Basics of Biology
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Lecture No. 02
Classification of Living Organisms (Part – 3)

Hello everyone, this is Doctor Vishal Trivedi from Department of Bioscience and Bioengineering IIT, Guwahati and what we were discussing, we were discussing about living organisms. And in that context in this particular module, we are discussing about the classification of the living organisms. And so far, what we have discussed we have discussed about the classification of the animals. And in the previous lecture, we discuss about the classification of the invertebrate animals.

And in that we have discussed about the properties of the Porifera, Coelenterata where we have discussed about the properties of the Platyheminthes and the Aschelminthes apart from that, we have also discussed about the some of the exclusive properties of the phylum Mollusca and Echinodermata. And then very briefly, we discussed about the properties of the Hemichordate. So, so far what we have discussed are the organisms, which are actually been falling into the category of invertebrate.

And we have discussed about the Hemichordate which is found to be a connecting link between the Chordata and the non-chordata. So, in today's lecture, we are going to discuss about the Chordata and we are going to discuss a different sub phylum and divisions, what are present in the phylum Chordata. So, let us start our discussion about the phylum Chordata.

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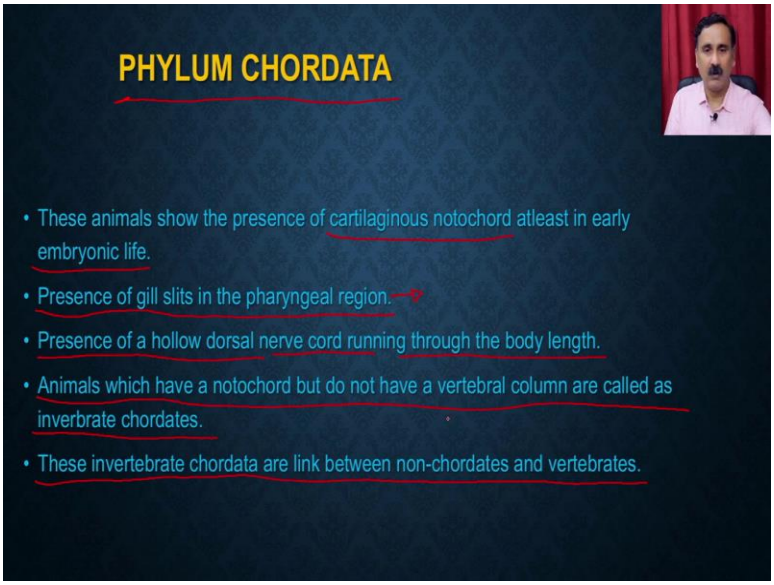

So, as the name suggests, the Chordata means the organisms which are actually going to have the notochord. So, the phylum (coid) Chordata is actually the organisms which are actually going to have the cartilaginous notochord, at least in some phase of their life cycle, if they do not have the well developed notochord in the adults at least they will going to show the some notochord in the early stage of the embryonic lifecycle and all those organisms are actually going to be present in the phylum Chordata.

Apart from that the chordates are actually going to have the gill slits in the pharyngeal region. So, this pharyngeal region is the region which is required for the respirations. Then they are actually going to have the hollow dorsal nerves cord running throughout the body. So, they are going to have the nerve cords, which runs from the throughout the body and that is how it is actually going to regulate the activities within the whole body or it is actually going to work as a sensory organs so that it will be actually going to sense all the activities that are happening within the body.

Then the animals which have the notochord but do not have the vertebral column are called as the invertebrates chordates. These invertebrates chordates are the link between the non-chordata and vertebrates. So, within the Chordata, you have the different types of animals one of the animals which actually going to have the vertebral columns are called as the vertebrates whereas, the animals which actually have a notochord, but do not have the vertical columns are called as

the invertebrate chordates. And invertebrate chordates are found are supposed to be a connecting link between the non-chordata and vertebrata.

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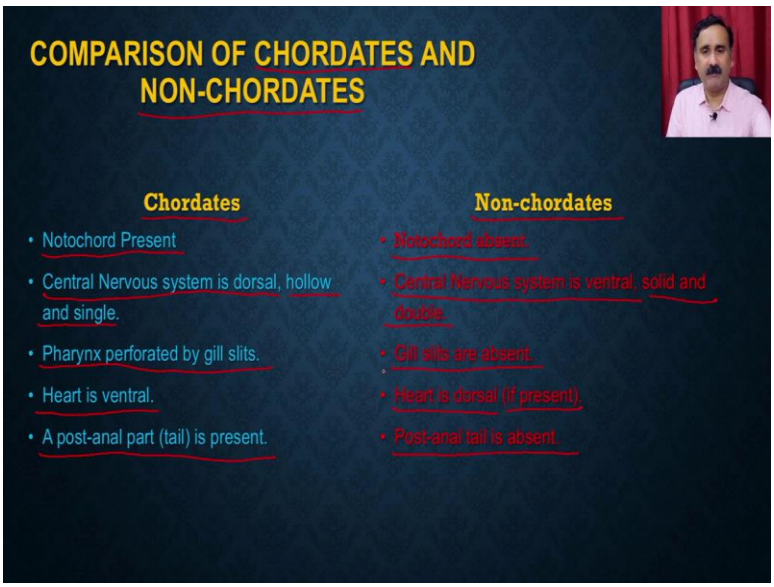

What is the difference between the chordata and the non-chordata? So, we have listed out the some of the classical differences between the chordata and the non-chordata. So, these are the list for the chordata and these are the properties of the non-chordata. So, in the chordata you are going to have the notochord which is present in the case of non-Chordata notochord is completely absent.

In the chordata the central nervous system is dorsal and it is hollow and single which means there will be a single dorsal nerve, which are actually going to run throughout the animal. Whereas, in the case of non-chordata the central nervous system is ventral, solid and double. Then the pharynx performed by the gill slit firings are perforated by the gill slits, whereas, the gill slits are completely absent in the case of non-chordata.

The heart is ventral and the heart is dorsal if it is present, it is going to be a dorsal. Whereas, the tail is present in the case of the chordata whereas, the tail is not present in the case of non-chordata. So, with this very few classical differences between the chordata and non-chordata, let us move on and discuss about the classification of the chordata.

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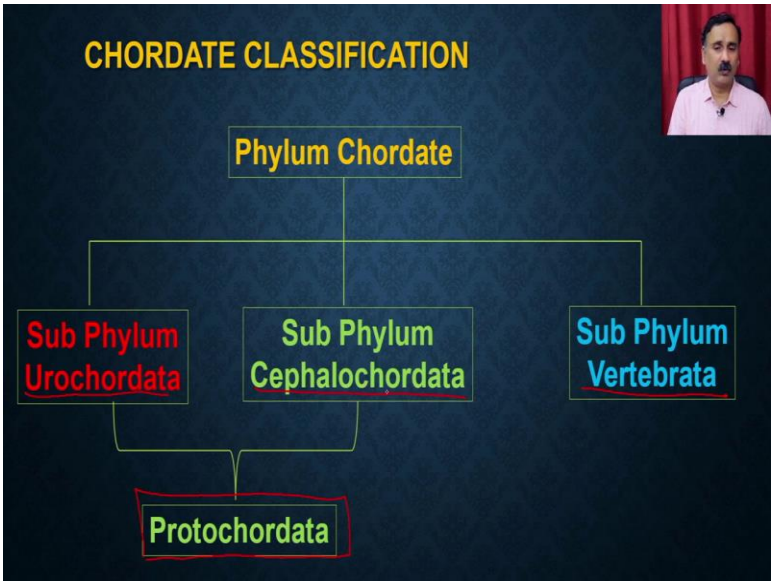

So, chordata is a very big phylum, the chordata is being further divided into the three sub-phylums. These are the urochordata, cephalochordata and the vertebrata. Cephalochordata and urochordata are considered to be protochordata, which means they are not going to have the well developed system. So, let us first discuss about the sub phylum urochordata and then we are going to discuss about the sub phylum cephalochordata.

