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Reptilia

GENERAL CHARACTERS AND CLASSIFICATION UPTO LIVING SUBCLASSES

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Introduction

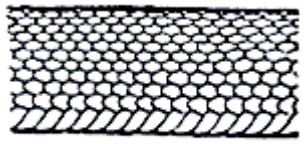
Monocondyla with a scaly skin (H. Gadow. 1901).

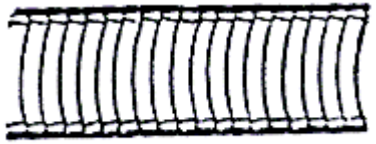
- Reptiles are **cold-blooded (ectothermic), air-breathing vertebrates** characterised by **dry, scaly skin** and laying **amniotic eggs** adapted for terrestrial life. A basioccipital bone is present in the skull, which articulates with the vertebral column by a single condyle.
- Reptiles evolved from **amphibian ancestors** during the late **Carboniferous period (~320 million years ago)**.
- They were among the **first vertebrates** to become **fully terrestrial**, thanks to **adaptations** like **internal fertilisation** and the **amniotic egg**.

L. *repere* = to crawl

General characteristics

- **Habitat:** Chiefly terrestrial, also found in aquatic environments (freshwater and marine).
- **Body plan:** Bilaterally symmetrical. Divisible into four regions – head, neck, trunk and tail.
- **Limbs:** 2 pairs, pentadactyl. Digits with claws. Limbs are absent in a few lizards and all snakes.
- **Exoskeleton:** Horny epidermal scales (small), scutes (large) and dermal bony plates (osteoderms).

