B.Sc 2ND SEMESTER

Paper: Diversity of Chordates

Topic:

Biting mechanism of Snake

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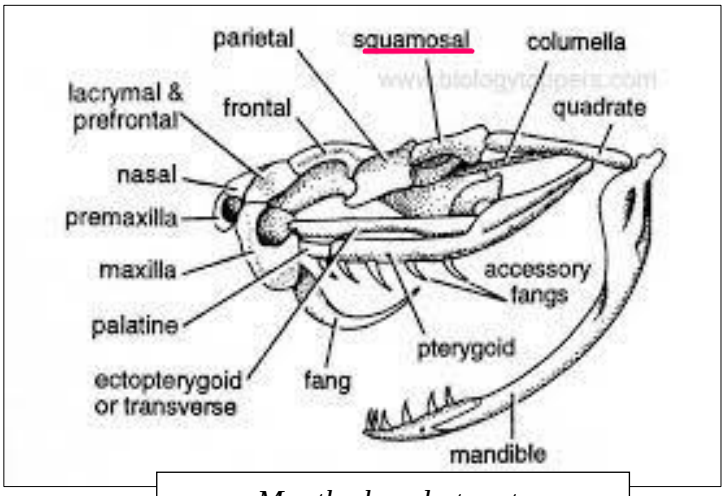
The mechanism of biting in snakes is a complicated process
There are four distinct phases when a poisonous snake bites: (1) The strike; (2) opening of the mouth and elevation of the fangs; (3) closing of the jaws and the injection of venom; (4) retraction of the fangs and can be describe as:

1) The strike

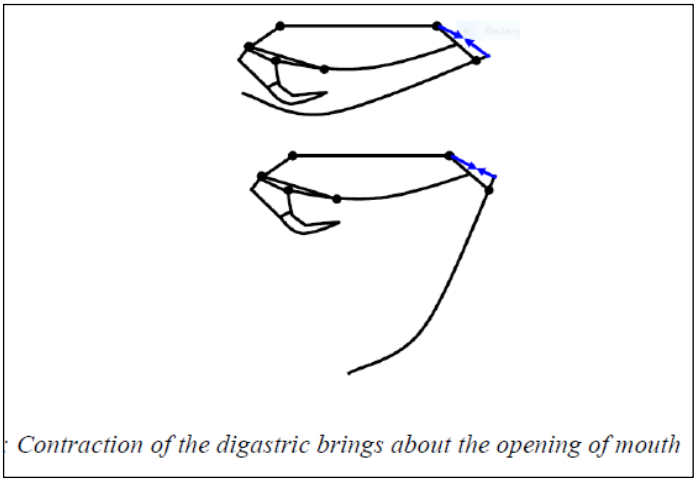
- *In this phase the snake throws itself forward with great rapidity and violence, the distance covered not generally exceeding one-third of its length. Vipers strike with greater velocity than the colubrids, some of which especially the hooded species raise the head from the ground thus compensating to some extent for the limited mobility of the fangs.*



Mouth closed at rest

1) Opening of the Mouth and Rotation of the Maxilla leads to elevation of fangs

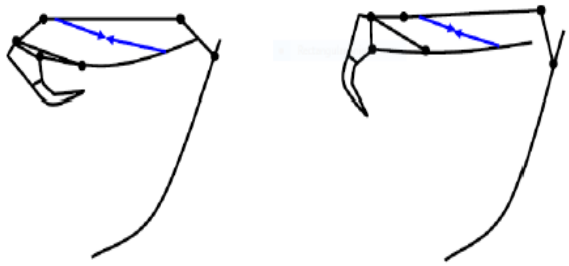
- *By the **contraction of the Digastric muscle**, the mouth is opened (Lower jaw moves downside when mouth is opened)*



Contraction of the digastric brings about the opening of mouth

*With the opening of the mouth, the lower jaw or mandible moves down and the **lower end of the quadrate bone moves forward.***

Quadrate and Squamosal bone are movable. The pterygoid bone is movably attached to palatine.



