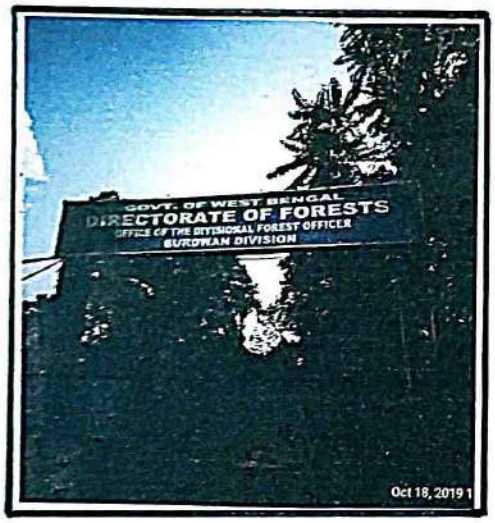
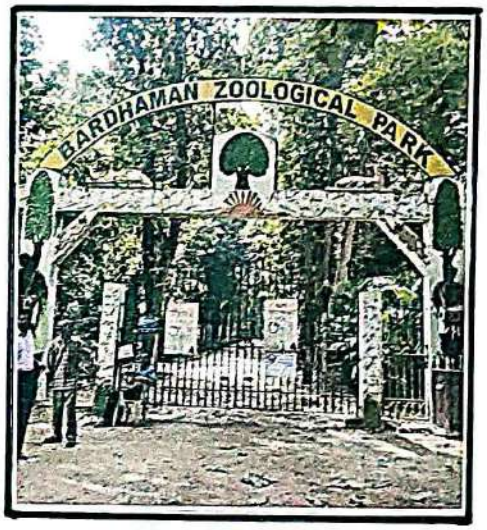
KAZI NAZRUL UNIVERSITY

Registration No. : KNU19113000970 of 2019-2020

Subject : Excursion Report.

Sem - I , Roll. no. - 29.





A brief report on the Educational tour to Ramanabagan zoological park, Burdwan

Objective of an educational tour :— Tour & travel not only enriched our knowledge level but it also helps us for uplift of self confidence. But when it becomes an educational tour then it must have possess significant features which should undoubtedly has a precious role on society. In the present scenario we the students of 1st semester, department of zoology Raniganj Girls' College arrange an educational tour in Ramanabagan, Burdwan as per our syllabus. We first earn some valuable knowledge on living system then we visit to science center to relate the theoretical knowledge with the applicative field.

Date of journey :— We initiate our journey on 18th of October, 2019 (Friday) at 8:00 AM on Friday by local train (Assansole – Burdwan) & by the toto under the guideline of Dr. Umesh Chandra Halder, Dr. Buddhadev Mallick and Mr. Shantiram Majhi.

Route of journey :— It is about 4 km from Burdwan rail station to the west. It is well connected with G.T. Road by Sukumar Sen Road that meets G.T. Road at Golapbag crossing.


বর্ধমান জুলজিকাল পার্ক
BARDHAMAN ZOOLOGICAL PARK
BURDWAN
টিকিট কাউন্টার
বৃহস্পতিবার বন্ধ
স্বাগতম

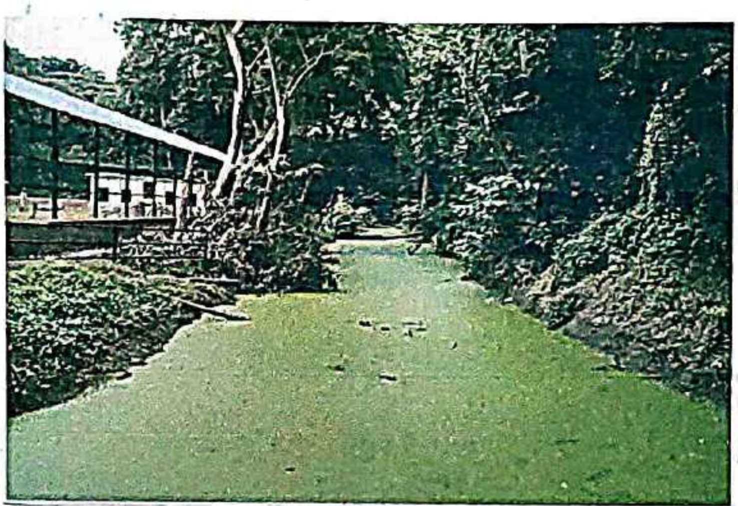
Place details :- Ramanabagan wildlife sanctuary is in Burdwan, Westbengal, India. The animals found include spotted dear, common langur. Blackbuck is recently introduced. Ramnabagan mini zoo spread over an area of 14·31 hectares is in Mouza Baburbag in Burdwan. This area is declared reserve forest in 1960.

In 1978, the area had been converted to a deer park with the introduction of six spotted deer.

Ramana garden with its tall teak & sal forest having mesophytic associates like dumur, jam etc., is a solace from the din and bustle of urban life.

Team members :—

Bidisa Mondal, Srijeeta Ghosh, Arpita Layek, Toisita Ghosh, Ayushi Sarkar, Chaiti Chatterjee, Dipashree Pramanik, Lipi Das, Priyanka Maji, Shipra Dubey, Puja kumari Mahato, Sneha Biswakarma, Supriya Gope.



Experiment details :—

1. Analysis of Biological water body by observing plankton.

Zooplanktons are primary consumers of the water body that determine the ecological hierarchy of a system. They serve as primary food source for different levels of food chain consumers and fish productivity depends upon their abundance which is the indirect indicative of phytoplankton abundance and good water quality. Polluted water contributes to less abundant & less diverse zooplanktons in a water body. Our present work incorporates data from water bodies adjacent to our Raniganj Girls' College to study zooplanktons qualitatively and quantitatively depending upon different water parameters.

• AIM AND OBJECTIVE :—

I. To estimate dissolved oxygen from different source of water.

II. To estimate pH level of water sample.

III. To quantitively measured zooplanktons.

IV. To conclude significance of physical factors of water to determine zooplanktonic diversity.

- PROCEDURE :—

I. At first water sample from near by pond were collected by using plankton net.

II. Then dissolved oxygen and pH were measured according to following methods.

III. Zooplanktons were identified and quantitively measured.

- Result :—

Taking 1 ml from the collection sample in the counting chamber observation are made.

□ Observation :—

No. of square	Cladocera	Copepoda	Rotifera	Ostracoda	Total
1.	—	4	—	—	4
2.	—	2	—	—	2
3.	1	2	—	—	3
4.	—	2	—	—	2
5.	—	4	1	—	5
6.	—	3	—	2	5
7.	1	2	—	—	3
8.	—	1	—	—	1
9.	—	1	—	—	1
10.	—	2	1	—	3
11.	—	3	—	—	3
12.	1	—	—	—	1
13.	—	2	—	2	2+2=4
14.	1	5	—	—	5+1=6
15.	—	—	—	—	0
16.	—	—	1	—	1
17.	1	2	—	—	3
18.	1	2	—	—	3
19.	—	1	—	1	2
Total	6	38	3	5	51+1 =52

Calculation :—

As population % of any zooplankton =

(No. of plankton ÷ total no. of plankton) x 100

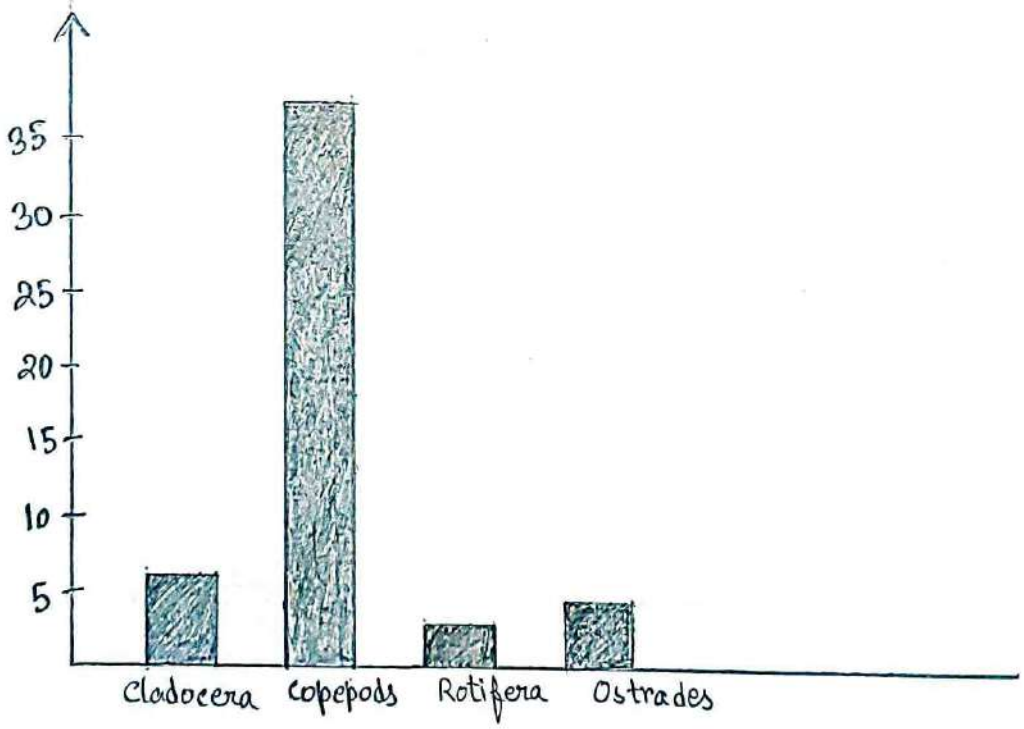
Hence,

Population % of Cladocera = (6/52) x 100 = 11.53%

Population % of Copepods = (38/52) x 100 = 73.07%

Population % of Rotifera = (3/52) x 100 = 5.76%

Population % of Ostrades = (5/52) x 100 = 9.61%



• PRINCIPLE :-

The Winkler method determination of dissolved oxygen is based on two oxidation reduction reaction. The manganous sulphate reacts with alkali (KOH or NaOH) to from a white precipitation of manganous hydroxide, which in the presence of oxygen gets oxidized to from a brown colour compound. In the strong acid medium, manganic ions are reduced by iodide ions. which get converted to iodine equivalent to the original concentration of oxygen in the sample. The iodide can be titrated against thiosulfate solution by using an indicator.

$$2KOH + MnSO_4 = K_2SO_4 + Mn(OH)_2$$

$$2Mn(OH)_2 + O_2 = 2MnO(OH)_2$$

$$2MnO(OH)_2 + 2H_2SO_4 = MnSO_4 + 3H_2O$$

$$Mn(SO)_4 + 2KI = MnSO_4 + 2K_2SO_4 + I_2$$

$$2Na_2S_2O_3 + I_2 = Na_2S_4O_6 + 2NaI.$$

• REAGENT :-

a) Alkline iodide
b) Manganous sulphate
c) Sodium thiosulphate solution (0.025)
d) Concentrated H_2SO_4
e) Starch indicator (1%)

- METHOD :—

a) In a narrow mouthed bottle the surface water sample is collected properly in easily moaning.

b) Collected sample is fixed immediately & taken to laboratory for analysis.

c) Then further steps was performed using 25 ml for titration & 1 ml each for alkaline iodide & manganous sulfate.