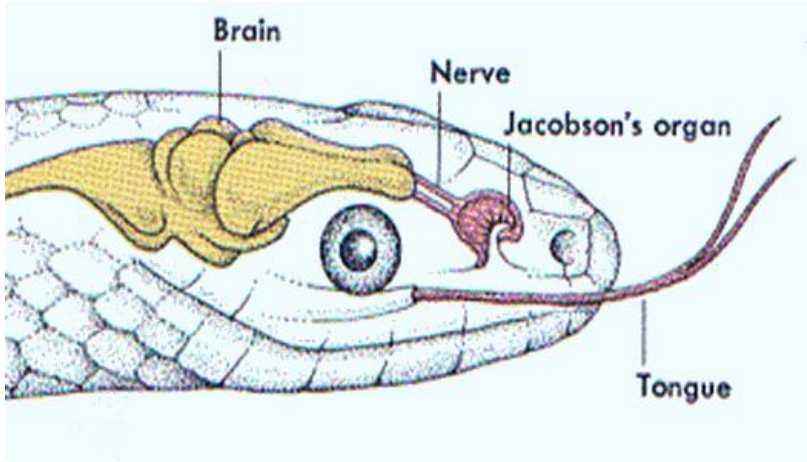




Osteoderm of a Nile crocodile

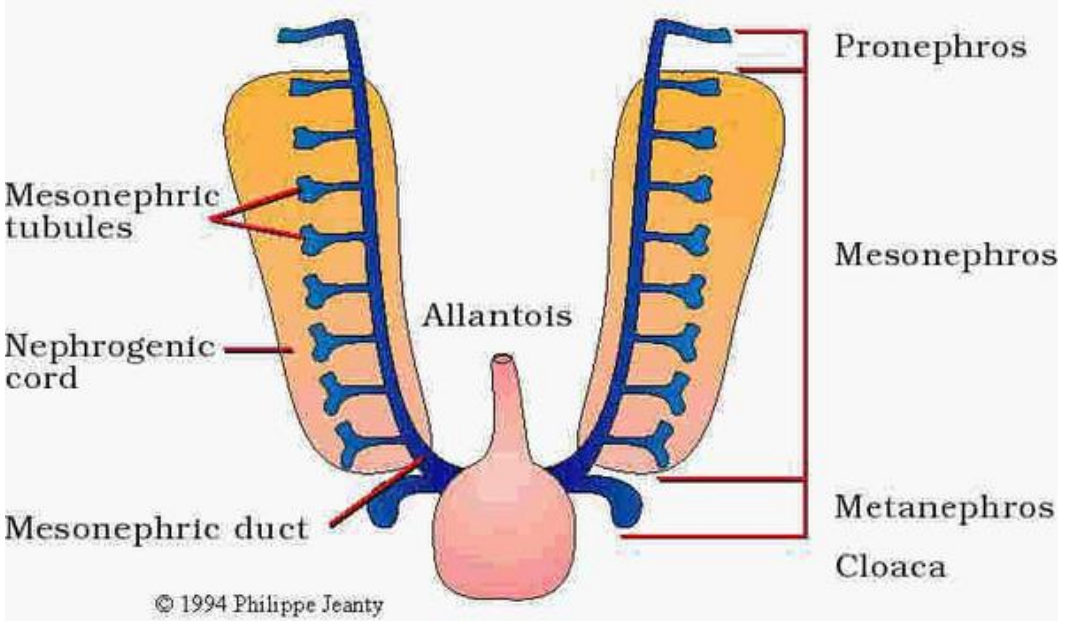
General characteristics

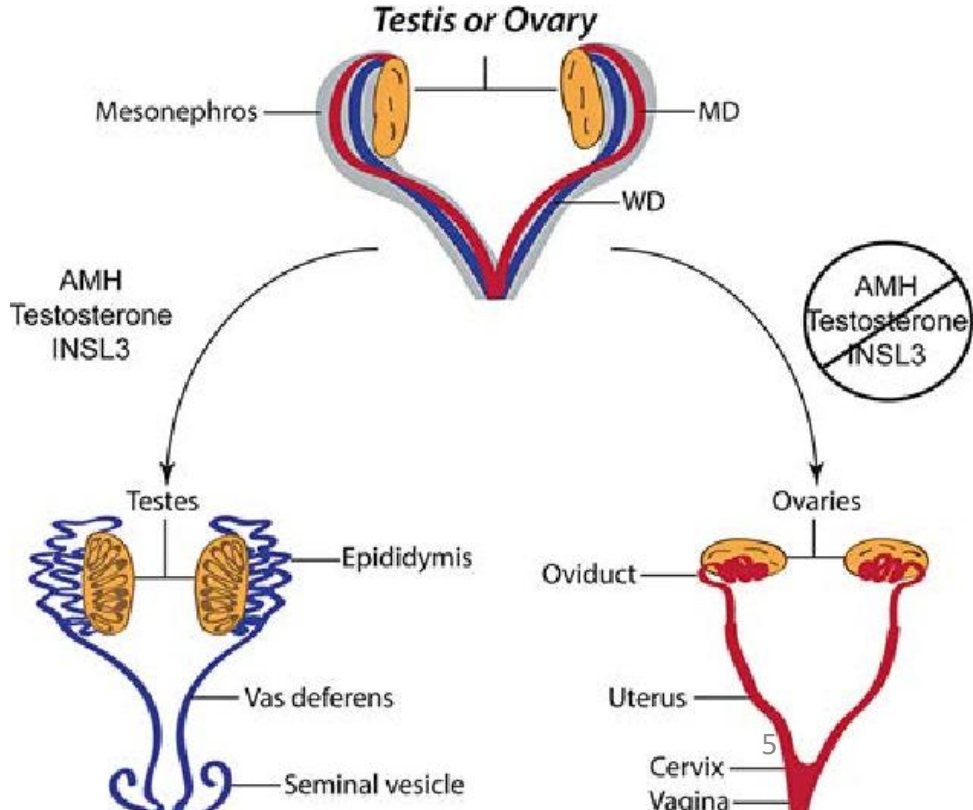
- **Skin:** Dry and cornified, devoid of glands.
- **Integumentary glands:** Few scent glands, which help to attract opposite mates during breeding seasons.
- Vomeronasal organ (**Organ of Jacobson)** is well developed in most squamatas and *Sphenodons.*
- **Mouth:** Terminal. Jaws bear simple conical teeth. In turtle teeth is replaced by horny beaks.
- **Cloacal opening:** Transverse or longitudinal
- **Heart:** Imperfectly **four-chambered**. Composed of two auricles and two ventricles. **Ventricles are partially divided**, except, in crocodiles it is completely divided. Right and left systemic arches present.
- **Blood:** RBC oval and nucleated. Ectothermic