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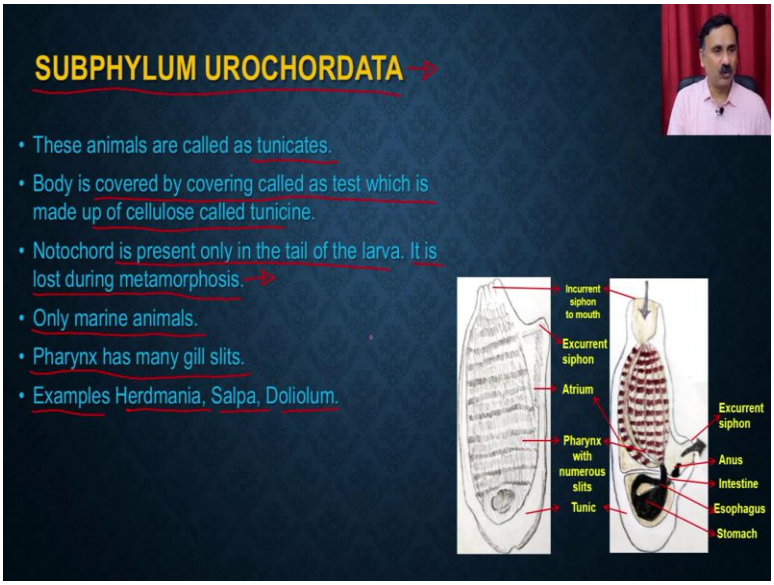

So, sub phylum urochordata these animals are called as tunicates. The body is covered by a covering called as test which is made up of the cellulose called a tunicine. So, this is see you

have the (())(06:53) one of the tunicates where you have the cell body which is covered by the test and it is made up off of the cellulose which is called as tunicine. The notochord is present only in the tail of the larva. It is lost during the metamorphosis.

So, this is the class of example where the notochord is not present in the adult it is only present very briefly in the tail of the larva and it is lost during the metamorphosis which means when the larva is developing into the adult, the tail is actually going to loose. These are the exclusively marine animals so they are not found in the freshwater. The pharynx has many gill slits.

So, pharynx has many gill slits you see here that this is the pharynx where you have the slits and these slits are being used for respirations the examples are the herdmania, salpa and Doliolum so, what you see here is one of the organisms from the sub phylum urochordata. Now, let us move on to another sub phylum which is called as the cephalochordata.

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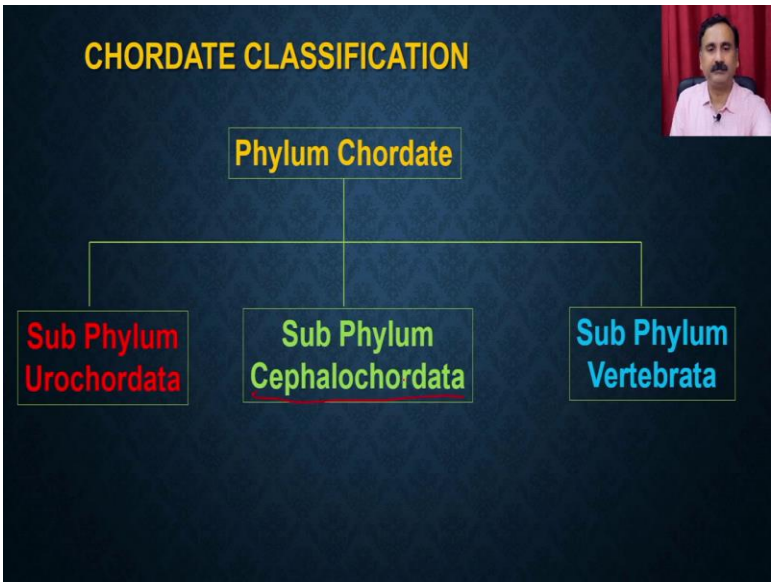

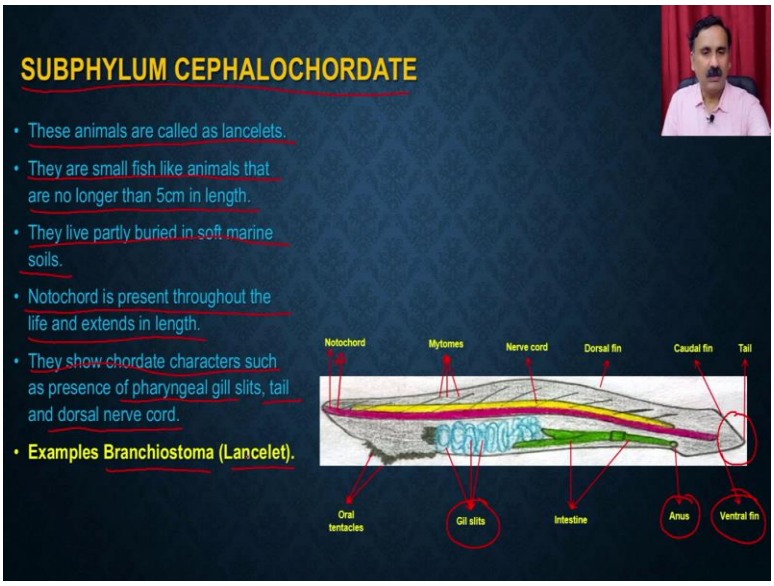

So, phylum and cephalochordata or sub-phylum and cephalochordata. These animals are called as the lancelets they are small fish like animal that are no longer than 5 centimeter in length. So, they are fish like animals, you see there is fish like streaming body where you have the initial mouth part (08:26) and the last part you have a tail they live partly buried in soft marine soil. The notochord is present throughout the life and extend in length.

So, notochord its present this is the notochord what you see this pink color thing is notochord and it is extended throughout the length of the organisms. They showed the choredata characters such as the presence of pharyngeal gill slits tail and the dorsal nervous system. So, what you see here is you have a very well developed a tail, then you have the caudal fins and then it has a dorsal fin because these are animals like fish like animals and then they have the gill slits, gill slits are present in the pharyngeal cavity or within the pharynges.

And then it has a notochord which runs throughout the body. The examples are the Branchiostoma or the lancelet. This is the structure of the Branchiostoma where you have the different types of the part of the structures it in where you have the well-developed anus you have the ventral fins, then you have the intestine, then you have the dorsal fins, nerve cords. So, nerve cord is the dorsal in the case of the, Branchiostoma.

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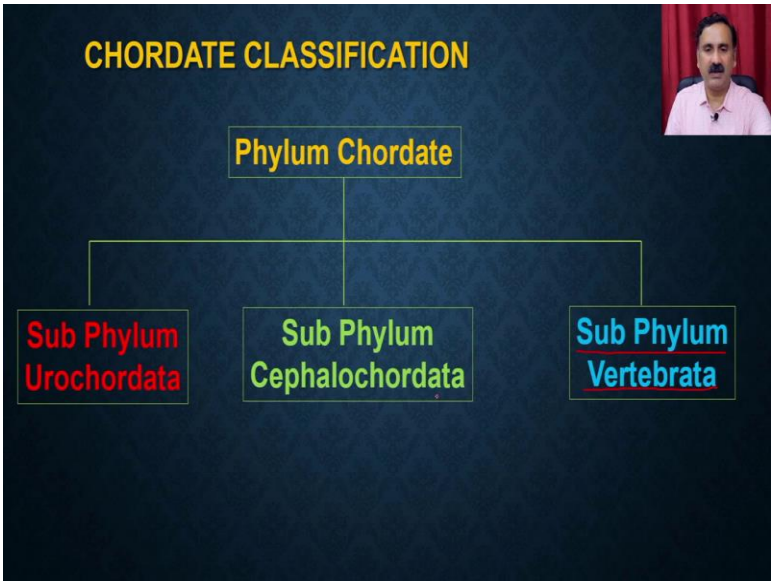

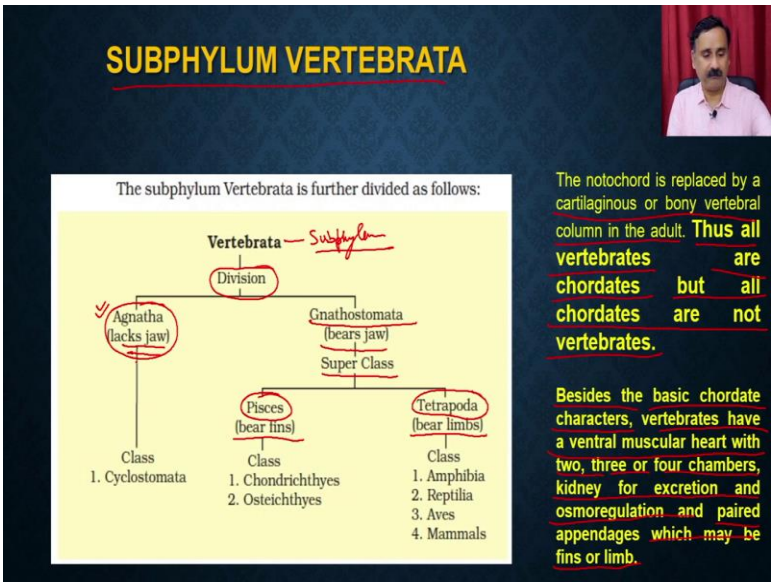

Now let us move on to the next sub phylum. So, the next sub phylum is called as the sub phylum and vertebrata. And the sub phylum and vertebrata can be further divided because within the vertebrata you have the very huge number of organisms. So, sub phylum vertebrates can be divided into the two divisions.

