

Introduction

Welcome to South Carolina Association of Naturalists' (SCAN) third book. We hope you will find useful and enjoyable the discussions, lists, illustrations, photographs, and other information we have included. We have included the same categories of information included in the previous books. To enable greater utilization of the species observations made by SCAN, we are enclosing with each book copy a DVD providing a complete searchable tabulation of all data collected. We hope this digital data will be useful to both professional and amateur naturalists.

As with all the flora and fauna lists SCAN produces, these were created through the contributions of members who were willing to keep a list of what they saw on the trip that day. The expertise of the contributors is mostly "advanced amateur" but a lot of gracious help came from professionals. SCAN members include people with a wide range of interests and areas of expertise; all the expert observations were combined to make one list per trip. It is definitely a case of the sum being greater than the individual parts. While we did our best, we admit that there may be a few cases of mistaken identity on these pages. Also, you should be aware that the number of species observed and their class distribution is largely determined by the interests of the SCAN member participating in each field trip. Our lists should not be taken as a full inventory of species found at any specific location.

Field trip reports are arranged by counties in alphabetical order. Species are organized under each field trip report in a taxonomic order developed by SCAN and based on standard taxonomic schemes. Flora are listed first; fauna are listed second; fossils are listed last.

This book may be useful to readers in several ways. SCAN members can use it for reminiscing about trips they remember with fondness. Other readers may well find, from the descriptions, sites that are nearby or of special interest and can use the directions and maps to visit the site personally, if open to the public. If you are near a site and in similar habitat, the flora and fauna list will give a good idea about what you might be seeing. Persons with a particular interest can select sites that have had similar species observed. Remember that the time of the year and current weather conditions will strongly affect the actual species observed.

During the decade included in this book, 1996 through 2005, field trips were taken within 35 of the counties in South Carolina. Field trips were not limited to our state but included visits to sites within five counties in North Carolina and four counties in Georgia.

South Carolina Physiographic Regions

by Edwin E. Ott

The land area of the state of South Carolina is the shape of an enormous slice of delicious blackberry pie. The point of the slice is in the northwest and the crust edge is in the southeast. South Carolina is bounded on the northwest by the Blue Ridge Mountains and on the southeast by the Atlantic Ocean. The interaction of mountain erosion and ocean deposition has sculpted the physiography of South Carolina.

The Mountain Region lies in the extreme northwest of South Carolina and consists of a small portion of the Southern Blue Ridge Escarpment. This is a region of rugged mountains with narrow valleys. Elevations generally vary from 1,000 feet above mean sea level (famsl) to 3,000 famsl. The highest point in the state is Sassafras Mountain in Pickens County with an elevation of 3,564 famsl. The Mountain Region includes less than two percent of the total land area of South Carolina.

The Piedmont Region lies adjacent to the Blue Ridge. The South Carolina Piedmont is a portion of a larger region, known as the Southern Piedmont, which stretches from Alabama to Virginia. The Piedmont consists of two terranes, the Piedmont Terrane and Carolina Terrane, which were attached to North America in very ancient time. Remnants of ancient mountains which have eroded to gentle to moderately steep slopes are seen today. Elevations generally vary from 400 to 1,200 famsl. In this region, typically clayey soils rest atop metamorphosed rock.

Piedmont rock extends into the Atlantic Ocean, thus supporting the remainder of the state. Over eons, the sea level has risen and fallen. Clay, silt, and sand eroded from the Piedmont, washed into the sea, and settled as deposits on the sea bed. The line running southwest to northeast across the state where Piedmont rocks meet ancient marine deposits