General characters

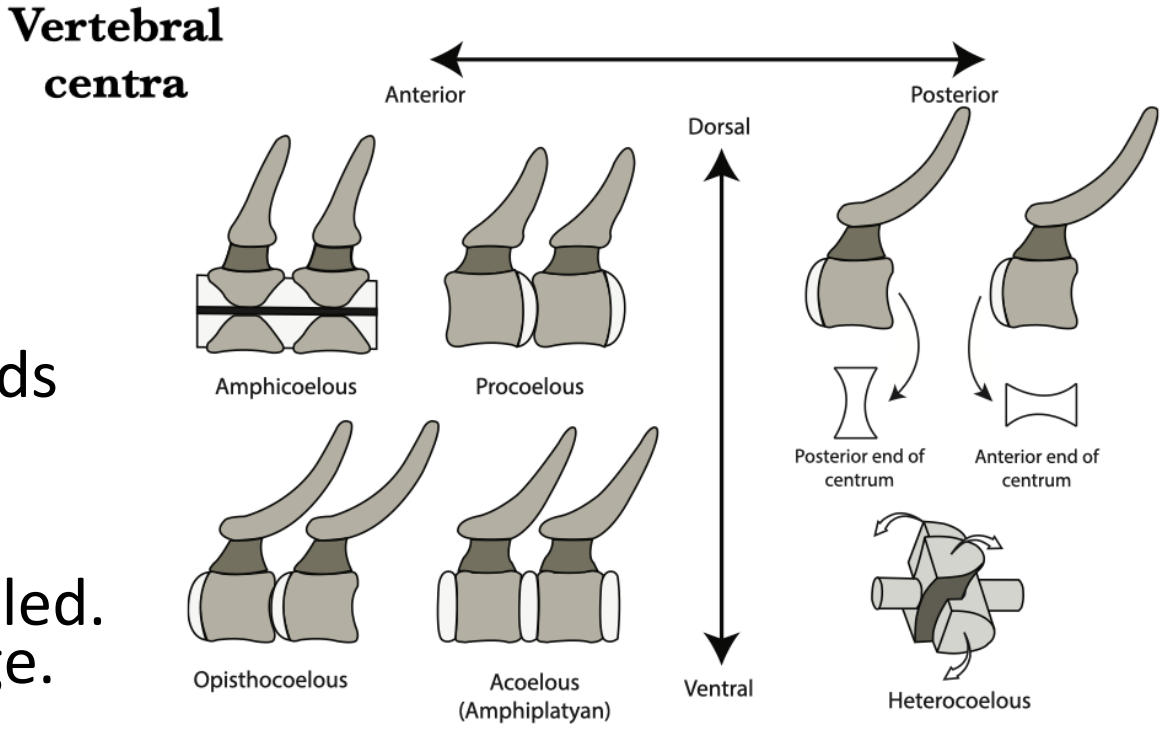
- **Respiration:** Mainly by the lungs. Pharyngeal and cloacal respiration is seen in many aquatic turtles.
- **Kidney:** Metanephric
- **Excretion:** Uricotelic
- **Cranial nerves:** 12 pairs
- **Mullerian duct** persists as **oviduct in female** and **Wolffian duct** is retained as **vas deference** in **male**.
- **Fertilisation:** Internal
- Males possess copulatory organs.

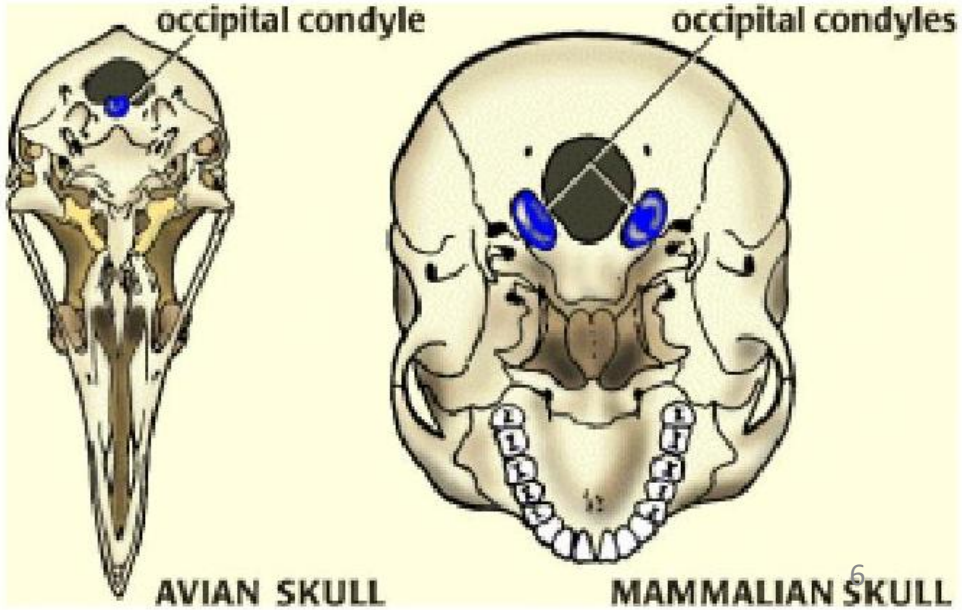




General characters

- Mostly oviparous, a few species of lizards and snakes are viviparous.
- **Cleavage:** Meroblastic
- **Eggs:** Cleidoic, i.e., large, yolky and shelled. Shells are porous, allowing gas exchange. Eggs amniotic, i.e., possess an extra-embryonic membrane, **amnion, chorion and allantois.**
- **Development:** No metamorphosis. Youngs resemble adults. Parental care is usually absent.
- **Skull:** Single occipital condyle.
- **Vertebrae:** Procoelous. Two sacral vertebrae instead of single one in amphibians





Distinctive Features (Compared to Amphibians)

🌍 1. Adaptation to Fully Terrestrial Life

- Reptiles are **fully terrestrial**, unlike amphibians which depend on moist environments.
- No larval stage requiring water for development.

