

1. COURSE NAME & CREDIT LOAD

COURSE CODE: FWM 312A

COURSE TITLE: Herpetology

NUMBER OF CREDITS: 2 Credits

COURSE DURATION: Three hours per week for 12 weeks (36 hours)

As taught in (2009/2010) session (2 hrs for Lectures and 1 hr for Practicals).

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3. COURSE DETAILS:

3.1 Course Synopses:

Classification and characteristics of important West African reptiles. Anatomy, physiology and reproduction of African reptiles. Food and feeding habits. Distribution and economic importance.

3.2 Course note:

FWM 312

Herpetology is the science and study that deals with creeping creatures. Classes of animals in herpetology are:

- (i) Reptiles
- (ii) Amphibians

REPTILES

They are vertebrate and they possess all the features that are characteristics of their phylum.

CHARACTERISTICS

- (i) Bilateral symmetry
- (ii) Possession of skull
- (iii) Backbone enclosing a tubular nerve cord which is expanded in the head region to form the brain.
- (iv) Eyes, Nose and ears
- (v) They have a heart, a blood system that is closed-off from the body cavities and a standard complement of viscera.
- (vi) They have alimentary tract.
- (vii) They possess excretory and reproductive organs.
- (viii) They have a paired limbs or vestiges

GENERAL CHARACTERISTICS OF REPTILES

1. Reptiles are poikilothermic or cold blooded. Poikilothermy do not refer to the absolute temperature of the body but signify the lack of an effective internal mechanisms for regulating the body temperature in response to the changes in temperature of the environment. However, other methods of temperature control involving the utilization of external sources of heat are employed such basking in the sun, hibernation, running, staying closer to light etc.
2. As a rule, reptiles breathe atmospheric air by means of lungs. They never possess gills like fishes and amphibian larvae.

3. Almost all reptiles are covered with scales or scutes. Axtics which distinguish them from amphibians.
4. Most reptiles lay eggs which have much yoke with extra-embryonic membrane. These eggs are laid or deposited on land though some bear their young alive e.g.
5. At birth or hatching, the young reptiles are essentially and completely similar in shape and habit like their parents.
6. The ventricle of the heart is usually only partly divided by a septum and two separate aortic trunks arise from it.
7. Like amphibians, reptiles have only one bone in the ear to conduct sound vibrations from the ear drum to the inner ear.
8. In size, reptiles show great variation, though most living forms are of modest size. tiny lizards the smallest of modern reptiles may be under 5cm long while the largest living crocodiles and snake may reach length at least 6 and 9cm respectively. The biggest dinosaurs were 18-27m long and had weights up to 51000kg.
9. Reptiles inhabit many different sorts of terrains and have evolved diverse patterns of structure and behaviour. They can be found in tropical forest and all over the edges of tropical beaches. They have flourished in warm seas and freshwater and have made their homes in prairies and deserts. Only in the tundra and the icy Polar Regions, the top of high mountains and the depths of ocean and lakes have remained inaccessible to them.
10. Many reptiles are terrestrials and can walk, run or crawl on the surface of the earth. Some of them pursue a secretive existence under stones (they hibernate)

and among the roots of vegetation or could burrow underground while others spend most of their lives among the foliage of trees.

TE REPTILE BODY

1. THE SKIN: By comparison with the skin of an amphibian e.g. frog, the reptilian integument is comparatively water proof as in other vertebrates. It is made up of 2 main layers.

- (a) The superficial epidermis. this is derived from the embryo from the outer most layer (ECTODERM).
- (b) An inner dermis derived from the mesodermal tissues.

The scales of reptiles are formed mainly from thickness of the epidermis large plate – like scales such as those this form the outer layer of a turtle shell are often called SCUTES.

Scales / scutes may be modified to form crest horns or other features. The outer part of the scales are composed of dead horny tissues of this the protein keratin forms a large part.