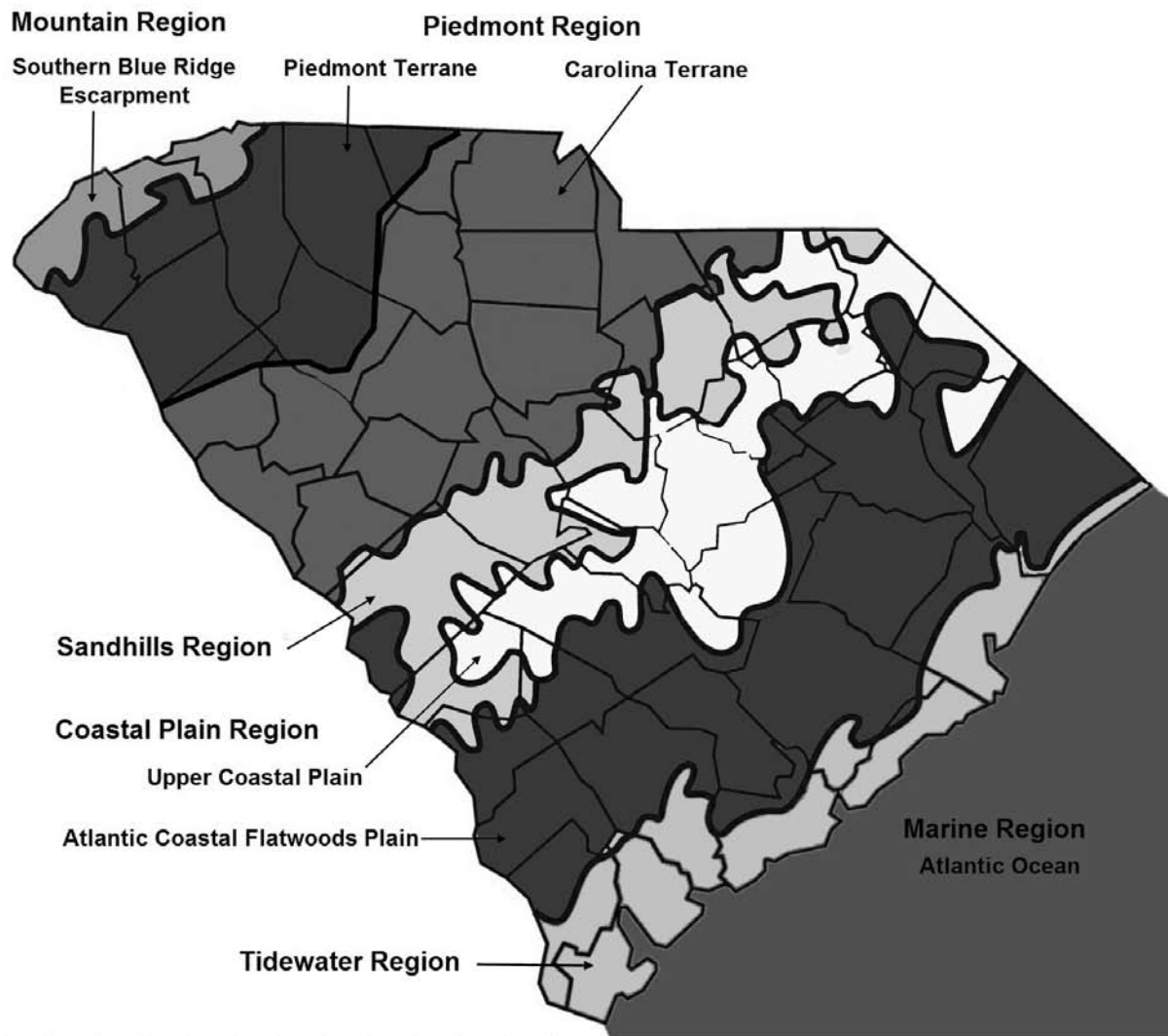
is known as the Fall Line and is generally considered the end of the Piedmont physiographic region. The Piedmont represents approximately 33 percent of the state's total land area.

The Sandhills Region is a broad band of deep sand deposits which follows the Fall Line. This region consists of moderately to strongly sloping uplands with elevations ranging from 250 to 450 famsl. This region tends to be well to excessively drained. The Sandhills represents approximately 11 percent of the state's total land area.

The Coastal Plain is the large area of exposed marine deposits stretching from the Sandhills to the Tidewaters and coast. This area has been covered and uncovered through the ages with sea level changes. The land surface is gently sloping to flat. Elevations generally range from 0 to 450 famsl. The Coastal Plain comprises approximately 48 percent of the state's total land area. This region can be subdivided into the Upper Coastal Plain and the Atlantic Coast Flatwoods Plain. The Upper Coastal Plain has gently sloping topography and soils highly suitable for agriculture. The Atlantic Coast Flatwoods Plain has a mostly flat topography and the soils tend to be poorly drained. Before colonization, the Flatwoods were blanketed in Longleaf Pine forests.