Sphenopterygoid contracts and brings about the rotation of maxilla and elevation of fangs

- *With the contraction of Sphenopterygoid muscles, this results in the* ***forward movement of the pterygoid and up-pushing of the ectopterygoid bone.***
- *The upward movement of the Ectopterygoid bone brings* ***about a 90° rotation of maxilla on its own axis and as a result the fang is raised and becomes erected.***
- *When the mouth is closed the fang remains in horizontal position parallel to the roof of the mouth, but during opening of the mouth in striking position, fang takes almost vertical position.*

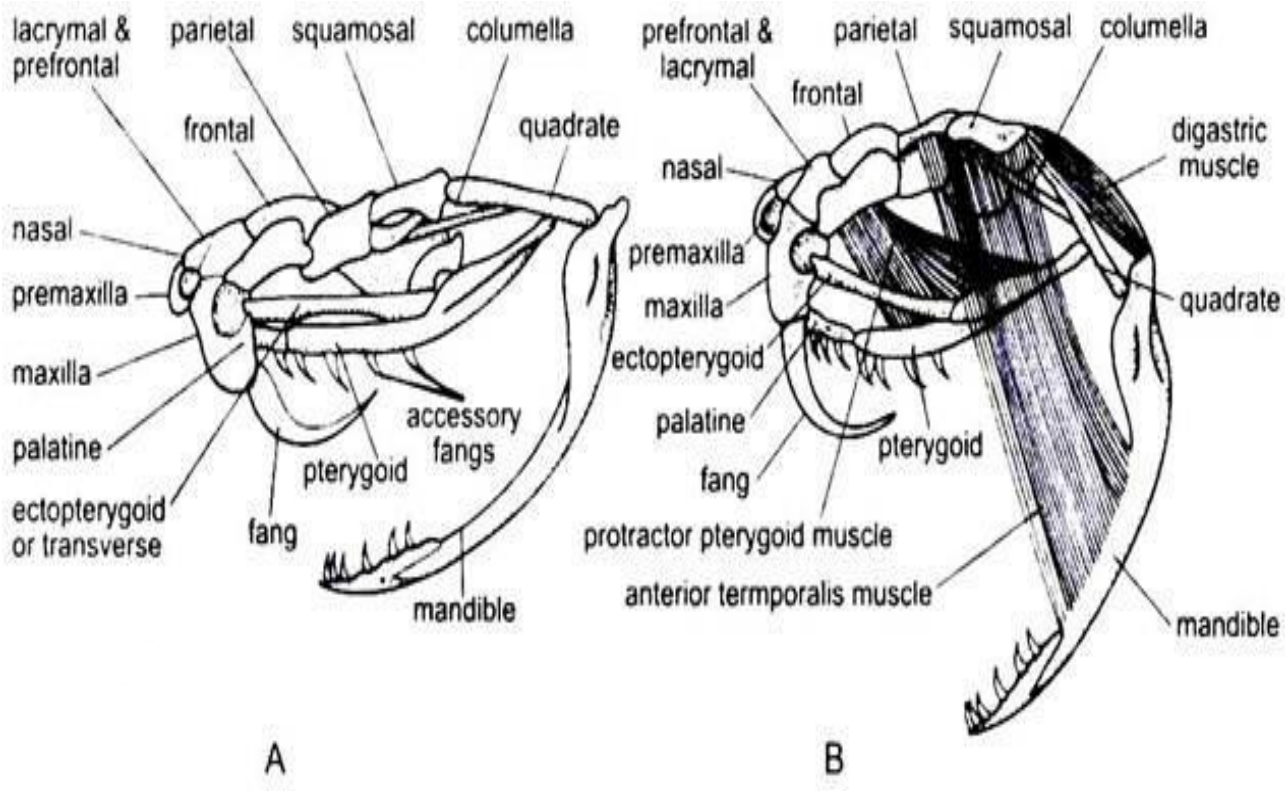
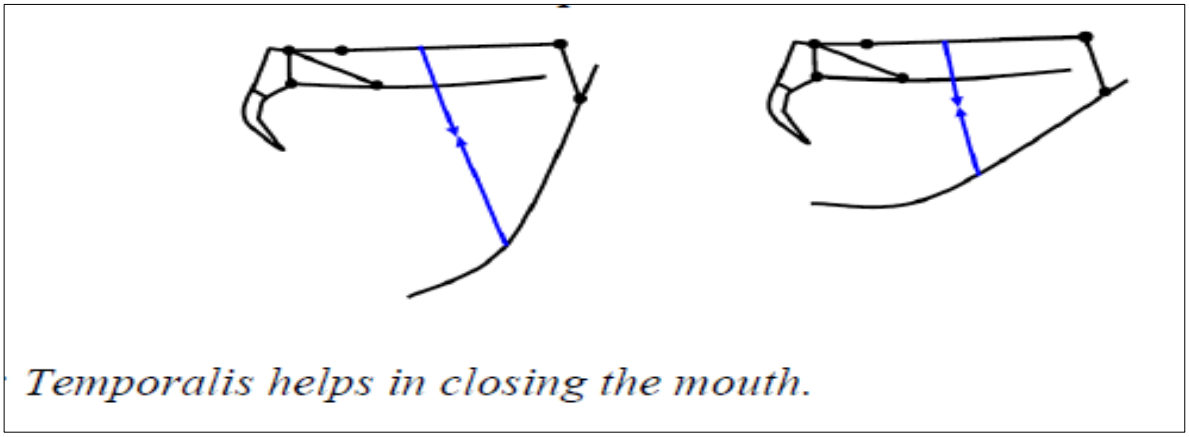
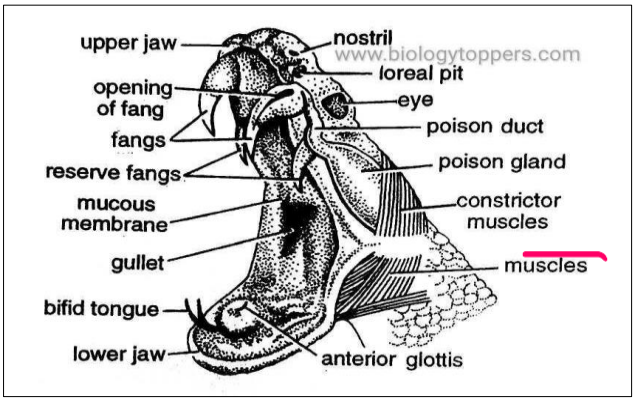