- OBSERVATION :—

No. of observation	Volume of the sample taken	Initial burrate reading (ml)	Final burrate reading (ml)	Difference (ml)	Mean (ml)
1	25	0	0.8	0.8	0.833
2	25	0.8	1.7	0.9	
3	25	1.7	2.5	0.8	

- CALCULATION :—

Hence dissolve O_2 (mgL^{-1}) in sample

$$C = \frac{V_1 \times N \times 8 \times 1000}{V_4 \times \frac{V_2 - V_3}{V_2}}$$

$$= \frac{0.833 \times 0.025 \times 8 \times 1000}{25 \times \frac{200-2}{200}}$$

$$= \frac{166.6}{24.75}$$

$$= 6.731 \ mg\,L^{-1}$$

- Likewise the dissolved Oxygen of sample A & B was calculated & these are 8.49 $mg^{L^{-1}}$
- & 7.49 $mg^{L^{-1}}$ respectively.

V1 = volume of $NO_2S_2O_3$

V2 = Volume of sample after placing stopper.

V3 = volume of alkaline Iodide & $MnSO_4$.

V4 = volume of sample water for titration.

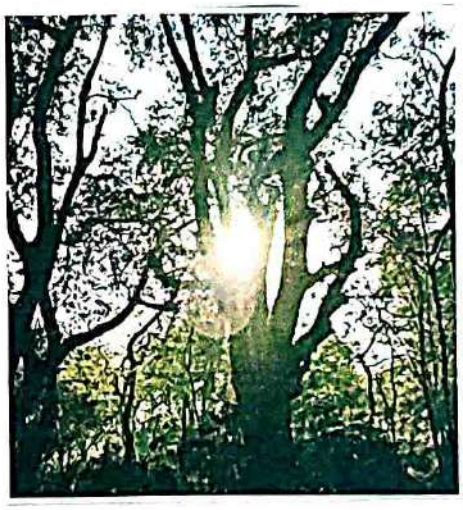
N = Normality of $Na_2S_2O_3$ (0.025 N)

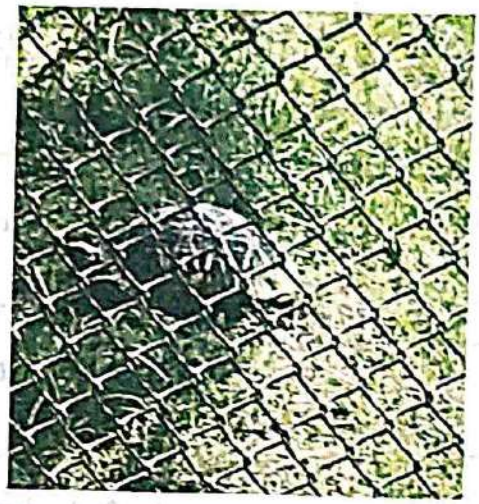
8 = Equivalent weight of O_2

2. Study over biology of different plants and animals.

Different plants found in the garden are given below.

Name of the Plant	Family of the Plant	Scientific Name
Amlaki	Phylanthaceae	Phyllanthus emblica L.
Foreign Shirish	Leguminoseae	Albizia saman (Jacq.) Merr.
Tamal	Ebenaceae	Diospyros montana roxb
Mahua	Sapotaceae	Madhuca longifolia
Shal	Diptocarpaceae	Shorea robusta Gaertn



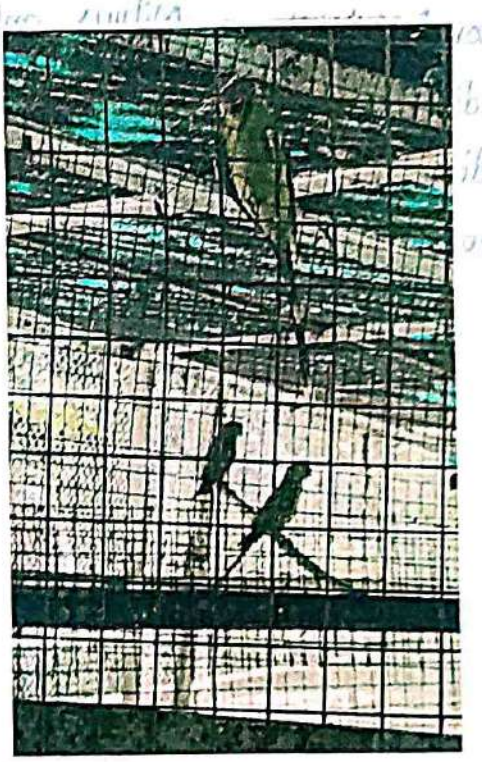



Golden Pheasant or Chinese Pheasant (Chrysolophus Pictus)
Found in forests in mountainous areas of Western China but also found in Europe, South America, Australia etc.
Flightless bird can sprint at maximum 50 km/h
Adult male 99-105 cm in length, female 60-90 cm in length.
Feed on the ground on grains, leaves, insects etc.
Lay 8-12 eggs, incubation period 22-23 days.
Conservation Status :- Least concern as per IUCN.


Silver Pheasant (Lophura nycthemera)
Found in mountainous forest of mainland South East Asia
Male
Female
Colour :- Black, White
Brown
Length :- 120-125 cm
55-90 cm
Feed on ground on grains, leaves, insects
Conservation status :- Least concern as per IUCN

☐ Different animal present described below through the table :—

Name of the animal	Scientific name of the animal	No. of animal.
Crocodile	Crocodilus porosus	1
Sloth Bear	Melursus ursinus	1
Rhesus Monkey	Macaca mulatta	4
Bonnet Monkey	Macaca radiata	1
Spotted Deer	Rusa alfredi	70
Rosy pelican	Pelecanus onocrotalus	2
Pea - Fowl	Pavo cristatus	4
Common Pariah kite	Milvus migrans	7
Indian Parakeet	Psittacula krameri	4
Indian Star Tortoise	Geochelone elegans	10
Porcupine	Erethizon dorsatum	1



Bird watching :-

We saw Lesser whistling Teals, Red crested Pochards, Marsh sandpiper, Black drongo, common coot, cormorant, purple moorhen, parakeet. The lesser whistling teals were in hoards, creating a cacophony. The parakeet also broke the silence of the forest.

ACKNOWLEDGEMENT

Under the prescribed syllabus of KNU, students of Bachelor in Zoology (1st Semester) were required to have visit an ecological tour spot under the subject of "Principle of Ecology" (CC2) to explore knowledge about our ecosystem. It was our great pleasure to visit Burdwan Zoological Park.

We would like to express our sincere thanks and gratitude to Department of Zoology of Raniganj Girls' College for Advanced Learning for providing such an opportunity to make us familiar with the different species of animals, birds & their behaviours.

I would like to Dr. Umesh Chandra Haldar Sir and Dr. Buddhadev Mallick Sir for arranging the trip & their care, help, support, interest & valuable hints during the entire field visit & stimulating suggestions & encouragement in this field writing.

I have furthermore to thank to Mr. Santi (surname) Sir for abundant support for the completion of this report.

18.11.19

18/11/19.

Name- Bidisa Mondal.

Registration No.- KNU19113000970 of 2019-2020

Paper Name - Diversity of Chordates (CC-V)

BEAK OF BIRDS

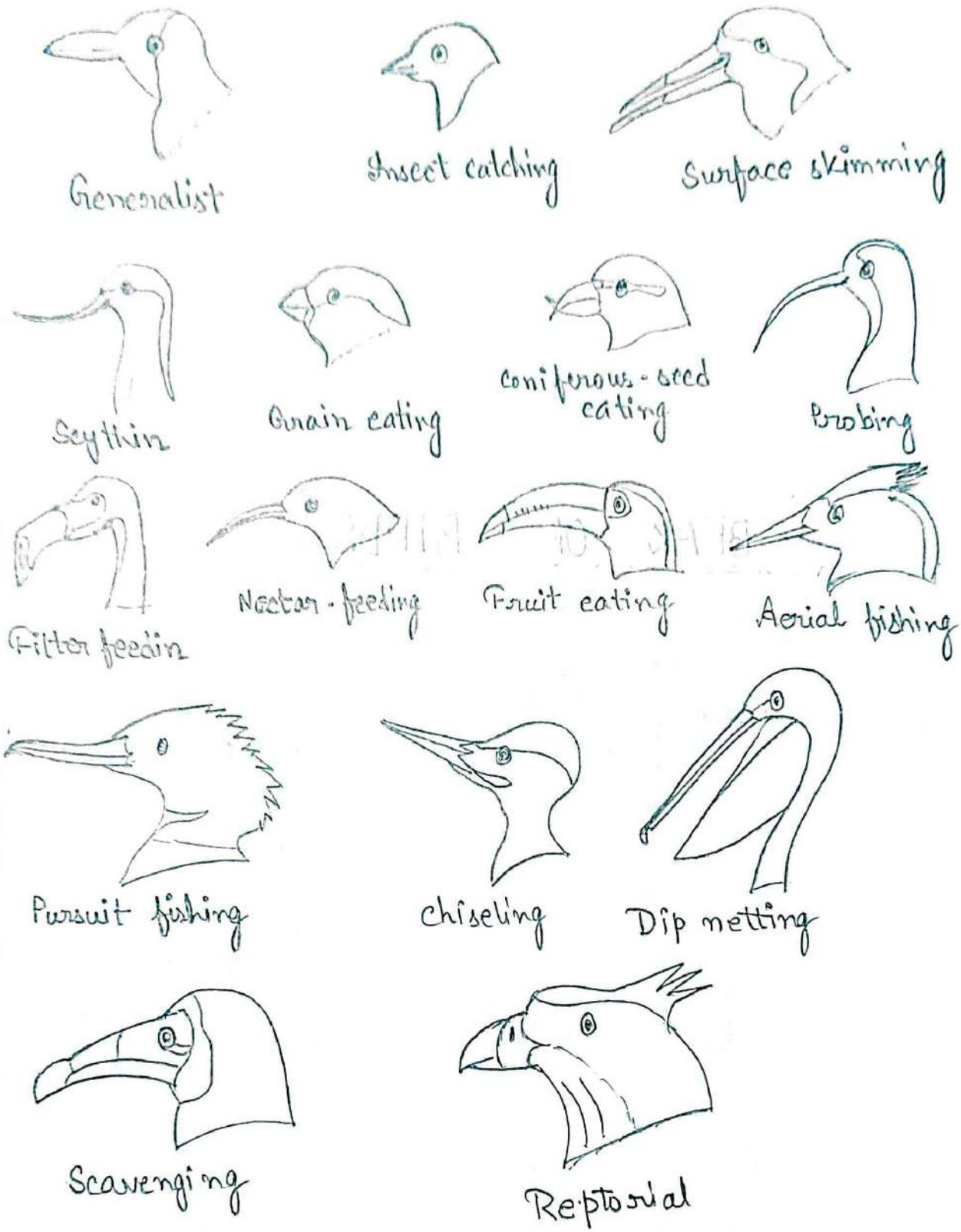


Fig:- Different types of beak.

There are many types of birds and as a result many types of bills although all share a similar origin, form & function.

A birds bill, or beak to use its more informal name, consists of two mandibles, upper & lower, each of a bone core covered in a horn like sheath of compact epidermal, or skin, cells.