So, this is the sub phylum sub phylum vertebrata then sub phylum can be divided into division. So, you have the two division one is called as Agnatha which is the organism which are not going to have the jaw, then you have the Gnathostomata. Gnathostomata are the organism which are going to have the jaw and within the Gnathostomata you have the superclass.

So, superclass is you have the two major superclass, the organism which are actually going to be are the fins they are belonging to Pisces and the organism which are actually going to be are the limbs they are being present to the Tetrapoda. So, in the case of vertebrate, why they are called as vertebrates? Because the notochord is replaced by the cartilaginous or bony vertebral column in the adult thus, all the vertebrates are chordata, but not all chordata are vertebrata which means, if the notochord is replaced by the cartilaginous or bony ventral column into the adult, then they are been called as the vertebrates.

This means, all the vertebrate are chordata, but not the all chordata are vertebrate. Besides the basic chordata characters, vertebrates have the ventral muscular heart with 2, 3 or 4 chambers. So, you can you will see when we are going to discuss about the classifications that the within the vertebrata you have the heart which can be 2 chambered, 3 chambered or 4 chambered, you have the well-defined kidney for excretion and osmoregulation and paired appendages which may be fin or the limbs.

Which means it is going to have the paired appendages for the moment either they are going to use that for swimming which is actually they are going to be in the fins in the case of the fishes or they are going to have the limbs which are actually going to be presenting the Tetrapoda. So, let us discuss about the classification of the vertebrata. So, we are going to start first with the division agnatha which are the organism which does not contain the jaw.

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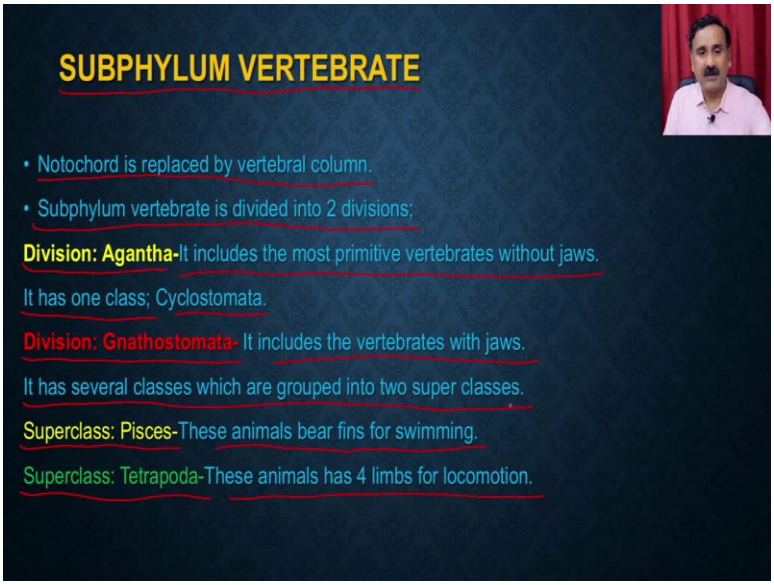

So, sub phylum vertebrate sub phylum vertebrate what are the different properties the notochord is replaced by the vertebral column that is why they are called as the vertebrate and the sub phylum of vertebrate is divided into two divisions, one is division Agantha. It includes the most primitive vertebrates without a jaw it has one class which is called as cyclostomata.

Whereas, the division Gnathostomata it includes a vertebrate with a jaw and it has the several classes which are grouped into two super classes. Superclass one is called Pisces these animals bear the fin for the swimming, whereas the superclass Tetrapoda these animals have the four limbs for the locomotions.

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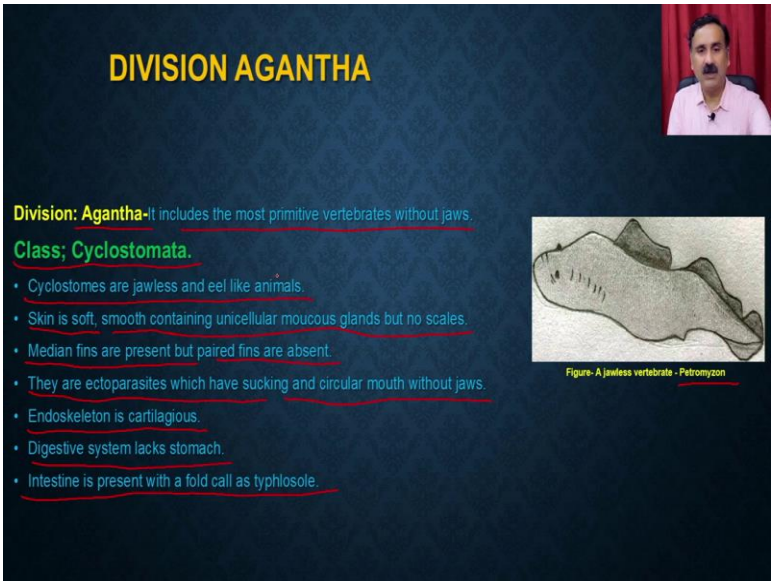

Now discuss about the division Agantha. So, division Agantha it includes a most primitive vertebrates without the jaw and within that you have the class cyclostomata. Cyclostomata are jawless and eel like animals. So, skin is soft, smooth, containing unicellular muscular glands, but no scales. Median fins are present, but paired fins are absent. They are ectoparasite which have sucking and circular mouth without jaw.

The endoskeleton is cartilagious and the digestive system lacks the stomach. Intestine is present with a fold called as the typhlosole. So, this is an example and where you have the Petromyzon. So, this is the fish, fish like organism but do look like eel like animals.

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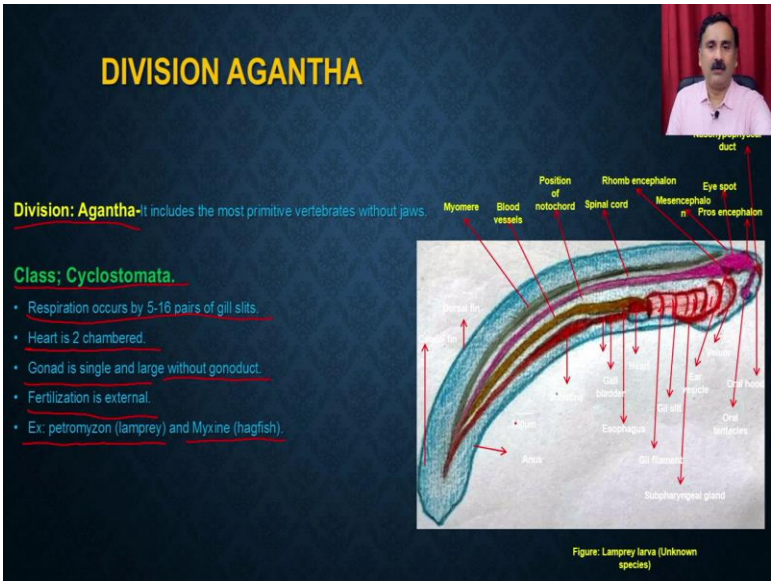

So, within division Agantha you have a class which is called as the cyclostomata where the respiration occurs by the 5 to 16 pairs of the gill slits. Heart is present and heart is 2 chambered the gonads is single and a large without the gonoducts and fertilization is external the examples are petromyzon which is lamprey and myxine which is called as the hagfish. So, this is what you see here you have the structure of the organisms and it is going to have the all-other different parts of the body.