They are continually being shed from piece meal or sometimes being sloughed off periodically in one piece as in snakes. The loss is made good by the proliferation of the living cell in the deepest layer of the epidermis. The dermal part of the skin consists mainly of connective tissue and contains nerves, blood vessels and involuntary or smooth muscle fibres.

The dermal part of the skin contains most of the pigment cells these are responsible for the colour of the skin and may be involve in the process of colour change.

The scales of reptiles constitute the series of unit this may vary in numbers and position only very slightly between individual of the same species and more remarkably different between different spp. so scale count are therefore used as aids for reptile identification.

2. TEETH: Most reptiles possess teeth and in certain groups e.g. snakes. This shows remarkable modification of their structure and function. The tooth tip is usually capped with a thin layer of extremely hard highly calcified enamel like structure. This enamel is nearly always homogenous (of the same) in structure unlike the enamel of mammals. In most reptiles, the teeth are shed and replaced through out life like mammals.

In some reptiles, the replacement follows an alternation pattern between any 2 functional teeth there is often an empty tooth space. The teeth usually have a fairly single conical or peg-like form though they may vary in size and shape over different parts of the jaw. They are not clearly differentiated into incisors, canines and molars and neither do they develop complicated crown patterns like the chick teeth of mammals.

In some reptiles, the teeth are restricted to the bones along the edges of the jaws or the pre-maxillae and maxillae above or the dentaries below and in some reptiles the teeth is entirely absent e.g. Turtles where they are replaced functionally by horny beak.

SKELETON OF REPTILE

The internal skeleton of a reptile is composed of 2 kinds of tissue these are cartilage and bone.

The bones may arise in the embryo either by ossifying directly in connective tissue or by ossification of pre-existing cartilaginous framework. Those that develop in

the first manner are known as “membrane” or “dermal bone” and this mostly occur in the skull or shoulder girdle while bones that develop in the cartilaginous framework can be found in the ribs, sternum and pelvic girdle and limb. Bones grow in length by the development of dir cartilaginous extremities. The tissue so formed is been developed into bones.

THE SKULL

Skulls of reptiles consist of 2 shells one inside and the other outer.

The outer part or layer is made up of dermal bones this mostly lie just beneath the skin or the lining of the mouth WHILE the inner bone surround the brain, inner ear and the nose and is perforated by canals for the cranial nerves.

In reptiles, the outer shell is represented by the bones of the skull roof and sides, those around the eyes, those in the upper jaw and palate and most of those in the lower jaw. In some reptiles especially lizards or snakes, both the upper jaw and the lower jaw are moveable on the cranium and this phenomenom is called “KINESIS”. The number of separate bones particularly of dermal bones in the reptilian skull is considerably greater than that in the mammals. The vertebral column support the body along its length and gives attachment to the back muscles this plays an important role in locomotion.

THE LIMBS

Majority of reptiles have four limbs though in some groups one or other of both pairs of the limbs may be reduced or even entirely absent e.g. snakes, crocodile. The upper part of the shoulder girdle is formed by the scapula. The socket of the shoulder joint lies at and junction of the scapula. The pelvic girdle consist typically of 3 palate of bones.

- (i) Ilium above this is generally firmly connected with the canal
- (ii) Acetabulum or socket for the femur lies at the junction of these 3 bones.
- (iii) Pubis and ischium usually meet in fellow of the opposite side in a broad joint. The pelvic bones give attachments not only to muscles of the leg and thigh but also to some of those of the ventral abdominal wall and tails and sometimes also to those of the male organs for copulation. The femur is usually stout with a cylindrical shaft and broad ends and has prominent processes (trochanters) for muscle attachment near its heads. The foot of reptiles shows a greater variation from those mammalian counterpart. Some are hook like in shape, webbed and some are twisted peculiar to the environment of that reptile.