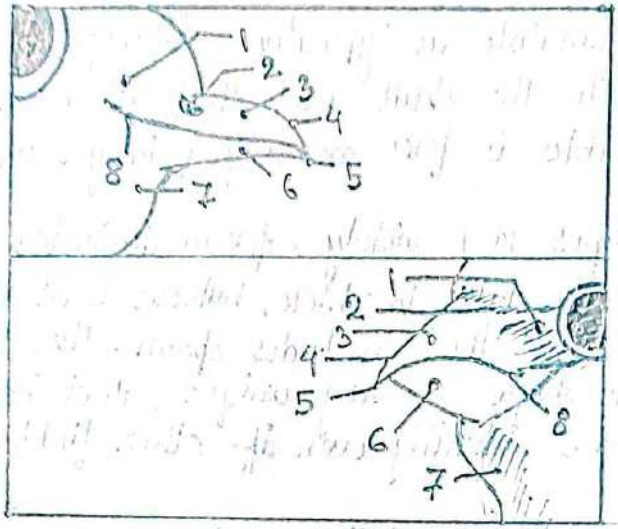
The upper mandible is typically, although not in all species, rigidly attached to the skull such that it does not move, only the lower mandible is free moving & hinges against it.

- **Shape** :- Bill shapes vary widely, from delicated triangles or thin, needle-like bills to thick, bulbous bills to sharply curved bills to radical shapes that includes spoon-like tips or horny casques. When the shape is very unique, that be a diagnostic clue for a bird's identity even if other field marks cannot be seen.
- **Color** :- The color of a bill can be a clue for species, gender or age. Note the overall color as well as any specific markings, such as a colored tip or base, subterminal band or color differences between the top and bottom of the bill.

Specific Bill Parts :—

When birders can get a good look at a bill, there are a number of different parts that can yield clues about the bird's identity, such as....

1. Lores : While not part of the bill itself, the lores are the space between the base of a bird's bill and the forward edge of its eyes. This area may be a different color or show a smudge or eye line that can be an identification clue.
2. Nares : More commonly called the nostrils, the position of the nares as well as their size and shape are important to note for bird's identities. In some types of birds, such as raptors, the nares are covered by a fleshy cere, while in others, such as many seabirds, elongated tube-like nares help filter seawater.


1
2
3
4
5
6
7
8
1
2
3
4
5
6
7
8

3. Maxilla: Also called the upper mandible, the maxilla is the top half of a bird's bill. Size, length & shape will vary, and some birds have knobs, fleshy wattles or other features that distinguish the maxilla.

4. Tip: The tip of a bird's bill may be different shapes, such as blunt or sharply pointed, depending on the bird's general diet. Hooks are common at the tip of carnivorous birds' bills, while many waterfowl have small bumps, called nails, on the tip of the maxilla.

5. Culmen: Difficult to see on many bird species, the culmen is the center line drawn down the length of a bird's maxilla. In some species, this can be a very distinct peak that divides the sides of the bill, while it may not be noticeable in other species.

6. Mandible: The lower half of a bird's bill is called the mandible or lower mandible. The color may vary from the maxilla either along the entire length or just at one end, and can be a great clue for identification. Some birds, such as many gulls, may show spots or other markings just on the mandible.

7. Chin: Not directly part of bill, the chin is the area of feathers immediately adjacent to the base of a bird's mandible. In some species, the color of the chin may vary from the throat or face, providing a valuable identification clue.

8. Gape: This is a fleshy area at the base of the bill where the upper and lower mandibles meet. In young birds, it is often enlarged or may seem so because the birds have not developed their mature feathers to help conceal it, and it may be brightly colored so their mouths are more noticeable when they beg for food. On some species, such as the bananaquit, the gape remains colorful on adult birds.

Types of Beak :-

- Generalist: Typically a fairly large bill, relative to head size, with a curved upper mandible and a smaller flatter lower mandible usually associated with omnivorous bird such as

Crows, jays, magpies and other corvids who are opportunistic eaters of a wide range of food.

- Insect Catching: Perhaps unsurprisingly, birds with this type of bill typically catch insects either in flight or directly from trees, shrubs, plants and even the ground. They are generally pointed and small in size, compared to overall head size, with fairly similar sized upper and lower mandibles.
- Grain or Seed eating: Finches are the most obvious members with this type of bill, characterised by a broad triangular shape with strong upper and lower mandibles enabling the bird to break into the shells of grains and seeds.
- Coniferous-Seed eating: This type of bill usually has similar sized upper & lower mandibles with extended tips offset from each other resulting in each mandible crossing over or under the other. These birds, crossbills, are able to use the elongated tips to prise seeds from pine cones.
- Nectar Feeding: Birds that feed on nectar from flowering plants tend have a long, fine bill with a moderate downward curve to it to allow the collection of nectar from the base of the flower. Hummingbirds are perhaps the best known types of birds with this kind of bill.
- Fruit Eating: Birds that eat fruit often have very large bills in relation to head size enabling them to grasp and manipulate large pieces of fruit and break through the outer skin to the soft fruit insid.
- Chiselling: The most common birds with chiselling bills are the woodpeckers. They are relatively long and thin, though very strong, and can be struck against tree trunks or branches at up to 40 times a second. They are used for opening up hollows, getting a subsurface bugs and to signal other birds in the area.

- Dip Netting: These bills are characterised by a long straight upper mandible, often with a small hooked end, and a lower mandible that has been adapted to hold a large fold of skin that can be used like a net to trap fish or a crustaceans in a large gulp of water. The water is drained off and the catch is then swallowed. Pelicans are perhaps the best known examples of birds with this type of bill.

- Surface Skimming: Birds that fly just above the surface of the water dipping their bills into the water to catch small fish tend towards this type of bill. The lower mandible is thickened and elongated with the upper mandible curving into it part way down its length. The lower mandible is drawn through the water until it encounters the resistance of food when the upper mandible strikes down to trap the fish or other creature in the bill.

- Scything: The bills are used by wading birds in mudflats and other wetlands to catch small insects or other creatures by sweeping the long thin, upturned bill through the surface waters or mud.

- Probing: Probing bills are characterised by a long thin, downward curving shape used by the bird to feed on worms and other small invertebrates in mud or soft ground.

- Filter Feeding: These bills have a strange shape indeed; they tend to have a pronounced almost 90 degree downturn to them with a large bulbous lower mandible. This downward angle allows for the bottom half of the bill to be submerged in water whilst the top half remains in the air. The bird uses this bill to filter out small crustanceans from the water. Flamingoes are the most easily recognised species with this type of bill.

- Aerial Fishing: The kingfisher has this type of long spear like bill, which it uses to catch small fish in a diving flight into the water from above.

- Pursuit Fishing: Some species of aquatic birds chase fish by diving from the surface of a pond, lake, river or sea and catching them in this relatively flat splayed bill.

- Scavenging: Scavening birds are opportunistic birds that eat from the dead carcasses of animals or other birds. Their bills are quite large with a pronounced hooked end helping to tear flesh from the body. The often have no head feathers around the base of the bill or even on the entire head as in some vultures.

- Raptorial: Birds of prey such as the Sparrowhawk and owls that feed on small mammals or other birds have this type of bill. It is sharply hooked to pierce prey and hold onto it once caught and then is used to tear off pieces for easier feeding.

INTEGUMENTARY SYSTEM

The skin and associated structures make up the integumentary system. The skin protects land-dwelling organisms from desiccation and from loss of heat. Skin is a mammal's largest organs. Its protects the body against physical, chemical, and biological attacks, it helps to regulate body temperature, it is used to communicate to other individuals, and a skin derivative provides nourishment for the young.

Like the integuments of other vertebrates, mammalian skin is composed of two layers, the dermis and the epidermis. Identify and locate the structures underlined in the following text in Fig. 47.

Fig:- . Cross-sectional diagram of skin surface (Martin and DeBaise 1981)

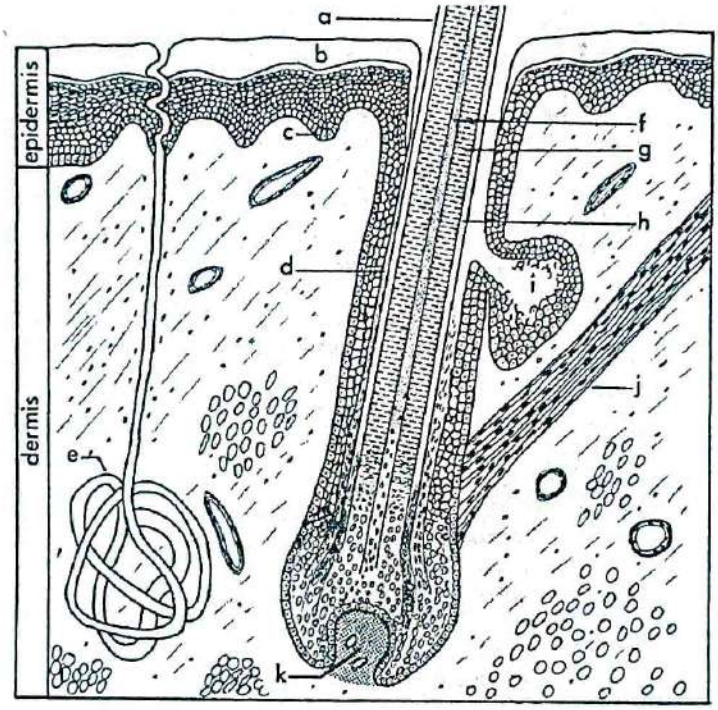
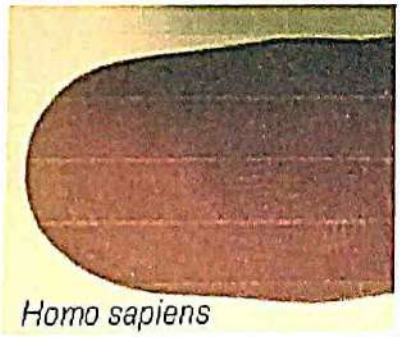


Figure 4-1. Sectional view of skin showing hair and various structures in dermis and epidermis. a, hair; b, stratum corneum; c, stratum germinativum; d, hair follicle; e, eccrine sweat gland; f, medulla; g, cortex; h, cuticle; i, sebaceous gland; j, arrector pili muscle; k, papilla.

Epidermis :- The epidermis consists of several layers, representing successive stages of development. The oldest part of the skin is the outer layer of tough, protective, cell. As the cells age and mature, they eventually lose their nuclei and most of the cell contents are converted to keratin. Keratin is a protein that makes up the protective layer of skin, and also such structures as nails, hooves, hair, and horns — evolutionary and developmental derivatives of skin.

The outermost layer of epidermis is the stratum corneum. The epidermis on the soles of feet and the palms of hands is thick. Elsewhere on the body, the epidermis may be quite thin. Thickened portions of the epidermis form the pads on the feet of the most mammals and the friction ridges on the digits and palm of primates, Fingerprints are the impression of the friction ridges. Calluses are also products of the epidermis. Hair, horn, claws, and epidermal scales are all made of modified keratinized cells of epidermal origin.