You have the gallbladder, esophagus, heart which is 2 chambered heart then you have the ear vesicles, gill slits. So, these are the gill slits that are present in the organisms, then you have the oral hood, oral tentacles and so on.

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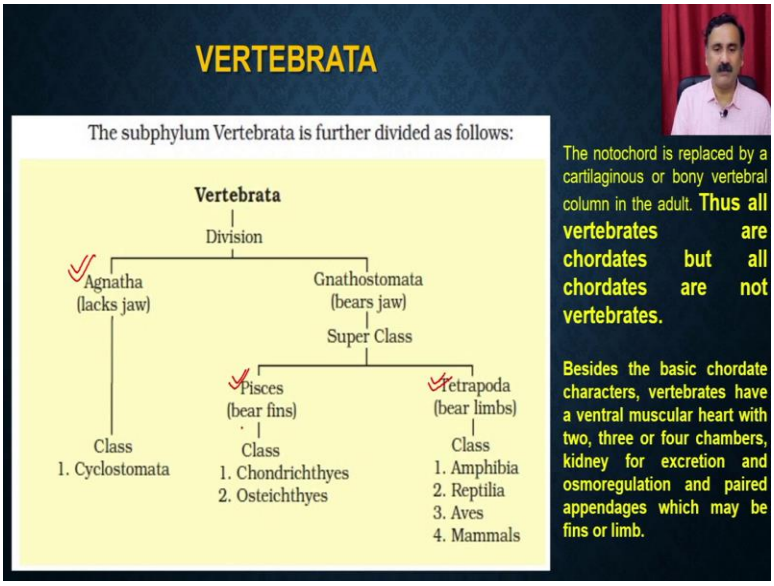

Now, let us talk about the vertebrata. So, we have discussed about the division Aghanta then we are going to now talk about the Gnathostomata, where we have the two-sub superclass one is called a Pisces the other one is called as the Tetrapoda.

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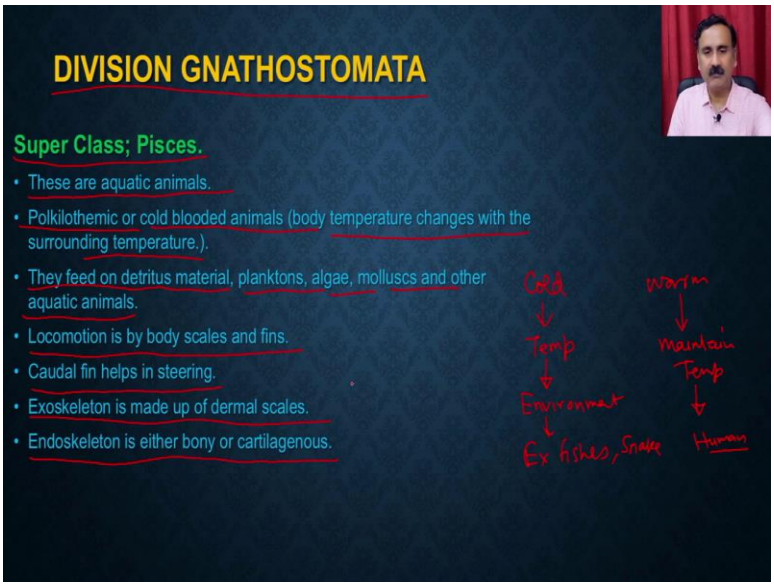

So, division Gnathostomata is superclasses Pisces these are the aquatic animals, they are polkilothermic or cold blooded animals, which means, they are body temperature changes with the surrounding temperatures you can have the two different types of animals which are called as

cold blooded animal or the warm blooded animal. So, cold blooded animals will not be able to maintain the body temperature.

So, they will actually going to their body temperature is going to change as per the environment or the external temperature. Whereas, the warm animals are actually going to maintain the temperature and they are going to spend a lot of our energy for that. Examples in this case is fishes and all other are like fishes, the snake and the amphibians. Whereas in the warm blooded animals, you can have the mammals like the humans.

They feed on the detritus material planktons, algae, molluscs and the other aquatic animals. Locomotion is by the body scales and the fin, the caudal fin helps in steering. So, you can see always there is a fish always has a caudal fin and that helps in movement it helps really helps in deciding the directions. Then exoskeleton is made up of the dermal scales and the endoskeleton is either bony or cartilaginous.

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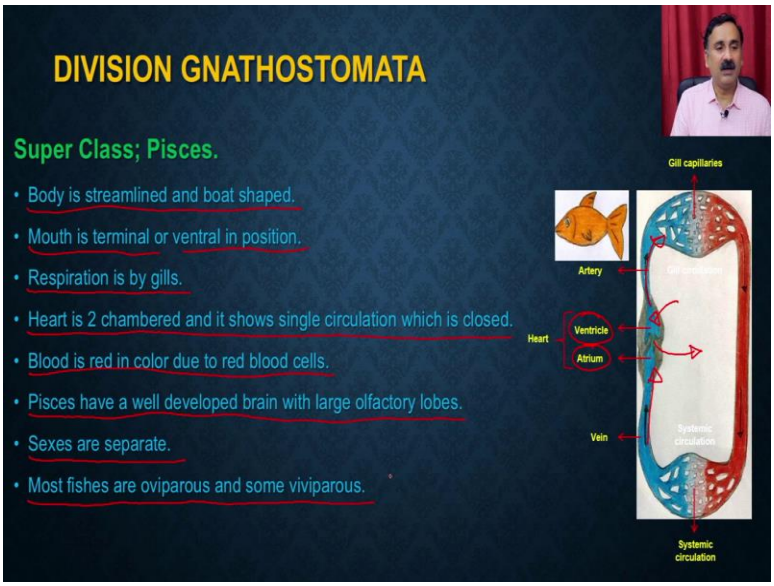

Superclass Pisces the body is streamlined and the boat shape. So, if you see a typical fish, where the body is streamlined so it actually can help the fishes to swim very smoothly without actually experiencing a lot of frictions. The mouth is terminal and ventral in positions the respiration is by the gills. So, you will see that there is gill slits and those gill slits are actually going to filter the water and during that process, it is actually going to take up the water season from which is dissolved in the water.

Heart is 2 chambered and it shows the single circulation which is the closed. So, heart is 2 chambered where you can have the one ventricle and one oracle and it is actually a single circulation which means it will not be going to a double circulation system which means the blood is going to come into the heart and then it goes from the heart which means it is not like blood is going to filled into the heart and then it is actually going to go.

So, it is actually a uni-directional single circulation system. The blood is red in color due to the red blood cells. The Pisces have a well developed brain with a large olfactory lobes, the sexes are separate and the most fishes are oviparous and some are viviparous.

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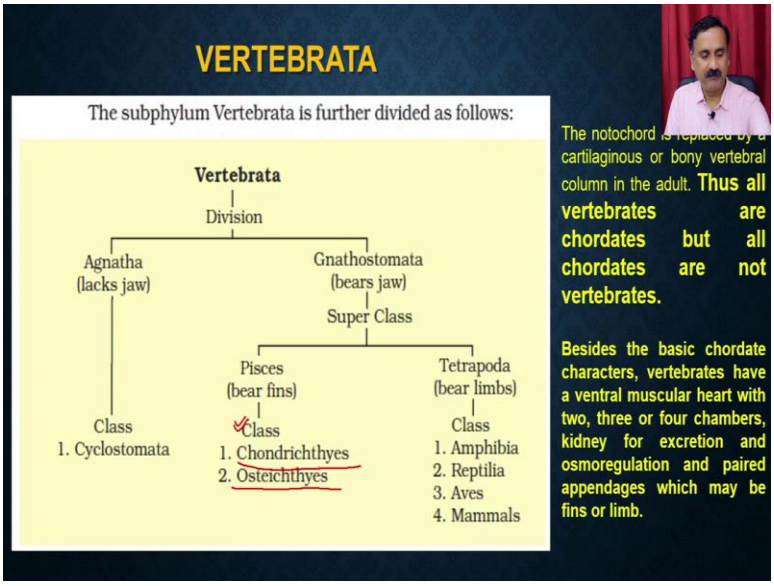

Then we move on to the superclass Pisces within that we have the two sub classes one is called as the Chondrichthyes another one is called as the Osteichthyes.