🛡️ 2. Dry, Keratinised Skin

- Skin is **thick, dry, and covered with keratinised scales** or scutes.
- Prevents **water loss**, unlike the **moist, permeable skin** of amphibians.

Distinctive Features (Compared to Amphibians)

- 🫁 **3. Efficient Lungs**
- Respiration occurs **entirely through lungs**, with **no cutaneous respiration**.
- Lungs are **more developed and compartmentalised** compared to those of amphibians.
- 🥚 **4. Shelled Eggs with Extra-Embryonic Membranes**
- Reptilian eggs are **amniotic**, with a **calcareous or leathery shell**.
- Contain **amnion, chorion, allantois, and yolk sac** — enabling development on land.
- Amphibian eggs lack these and must be laid in water.

Classification of Reptilia

The class Reptilia is classified into *five* subclasses based on the presence/absence of certain openings through the posterolateral or temporal region of the skull.

- **Anapsida:** without any opening in the temporal region.
  - Found in Cotylosaurs and Chelonians
- **Euryapsida:** Skull with a single dorso-lateral temporal opening on either side, bounded below by postorbital and squamosal bones.
  - Found in Pelycosaurians.

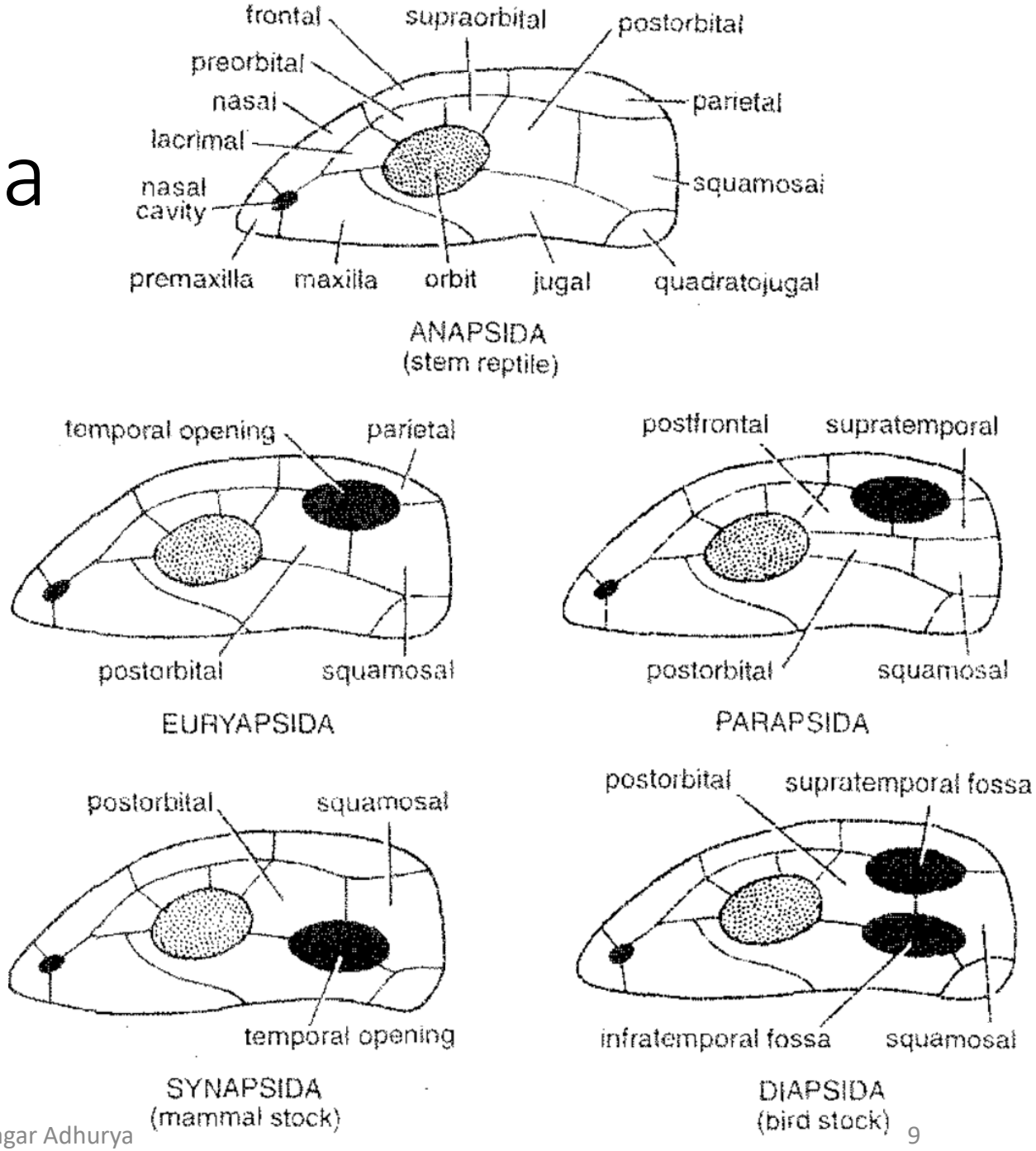


Fig. 1. Five types of skulls in lateral view in 5 subclasses of reptiles.