Fig :- Fingerprint of human (Homo sapiens). We may have an opportunistic sample [e.g. last year had a pine marten (Martes americana)]

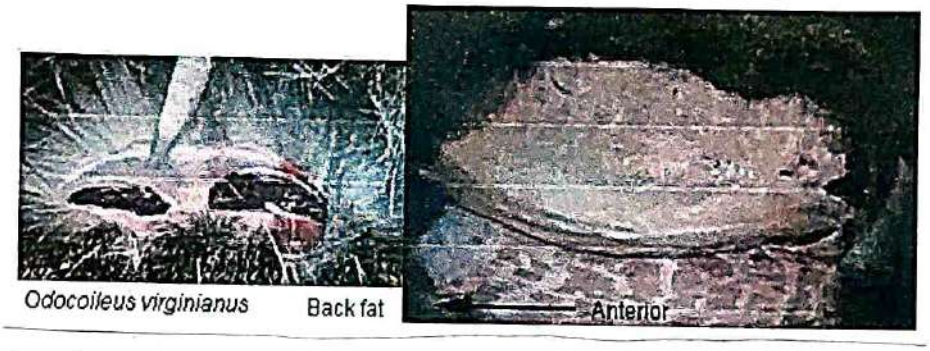


Homo sapiens

Pine marten
Front paw
Martes americana

Dermis :- The dermis lies below the epidermis. It is a thick layer of connective tissue with associated muscles, nerves, and blood vessels. The connective tissue consists largely of collagen. Collagen and other fibers in the dermis become toughened and hardened during the process of tanning when a skin is transformed into leather. Unlike the epidermis, the dermis is well-supplied with blood vessels and nerves for sensation of touch, pressure, temperature and pain. Beneath the dermis is a layer of fatty tissue, variably thick, that provides insulation and energy storage.

Fig:- Subcutaneous fat in a deer in the winter. This picture is the subcutaneous fat of a yearling doe (nearly 2 years old) that was hit by a car on 2/8/04. On the left is in image from just anterior to the tail cut through the tissue, and on the right is much of the back with the skin peeled back.



Skin Glands :- Associated with the skin are two kinds of glands, sweat and sebaceous glands. The epidermal sebaceous glands lubricate the hair and are described below. Sweat glands (sudoriferous glands) are coiled tubes in the dermis connected with the surface by narrow ducts. In humans and some ungulates, sweat glands are distributed over much of the body. Some mammals such as rodent and lagomorphs (rabbits) do not have sweat glands. Cats (Felidae) and dogs (Canidae),

and perhaps other carnivores, have sweat glands in the pads of the feet. It is thought that mammary glands evolved from sweat glands as discussed below.

Hair :-

General :- Hair is a uniquely mammalian feature. The developing epidermis invaginates into the dermis to form a follicle. At the deepest point of the follicle, the dermis pushes back & forms a small structure called the papilla. The papilla is well supplied with blood vessels.

Each hair consists of three parts. The center is the medulla. This is surrounded by a denser cortex containing most of the pigment granules that give each hair its characteristic color. The cortex is covered by a thin layer called the cuticle.

Glands :- Sebaceous glands open into each follicle. The secrete oily substance (sebum) that continually lubricate and condition skin and hair. Sebum makes beavers waterproof and prevents undue drying of the pelage of terrestrial mammals. Glands that secrete cellular debris as well as molecular products are termed apocrine glands. These glands empty into or near a hair follicle.

There are many examples of skin glands that have moved beyond their roles in lubrication to serve other functions. In skunks protective and communicative functions are both present. Note the warning coloration of the skunk. Many species use glandular scents to mark individual territories, particularly the carnivores (order carnivora).

Fig.:- Scent glands in the white-tailed deer (Odocoileus virginianus). Legs from a deer may available in class to find these glands.

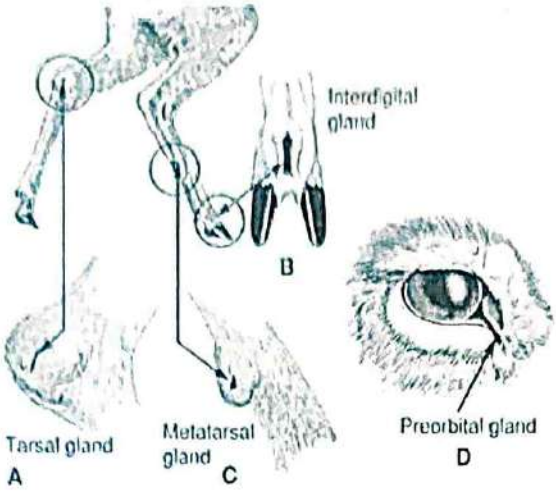


Figure 4.9 Scent glands in white-tailed deer, *Odocoileus virginianus*. (A) Tarsal gland; (B) interdigital gland; (C) metatarsal gland; (D) preorbital gland.
(After Feldhamer et al. 1999:107)

Hair musculature :- Hair does not grow vertically from the skin but emerges at an angle, which can be altered to regulate the depth of the pelage. A small arrector pili (plural, arrectors pilorum) muscle is attached to each follicle. Hair "standing on end" increases the insulative value by increasing the dead air space.

Kinds of Hair :- Hair with continuous growth (human head hair or a horse's mane) is called angora hair. Definitive hair ceases to grow at a certain point and is replaced periodically when the animal molts.

The pelage (or coat) that we usually see is the body hair, or guard hair. Guard hairs are frequently long, stiff hairs; Bristles show angora growth. In certain mammals hairs are so stout and strong that they form spines. The third type, which is most common, is awns. Awns are guard hairs with definitive growth and are the most noticeable hairs on most mammals. Examine a quill under the microscope in the lab.

Fig:- Tip of spine of porcupine quill.

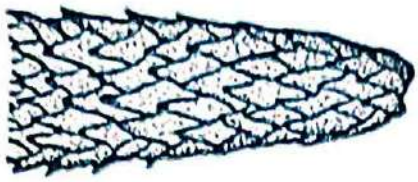


Figure 4.6 Enlarged view of a quill tip of a New World porcupine (*Erethizon dorsatum*). Note presence of barbs. (Shadle and Chedley 1949:172)

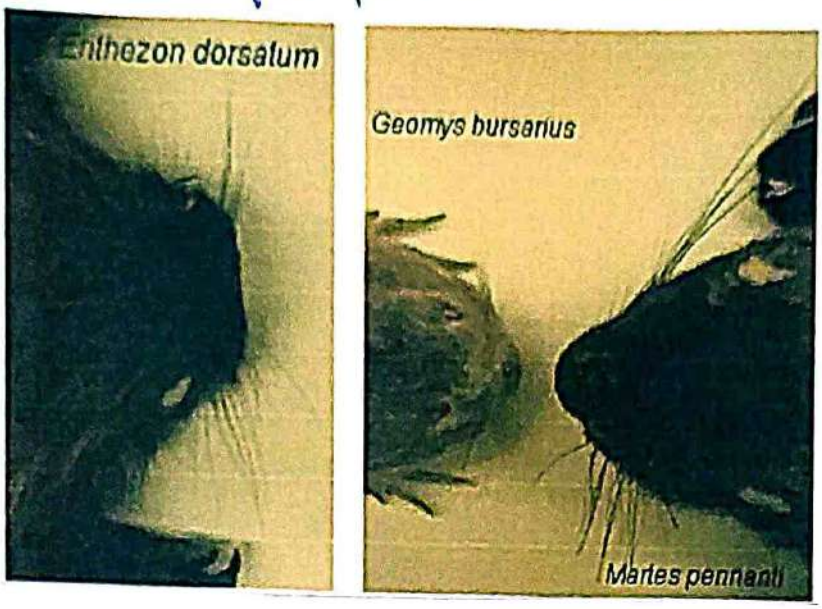
Examine skins of a variety of mammals — such as the porcupine, hare (Lepus americanus), ermine (mustela erminea), otter (Lutra canadensis), and mouse (Alces alces). Identify the types of hair found on each. What is the function of each kind of hair? What differences do you see among these different animals that might be associated with the habitats they normally live in? Why might moose or deer hair have the character that it does, while snowshoe hare hair is different in nature?

Underhairs are shorter and finer hairs growing around the guard hairs often in much greater numbers. Underhairs with angora growth are called wool. In domestic sheep, guard hairs have been eliminated through selective breeding and the growth rate and density of the wool has been increased.

The pelage of an animals in the combination of longer guard hairs and the underfur (underhairs), fine & relatively short hair with definitive growth that densely covers most mammals.

Special tactile hairs, the vibrissae are found not only on a mammal's face but may occur also on the legs or elsewhere on the body. Nerves at the base of vibrissae communicate response to the brain. Vibrissae are especially prominent on the muzzles of nocturnal and burrowing mammals.

Fig:- Vibrissae on the porcupine and the pocket gopher (Geomys bursarius) and the fisher. Look at other mammals in the lab for presence or absence of vibrissae.



Note the location of vibrissae on specimens of a variety of mammals in relation to the habits or habitat of each species. Among the animals you could look at are the woodchuck (Marmota monax), pocket gopher (Geomys bursarius), muskrat (Ondatra zibethicus), and other (Lutra canadesis).

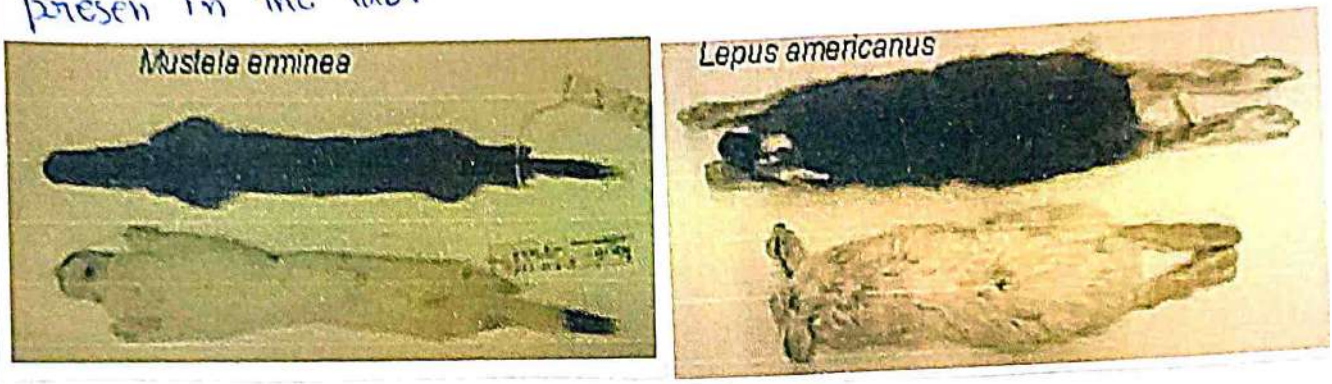
Color:- Mammalian hair and skin coloration serves three basic functions: (1) protection from electromagnetic radiation (especially ultraviolet light), (2) concealment (cryptsis) by camouflage, countershading, or disruption & (3) Communication, such as the "warning" color patterns in skunks (Mephitis mephitis).

Bright color are rarely found in mammals; most mammals are nocturnal and most are colorblind. Primates are exceptions; they have color-vision and may display brightly colored pelage & brilliantly pigmented areas of bare skin. The squirrels are another diurnal and somewhat colorful group, but they do not match birds in coloration.

