

Cold-Blooded Winter Strategies

By Frederick Boyce

Many will have no doubt seen the very widely circulated news story last month about the alligators at Shallotte River Swamp Park in Ocean Isle Beach that were breathing through snouts that were frozen hard in the ice. The story even appeared on some Florida stations, in the traditional stronghold of the American alligator, where the populace was fascinated anew by this wintertime strategy of alligators in North Carolina. Known as “icing” among alligator biologists, this behavior is nothing new but is not often seen by the public. It has likely been around for as long as alligators have encountered freezing temperatures in the colder parts of their range.

Alligators and crocodiles comprise the two main families of a group of ancient animals known as crocodylians. The earliest crocodylians predate the dinosaurs, appearing at the dawn of the Triassic era some 200 million years ago. Crocodylians, along with dinosaurs, flying reptiles and birds, are members of a group of reptiles known as the *Archosauria*, or “Ruling Reptiles.” Now that dinosaurs and flying reptiles are extinct, the closest living relatives of modern crocodylians are birds. Throughout the Mesozoic era, the Age of Reptiles, crocodylians reached their greatest diversity and numbers and occupied many different types of habitat.

There were terrestrial crocodiles that ran about on long legs like scaly wolves, and some that even ran upright, on two legs. One of these, a fearsome ten-foot-long bipedal predator that lived in what is now North Carolina during the Cretaceous period, goes by the scientific name of *Carnufex*, or less formally, the Carolina Butcher. Other ancestral crocodylians reached gigantic sizes, such as *Sarcosuchus* of Africa and *Deinosuchus* in North America, both of which could well have preyed on dinosaurs and reached lengths approaching 50 feet.

Modern alligators did not come along until the Oligocene period, a little less than 40 million years ago, long after the last dinosaurs had disappeared. A very important anatomical feature that crocodylians developed is the secondary, or hard, palate, a broad shelf of bone that forms the roof of the mouth and which separates the air passages from the mouth cavity. Mammals also developed a hard palate, but among reptiles only the crocodylians have this advanced structure. The internal nares, the air openings that lead directly to the trachea and lungs, are positioned far back in the mouth, at the back end of the hard palate. This arrangement makes it possible for crocodylians to breathe, underwater, using their long snouts like snorkels, with only the nostrils at the tip protruding, and this is also what makes it possible for the icing behavior to happen.

Icing is only a short-term strategy, however, good for getting through cold snaps. Alligators also construct deep burrows known as “gator holes” where they spend much of the winter, like other reptiles, in a state of torpid inactivity known as “brumation.” During brumation, the reptile lowers its operating metabolism to a fraction of its normal rate. Snakes and lizards work their way into subterranean cavities, into crevices or fissures in rock or beneath rotted stumps where networks of tunnels are left by decaying roots. They sometimes utilize the burrows of other animals as well.

Farther south in the Coastal Plain, endangered indigo snakes and eastern diamondback rattlesnakes commonly overwinter in the long, comfortable burrows excavated by gopher tortoises. Snakes often brumate in groups, either of single or mixed species, often utilizing the same favored den, or *hibernaculum*, year after year. Some timber rattlesnake dens high in the Appalachians may have been in use for centuries. Rat snakes will readily take advantage of human structures, spending the winter between the walls of warm and cozy houses. I once had several that would spend the winter in the walls of a house that I had in the mountains, entering through a hole in the window sill. The snakes would bask on the sill in the early spring, and I would gently raise the window and feed them frozen-thawed mice to help get them going again after their winter fast.

Turtles, however, are clearly the champions of brumation. Whereas alligators have mastered the art of breathing through ice, some turtles have mastered the art of not breathing at all. They can accomplish this feat by way of using their thick bony shells to buffer the deadly lactic acid that accumulates as a by-product of cell respiration. It is the build-up of lactic acid in the blood rather than the lack of oxygen which is the greater danger. Even without oxygen, a brumating turtle is still going to burn miniscule amounts of fat and sugar, producing toxic waste (lactic acid), just as a kerosene heater

inside your house is going to generate dangerous fumes. Some fresh-water turtles have the singular ability to remove the lactic acid from their blood and store it in their calcium-rich shells, where the acid is neutralized. By then lowering its metabolism to as little as 10% of its usual capacity (a level that would be fatal to humans), a painted turtle is capable of spending an entire winter on the bottom of a pond with no oxygen at all. Sea turtles, however, do not brumate, but typically migrate to warmer seas. Some are occasionally caught by a sudden cold snap and become “cold-stunned,” a condition much like hypothermia. Cold-stunned sea turtles historically died in large numbers each year, but these days many are rescued, treated and kept warm at facilities such as the three NC aquariums and the sea turtle hospital at Topsail Beach until they can be released.

Additional sources used in the preparation of this article include *The Vertebrate Body* by A.S. Romer; *Crocodylians: Their Natural History and Captive Husbandry* by Truttnau and Sommerlad; and Curt Stager, Ph.D., Paul Smiths College.

Frederick Boyce is the staff herpetologist at the NC Aquarium at Pine Knoll Shores.



An alligator “icing,” photographed by George Howard, general manager of the Shallotte River Swamp Park in Ocean Isle, NC (swamppark.com). Photo used with permission.



At the Aquarium

The NC Aquarium at Pine Knoll Shores has set the schedule for recurring spring programs as follows:

Tuesday and Friday

Behind the Scenes: Shark Snack—2:30-3:30 p.m. Visit food preparation areas, animal holding areas and labs, and get an overhead view of the Living Shipwreck and watch the aquarist feed the sharks. Ages 5 and up; \$20.

Wednesday, Thursday and Sunday

Behind the Scenes: Aquarium at a Glance—12-12:45 p.m. Visit food preparation areas, animal holding areas and labs, and get a look at the Living Shipwreck exhibit from above. Ages 5 and up; \$12.

Saturday

Behind the Scenes: Aquarium Close Encounters—2-3:30 p.m. Visit labs and holding areas, help with food preparation and feed the animals in this thorough behind-the-scenes tour that includes a look at the Living Shipwreck from above. Ages 8 and up, \$20.

For details on these and other programs, call 247-4003 or visit ncaquariums.com.