Classification of Reptilia

- **Parapsida:** Skull with a single dorso-lateral temporal opening on either side, bounded below by the supratemporal and postfrontal bones.
  - Found in Mesosaurs and Ichthyosaurs
- **Synapsida:** Skull with a single lateral temporal opening on either side, bounded above by the postorbital and squamosal bones.
  - Found in Protorosaurs and Sauropterygians
- **Diapsida:** In this case, there are two openings on each side, separated by postorbital and squamosal bones.
  - Found in Lepidosauria and Archosauria

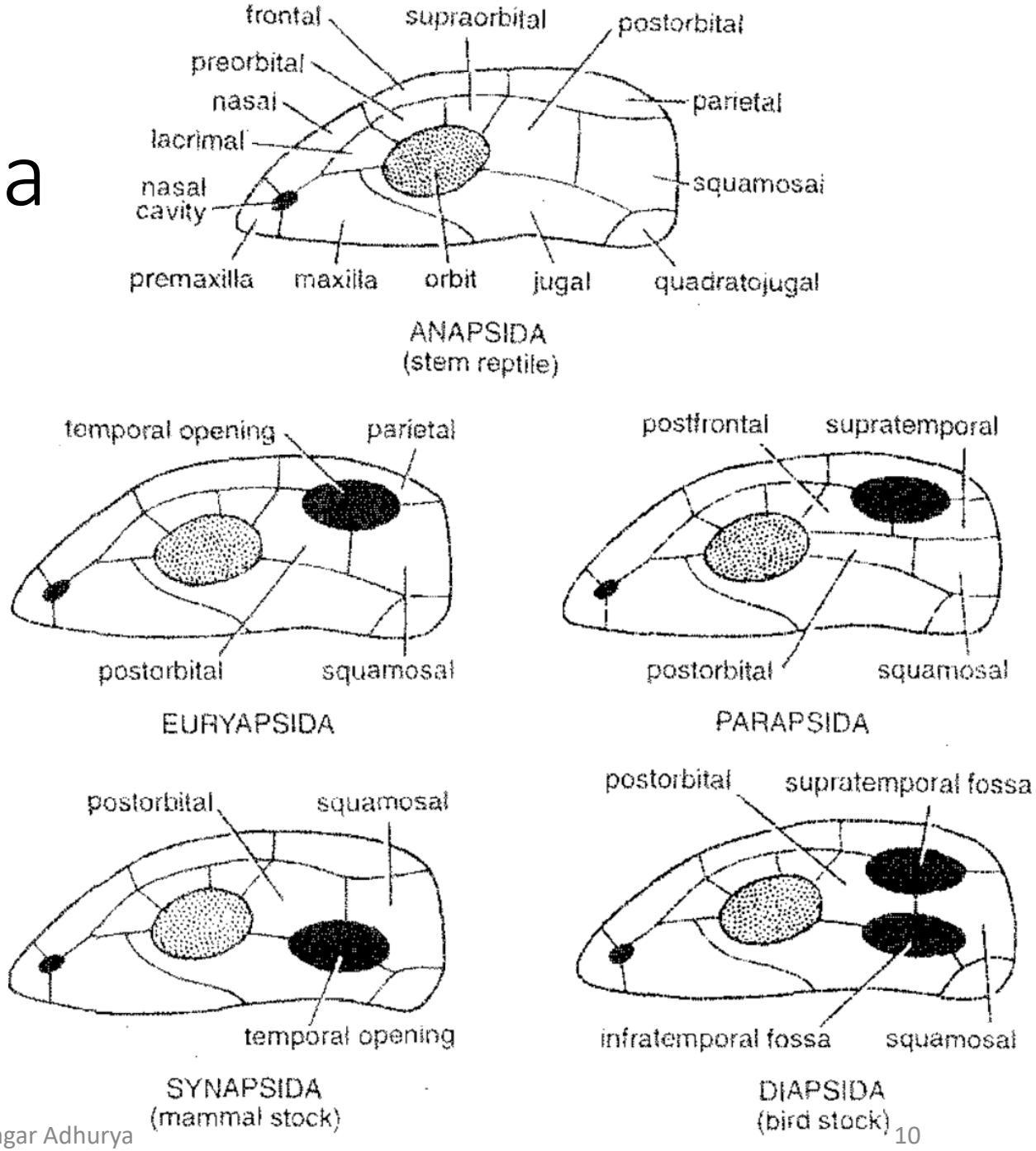
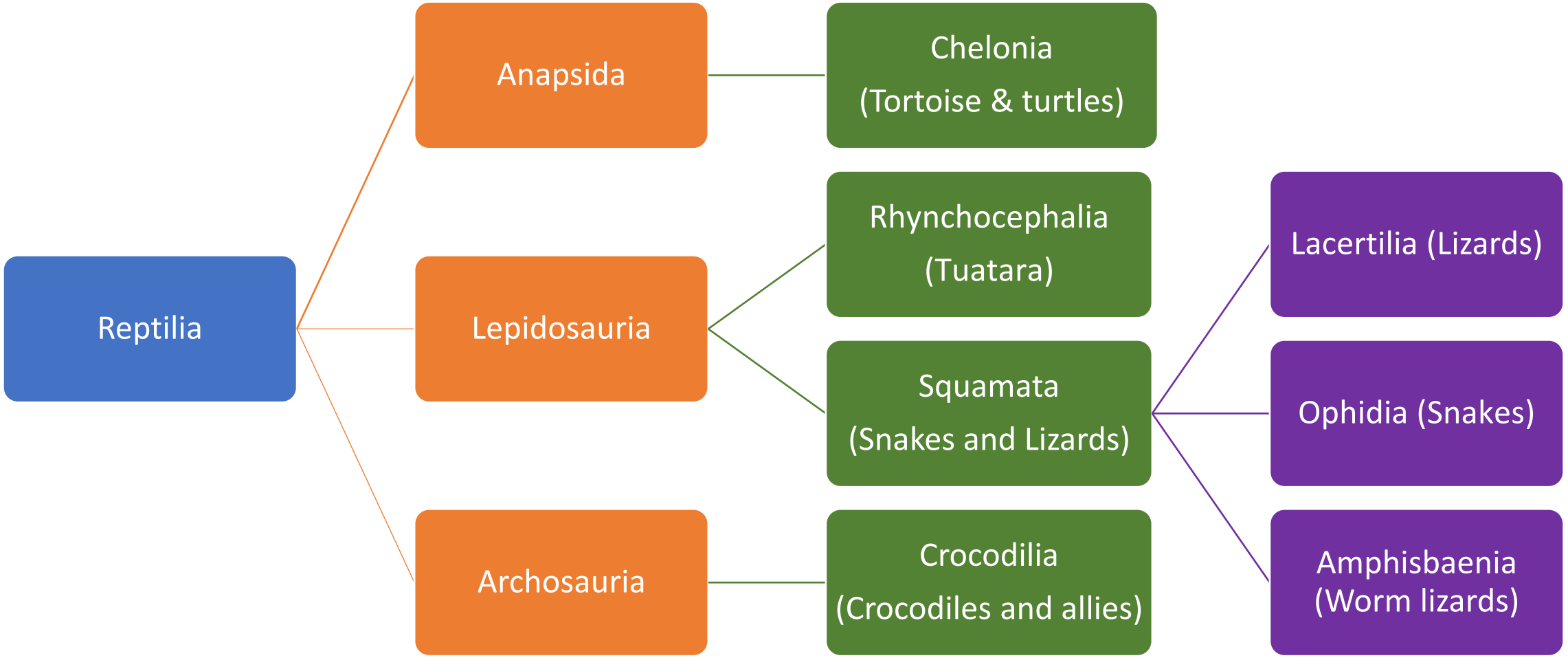