The color of an individual hair mainly depends on the kind and concentration of pigment granules in the cortex. The different pigments are not evenly distributed over the length of each hair. Most hairs show a pattern called agouti.

Hair Replacement :— The pelage must be maintained to maintain its functionality. Hair cannot be repaired when damaged because it is nonliving. This process is called molting. Two kinds of molts are recognized : maturational molt and seasonal molt, which usually occurs once or twice a year and often follows a regular spatial pattern within a particular species. Species subjected to seasonal changes generally have a longer pelage with good insulating abilities in winter. Some northen species have white coats for winter & brown coats for summer.

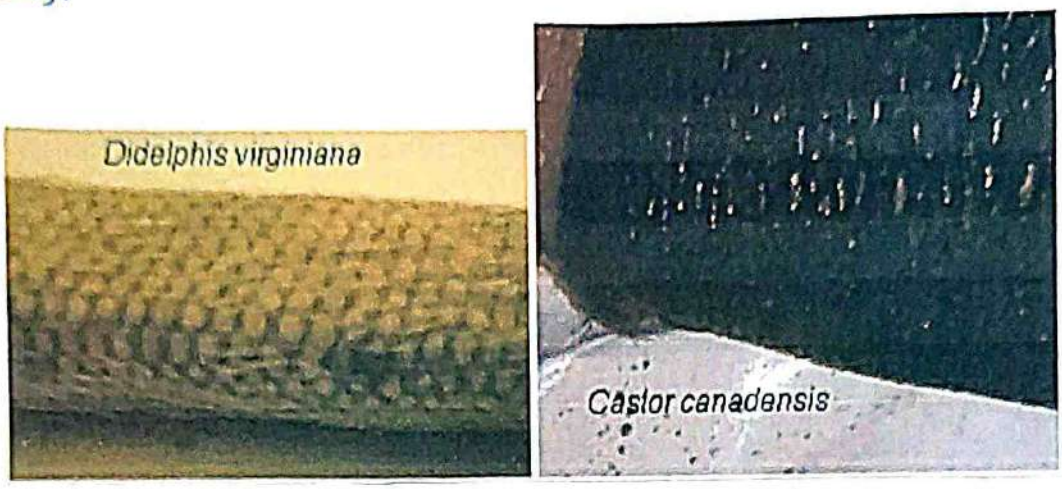
Fig :— Compare winter and summer pelts of the ermine (Mustela erminea) & the snowshoe hare (Lepus americanus) that are presen in the lab.



In many mammals there is a distinctly juvenile pelage that distinguishes young animals from adults. Members of the deer family are a good example of this, moose calves are reddish in color, for example.

Scales :— The scales on the more or less naked tails of rats, mice, & beavers are protective, epidermal thickenings of the skin made of keratinized cells. The thinner skin between these scales allows flexibility. The pangolin is covered with epidermal scales of a different kind. They consist of keratinized cells are in structure and development basically equivalent to hairs. However, they do not grow from follicles in the skin but from raised papillae protruding from the surface.

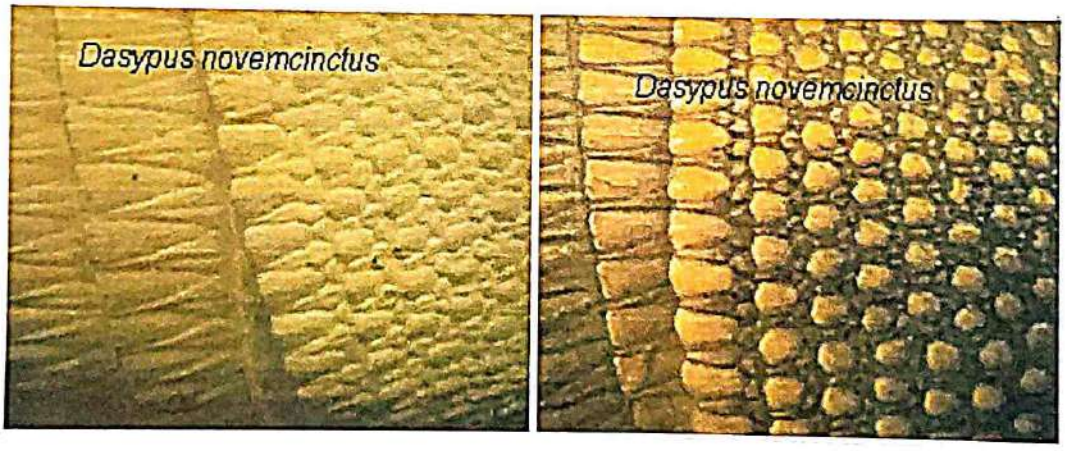
Fig:- Examine the scaly tail of a beaver (Castor canadensis) or rat (Rattus norvegicus) or opposum (Didelphis virginiana) and note the placement of hairs in relation to the placement of scales.



The armadilo (Edentata: Dasypodidae) has both epidermal scales and dermal bone. The epidermal scales resemble the scales on the tails of the rats and beavers. The dermal bone is unique among mammals. Dermal bone also arose in ancient fishes, the ostracoderms.

Examine the nine-banded armadillo (Dasypus novemcinctus). Note the arrangements of dermal bone and epidermal scales. How do the size and the shape of the two layers compare? How is the shell constructed to allow for flexibility?

Fig:- Shell of a nine-banded armadilo (Dasypus novemcinctus)



Horns and Antlers:- Horns and antlers are found today only in two mammalian orders, Artiodactyla and Perissodactyla. Extinct mammals from other orders (including the Rodentia) also had cranial ornamentations. Five different kinds of head ornamentations are recognized, each occurring in a different family.

Horns:- True horns are found only in the family Bovidae (order Artiodactyla). True horns are always unbranched and permanent and are composed of two parts: the bony horncore & the horn itself. Horns are covered by a sheathing layer of keratinized epidermis, the horn.

Fig:- Diagram of horn (De Blase & Martin) on the left, and the horncore and horn of a bison on the right.

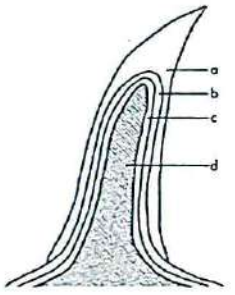


Figure 5-1. Diagrammatic section of a bovid horn: a, horn or keratinized epidermis; b, epidermis; c, dermis; d, bone.

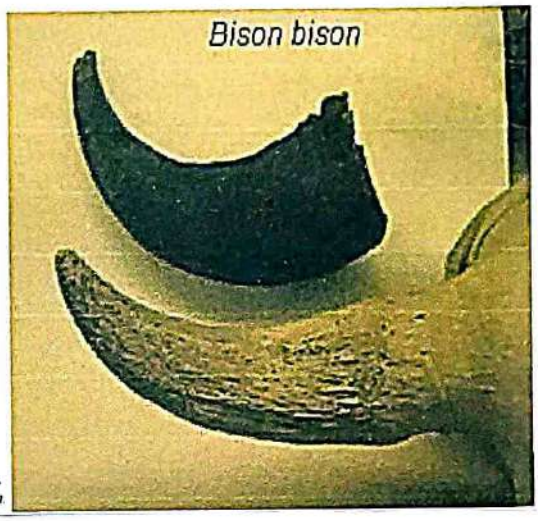


Figure 5-2. gazelle, *Ga*

Examine horns & horn cores of the available bovids (cow, Bos taurus, and on wall bighorn sheep, Ovis canadensis & mountain goat Oreamnos americana).

Pronghorns:- The pronghorns (Antilocarpra americana) of western North America is the only living species of the family Antilocapridae (Artiodactyla). As in the Bovidae the horn (properly called a pronghorn) has a bony core covered by a keratinized sheath and serves a similar function. However, unlike other horns, in pronghorns the sheaths are (1) branched and (2) deciduous. Both sexes have pronghorns, but they are more

prominent in the males. In females, the pronghorns sometimes are unbranched or absent altogether. Compare the diagrams of the pronghorn with the diagram of the bovid horn. How do the horn cores differ?

Fig:- Cross-sectional diagram of a pronghorn.

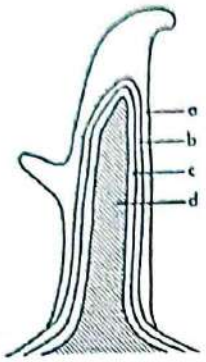


Figure 5-3. Diagrammatic section of a pronghorn: a, keratinized epidermis; b, epidermis; c, dermis; d, bone.

Antlers:- Antlers are only found in the family Cervidae (Artiodactyla). Antlers are present only in males, except for female caribou (reindeer) in the genus Rangifer. They arise from bony stumps (pedicels) on the frontal bones. The point of separation between pedicle & antler is the burr. This "velvet" carries blood vessels & nerves supplying the growing bone. Antlers are usually used only during sparring matches & in displays to potential mates & rivals. Antlered animals tend to used their hooves for defense when attacked by predators.

Fig:- Diagrammatic cross-section of a developing antler.

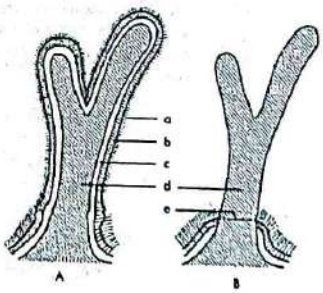
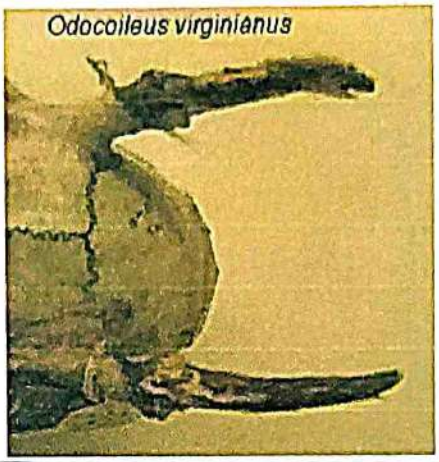


Figure 5-4. Diagrammatic section of antler with (A) and without (B) velvet: a, velvet; b, epidermis; c, dermis; d, bone (or antler); e, abscission line at region of burr.

Fig:- Sample skulls of deer (cervidae) in the laboratory showing different aspects of antler growth.



Be able to distinguish to species the antlers of available cervids [mule deer Odocoileus hemionus and white-tailed deer Odocoileus virginianus, wapiti (elk) Cervus elaphus, moose, Alces alces, and caribou Rangifer tarandus]. moose antlers are palmated, while caribou antlers have a small amount of palmation and the brow tine. white-tailed deer antlers typically curve forward and around, while mule deer antlers appear to branch rather than curve around. The mule deer antlers present in the laboratory are not the best example of this type of branching (as opposed to curving around).