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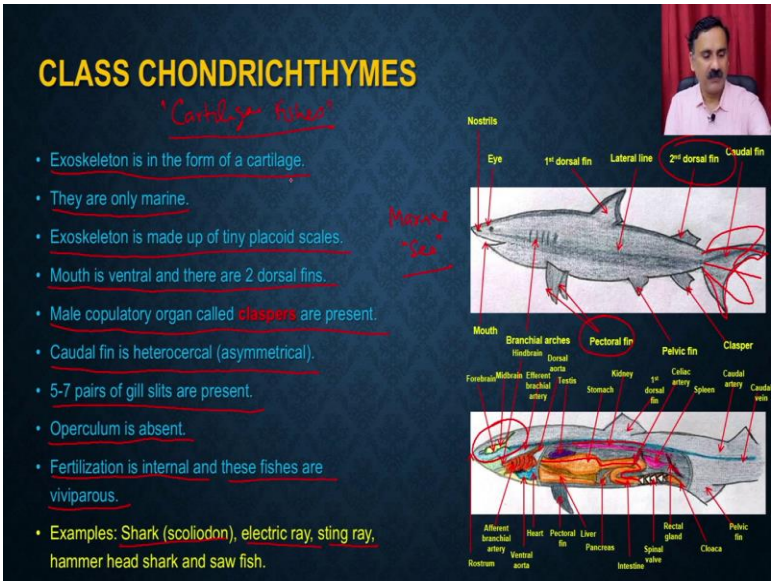

So, the class Chondrichthyes exoskeleton chondrichthymes or these are called as the cartilaginous fishes so cartilaginous fishes other one is called as the bony fishes. So, exoskeleton is made up of in the form of the cartilage they are only marine the exoskeleton is made up of the tiny placoid scales. The mouth is ventral and there are two dorsal fins. (More) male copulatory organ called claspers are present the caudal fin is hetero circle or asymmetrical 5 to 7 pairs of gill slits are present and operculum is absent.

Fertilization is internal and these fishes are viviparous. Examples are all the fishes what you know which are present in the marine, the shark, electric ray, Stingray, hammerhead shark and the saw fish. So, this is what you see here is actually a fish which is a cartilage fish and mostly these cartilage fishes are present in marine which means they are present in sea and they are actually having the well-developed system.

So, they have the 2 chambered heart and the caudal fin what you see is asymmetrical which means it is not like this, it is not like this is like a one side it is small the other side is small. So, it is actually asymmetrical. Then it has the dorsal fins, it has the ventral fins and the pectoral fins. These fins allow the fish to swim into the into the water and the caudal fin is actually been used to decide the direction.

Then if you cut the fish, you will see that it has a huge amount of all the different types of the organs right has the heart, then it has the digestive system. So, what you see here is actually the

elementary canal like this is the elementary canal what you see here and that ended up into the anus and then it also has the kidney which is like this and then it also has the forebrain. So, vein is well developed in the case of the cartilage fishes.

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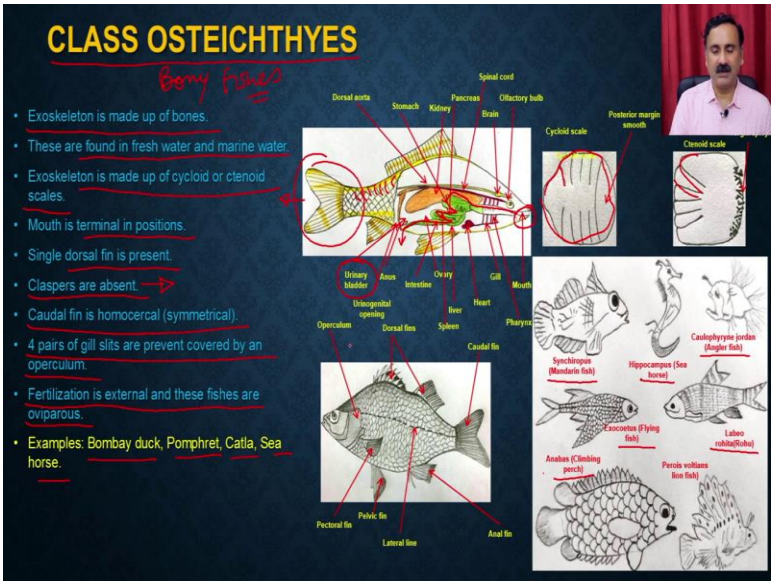

Then we have the another superclass which is called as the class Osteichthyes. These Osteichthyes are also called as bony fishes because the exoskeleton is made up of the bones these are found in the freshwater and marine fish water. The exoskeleton is made up of the cycloid or the cetnoid scale. So, what you see here is actually so, you have seen these scales are present onto the fish, which we actually draw like this.

So, these scales could be of two different types as per the design, it could be a cycloid scale, which is actually going to have this kind of structure or it could be cetnoid scale which is of this kind. So, mouth is terminal in positions and the single dorsal fin is present, which means the single dorsal fin and you see it is symmetrical in shape. Then it has a clasper, claspers are absent from mouth.

So, male sex origin, the claspers are absent in the case of the bony fishes, then caudal fin is symmetrical caudal fin is symmetrical, then it has 4 pairs of gill slits and are prevented covered by an operculum. So, you have the gill slits and the fertilization is external and these fishes are oviparous. So, you see the many examples of these fishes, you have the Bombay duck, Pomphret, Catla seahorse and all that.

So, what you see here is the many fishes like the mandarin fish, you have the seahorse, you have the angelfish, Labeo rohita the Rohu the main fish what we eat in our homes, and then we have the flying fishes, then we have the Anabas or the climbing perches and so on. And as far as the internal anatomy is concerned, they are also be very well developed. So, if you see that they have a well-developed the digestive system then they have developed sex organs.

And if this is the digestive system where you have the interior you have the mouth and then it enters into this is the stomach and then it ends up into the anus. Then it has the urinary bladders and the other kinds of things.

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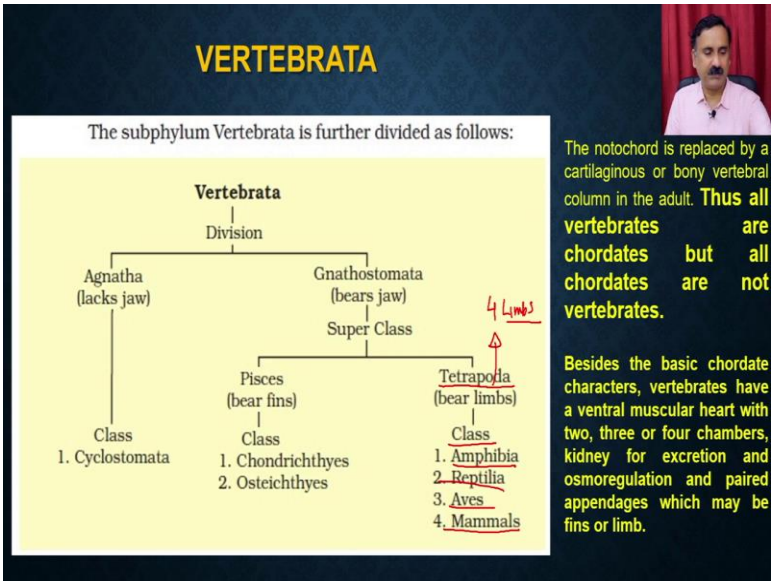

Now let us move on to the next class and the next superclass is the Tetrapoda. So, Tetrapoda are the animals, which are actually going to have the four limbs, four limbs and the two hind-limbs. Tetrapod can be further divided into the many sub classes like the class like the Amphibia Reptilia, Aves and the Mammals.

