatening to unravel this rich ecosystem. In addition to perils at their wintering and nesting (red) habitats, eiders face threats from oil spills and fishing gear at their molting areas (green).

PREPARING FOR THE MELTDOWN

To prevent changes that could destroy both the breeding and wintering habitats of the spectacled eider, we must act quickly to reduce the emission of greenhouse gases. In addition, we should take the following steps to help the spectacled eider navigate threats posed by global warming:

- **Accelerate research on the ecology of the spectacled eider.** Given that the eider's wintering grounds were only discovered within the past decade, much remains to be learned about the species' ecology and conservation needs. In particular, we need to learn more about how climate change is altering the ecology of the Bering Sea, and how these changes are increasing threats to the already-threatened spectacled eider.
- **Protect spectacled eiders on their breeding range.** In an effort to stem the declines of many duck

species, wildlife officials banned the use of lead shot in waterfowl hunting in 1991. Lead shot is still legally available for upland hunting, however, and is cheaper than nontoxic alternatives, so some hunters in this remote area still use it. Health and wildlife officials should expand their efforts to enforce the waterfowl ban and stress the ecological and health consequences of subsistence hunting with lead shot. In addition, activities that degrade coastal wetland habitats should be curtailed. Proper handling of garbage that might attract foxes and gulls that prey on eider ducklings should also be required.

- **Reduce threats in molting range.** Spectacled eiders gather in a few small offshore areas to molt. Because they are flightless and concentrated during this several-week-long period, they are vulnerable to oil spills and entanglement in fishing nets. Fishing and ship traffic should be limited in areas where molting birds are present.

REFERENCES

- Gay, Joel. "Lead From Hunters' Shots Turns Up in Birds, Alaskans." *Anchorage Daily News*, 25 May 2004. Available at: <http://www.adn.com/front/story/5107755p-5034663c.html>.
- Grand, James B., Paul L. Flint, Margaret R. Petersen and Christine L. Moran. "Effect of Lead Poisoning on Spectacled Eider Survival Rates." *Journal of Wildlife Management* 62 (1998): 1103-1109.
- Grebmeier, Jacqueline M., James E. Overland, Sue E. Moore, Ed V. Farley, Eddy C. Carmack, Lee W. Cooper, Karen E. Frey, John H. Helle, Fiona A. McLaughlin and S. Lyn McNutt. "A Major Ecosystem Shift in the Northern Bering Sea." *Science* 311, no 5766 (10 March 2006):1461 – 1464.
- Highsmith, Raymond C. and Kenneth O. Coyle. "High Productivity of Northern Bering Sea Benthic Amphipods." *Nature* 344 (26 April 1990): 862-864.
- Huntington, Henry P. "Impacts of Changes in Sea Ice and Other Environmental Parameters in the Arctic." Final Report for the Marine Mammal Commission Workshop, Girdwood, Alaska, 15-17 February 2000. Available at: <http://www.mmc.gov/reports/workshop/pdf/seaicereport.pdf>. Internet; accessed 21 Aug 2007.
- Mars, J. C. and D.W. Houseknecht. "Quantitative remote sensing study indicates doubling of coastal erosion rate in past 50 yr along a segment of the Arctic coast of Alaska" *Geology* 35, no. 7 (2007): 583-586.
- McNutt, Lyn. "How Does Sea Ice Cover Vary in the Bering Sea From Year to Year?" Available at: http://www.beringclimate.noaa.gov/essays_mcnutt.html. Internet; Accessed 24 Aug 2007.
- National Academy of Sciences. *The Bering Sea Ecosystem*. National Academy of Sciences Press: Washington, DC, 1996.
- National Oceanic and Atmospheric Administration, Alaska Fisheries Science Center. "Warming Climate Reorganizes Bering Sea Biogeography." Available at: <http://www.afsc.noaa.gov/quarterly/jfm2007/divrptsRACE4.htm>. Internet; Accessed 24 Aug 2007.
- Petersen, Margaret R. and David C. Douglas. "Winter Ecology of Spectacled Eiders: Environmental Characteristics and Population Change." *The Condor* 106(2004):79-94.
- Petersen, Margaret R., J. Barry Grand and Christian P. Dau. "Spectacled Eider (*Somateria fischeri*)." In *The Birds of North America*, No. 547 (A. Poole and F. Gill, eds.). Philadelphia, PA: The Birds of North America, Inc., 2000.
- Petersen, Margaret R., William W. Larned and David C. Douglas. "At-Sea Distribution of Spectacled Eiders: A 120-Year-Old Mystery Solved." *The Auk* 116, vol. 4 (1999): 1009-1020.
- Springer, A.M., C.P. McRoy and M.V. Flint. "The Bering Sea Green Belt: Shelf-edge Processes and Ecosystem Production." *Fisheries Oceanography* 5 (1996), 205-223.
- Stehn, Robert A., Christian P. Dau, Bruce Conant and William Butler. "Decline of Spectacled Eiders Nesting in Western Alaska." *Arctic* 46, no. 3 (1993): 264-277.
- U.S. Fish and Wildlife Service. Spectacled Eider Recovery Plan. Anchorage, Alaska, 1996. 157 pages.



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