Fig. Skull of a viper showing biting mechanism. A–Mouth closed at rest; B–Mouth opened when striking the prey.

2) Closing of jaw (mouth) & Injection of Venom



- *Closure of the jaws follows, a result brought about by the **simultaneous contraction of the anterior, middle and posterior temporal muscles** which strongly elevate the mandibles*
- *Through the contraction of the digastric muscle and **during the rotation or forward movement of the squamosal bone**, the **ligament present in the poison gland are stretched.***
- *A simultaneous **stretching or contraction of constrictor muscles** around the poison gland, **forces its poison through** poison duct into the canal or groove of fang to **be injected into the victim.***



3) Retraction of fangs

- *Immediately following the insertion of the fangs, and actually accompanying the discharge of venom, **contraction of the retractor muscles** which operate on the pterygo-palatine-transverse arch occurs, dragging the elevated fangs downwards and backwards through the tissues and mouth comes to its resting state.*

Difference between Non-poisonous Poisonous snakes:

Characters	Non-Poisonous Snakes	Poisonous Snakes
1. Physical features	Stout, dull coloured.	Slender, brightly coloured
2. Head	Rounded or elliptical	Triangular or posterior broadened
3. Head Scales	Large	Small
4. Saliva	Non-toxic	Contains toxic peptides and enzymes
5. Fangs	Not present.	Present, hollow like hypodermic needles
6. Teeth	several small teeth	Two long fangs.
7. Pupils	Rounded	Elliptical pupil
8. Anal Plate	Double row	Single row
9. Tail	Not much compressed, rounded	Compressed
10. Ventral belly plates	Small, never extends across the belly	Broad and always extended across the entire width of the belly
11. Bite mark	Row of small teeth	Fang Mark
12. Family	Boidae, Uropeltidae, Xenopeltidae, Typhlopidae	Viperidae, Elapidae, Colubridae, Hydrophidae
13. Examples	*Oligodon arnensis, Dendrelaphis tristis, Ahaetulla nasuta, Zamenis longissimus*	*Bungarus caeruleus, Daboia russelii, Ophiophagus hannah, Naja naja*

Review Questions

1. State four differences between poisonous snake and non poisonous snakes citing at least three Indian examples of each. [4]
   1997, 1999, 2006, 2008, 2010
2. Describe the structure of poison gland. [3]
   1997, 2006, 2008, 2010
3. Give an account of the muscles involved in the biting mechanism of poisonous snakes, and also illustrate the biting mechanism. [3+3]
   2005, 2006, 2008, 2010
4. Distinguish between proteroglyphous and solenoglyphous fangs. [4]
   1999