The Tidewater Region is the area subject to direct tidal influences along the edge of the Coastal Plain. This region consists of tidal marshes and rivers, with brackish to marine salt levels. Beaches, dunes, and barrier islands are included in the Tidewater Region. The Tidewater covers approximately 6 percent of the state's total land area. The Marine Region is the portion of the state covered by sea water from the coast to South Carolina's 3-mile jurisdictional boundary in the shallow continental shelf offshore.

Map of South Carolina Physiographic Regions



Paleontology in South Carolina

by James L Knight

Most of the eastern United States is not thought of as an area rich in fossil history. The western portion of the country, particularly Wyoming, Montana, and Utah are where the dinosaurs are found, right? It is true that the west has a very rich fossil history that has been studied for over a hundred years. However, the east coast also has a vast and varied fossil history that researchers and hobby collectors have been aware of for almost two hundred years. The history of the study of Paleontology in South Carolina can be divided into three periods, each marked by events familiar to everyone.

The first period of paleontology in South Carolina was that portion of time prior to 1861. In the four decades before that momentous year numerous scientific papers were published, reporting on fossil specimens collected in various portions of coastal South Carolina. Most of this study was centered in Charleston, one of the great centers of learning in the United States, the others being Boston and Philadelphia. Giants of the burgeoning scientific world were regular visitors to Charleston, including the ornithologist John James Audubon, Louis Agassiz, discoverer of the phenomenon of glaciation and the founder of the Museum of Comparative Zoology at Harvard University, and Joseph Leidy, of the Academy of Natural Sciences, Philadelphia. Agassiz, and Leidy in particular, both renowned paleontologists, were particularly interested in the fossil collections being amassed by both private collectors and the Charleston Museum. Some South Carolina natives were beginning to carve a scientific niche for themselves based on their personal research, such as the Columbia physician Robert Gibbes, who was best known for his pioneering work on fossil shark teeth and had collected large bones that proved to be remains of whales. Many of the scientifically important specimens came from the commercial phosphate pits located just inland from Charleston. Nodules of phosphate, dug up by slave labor, were being mined and crushed for fertilizer. Dug from among the phosphate clumps were occasional fossils, many of which were unknown in the scientific world.

Scientific research in general, and paleontological research in particular, ended in South Carolina on the morning of April 12, 1861. The Confederate bombardment of Fort Sumter in Charleston Harbor, signaled the end to research efforts not related to the war. In 1865, when the truce was signed at Appomattox, ending the war, the South lay in ruin, and with it the hopes and collections of those researchers wanting to get back to their pre-war occupations. More than a century would lapse after the truce at Appomattox was signed, during which time South Carolina would go through Reconstruction before rediscovering its place in the nation, would paleontology again be undertaken with the same rigor and gusto that it had enjoyed before the war.

The 1950's and -60's saw the rebirth of scientific research, including paleontology, in the state. The Charleston Museum was working on a variety of scientific endeavors, including building the fossil collections there. Hobby fossil collectors had begun prospecting the banks of drainage ditches throughout the Charleston area and had reported finding large bones which turned out to be the remains of whales, but of kinds previously unknown. Albert Sanders, Curator of Natural History at the Charleston Museum, recognized the scientific significance of the bones. He applied for, and received, a grant from the National Geographic Society to undertake an excavation near Summerville in order to remove the bones for scientific study. Sanders' efforts yielded previously unknown genera and species of whales, in addition to a great many other kinds of animals, and, based on the collections built by him and deposited at the Charleston Museum, much of the evolutionary history of whales will be written based on specimens he collected in coastal South Carolina.

The South Carolina State Museum was opened in 1988. By early 1989 staff from the State Museum had begun a substantial fossil collecting effort that has resulted in numerous discoveries of animals not previously known from the state. It is difficult to estimate in any real way the number of invertebrate species that occur in the fossil record of South Carolina. However, identifiable remains of more than 650 species of vertebrates have been found within the borders of the state. This includes almost 200 species of sharks, skates, and rays from areas that are, today, dry land. This is because the Atlantic Ocean has advanced and receded over the coastal plain of South Carolina perhaps as many as 30 times in the past 75 million years. Dinosaur fossils from South Carolina were deposited in Florence, when it was at the edge of the ocean. The inland most vertebrate fossil sites known from the state are in Aiken, more than 100 miles from the ocean. This is because the area that is now Aiken was under salt water during a time period called the Eocene, about 40 million years ago. The oldest fossils known from the state are of trilobites, an extinct group of arthropods with a distinctive body design of three parts, hence the name. These fossils are from the Batesburg-Leesville area, and are more than 500,000,000 years old!

