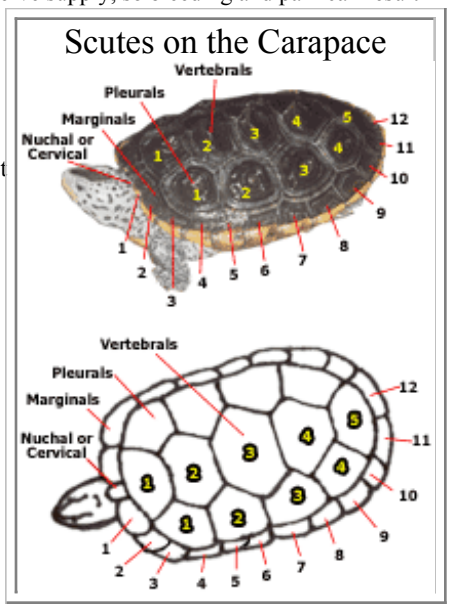
Shells: Anatomy and Diseases of Turtle and Tortoise Shells

Drs. Foster & Smith Educational Staff

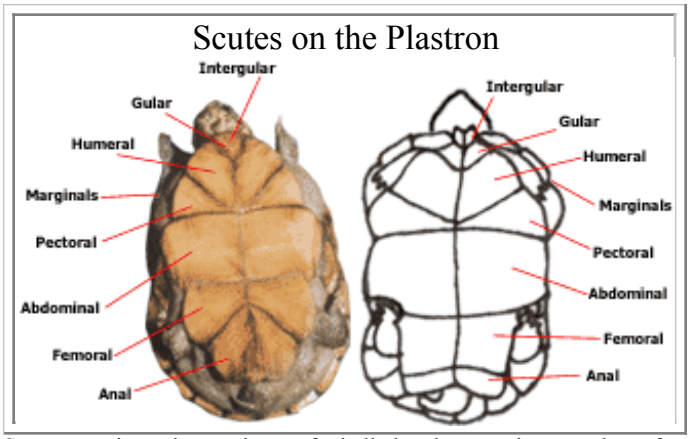
What makes a turtle or tortoise different from all other animals is its shell. Turtle shells have fascinated children and scientists for centuries. This article will provide basic information on the anatomy, growth, and diseases of turtle shells.

Anatomy

Parts of a shell: There are two parts to the shell of a turtle: the upper portion is called the "carapace" and the bottom half is called the "plastron." Both shells are actually made of many fused bones. The carapace is the fusion of about 50 bones - the ribs and vertebrae. The plastron is the fusion of bones including the clavicles (collar bones), bones between the clavicles, and portions of the ribs. A bony bridge joins the carapace and the plastron along the side of the turtle. Some turtles have a moveable joint, usually in the plastron, which acts as a "hinge" and allows the turtle to pull the carapace and plastron together tightly, while the turtle retracts its body into the shell. Shells have a blood and nerve supply, so bleeding and pain can result if the shell is injured.



Scutes: The shells are covered with a layer of keratin (the same type of material that makes up our fingernails or horses' hooves). The keratin is arranged in patches called scutes, or shields. The carapace usually has 38 scutes, and the plastron, twelve to fourteen. The names and numbers of the scutes roughly correspond to the adjacent bones and body portions. The scutes, however, do not precisely overlap the bones. Instead, they are staggered, which helps give the shell more rigidity.



Some aquatic turtles, such as soft-shelled and sea turtles, may have fewer bones in their carapaces, and the scutes are replaced by leathery skin.

Scute patterns: Different species of turtles have scutes of different patterns and designs, and there is often individual differences among members of the same species.

Shell shapes: The shell shapes of turtles differ with each species, and are often related to habitat. Most aquatic turtles are generally flatter, allowing them to move faster through the water. Tortoises, on the other hand, have carapaces that are dome-shaped.

Shell growth

As a shell grows, the number of scutes generally does not change, but their size does. In some turtles, old scutes are shed and

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replaced by larger, new ones. In other species, including box turtles, tortoises, and wood turtles, scutes enlarge in diameter as new keratin is laid down. The "growth rings" in scutes have been used be some experts to help determine the age of a turtle. Age estimation based on growth layers, however, can be erroneous for several reasons:

- Some turtles produce multiple growth zones per year.
- Growth is determined by changes in the environment (seasons), so age determination by examination of growth rings would be more accurate in wild turtles, than those kept in environments which do not change significantly.
- Growth layers may wear with age, so older turtles may be estimated to be younger than they really are.

Diseases affecting the shell

Retained scutes: "Dysecdysis" is the term to describe the condition in which an old scute is retained and not shed properly. This condition is often associated with poor husbandry, and may occur if the turtle has not been able to dry off or bask sufficiently to lose its old scutes. Retained scutes often become infected. A turtle with dysecdysis should be examined by a veterinarian.

Metabolic bone disease and pyramiding: A turtle with an inadequate calcium or Vitamin D intake, inadequate exposure to ultraviolet light, or disease of the liver, kidneys, or parathyroid glands may develop metabolic bone disease. This causes softening and malformation of the bones. The shells of turtles with metabolic bone disease are often deformed, with the rear area of the carapace pulled downward, and the marginal scutes pulled upward. Tortoises with metabolic bone disease may develop pyramid-shaped scutes. Metabolic bone disease can be fatal; turtles suspected of having this disease should be examined by a veterinarian. Husbandry and diet changes may be able to correct the calcium imbalance, but deformities are generally permanent.

Pyramiding, or pyramidal growth syndrome is a condition in which the scutes take on a conical shape. This condition has been associated with feeding excessive protein, inadequate calcium, low fiber, and other dietary excesses or deficiencies.

Renal failure and sloughing of scutes: Although rare, renal failure in a turtle has been reported to cause a turtle to slough his scutes. Kidneys help to maintain the proper calcium and phosphorous levels in the blood. If the kidneys fail, the phosphorous level in the blood increases. The turtle's body attempts to compensate by moving calcium from the bones into the blood stream. The bones in the shell, then, can become soft.

Ulcers: Ulcers of the shell may be superficial or deep, and may be termed "shell rot." Ulcers are generally a result of poor husbandry. Turtles with ulcerative shell lesions should be examined and treated by a veterinarian, as the ulcers may become infected and penetrate through the shell. The shell will need to be cleaned daily, and dead tissue removed. Topical and/or injectable antibiotics are required in the case of bacterial infections. Deep ulcers may need to be repaired through surgery and the application of acrylic or fiberglass material. In a disease called "septicemic cutaneous ulcerative disease," or SCUD, ulcers may be seen on both the shell and legs. This condition is often associated with the bacteria, *Citrobacter freundii*.

Injuries: Injuries due to trauma, animal bites, or burns can cause pain, can lead to infections, and may cause misshapen scutes as they heal. Although the shell has a remarkable ability to repair itself, any turtle with an injury to the shell should be examined by a veterinarian immediately. Fatal infections can occur.

Other causes of deformed scutes: Scutes may also be deformed in size or shape due to genetics or improper egg incubation.

The shell of a turtle is an amazing adaption which has allowed turtles to exist for millennia. The proper diet, husbandry, and care are vital to maintain a healthy shell.

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