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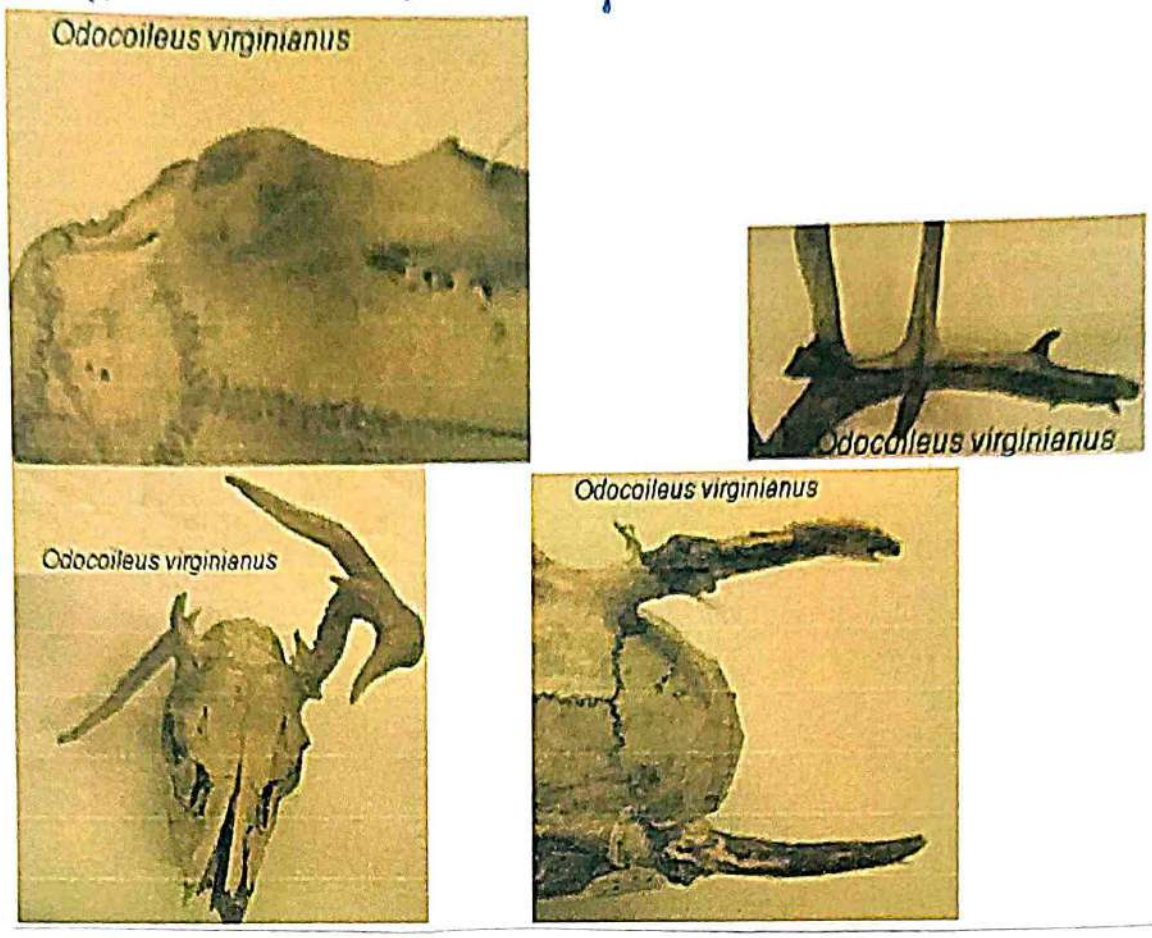

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Fig:- Drawing of different antler shapes & body sizes of extant members of the deer family of North & South America (from Geist 1999). Note the curvature on the white tailed deer antler compared to the branching on the mule deer antler.

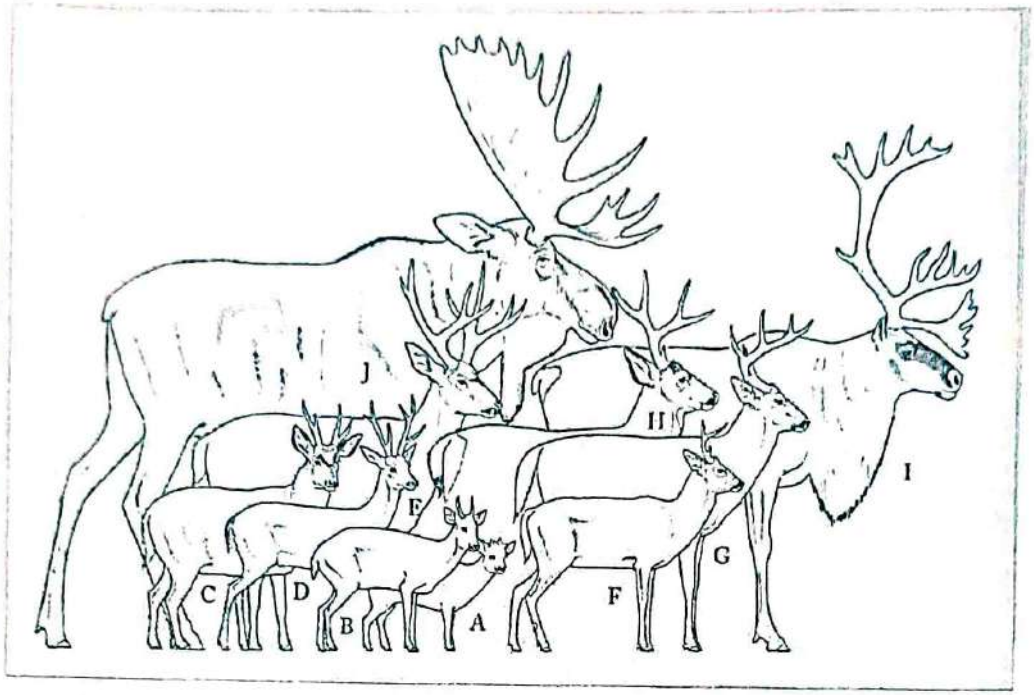


Fig 6-1. The living New World deer, drawn to scale and arranged by size from front to rear, are very diverse in adaptation. (A) The South American Pudu pudu is the smallest of all living deer; (B) the brocket deer Mazama; *(C) the Andean mountain deer or huemul* Hippocamelus; *(D) the pampas deer* Ozotoceros; *(E) the swamp-adapted marsh deer* Blastocerus; *(F) the white-tailed deer* Odocoileus virginianus, *tropical form; (G) the white-tailed deer, large northern form; (H) the mule deer* Odocoileus hemionus; *(I) the reindeer* Rangifer tarandus; *(J) the moose* Alces alces. *The pudu and the brocket deer are ecologically "duikers or slinkers": the huemul is a goatlike mountaineer; the pampas deer is a gregarious form inhabiting fertile grasslands; the marsh deer is a swamp specialist similar to the African sitatunga antelope; the white-tailed, the mule, and the roe deer are cold temperate zone opportunists; the reindeer and the moose are grotesque Ice Age giants with a circumpolar distribution.*

Look at the skulls of male and female moose, and also at the skulls of male and female deer. Note the abscission line and the pedical.

Claws, Hooves, Nails :—

Objectives :— In this section we learn about claws, hooves & nails of mammals. You should be able to identify and apply correctly all underlined terms.

The ends of most digits of mammals others than whales and most sirenians are protected by hardenend plates of the protein keratin (also present in hair). They are formed by the epidermis in a process similar to the growth of hair.

Claws :— The claw is the ancestral form of digital covering. A claw is composed of a harder dorsal plate called the unguis & a softer ventral plate termed the subunguis. The subunguis is continued by the cushion-like pad. In cross-section unguis & subunguis form a U-shaped structure with the unguis enclosing the subunguis. The downward curve is caused by a higher growth rate of the upper surface of the unguis. A claw is thicker in the median line than at the sides.

Fig :— Diagram of claws & nails.

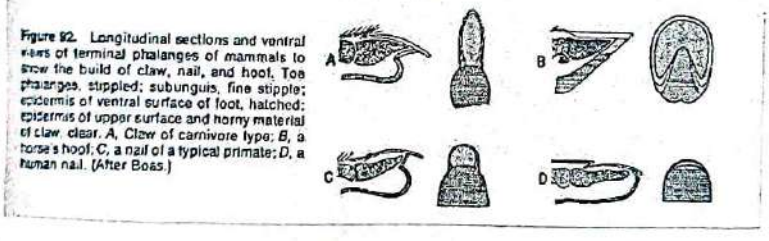


Figure 92. Longitudinal sections and ventral views of terminal phalanges of mammals to show the build of claw, nail, and hoof. Toe phalanges, stippled; subunguis, fine stipple; epidermis of ventral surface of foot, hatched; epidermis of upper surface and horny material of claw, clear. *A*, Claw of carnivore type; *B*, a horse's hoof; *C*, a nail of a typical primate; *D*, a human nail. (After Boas.)

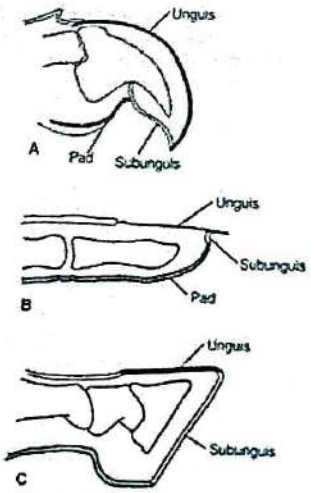
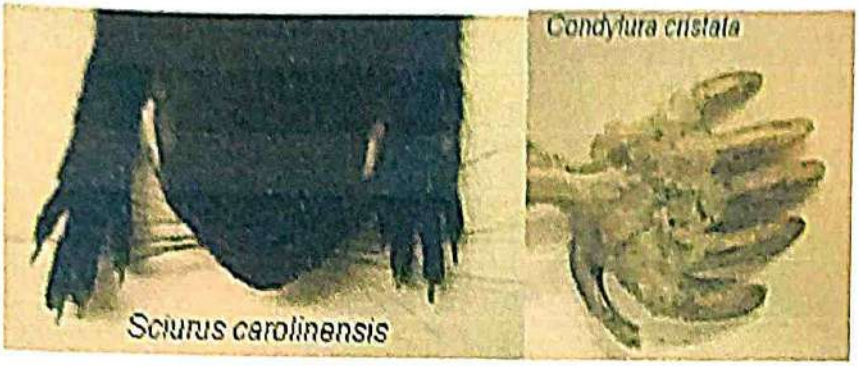
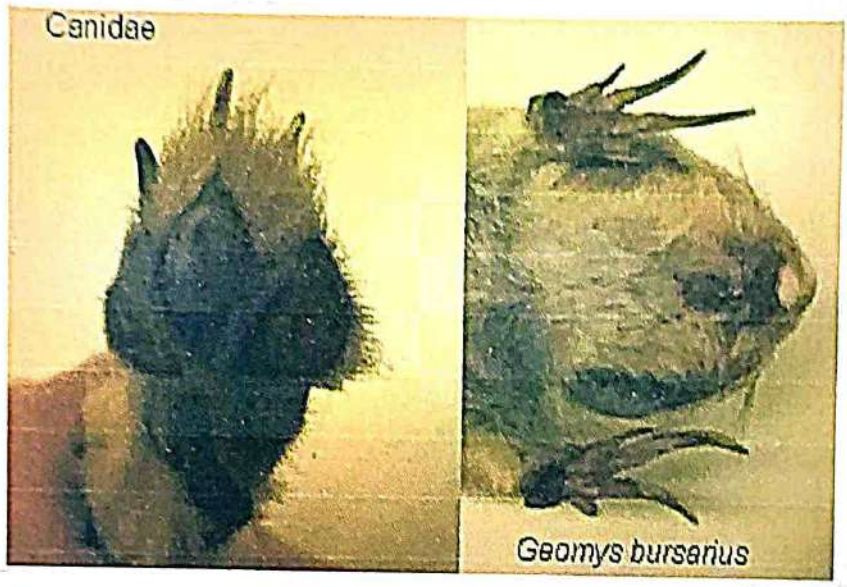


Figure 5.6 Claws, nails, and hooves. Similarities in the general structure but distinct variation with regard to specialized functions are evident for (A) claws, (B) nails, and (C) hooves. Top views of each part are lateral sections. Unguis is solid black; subunguis, light gray, and pad, dark gray.