Bees in South Carolina

by Mary Garland Douglass

Say the word “bee” and most people think of honeybees or bumblebees. There is actually far more diversity in the bee world though – approximately 6800 species of bees have been identified in North America alone (Michener 2007). South Carolina is home to more than 60 different genera and hundreds of species!

Bees of course are members of the Order Hymenoptera, along with wasps, ants, and the sawflies and their kin. But what makes a bee a bee, and not a wasp? Bees are a diverse group, consisting of several distinct families and exhibiting many different lifestyles and social arrangements. Perhaps the simplest way to understand what distinguishes bees from their non-bee relations is to consider what they eat. Bees are vegetarians – specifically, they all depend on pollen as a source of protein. While many wasps also visit flowers and consume pollen and nectar, almost all of them capture other arthropods to feed their offspring. Bees collect pollen and mix it with nectar or honey for their developing larvae to eat.

As an adaptation to this pollen-collecting lifestyle, bees are typically quite hairy, and all have at least some hairs that are branched or feathery. A few wasps are fairly hairy, but their vestiture consists of simple, unbranched hairs. One of the ways scientists categorize bees is by their degree of social organization. The most familiar bees are the true social or eusocial species, which in North America includes only the bumblebees and honeybees. In other parts of the world, there are different types of eusocial bees such as the stingless bees and orchid bees of the tropics. All of these social insects live together in a single nest, have a division of labor among workers, and have generational overlap which typically is a single mother (the queen) and progeny that are cared for by their own sisters. In contrast with this are the solitary species, in which each female provisions her own nest, and then dies before her offspring develop. Solitary bees typically nest in underground burrows, tunnels in wood, or in plant stems. Worldwide, over 90% of bee species are solitary.

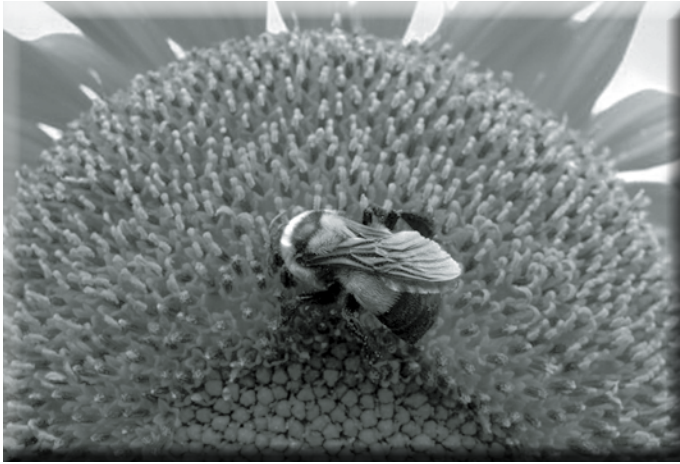
A confusing aspect of the solitary bee lifestyle is that these species often form “nesting aggregations” in which many females nest in the same area. Although these appear to be colonies, each female acts independently, digging and provisioning her own nest. The aggregations are a result of a population building up over time in an area with favorable nesting habitat. A few bee species have intermediate lifestyles in which females share a single nest entrance, or have a minimal degree of cooperation. However, the great majority of South Carolina’s bee species are truly solitary.

Scientists generally use the details of wing venation and shape of the “tongue” or mouthparts to distinguish the various families of bees. These are traits that are difficult to see without examining the bee under a microscope. However, another character which is useful in identifying bees in the field is the location of the scopa. This is an area of modified hairs the bee uses to store the pollen before taking it back to her nest. Perhaps the easiest group to distinguish this way is the leaf-cutter bees and their relatives in the Megachilidae family. These bees carry pollen on a dense brush of hairs on the underside of their abdomen. It is easy to see the brightly-colored pollen on the “belly” of the bee. In several other bee families, the scopa consists of long plumose hairs on the hind legs of the insect. One family, the Colletidae, lacks a scopa and stores pollen internally in the crop. Male bees also lack a scopa since they do not store pollen, although they do visit flowers to eat pollen and nectar.

