Snake Skins, Skulls and Skeletons!

There is very little doubt that snakes are among both the most feared and revered groups of animals, at least certainly among vertebrate animals, or those animals with a spinal cord or vertebra. As discussed in previous articles, this is most often due to their vastly different appearances and evolution over thousands, if not millions of years, than what we are much more familiar with, as in humans and other mammals. Their elongated, limbless or legless bodies, lack of eyelids and ability to blink, lack of external ears, and hardened scales covering their bodies instead of hair or feathers all make snakes, as well as other reptiles and amphibians, very unique groups of animals.

**Figure-Snake Skeleton. Photo Credit: DK Find Out!*

Skeletal System:

Contrary to (still popular belief), all snakes do have an internal skeletal structure and bones. Their internal skeletons, however, are obviously less complex than those of other vertebrate animals, owing to their lack of joints, appendages, or limbs such as arms or legs. However, some more primitive groups of snakes such as the Boidae (boas) and Pythonidae (pythons) do still possess vestigial, or remnant pelvic girdles or similar structures known as **"Spurs"**, which are used primarily during mating and reproduction. Snakes also possess **Vertebrae**, which can range anywhere from 130 to 500 (or more), depending on the species or scientific group of snakes, as well as one or more pairs of **Ribs** attached to each vertebrae. The bones in their cloacal, or tails also comprise of additional vertebrae segments as well.

All snakes also have **Skulls**, which are perhaps the most diverse groupings of bones in a snake's skeletal structure. **Quadrate bones**, or lower jaw bones, and **Maxilla bones**, or their upper jaw bones, are very flexible, and are connected by loose muscles, tendons, and ligaments, which allow most snakes to swallow or ingest prey items larger than their heads! Contrary to popular belief, snakes do not actually "dislocate" their jaws when ingesting a meal. The joints of both their upper and lower jaws are located quite far back, and their lower jaw bones are also not fused anteriorly, or in their fronts, allowing them to move laterally when swallowing larger prey.

The vast majority of snakes also do have **Teeth**, which can vary in their overall number, number of rows, shape, and orientation depending on the species or groups of snakes, although most are recurved in order to grip their prey, and aid in swallowing and ingesting. Different species of snakes can have different types of teeth depending on their diets and their different methods used to capture and ingest prey. Snake teeth are both **Acrodonts**, or attached to their jaw bones, and **Polyphydonts**, meaning they are able to constantly shed and replace their teeth and/or fangs throughout their lives whenever they are lost or damaged, or whenever the snake constantly grows.

**Figure-Aglyphous Snake Skull. Photo Credit: All You Need is Biology-WordPress*

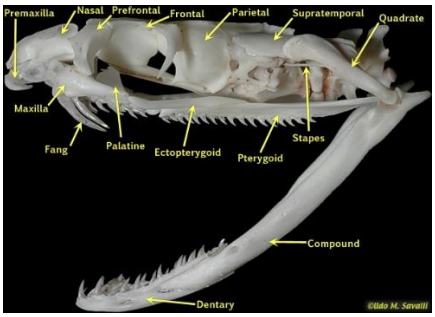

**Figure-Proteroglyphous Snake Skull. Photo Credit: Udo M. Savalli.*

Aglyphous snakes have several rows of recurved teeth without any special, or modified teeth or venom glands or ducts, and include examples such as all boas and pythons, most colubrid snakes, and many other nonvenomous species of snakes. **Solenoglyphous** snakes possess a pair of large, hollow, front-ward oriented fangs which fold against the roofs of their mouths when their jaws are closed, and are normally covered by protective layers of sheaths and thin ligaments. These snakes include all pit vipers and other species of viperid snakes. **Opisthoglyphous** snakes, or more commonly known as the "rear-fanged" snakes, have one or more pairs of enlarged teeth or fangs located towards the rear of the jaws, or maxillae, which are normally also recurved and are grooved to enable for their venom flow. Finally, **Proteroglyphous** snakes have a pair of small, unhinged, front-ward oriented fangs located on their front, or anterior maxillae that are hollow, short, and grooved to enable the flow and injection of their venoms. These snakes include the cobras, taipans, mambas, coral snakes, and all other venomous elapid snakes.