THE BRAIN

The reptilian brain lies quite loosely within the cranial cavity and surrounded by tough fibrous membrane called "DURA MATER". The hinder part of the brain is well protected by the bones of the back and base of the skull as well as those of the roof. Brain account for about 1% of the body weight in medium size lizard the (*Lacerta viridis*), the brain account for about 0.5% of the body weight and in large reptiles, this proportion is very great reduced. The brains of reptile like those of other vertebrate can be divided in to 3 these are (i) Fore (ii) Mid and (iii) Hind region of the brain.

The fore brain consists of 2 cerebral hemispheres these are hollow with a surrounding cavities known as the "Lateral ventricle".

The roof of the mid brain or tectum is extremely well developed and forms a pair of prominent optic lobes this receives majority of fibres from optic nerves.

The hind brain consists of small cerebellum devoid of lateral lobes and is mainly concerned with balance and maintenance of posture and that of medulla oblongata.

THE EYES

The eyes of reptiles are usually well developed and plays an important role in dir adaptation. The eyes colour mainly due to pigmentation of the iris and is often bright, yellow or reddish. In some cases, the colour of the eyes lend itself to a general camoflag pattern e.g. cameleon. The retina may contain both rods and comes of various types.

In some reptiles, comes are only the field of the 2 eyes in mart reptiles overlap to some extent giving a degree of binocular vision of the 2 eyelids the lower is larger and more mobile. There is usually a third eyelid called “NICTITATING MEMBRANE” at the front of the eye this is more or less transparent and can sweep backward very rapidly across the cornea functioning for cleaning and lubricating the eye surface.

THE BLOOD AND LYMPHATIC SYSTEM

The reptilian heart posses to separate auricles and a ventricle this is usually incompletely divided by a septum. The pulmonary vein carrying oxygenated blood from the lungs and it enters the left auricle. The anterior venae cavae and posterior venca cava returning deoxygenated blood from the systemic circulation convey blood to the small sinus venosus this opens into and right autricle. It is a characteristics feature of all living reptiles, there are 3 separate arterial trunks are given off from the ventricle.

In reptiles, other than crocodiles the main interventricular septum lies in the horizontal plane rather than the vertical plane and partly divides the ventricle into dorsal and ventral cavities.

The red blood cells of adult reptile are oval and nucleated and they are more numerous than the white blood cell.

Lymphatic vessels are present in reptiles and there are usually paired lymph heart with contractile walls in the pelvic region.

EXCRETORY ORGANS AND EXCRETION

The kidneys are partly developed from the posterior of the 3 kidney primordial in the embryo and called "METAREPHROS".

In certain lizards and snakes, the kidney tubules show an interesting difference. The kidney ducts or ureters open into the cloaca and often having a common opening with vasa differentia this may be raised up into a small urogenital papilla on the dorsal cloaca wall.

A urinary bladder is present in sphenodon, turtles and lizards. It is usually opens into the ventral wall of the anterior part of the cloaca and has no direct connection with the ureters, the urine has to traverse or pass through the cloaca in order to enter or leave it.

Lizards and snakes were formally believed to excrete the waste product of nitrogenous metabolism almost entirely in the form of uric acids and its salt. The uric acid is passed as a whitish semi-solid mass a characteristic reptilian dropping. At times, tortoise or tortoises like other chelonians can produce a liquid urine. In reptiles the product of urinary excretion may mingle in the cloaca with the faeces derived mainly from undigested remains of the food. However, urine and faeces may also be passed on separate occasion.

REPRODUCTION AND EMBRYONIC DEVELOPMENT

The gonads (testes or ovaries) are situated inside the abdominal cavity and may lie at different levels on the two sides of the body attached and each testis is the “epididymis” through the tubules called vasa deferentia of the sperms pass before enter the vas deferens and carry them now to the cloaca.