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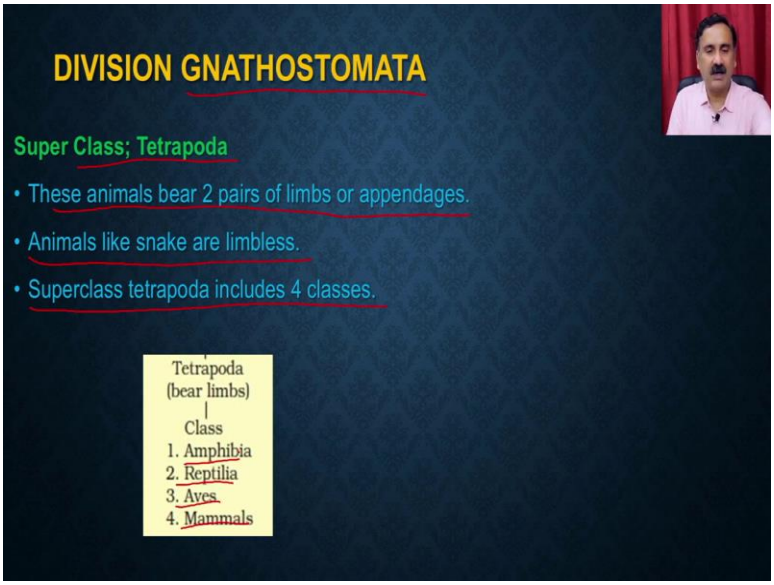

So, within the Gnathostomata you have the superclass Tetrapoda these animals bears the two pairs of limb or the appendages. Animals like the snakes are limbless and the superclass Tetrapoda include the four classes like the Amphibia, Reptilia, Aves and the Mammals. So, let us start first the discussion about the Amphibia.

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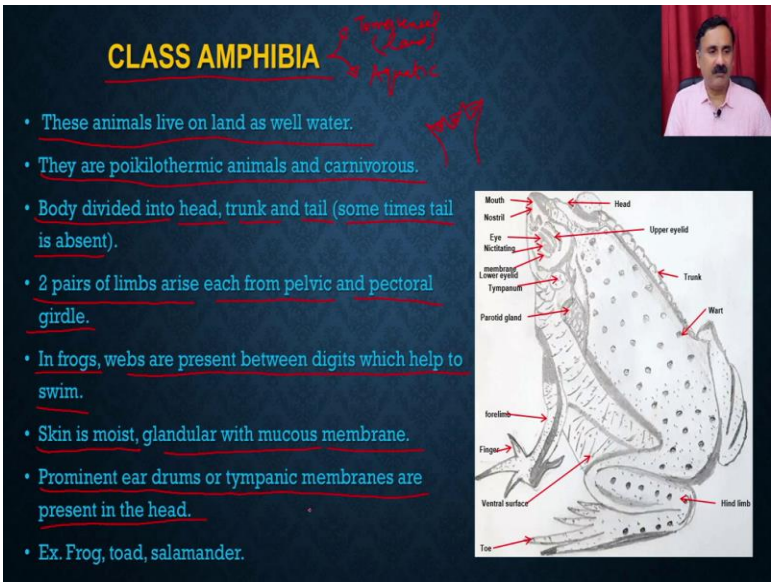

So, class Amphibia the organism which actually can stay on the two places; it can be terrestrial, which means they can be stay on to the land. So, they can be terrestrial or they can be aquatic and that is why they are called as the Amphibia. So, these animals live onto the land as well as

the water, they are poikilothermic animals and they are carnivorous. The body is divided into the head, trunk and the tail.

So, what you see here is actually this is the head, this is the trunk and this is the tail at the backside you have a tail in some cases you are actually the tail is absent. Then you have the two pairs of limbs which arises from the pelvic girdle and there are two pairs of limbs which are actually arises from the pectoral girdle. So, these are the four limbs and these are the hind limbs.

In frogs, the webs are present between the digits which helps to swim. So, you have seen the frog you have seen the frog, it has the webs like structure into the between the digits and that actually helps the frog to swim into the water. The skin is moist, glandular with the mucous membranes. So, in the case of the frog, what you see here is the skin is very soft and it is slimy actually, and that helps in the frog in terms of getting the protection from the prey.

And it is also helpful in terms of the frogs, the skin is not been getting damaged by the water also. They are having the prominent eardrums or the tympanic membranes are present in the head. The examples are frog, toad and salamanders.

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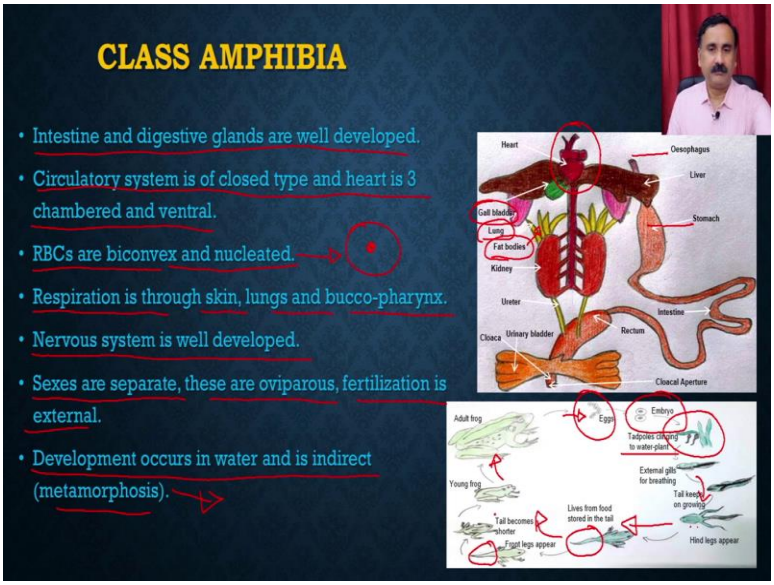

The class Amphibia the intestine and the digestive glands are well developed. So, this is what you see here is the digestive glands where you have the all the organs like you have the liver you have the oesophagus, you have the stomach and then you have the gall bladders, then you have

the all-other organs. So, this is what the internal structure of the frog what you see here is it they have developed lungs for the respirations.

Then they have the fat bodies, these fat bodies are actually been very good because the frogs are going for the hibernation and during that hibernation these fat bodies are being used for the for supplying the energy. Because they can be utilized for metabolism and that is how they can be utilized for the during the hibernation then it had they have the well-developed heart. So, circulatory system is of close type and heart is three chambered and the ventral.

RBCs are biconvex and they are nucleated. So, the RBC are nucleated which means they are actually containing a nucleus. Remember that in all other organisms like the humans they organism the RBCs do not have the nucleus. Respiration is by skin, lungs and bucco-pharynx which means the skin is soft and the slimy and because of that, it actually helps the frog to get the air from the or get the oxygen from the atmosphere.

Apart from that it has a well developed lungs and bucco-pharynx. So, it actually can take up the it can do the respiration from the three sources one it can actually respire through the skins, it can, then it can take up the oxygen through mouth and then it also can take up the oxygen through the lungs. Nervous System is well developed it has a well-developed brain which and other central nervous system.

The sexes are separate these are oviparous the fertilization is external, this means they are actually going to give the eggs. Development occurs in water and it is indirect, which means there will be a metamorphosis so what you see here is actually the lifecycle of the frog, where the adult frog after the fertilization is the adult frog is actually going to give up the egg and then these eggs are actually going to be fertilized with the sperm from the male frogs and then that will develop into the embryo.

That embryo will actually be developed into the tadpoles these tadpoles then actually will stick to the water the plants within the pond or the water and then they will eventually going to grow and then they will develop into a frog(29:48). So, initially they will be in baby tadpole and then the tadpole is actually going to develop. So, you see initially they are actually having the tail and then as they will go through with a developmental process, the tail is actually going to regress. And it is actually going to develop into the adult frog.

This tail, whatever the material is present in the tail is actually being used for a source of nutrition during the last phase of the metamorphosis and that is how it is actually going to be loss the tail.

