F O C U S 69

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Keeping Warm: Thermoregulation

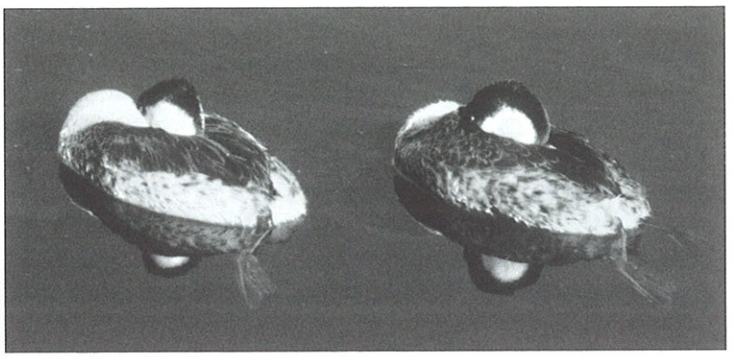
Rich Stallcup

Many plants and animals have evolved amazing adaptations for keeping warm in cold climates; those that didn't were frozen into extinction. How did birds do it?

Migration. Millions of birds of hundreds of species avoid harm from cold by migrating to warmer climates before winter shuts them down. This is an equal and opposite phenomenon to their having pioneered breeding ranges farther north after spring thaws—a most productive coincidence.

Plumage. "Warm-blooded" birds, unlike reptiles and amphibians that are "cold-blooded," have feathers, and feathers are among the most effective natural materials to warm a body. When pulled close they can deflect heat, and when fluffed can gather warmth between layers. Some species have more feathers in winter than in summer, and small birds tend to have more feathers for their size than big ones.

Soft Parts. "Soft parts," which are actually the bird's uninsulated hard parts (bill, legs and feet), transfer external temperatures to its body. When we see loons, grebes or ducks with their bills tucked beneath warming feathers, they may be resting but are certainly also maintaining or increasing their body temperature for upcoming foraging activity. They are not being lazy. When we see shorebirds standing or hopping on one leg (sometimes in flocks), it is not a behavioral disorder: they simply have the other leg pulled up, warming in the belly feathers.



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Clark's (left) and Western (right) grebes keeping warm. Identification notes: The Clark's has the eye in the white, a whiter face and side, and a narrower black dorsal neck stripe than the Western's. Bill color (the "best" field mark) cannot be seen here. Notice the laterally compressed tarsi and lobed toes typical of the grebe family.

Birds' tarsi* and feet contain tendons and blood vessels but few or no nerves, so these extremities don't feel the cold. Some ducks and geese (and other swimming birds) have special plumbing in their feet that helps keep them from freezing while they are standing on ice or swimming in slush. The blood vessels are parallel and contiguous, so cooled blood in the veins, returning to the heart, is warmed by arterial blood, recently pumped.

Roost Bundling. At high latitudes and altitudes, some species of gregarious passerines (like Pygmy or White-breasted nuthatches, bushtits, or bluebirds) pile into cavities during extreme cold. They bundle with others of their own kind, sometimes tens of individuals clustered into a small space. Warm? Yes, but might the ones on the center-bottom have a hard time breathing?

Torpidity. Many plants and animals survive freezing weather by going torpid. Some mammals hibernate, some amphibians burrow deep in the ground and slow down their metabolism, and many plants stop growth. This deep-sleep strategy seems as though it would be very successful for a whole suite of bird species, but surprisingly few use it. Here in the West, some individual Common Poor-wills, White-throated Swifts, and Anna's Hummingbirds go torpid in winter, while other individuals of those same species use migration to survive. Torpidity can be deep (where an animal is in deep sleep all winter) or shallow, as in the poor-will, swift, and hummingbird (where normal activity resumes during warm-weather incursions). Some hummingbirds have been shown to be active by day and torpid at night throughout cold spells.

Even though we know of the special adaptations birds have evolved for keeping warm, it is sometimes hard to believe they can survive windy and freezing and otherwise menacing weather systems—with good health and apparent joy.

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* The tarsus (singular) is the usually unfeathered part of a bird's leg between its ankle and foot.