Quadrant II- Transcript and Related Material

Programme	**: Bachelor of Science (First Year)**
Subject	**: Zoology**
Course Code	**: ZOC 102**
Course Title	**: Diversity of Chordates and Genetics**
Unit	**: 5-Reptiles**
Module Name	**: Venomous and Non Venomous Snakes**
Name of the Presenter	**: Mr. Kiran Gaude**

Notes

Snakes probably derived from a lizard ancestry in Mesozoic times. They have long, narrow bodies and they are devoid of limbs. Mouth and pharynx are distensible which enables them to swallow entire prey. Tongue long, narrow and forked. Tympanum and tympanic cavity are absent. Eyelids are replaced by transparent spectacles. Skin possesses scales and shields. They often shed their skin (Ecdysis). Vertebrae are numerous, divided as precaudal and caudal. Except atlas, all precaudal vertebrae carries ribs.

Snakes can be grouped as Venomous, Non Venomous or Mildly Venomous. More than 3000 species of snakes are known today of which 600 species are venomous. 200 species of snakes are medically important (According to WHO). In India more than 270 species are known of which 60 are highly venomous. Venomous snakes belong to suborder Serpentes, produces venom which is used for killing prey, for defence and to assist with digestion of their prey. The venom is delivered by injection using hollow or grooved fangs. The poison apparatus of snakes consists of a pair of poison glands, their ducts and a pair of

fangs. In venomous snakes the poison glands are situated one on either side of the upper jaw. The poison glands are possibly the superior labial glands or parotid glands. Each poison gland is sac-like and provided with a narrow duct at its anterior end. Fangs are the hollow maxillary teeth. They are long, sharply pointed, hook like, either grooved or perforated for the passage of the duct of the poison gland. Fangs regenerates when lost.

Based on structure there are two types of fangs:

- Open type (e.g., Cobra)
- Closed type (e.g., Viper)

Based on position there are three types of fangs in venomous snake:

- **Solenoglyphous** (*Solen*= Pipe+ *glyph= hollowed* e.g., vipers and rattle snakes)
- Single, long, curved and tubular fang attached to the snake's maxillary bone.
- The maxilla is hinged so that the fangs can be folded back parallel to the jaws when the mouth is closed, or erected perpendicular to the jaw when the snake is striking.

- **Opisthoglyphous** (*Opistho*= behind e.g., snakes of the family Colubridae)
- Fangs are grooved and are found back of the maxilla, behind the normal teeth.
- Such fangs are connected to Duvernoy's glands (different from true venom glands).
- They lack associated muscles to generate the pressure needed to evacuate venom also lack a chamber for storing venom.

- Snakes probably secrete their venom only during chewing.

- **Proteroglyphous** (*Protero*= first e.g., Sea snakes, Krait, Cobra)
- Present at the front of the mouth and are about three times shorter than solenoglyphous fangs.
- Permanently erect and grooved along its anterior face.

- Aglyphous: These are unmodified teeth, essentially non-fangs. Present in all snakes, even those that possess fangs which they use for gripping their prey during swallowing. A non venomous snake has enlarged posterior maxillary teeth that lack grooves, so they are by definition aglyphous. Example – Python, Boa.

Snake Biting Mechanism There are four distinct phases when a venomous snake bites.

(1) The strike

(2) Opening of the mouth and elevation of the fangs

(3) Closing of the jaws and the injection of venom

(4) Retraction of the fangs

Snake Venom- yellow fluid stored in poison gland Composed of a combination of proteins, enzymes, and other molecular substances. Snake venom works by breaking down cells and tissues, which can lead to paralysis, internal bleeding, and death for the snake bite victim. For venom to take effect, it must be injected into tissues or enter the bloodstream.

Types of Snake Venom: The four distinct types of venom act on the body differently:

- **Proteolytic venom** dismantles the molecular surroundings, including the bite. E.g., Vipers, some Cobra species such as the Mozambique Spitting Cobra, Black Necked Spitting Cobra, Zebra Cobra, Rattle Snakes, Gaboon Vipers, Saw Scaled Vipers, Russell's Viper etc.
- **Hemotoxic venom** act on the heart and cardiovascular system. It cause haemorrhage and haemolysis. E.g., the Boomslang (a back fanged snake from Africa).
- **Neurotoxic venom** acts on the nervous system and brain. It cause paralysis of respiratory muscles. E.g., Cobras, Mambas, Coral Snakes, Banded Kraits and Yellow Bellied Sea Snakes.
- **Cytotoxic venom** has a localized action at the site of the bite. It works on molecular by destroying the cell membrane, thus destroying the tissue. E.g., some Cobra species.

Non-Venomous Snakes- Do not produce venom (Some do produce venom but shows toxic effect on their prey). They do possess teeth as in venomous snakes. Python, Boas, Bullsnakes are true non venomous snakes.

Identification of Venomous or Non-venomous Snakes

Nature of the tail:

- Tail is flat, laterally compressed – Sea snake – Venomous.
- Tail is short and blunt – Sand Boa – Non venomous
- Tail is round and cylindrical – Venomous/Non venomous

Nature of the ventral scales:

If the tail is cylindrical, snake can be venomous or non venomous, observe the ventral scales:

- Small scales on the ventral side (belly region) – Non venomous, Garter snake.
- Ventral scales are large but do not cover the belly region completely, small scales at the end of broad ventral scales- Non venomous – Python.
- Ventral scales are broad and cover the entire width of the belly region – Venomous/ Non venomous.

Nature of the head scales

If the tail is cylindrical and ventral shield is broad covers the entire belly part, the snake can be venomous or non venomous, observe the head scales:

- Small head scales - Venomous- Viper. (If loreal pit (thermoreceptor) is present in front of eye then it is pit viper). Small scales on head, loreal pit absent-Pitless Viper (Sub caudal double). *Echis carinatus* (sub caudal single).
- Large shield in the head – Venomous/ Non venomous

Nature of the jaw scales and vertebral scales:

If the tail is cylindrical, ventral shield is large, head is covered with large shield, snake can be venomous or non venomous, observe the jaw and vertebral scales:

- If the vertebral scales are not large, third supra labial shield (upper jaw) is large and touch the nostril and eye – Venomous- Cobra or coral snake.

- Vertebral scales (mid dorsal on back) are large and hexagonal, four infra labial scales with 4th one is the largest – Venomous - Krait.
- None of the characters of Cobra, Coral snakes or Krait- Non Venomous snakes