**Figure-Solenoglyphous Snake Skull. Photo Credit: Wild View: Wildlife Conservation Society*

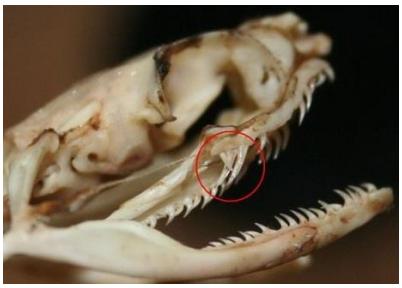

**Figure-Opisthoglyphous Snake Skull. Photo Credit: All You Need is Biology-WordPress*

Integumentary System:

The Integumentary System comprises of a snake's outer-most, external organs and organ systems, including their thin layer of underlying skin, hardened, overlapping **Scales**, and sometimes other external, keratinized structures such as the rattles on rattlesnakes. A snake's skin and scales serve to provide additional layers of protection from dehydration and desiccation (or water loss), as well as help to prevent external damage or injury, and aid in their overall movement and locomotion. Snake scales can have many different purposes, functions, shapes, and textures, all of which can be used as identifiers in our ability to classy them taxonomically, as well as oftentimes enhance our ability to identify and distinguish many different species from one another more closely or minutely.

**Figure-Keeled/Semi-Keeled Scales on a Snake. Photo Credit: Central Florida's Biologist.*

Some species of snakes have **Smooth Scales**, while others have tiny ridges or keeled on each scale, which are known as having **Semi-Keeled or Keeled Scales**, giving them a rougher texture and

appearance. A snake's belly, or **Ventral Scales** or **Scutes** are much flatter, and wider overall, enabling them the ability to gain better grips and traction during movement and locomotion in coordination with their muscular system. These ventral scales than divide into one to two rows of smaller scales at, or slightly past their ventral opening or cloaca, on the undersides of their tails, which are known as **Subcaudal Scales**, which can also oftentimes be useful in identification and classification. Contrary to (still) popular belief, snakes actually are not slimy at all, and have comparatively fewer external glands, of which, they are not able to use to "sweat", perspire, or excrete other oils or secretions in the way that our human bodies do.

**Figure-Smooth Scales on a Snake. Photo Credit: VT Herp Atlas.*

Snakes also have a clear, transparent scale covering each of their eyes, known as a **Spectacle**, and do not have eyelids, or the ability to blink. These clear scales also serve to protect the eye from outer, external damage or injury, while also retaining water moisture and hydration, providing the same protective purposes in preventing water loss and desiccation. Snakes can also have tremendously variable scalation along and on top of their heads and jaws as well. Scales located on the tops of their heads are called **Parietal Scales**, and may be small and granular, or large and plate-like depending on the species and taxa. Scales along, behind, and underneath the eyes are known as **Ocular, Post-Ocular, or Supra-Ocular Scales**, scales located along the upper and/or lower jaws are known as the **Labial Scales**, and scales located at the tips of the snouts are known as the **Rostral Scales**. In many species, all or some of these types of scales can also be highly modified for specific functions or niches, in the form of "horns" or other "appendages". All snake scales, however, are comprised of Keratin, which is the same material as that in our hair and nails.

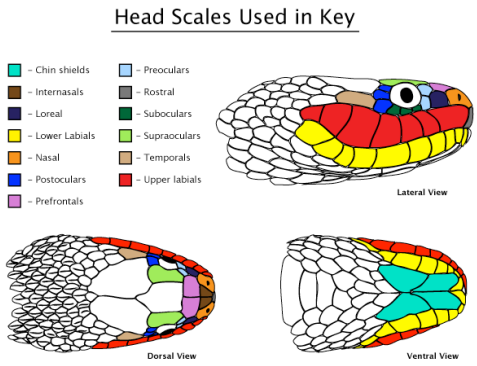

**Figure. Key to the Scalation On/Around the Head of a Snake, including Loreals, Labials, Oculars, Temporals, and*

Rostrals. Photo Credit: Jonathan Drescher-Lehman.

Unlike many other animals, snakes and other reptiles also exhibit Indeterminate Growth, meaning they do not stop growing through their lives, although their growth rates normally will slow considerably once they reach their sexual maturity levels. As a result, snakes and other reptiles must periodically shed their skin, which the frequency thereof often depends on their overall age, health, and food intake and availability. The more snakes eat, the more they grow, and therefore, the more often they may shed their skins, which is known as **Ecdysis**. Snakes and other reptiles can shed their skins up to several times each year, so determining their age by the number of times they have shed is not reliable. Prior to shedding, a snake's eye-caps will become a milky whitish-blue and appear cloudy, and their skin and scales will form a slightly bluish hue and reduction on color and pattern intensity, which is caused by fluid buildup between their layers of skin and scales.