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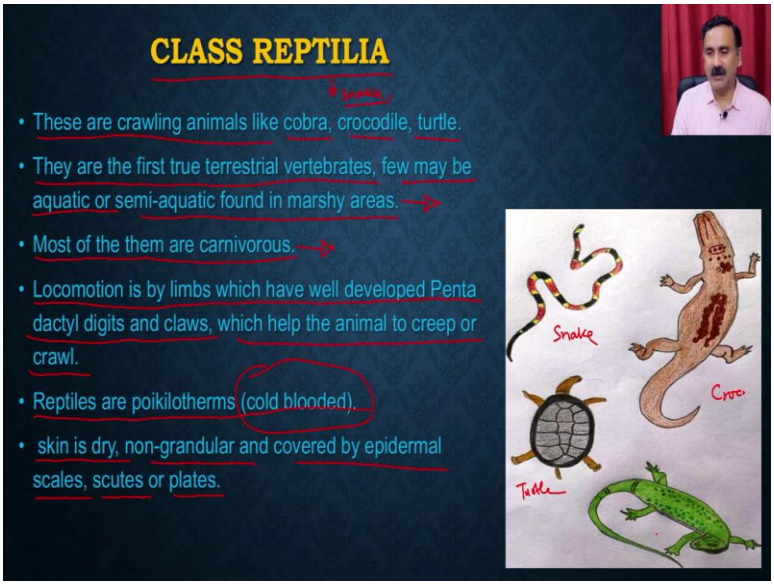

Now, let us move on to the another subclass which is called as the Reptilia. So, Reptilia are the, all the animals which are like snake and the crocodile and all the kinds of things. So, these are the growling animals like the cobra crocodiles and turtle which means they crawl from one part to another part and they could be Tetrapodas which means they will be going to have the well-developed limbs or they could actually slide just like snakes.

They are the first two terrestrial vertebrates few may be aquatic or the semi aquatic found in the marshy lands. So, these are the first animals which are completely terrestrial compared to that you might have seen that when we were talking about the amphibians, they were semi terrestrial like they can actually go into the water or they can be remain on the terrestrial, but these animals are true terrestrial because they were remain onto the land.

And some of these Reptilia animals are also found in the water as well. Most of these animals are carnivorous, which means they are actually going to take up the nutrition from the other animals. The locomotion is by the limb, which may have been developed Penta dactyl digits and claws, which helps the animal to creep or to crawl, reptiles are the poikilotherms. So, this means they are also the cold-blooded animals.

Skin is dry, non-granular and covered by the epidermal scales scutes or the plates. So, these are the some of the examples what you see this is the snake, this is the turtle. This is the crocodile and this is the lizard.

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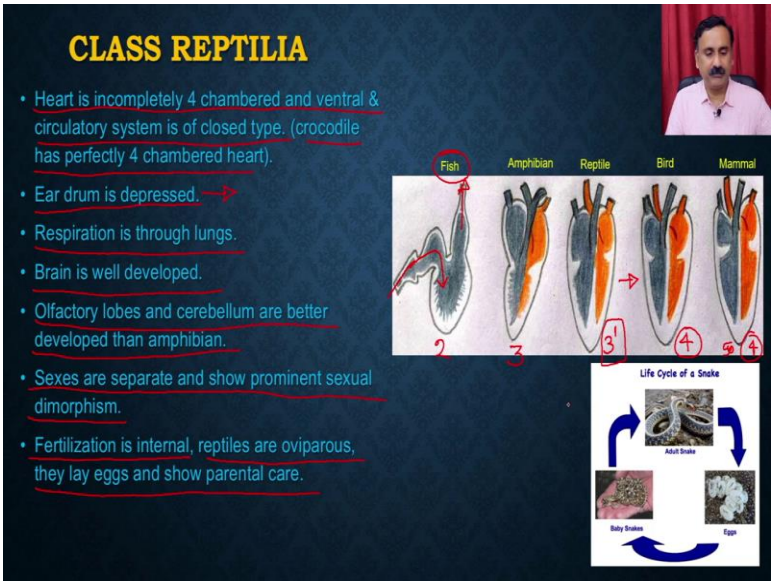

The class Reptilia, the heart is incompletely four chambered and ventral and the circulatory system is of closed type. Only the crocodile has the exception that it has a 4 chambered heart. So, you see how that heart is actually been developed, while the animals are going from the evolutions. So, in the fish, you have the 2 chambered heart, but these 2 chambered hearts are continuous which means the blood comes from one side and then it goes on to the other side there is no circulation actually.

Compared to that the emphibians so, this is the 2 chambered heart then compared to that the emphibians they have the 3 chambered heart and then in the Reptilia it has the 3 prime heart which means it is actually having a 3 chambered heart but the one of the chambers is also partially been chambered. So, it is partially 4 chambered heart then that get converted into a 4 chambered heart in the bird as well as the mammals. So, mammal is also having the 4 chambered heart.

The eardrum is depressed which means there is a no eardrum. The respiration is through lungs, the brain is well developed. The olfactory lobe and cerebellum are better developed than the amphibians, sexes are separate and show the prominent sexual dimorphism fertilization is

internal reptiles are oviparous they lay eggs and show the parental care. So, this is what it is showing here.

So, the adult snake is actually giving the eggs then these eggs are getting fertilized and then the fertilized eggs are actually giving the baby snake which are actually been developed into the adult snakes.

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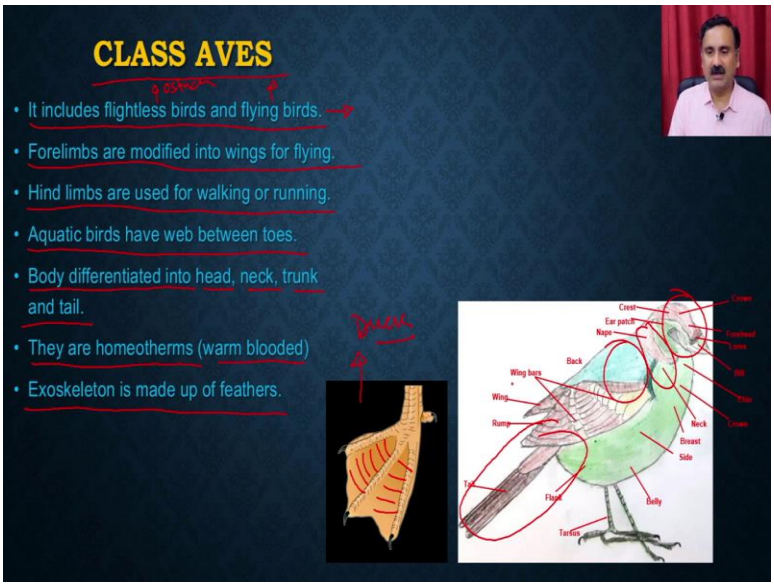

Then we are talking about the class Aves. So, it includes the flightless birds and as well as the flying bird which means it includes the birds which could fly or which could not be able to fly. For example, the flightless bird which means ostrich, and flying bird like all the domestic birds what we see. Four limbs are modified into the wings for the flying hind limbs are used for walking or to the running.

Aquatic birds have web like toes. So, this is what you see here, aquatic birds have the web like structure web like membrane. This is present in the duck. And the body is differentiated into the head, neck, trunk and the tail. So, what you see here is this is the head, then trunk and then you have the neck here and this is your tail. They are homeothermos which means they are a warm blooded animals.

Because the birds are actually going to maintain a constant temperature the exoskeleton is made up of the feathers. So, this is what is a typical bird, where you have the beak, you have the neck you have the trunk and you have the back and then you have the wings.

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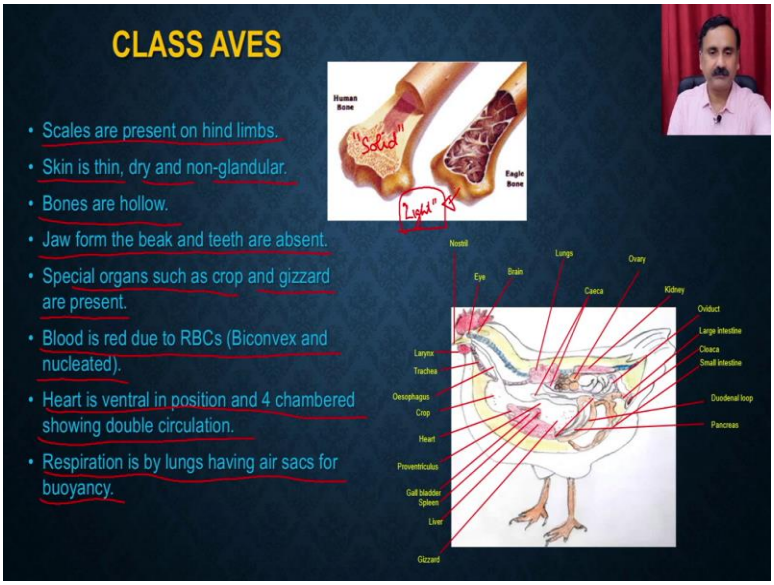

The scales are present on to the hind limbs skin is thin dry and non-glandular. Bones are hollow jaw form the beak and teeth are absent. So, they have the jaw but the teeth are absent especial organs such as crop and gizzards are presents. So, crops and gizzard are actually the organ which are actually been helping in the digestive system. The Blood is red due to the RBCs char biconcave and biconvex and nucleated.