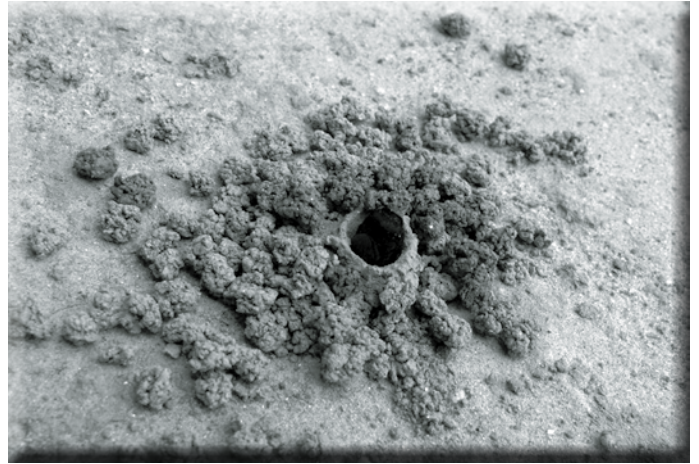
The honeybees (*Apis mellifera*) and bumblebees (*Bombus* spp.) are closely related, and instead of the scopa they share a unique pollen-carrying structure called the corbicula or pollen basket. A foraging bee moistens her forelegs with a little regurgitated nectar, and then uses them to groom herself until all the pollen is transferred to her hind legs. Then she uses her pollen combs to compact the pollen and press it into the corbicula, which is a concave smooth area surrounded by bristles on the rear femur. When the bee is carrying a full load, the pollen is obvious as two waxy-looking brightly-colored pellets on the hind legs, while the pollen combs are the broad rectangular segments just below.

Another interesting characteristic of bees is whether they are specialists or generalists in what type of flowers they visit. Generalists, which collect pollen from many types of flowers, are referred to as polylectic. On the other hand, many solitary bee species are oligolectic; they visit a limited variety of plant species, often only of a single genus. In most of these species, the larvae actually require the pollen of the preferred host plant to develop properly. We have seen several examples of oligolectic bees on our SCAN trips. The Southeastern Blueberry Bee, *Habropoda laboriosa*, and the Rose-mallow Bee, *Ptilothrix bombiformis*, are two examples. Rose-mallow Bees build their turret-topped

burrows in aggregations on dirt banks and dams around wetlands where their host-plant, *Hibiscus moscheutos*, occurs in abundance. Look for Southeastern Blueberry bees visiting vaccinium flowers in early spring. The Squash Bee, *Peponapis pruinosa*, is another interesting and economically important oligolectic species. If you grow squash in your garden, look for this bee when the blossoms first open at dawn.



Southern Plains Bumblebee, *Bombus fraterus*, by Mary Garland Douglass.



Hibiscus Bee's nest, *Ptilothrix bombiformis*, by Mary Garland Douglass.



Honeybee, *Apis mellifera*, by Mary Garland Douglass.

South Carolina Birds

by John E. Cely

South Carolina has a long ornithological history that dates back more than 300 years and includes such distinguished figures as Mark Catesby, Alexander Wilson (albeit briefly) John James Audubon, the Reverend John Bachman, Arthur Trezevant Wayne and others. More bird species, seventy-seven, have been described from South Carolina than from any other state. Currently 455 species have been recognized as occurring in the state although the number of actual residents is much smaller than that. For its outings between 1996-2005, the South Carolina Association of Naturalists has seen about half that number, 221, a very respectable figure.

Although one of the smaller states, ranking fortieth in size and consisting of about nineteen million acres, South Carolina is unmatched in terms of habitat diversity and protected wildlife refuges and preserves that support a wide variety of bird species. A relatively short five hour drive across the state results in a mountains to the sea "transect" that covers four major physiographic regions or landforms: Blue Ridge, Piedmont, Sandhills and Coastal Plain. The Coastal Plain is the largest physiographic region, consisting of about 13 million acres, and includes the renowned tidewater region that supports the richest bird diversity in the state. Here are found such extraordinary public and private preserves and refuges as the ACE Basin, Cape Romain National Wildlife Refuge, Francis Marion National Forest, Santee Coastal Reserve, Tom Yawkey Wildlife Center, Hobcaw Barony, and many more.

Along the Inner Coastal Plain are a number of public and private wildlife preserves including the state's only national park, the Congaree National Park, a globally important bird area, and the Santee National Wildlife Refuge, traditionally the leader in the Carolinas for the number of bird species recorded at an Inner Coastal Plain site during the nationwide Christmas Bird Count.