In modern reptiles except sphenodonts the male always possess some form of intromittent organ like penis but the structure differs but the structure widely among different groups. It seems likely that the difference is absent in primitive reptiles. The oviducts in the female are always separate and do not fuse caudally in the midline to form a single uterus and vagina as in most mammals. Fertilization takes place in the upper part of the oviduct. As in many vertebrates, the reproductive organs go through a cycle of seasonal changes these are evoked (cause) by the activity of endocrine glands such as the pituitary glands and also influenced by environmental factors especially temperature, light and possible food supply. In temperate regions, reptiles usually breed once a year, fertilization taking place in the spring and the young appear towards the end of summer.

Most modern reptiles lay eggs and it is supposed that it is the most of reproduction in primitive reptiles (early). Many snakes and lizards however are viviparous retaining the eggs within the oviduct until the young are ready and be born. The term ovoviviparous is often applied to this type of reproduction in cases where the eggs are large and yolky as in reptiles and this distinguishes it from the viviparity of mammals where the eggs are small and the embryo dependent on the placenta nutrition. The eggs of reptiles vary greatly in size and the shape they may be nearly round, oval or elongated and are usually whitish and are laid on land in sheltered situations such as land in sheltered situations such as crevices, among leaves or beneath the sand. In some cases nest is made.

TEMPERATURE REGULATION AND ACTIVITY

Heat is produced as a by-product of many metabolic processes and is likely by controlling the amount of the heat that is lost that mammals such as man are able to maintain their body at a constant temperature. The metabolic rate of reptiles is lower than that of birds and mammals and so less heat is generated in their body. Not only do reptiles produce less heat but what they do produce is more easily lost since they don't have insulating coats or fur or feathers and are not able to raise their temperature by any special means like shivering and so they to a large extent depend on external sources of heat that may be provided by sun rays, metal bodies, warm ground, for this reason, reptiles are known as "ECTODERMIS".

While reptiles require a fairly high environmental temperature to maintain them in their active state, they are very susceptible to overheating and sometimes may be killed when their temperature rises to a level only a few degrees above that their body could regulate. Many times, they undergo hibernation in case of discomfort. Although, reptiles have little power of maintaining their body over long periods of temperature under natural conditions. They tend to behave in such a way as to ensure that their body temperature remains within a certain optimum range this is called "ECCRITIC TEMPERATURE". Preferably about 33°C but sometimes body temperature can be raised to some extent by basking on the surface or retaining their metabolic heat.

ECOLOGY

NB. Reptiles in captivity may not behave as reptiles in natural settings because their diet and taste will change, behaviour and adapt to the environment they found themselves.

CLASSIFICATION OF REPTILES

Reptiles are animals with the class reptilian with four living orders. The four living orders are:-

1. Crocodilae (crocodiles, caimans, alligators, gavials and we have 23 species in this order.
2. Sphenodontia:- These are tuataras, from Newzealand, we have 2 spp. of tuataras.
3. Squamata (lizards, snakes, worm lizards they are called Amphibaenians) skinks, gecko e.t.c. They are to about 7,900 spp. of squamates.
4. Testildiness (Tortoise and Turtles), they have about 300 species.

GENERAL CLASSIFICATION

Assignment

Get only 2 amphibians or reptiles each and do the measurement of their head, arm, total body, Neck length, weight. Use formalyne, ethanol or methanol for preservation. Compare their name, botanical name etc.

AMPHIBIANS

Amphibians are animal that live in water i.e. Aquatic. Some are semi-aquatic.

Class is called “Amphibian class”

They have 3 living orders are:-

1. Orders:- Anura (frogs with 48 families. Among the families we have;
 - Bufonidae
 - Ranidae
 - Pipidae
 - Hylidae
2. Order:- Caudata/urodela (Tailed animals e.g. salamanda, Newts

3. Order:- Apoda/Gymnophonia:- These are caecilians

The common order is the “Anura”

**FEATURES CHARACTERISTICS OF AMPHIBIANS THAT MAKES THEM
ADAPTED TO THEIR ECOSYSTEM**

1. They possess lungs and gills.
2. They can carry out metamorphosis
3. Some possess tail for swimming
4. They have forelimbs and hindlimbs