Examine claws of an arboreal squirrel (e.g., gray squirrel), cat, dog, and a badger or mole: Locate the unguis & subunguis on each. What is the principal function of the claws in each of these mammals?

Fig:- Pictures of claws of several species that are present in the lab.

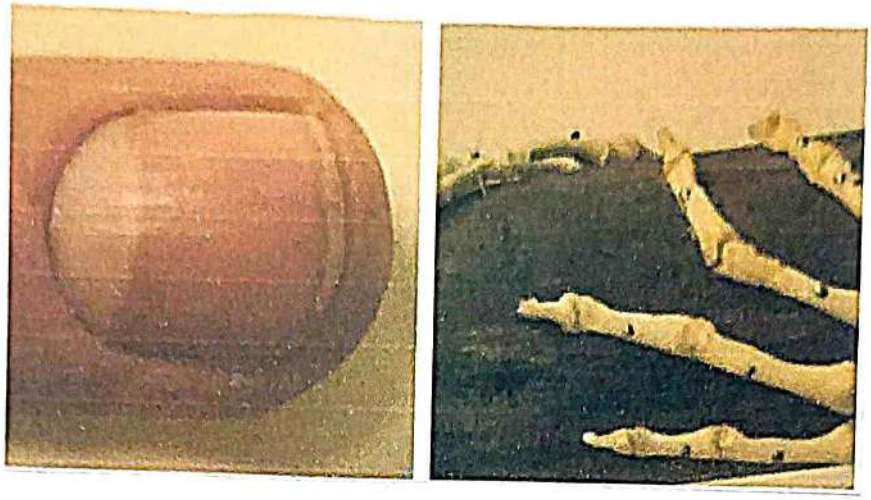




Nails:- A nail is a simplified derivative of a claw covering only the dorsal surface of the digit. Compared to a claw, the nail's wide unguis is thinner & less rigid & the subunguis is very much reduced. A nail offers less protection than does a claw but expose the end of the digit to permit more precise manipulation of objects.

Examine your own fingernail & locate the unguis & subunguis. Compare with the nail of other primates. Contrast with the claws observed above.

Fig:- Fingernail of a human (Homo sapiens) & the hand skeleton of a monkey, species unknown. Compare your fingernail to the monkey present in lab.



Hooves :- Well-developed hooves are found among extant mammals only in ungulates (Artiodactyla & Perissodactyla). They are further modified claws in which the unguis encloses both the end of the digit & the subunguis. The softer subunguis wears away more quickly than the unguis, thus forming a sharp edge. The pad lies just behind the hoof & is called the frog. In ungulates normally only the hoof, not the frog, is in contact with the ground.

Examine the hooves of the cow, white-tailed deer, & horse hooves in the laboratory. Locate the unguis, subunguis & frog.

Fig:- Picture of Bos taurus hoof in laboratory.

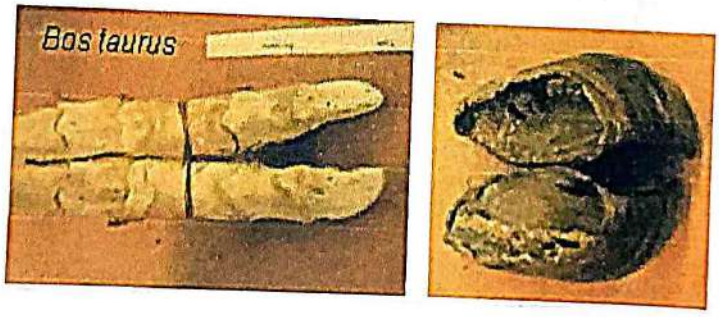
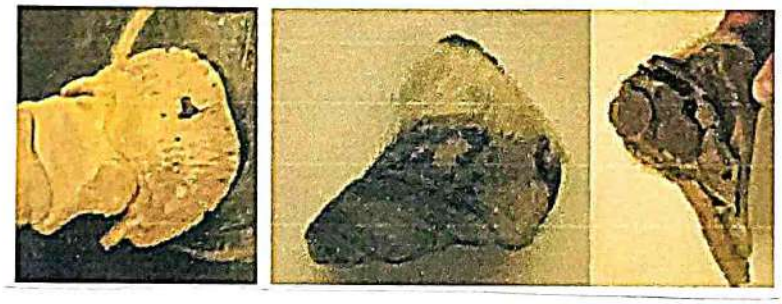


Fig:- Pictures of Odocoileus virginianus hooves that are available in the laboratory.

Fig:- Picture of horse hoof (Equus caballus.) in laboratory. Frist row, left to right is the hoof on mounted leg, side view of hoof, & cross-section. Bottom row is a view of the cross-section from the bottom.



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Identification of Embryonic Stages of Chick

A. Structure of the hen's egg :- The fully formed egg contain a large amount of yolk and it is called polylecithal (macrolecithal) and telolecithal. The active cytoplasm at the animal pole is very little and is in the form of a small disc with a zygote nucleus and is called germinal or blastodisc. Most of the space of animal pole and vegetal pole of the egg is occupied by the yolk. The yolk and disc are bounded by a plasma membrane.

After fertilization the ovum is surrounded by various membranes, added to the delicate vitelline membrane. The fully formed and laid eggs is surrounded on the other side by a calcareous shell. Beneath the shell membrane is the albumin or white of egg. The cleaved cells are called blastomeres. The central area of discoblastula consists of a translucent area, called area pelucida and the peripheral area of discoblastula is opaque, called area opaca.

Whole mounts of chick embryo at different stages:

1. 24 hour (First day) stage :-

i) The area opaca is divided into area vasculosa and area vitelina.

Teacher's Signature .....

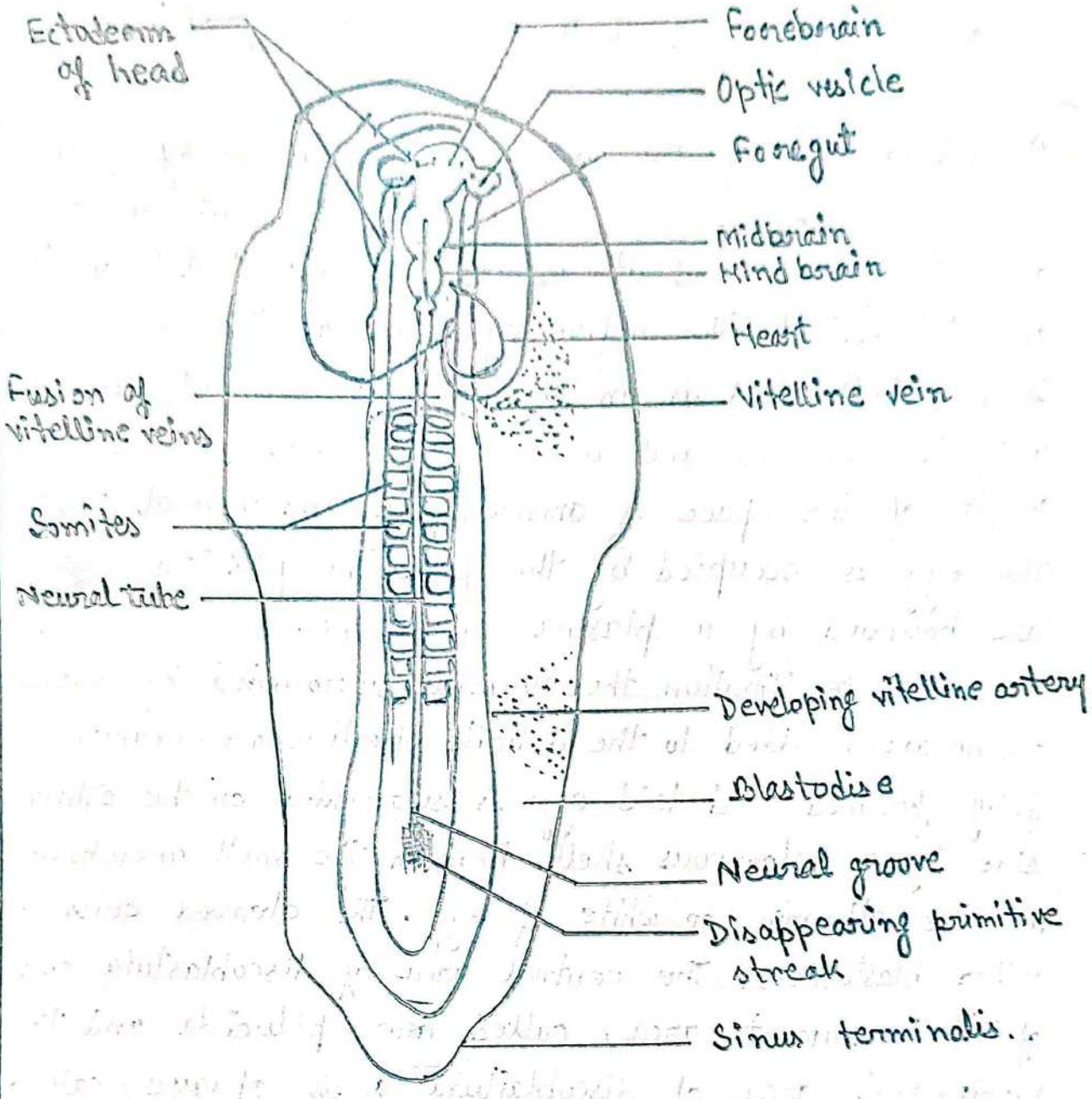

Fig:- Dorsal view of a 33 hour chick embryo.

ii) Abundant blood islands within the area vasculosa.
iii) The space between the head process and the pro-amnion is subcephalic pocket.
iv) Foregut is established and the anterior intestinal portal the opening of the foregut also appears.
v) Neural folds are very prominent.
vi) In the posterior region theere is a faint primitive streak.
vii) Between the neural pore theere is the anterior neuropore.
viii) Notochord is present.
ix) Distinct head fold situated above the pro-amnion.
x) Somites are about four pairs and well-formed.

2. 33 hour Stage :-

i) Neural folds unite dorsally and the neural tube is formed.
ii) At the anterior end theere is a little ventral flexion of the head process.
iii) Optic vesicles are well developed.
iv) The vesicles of the fore brain, mid-brain and hind-brain are formed.
v) Distinct notochord is present.
vi) Heart is thin wall and 'S' shaped.
vii) There are two large omphalomesenteric veins.