Fig. 1. Five types of skulls in lateral view in 5 subclasses of reptiles.

Classification (According to JZ Young (1981)



CLASS **SUBCLASS** **ORDER** **SUBORDER**

Subclass Anapsida

Characteristics

- Skull devoid of temporal fossae.
- The roof of the skull is solid.

Facts

- The most primitive form of reptile.
- The extinct order **Cotylosauria** is called '**Stem reptiles**' from which other reptiles have probably evolved.
- **This subclass has only one living order: Chelonia or Testudinata.**

Testudines: Tortoise, Terrapins and Turtles

- The body of the Testudines is encased by a convex dorsal shield (**carapace**) and a flat ventral plate (**Plastron**), which remains joined at the sides.
- The cloacal opening is oval or longitudinal.
- Absence of teeth in adult conditions and the jaws are covered by sharp horny plates.

Tortoise

- Shape of the shell is ovoid
- Limbs end in clawed digits, no web.
- Head and limbs can be completely withdrawn into the shell.
- Terrestrial or freshwater.

Indian star tortoise (***Geochelone elegans***)
Source: https://th.bing.com/th/id/OIP.ZRdso-HtroPWHzlVWm9CtAHaE8?rs=1&pid=ImgDetMain

Terrapins

- The shell is almost circular and covered with soft skin.
- Limbs are webbed, and some digits bear claws.
- Head and limbs can be completely withdrawn into the shell.
- Freshwater

Indian Flapshell Turtle (***Lissemys punctata***)
© David Raju
Source: Wikimedia Commons

Northern river terrapin (***Batagur baska***)
© Axis (ground_assault_11@yahoo.com)
Taken from Northern river terrapin (Batagur baska)

Turtles

- The digits of limbs are ensheathed by a covering and form paddles. Limbs are clawless or clawed.
- Head cannot be withdrawn completely under the shell.
- Marine.

Olive RidleyTurtle (***Lepidochelys olivacea***)
© Curt P Finfrock
Source: iNaturalist

Loggerhead Sea Turtle (*Caretta caretta*)
© Roberto Pillon
Source: iNaturalist

Subclass: Lepidosauria

Gk., Lepis = scale; Squaros = Lizard

- The skull of the members of this group has two temporal vacuities, i.e., a diapsid skull.
- Lizard-like reptiles with scaled skin.

Representative of the order Rhynchocephalia

Tuatara (***Sphenodon punctatus***)
© Digitaltrails
Source: Flickr

- **Tuatara** is exclusively found in New Zealand.
- Known for a very well-developed **third eye** (Parietal organ or Pineal eye), which is made up of a lens, a retina with a nerve connected to the brain, but lacking an iris.

Lacertilia (Lizards)

Oriental Garden Lizard (***Calotes versicolor***)
©Devika M B
Source: iNaturalist

Yellow Monitor Lizard(***Varanus flavescens***)
©Sagar Adhurya
Source: iNaturalist

Ophidia (Snakes)

Indian Wolf Snake (***Lycodon aucilus***)
©Aadit Patel
Source: iNaturalist

Russel's Viper (***Daboia russeli***)
©Jonathan Hakim
Source: iNaturalist

Amphisbaenia (Worm Lizards)

Red Worm Lizard (***Amphisbaena alba***)
©Alvarovelasua
Source: iNaturalist

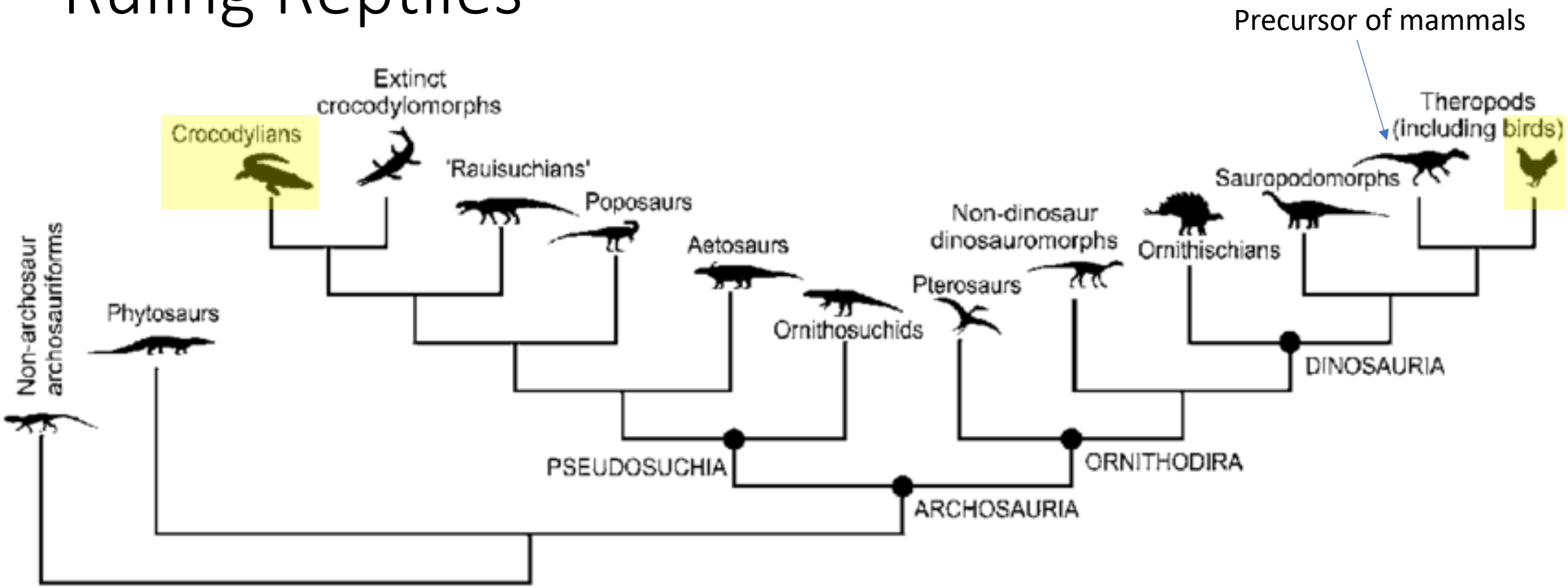
Black and White Worm Lizard (***Amphisbaena fuliginosa***)
©Matthieu Berroneau
Source: iNaturalist

Subclass Archosauria (Ruling reptiles)

Gk., árkhōn = leader; saúra = Lizard

- The skull is of diapsid type and lacks interparietal and parietal foramina.
- Some forms are toothless, and in others, only palatal teeth are lost.
- The lower jaw is with vacuities between dentary and angular.
- In some advanced forms, bipedality was present, and the girdles were modified accordingly.