The Sandhills Province, historically covered with extensive longleaf pine forests, now replaced in many areas with loblolly pine and "scrub oak," supports large numbers of the endangered Red-cockaded Woodpecker, found at such places as the Sandhills National Wildlife Refuge, Sandhills State Forest, and the Fort Jackson Military Reservation.

The Piedmont Province represents the area of greatest land use change in the state's 400-year history. In the not too distant past it was heavily farmed with cotton and other row crops but within the past two generations has reverted to dense stands of second growth pine and mixed pine-hardwood forest. These changes have in turn resulted in significant reductions for an entire suite of grassland and scrub-shrub birds associated with farmland such as Bobwhite Quail, Field Sparrow, Loggerhead Shrike, American Kestrel, Eastern Meadowlark, and Indigo Bunting, all of which have experienced significant population declines since bird surveys were first initiated in the state in the 1960s.

At less than 400,000 acres the Mountain or Blue Ridge Province of South Carolina is the smallest of the state's landforms but contains plant communities and bird species found nowhere else, including such peripheral breeders as Dark-eyed Junco, Black-throated Blue Warbler, Ruffed Grouse, Common Raven, Yellow Warbler, and Chestnut-sided Warbler. A significant amount of land within the state's Blue Ridge is under public protection.

Bird populations and distribution are in a constant state of change. The South Carolina avifauna of today, for example, is different in many ways from that of the 1940s when Alexander Sprunt and E. Burnham Chamberlain co-authored *South Carolina Bird Life*. Species unknown in the state then, such as the House Finch and Eurasian Collared Dove, have become common feeder birds. Wild Turkeys in the 1940s were found only in remote swamps and forests but have since made a tremendous comeback, as has our nation's symbol, the Bald Eagle, with several hundred nests now scattered across the state. Wood Storks, unknown as a state breeder in Sprunt and Chamberlain's day, today number in the thousands of nesting pairs. Tropical species such as Black-bellied Whistling Duck now nest in the state, and Roseate Spoonbills are regular summer visitors.

Urban sprawl and forest fragmentation have taken their toll on other species, especially the insectivorous neotropical migrants that breed here but overwinter in the tropics. As a youngster growing up on the edge of Columbia in the 1950s and 60s, I commonly found Eastern Kingbirds, Red-eyed Vireos, Orchard Orioles, Summer Tanagers and Wood Thrushes nesting in our yards and vacant woodlots. All of which are now less common in these areas.

Bird numbers in South Carolina will continue to change over the years. New species will be added to the state list, and populations will wax and wane. Those declining species, we hope, will be few in number. I remain optimistic, with the increasing conservation ethic in South Carolina and its unexcelled system of public and private conservation lands, that the future bodes well for bird conservation in South Carolina.

South Carolina Reptiles and Amphibians

by Edwin E. Ott

The zoological study of amphibians and reptiles is called herpetology. Herpetology is derived from the Greek word herpeton, (reptile) plus the suffix logy (a field of study). Herpeton is derived from the Greek verb herpo (to creep). Herpetological fauna are often called “herps.”

Carl Linnaeus, considered the father of modern taxonomy, grouped reptiles, and some fish, in the same class as amphibians. Today we know that this grouping is misleading. Amphibians and reptiles are both vertebrate quadrupeds and cold-blooded; otherwise, they are very different. Amphibians are the direct descendents of fish which ventured onto land. Amphibians retain an aquatic larval stage and breed by external fertilization (amplexus). Both mammals and reptiles are descended from amphibians. Reptiles are generally considered to include lizards (snakes are descended from lizards), turtles, and crocodilians. Recent phylogeny indicates that turtles and crocodilians should have their own classes. Crocodilians are the closest living relatives to birds.

When discussing amphibians and reptiles within South Carolina, one is concerned with frogs, salamanders, lizards, snakes, turtles, and alligators. Native to South Carolina there are 30 species of frogs, 36 species of salamanders, 12 species of lizards, 40 species of snakes, 16 species of land turtles and five species of sea turtles, and one species of alligator.

Frog species range in size from the tiny Little Grass Frog to the voracious Bullfrog. Families of frogs found in South Carolina include the familiar true toads (those dry, warty-skinned visitors to our yards), true frogs (such as Bullfrogs, Green Frogs, and Leopard Frogs), and tree frogs (such as Spring Peepers, Gray Tree Frogs, and Chorus Frogs). Less familiar are the Spadefoot Toads (which look like common toads but have smoother, wetter skin) and Narrowmouth Toads (which look more like a frog than a toad).