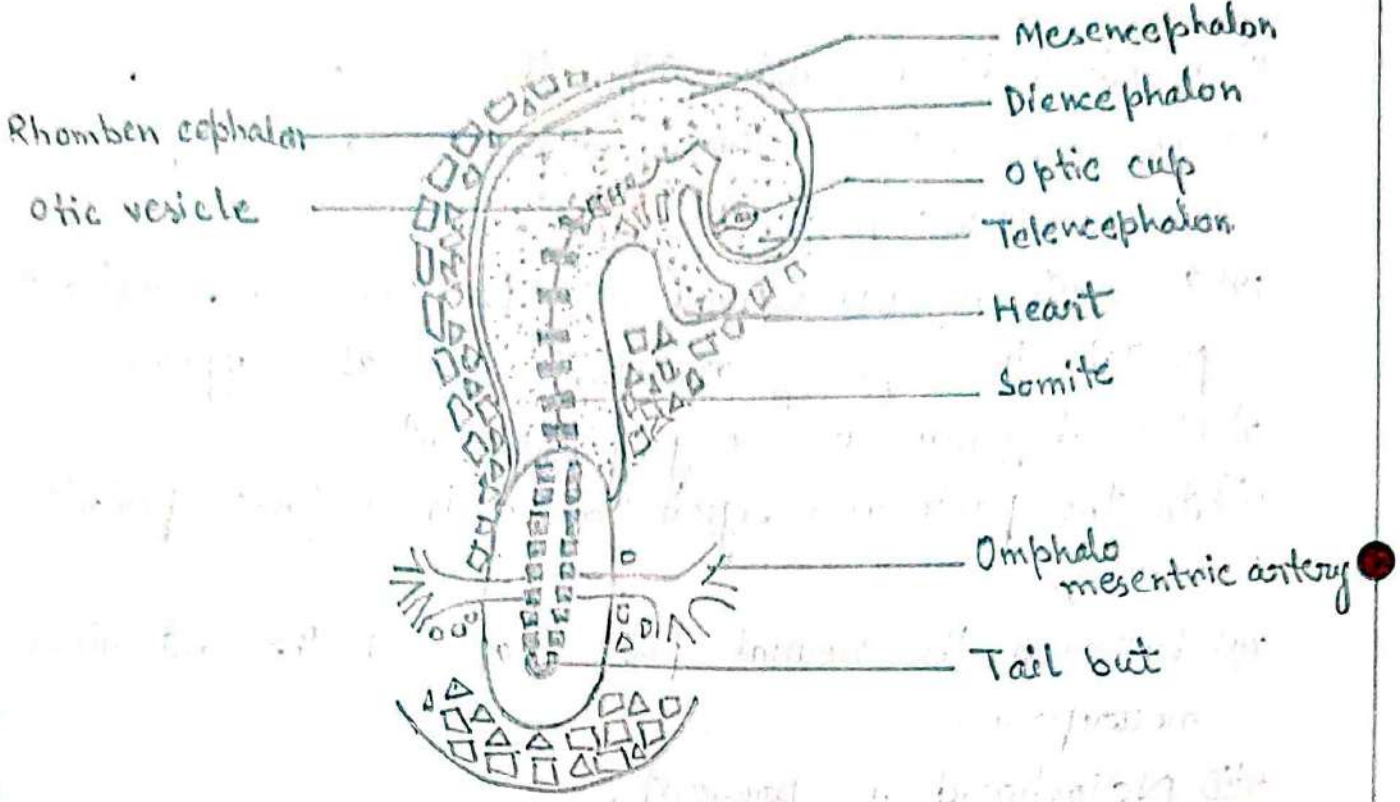

Fig:- 48 hours of incubation.

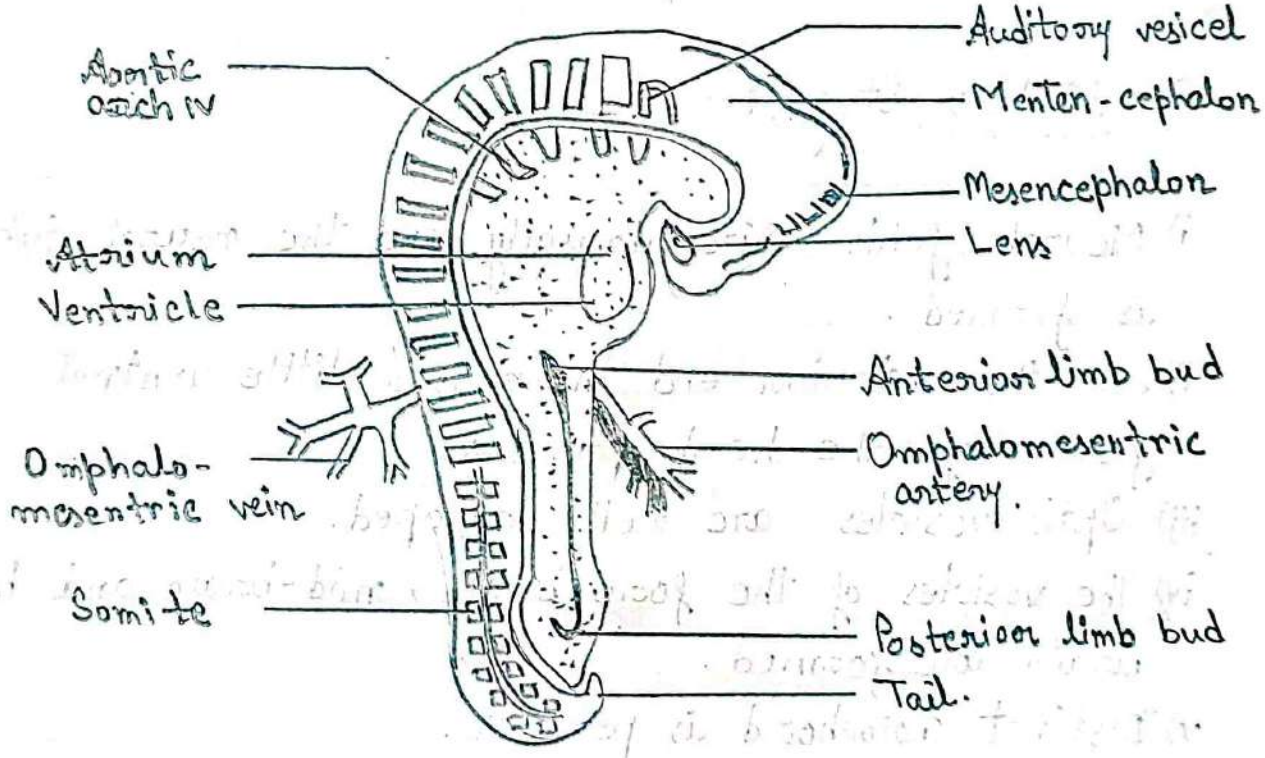

Fig:- 72 hours stage of entire chick embryo.

viii) Indication of the development of the aortic arches is evident.
ix) Pellucida, opaca, vasculosa and vitellina areas are easily distinguishable.
x) Primitive streak is visible at the posterior end.
xi) Twelve pairs of somites are present.

3. 48 hour stage :-

i) Embryo shows cranial flexure and twisting of head over the right side.
ii) Fore, mid and hind brain distinct and fore brain takes the anterior most places.
iii) Heart is differentiated into ventricular, arterial and sinus region.
iv) Vitelline veins and the arteries are distinct.
v) Somites are 26 pairs.
vi) Second aortic arches develop.

4. 72 hour stage :-

i) Torsion as well as flexure is increased thus bilateral symmetry is lost.
ii) Lumbar flexure and caudal flexure in tail region.
iii) First four aortic arches visible.
iv) A four pair of pharyngeal pouches have appeared and

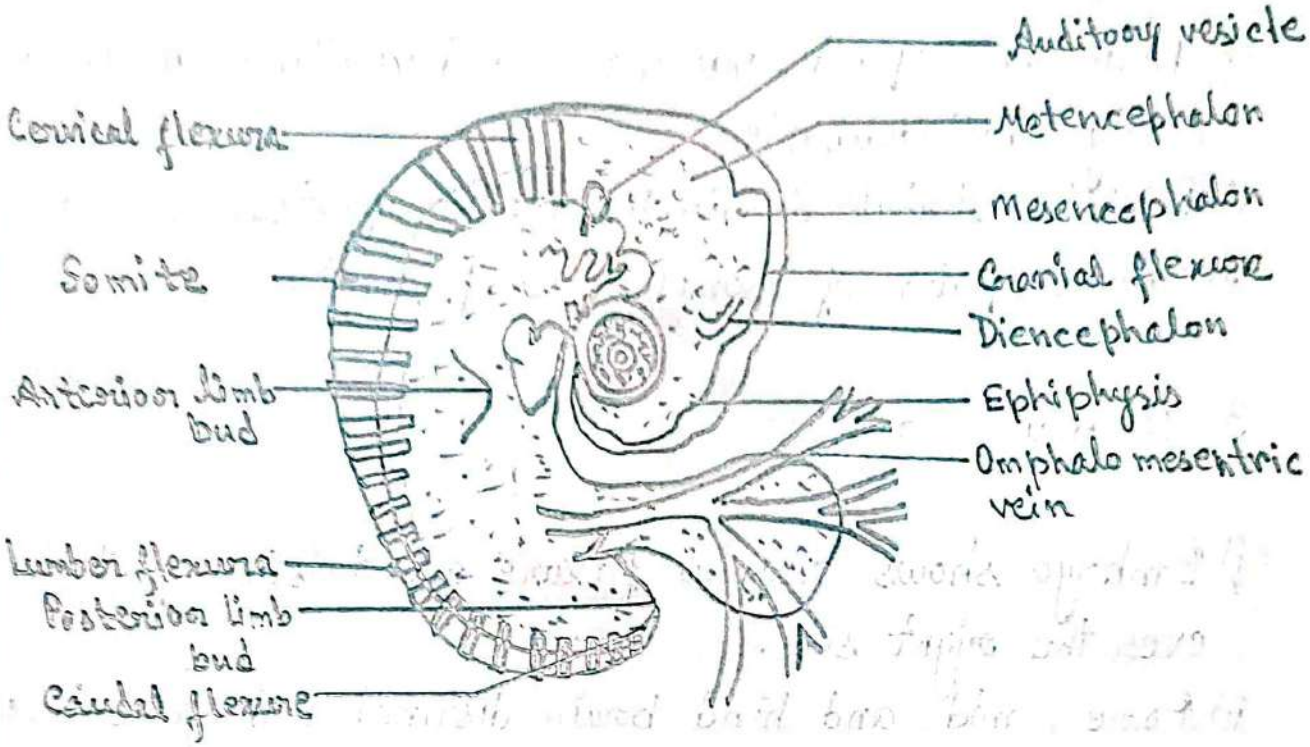

Fig:- 36 hours stage of entire chick embryo.

and vitelline arteries and veins are well developed.
vi) Eye develops lens.
vii) Mesodermal somites are thirty five pairs.
viii) Limb buds are visible.

5) 96 hour stage :-

i) Flexure and torsion are much more complete and gives the embryo a 'C' shaped appearance.
ii) Head, trunk and tail are clearly demarcated.
iii) Very large vitelline veins and arteries are visible.
iv) Wing buds and leg buds appear.
v) Somites are continued up to tail process and there number is forty two pair.