Ruling Reptiles



Bishop PJ, Bates KT, Allen VR, Henderson DM, Randau M, Hutchinson JR. Relationships of mass properties and body proportions to locomotor habit in terrestrial Archosauria. Paleobiology. 2020 Nov;46(4):550-68.

Crocodilia (Crocodiles and allies)

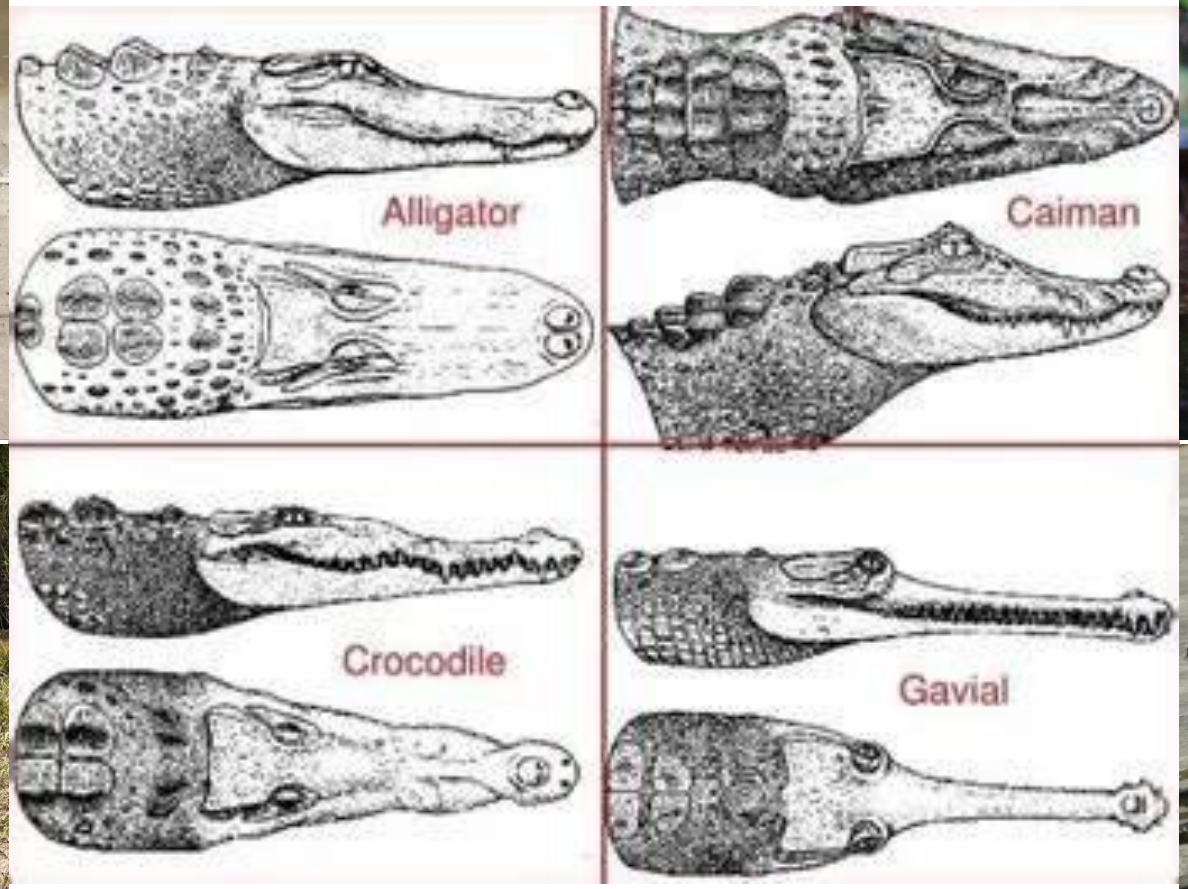
Saltwater Crocodile (***Crocodylus porosus***)
©Sagar Adhurya

Gharial ***(Gavialis gangeticus)***
©Sagar Adhurya

Different crocodiles

American Alligator
Source: Animal Wildlife Blog

Cuvier Dwarf Caiman
© Karel Jakubec Source: Wikimedia



Saltwater crocodile
© Eric Ralls Source: Earth.com

Gharial
© kilokiilo Souce: Reddit