Most of the salamander species in South Carolina fall into the family of lungless salamanders. These salamanders do not have lungs; rather they breathe through the skin and the lining of the mouth. Examples of lungless salamander species include the familiar Slimy Salamanders, Dusky Salamanders, and Three-lined Salamanders. Another commonly encountered family of South Carolina salamanders is the mole salamanders (*Ambystoma*). Mole salamanders spend much of their time under leaf litter or under ground. Fauna that spend much of their time underground are described as being “fossorial.” Examples of mole salamanders include the very common Marbled Salamander and our state amphibian, the Spotted Salamander. Newts are another family of salamanders which go from the aquatic larval stage into a terrestrial stage, called the eft, and then back to an adult aquatic stage. South Carolina has two families of salamanders which remain aquatic all their lives. Such species include the Hellbender, which has a very wrinkly skin, and Carolina Waterdog, which retains its external larval gills. All of the salamanders listed so far have four legs and the general shape of a lizard. However, South Carolina has two families of salamanders which look like eels. These are the amphiumas and sirens. These salamanders have long, snake-like bodies, tiny forelegs and no external hindlegs. Amphiumas have gill slits behind the head and sirens have external gills. The Two-toed Amphiuma and the Greater Siren may grow to lengths of approximately three feet.

South Carolina lizards include the very familiar Green Anole, which can change skin color between green and brown, and the Fence Lizard which loves to bask on logs, rocks, and fences. There are several species of skinks which are often seen as they hunt insects around our homes. Skinks have smooth scales, and several species are born with brilliant blue tails. No native lizards in South Carolina are venomous. Our whiptail species of lizard, the Six-lined Racerunner, can be seen darting over the ground in a bipedal stance. South Carolina has four species of legless lizards which are usually mistaken for snakes. Unlike snakes, these lizards have eyelids and long, breakable tails. The tails break from the body as a distracting defense against predator attack. Hence, the mistaken name of glass snake. Snakes are lizards which have evolved to have long, flexible, legless bodies. The great majority of snake species in South Carolina are not considered venomous to people. Most of the snake species fall into the families of harmless egg-laying snakes, such as the Eastern King Snake, Eastern Rat Snake, and Rough Green Snake, and harmless live-bearing snakes, such as the Eastern Garter Snake, Brown Snake, and water snakes. There are six species of venomous snakes native to South Carolina. Most of these venomous snakes are in the pit viper family. Pit vipers have heat sensing organs located between their nostrils and eyes. The pit vipers are the Copperhead, Cottonmouth, Pigmy Rattlesnake, Timber Rattlesnake, and Diamondback Rattlesnake. The other venomous species is the Eastern Coral Snake, which belongs to the same family as the cobras.

South Carolina has one true land turtle species, the Gopher Tortoise. This burrowing species is endangered, but successful efforts have increased the native population. Most of South Carolina's turtles live on both land and in water. South Carolina's largest freshwater species is the irascible Snapping Turtle. Many freshwater species fall into the family of basking turtles, so called because they are most often seen in water bodies basking in the sun on rocks and debris. These turtle species include the ubiquitous Yellowbelly Slider, River Cooter, Painted Turtle, and Chicken Turtle. The Box Turtle is in the basking turtle family, but lives principally on land. It derives its name from the ability to retract its head and limbs within the shell and close it tightly. The Diamondback Terrapin is a basking turtle which lives in brackish waters. Mud and Musk turtles are small turtles classified into another freshwater turtle family. Our strangest looking freshwater turtles are the softshells, such as the Gulf-coast Spiny Softshell Turtle. These freshwater turtles have flat, flexible, leathery shells and long snouts. Sea turtles spend most of their lives in water. Five species of sea turtles may visit the coastal waters of South Carolina. The Loggerhead Turtle, which is South Carolina's state reptile, regularly nests on the beaches and dunes.

The American Alligator is South Carolina's only native species of crocodilian. These magnificent creatures were almost hunted to extinction but have made a major comeback as a result of conservation efforts.



American Alligator, *Alligator mississippiensis*,
by Mary Garland Douglass.

Green Anole, *Anolis carolinensis*, by
Gordon Murphy.