Heart is ventral in position and it is for chambered heart showing the double circulation respiration is by the lungs having the air sac for the buoyancy. So, what you see here is a comparison between the bones between the human bones and the birds bone. And the human bones are actually solid.

So, they are not having air pockets whereas in the birds and bones they are actually having the air pocket and because of those the bird's bones are light. And because they are light, they can be able to help in terms of giving the low weight and because of that the birds can be able to fly.

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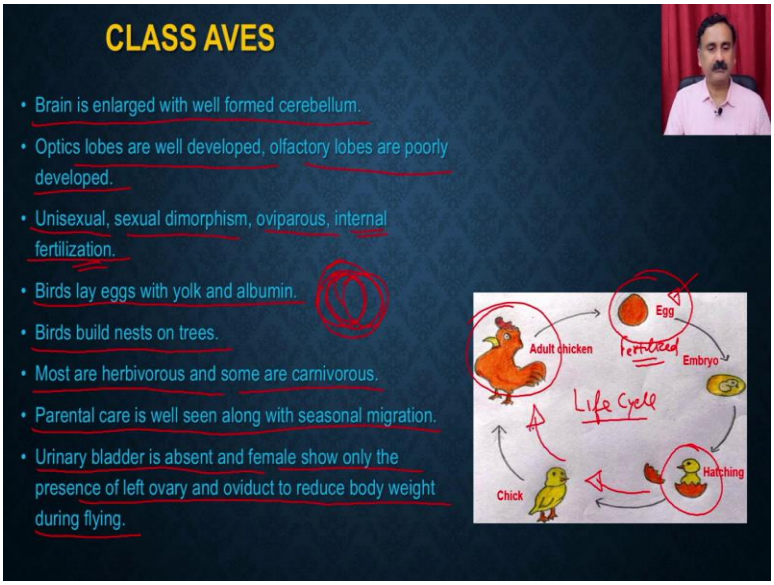

So, brain is enlarged with the well-developed cerebellum. Optic lobes are well developed olfactory lobes are poorly developed. It is a unisexual, sexual dimorphism it is a oviparous and the internal fertilizations birds lay egg with the yolk and albumin. Birds are very good in terms of building the nest onto the tree or in a home also, you might have seen that there are birds are which are actually forming the different types of birds, different types of birds are different types of nests.

You might have seen the very beautiful word nest from the many types of bird which we see in our homes. Most are the herbivores and some are actually are carnivorous. Parental care is well seen along with the seasonal migrations, you might have seen the migratory bird in our campus anywhere, we could see a lot of migratory birds which are coming from the other part of the world during the winter.

Urinary bladder is absent and the female show only the presence of left ovary and oviduct to reduce the body weight during the flight. So, what you see here is a lifecycle of a typical bird. So, this is the lifecycle where you are adult chickens are actually going to give the eggs then these eggs are actually going to be the fertilized eggs because as I said the fertilization is internal.

So, this means the eggs what you get from the adult chicken are actually the fertilized egg and then the fertilized eggs are actually being present outside and then it is going to be incubated for some time at 37 degrees Celsius and then the embryo is actually going to be hatched from the

from the egg and then this hatched egg chicken is actually going to develop into the well develop adult chickens.

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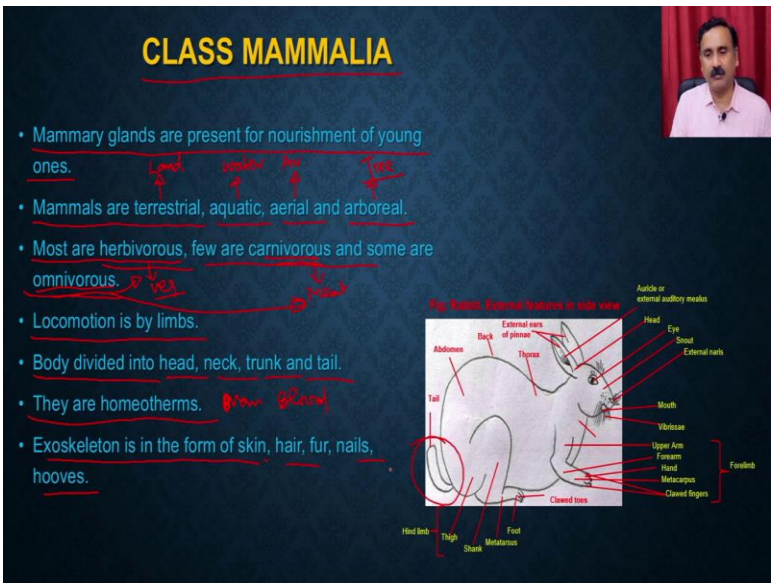

Now let us move on to the next class and next class is called as mammalia. See these glands are mammary glands are present for the nutrition of the young ones. So, these are the unique class of animals which actually contains the mammary glands for giving the nutrition to their young ones.

Mammals are terrestrial, aquatic, aerial and arboreal which means they are present what is terrestrial what they are present on land, aquatic which means they are present on to the water aerial which means they are present in air and arboreal which means they are present on to the tree. Which means the mammalian is a class of animals which are actually, spreading in all part all other areas it is they are present on land, water, air and tree and they are actually mean most developed animals so they are actually capturing these places with their skills.

Most are herbivorous few are carnivorous and some are on omnivorous. So, herbivorous means they are actually eating the vegetables carnivorous which means they are eating the meat and omnivorous which means they are actually eating the vegetable as well as the meat. Human are omnivera whereas lion is carnivore and some other like cows are herbivorous. Locomotion is by the limbs body is divided into the head, neck, trunk and tails they are homeotherms which means

they are warm blooded animals, they are warm blooded animals and exoskeleton is in the form of skin, hair, fur, nail and the hooves.

So, what you see here is a structure of the rabbit and I am sure you might have seen the rabbit. So, it has head then it has a trunk and all those kinds of things and it has a well developed tail also.

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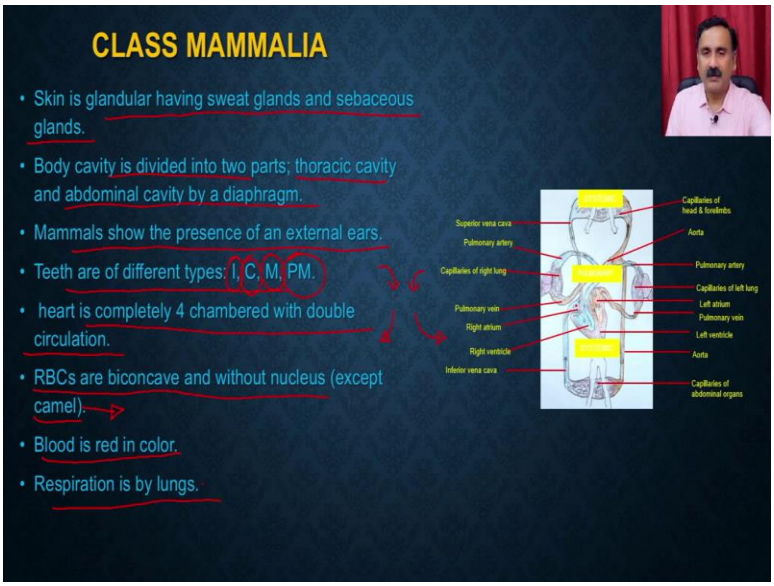

Then the skin is glandular having the sweat gland and the sebaceous gland body cavity is divided into two parts it has a thoracic cavity and the abdominal cavity by a diaphragm. The mammal shows the presence of an external ears, teeth are different types, you can have the incisors, you have the canines, you have the molars, and you have the pre molars.

Heart is completely four chambered with a double circulation, which means from the 2 chamber it is actually going to receive the blood and it from the 2 chamber it is actually going to supply the heart and that is called as the 4 chambered heart with the double circulations. RBCs our biconcave and they are without nucleus except there is an exception that in the camel there is nucleated RBCs. Blood is red in color and the respiration is by the lungs. So, this is what you see here is a circulatory system.

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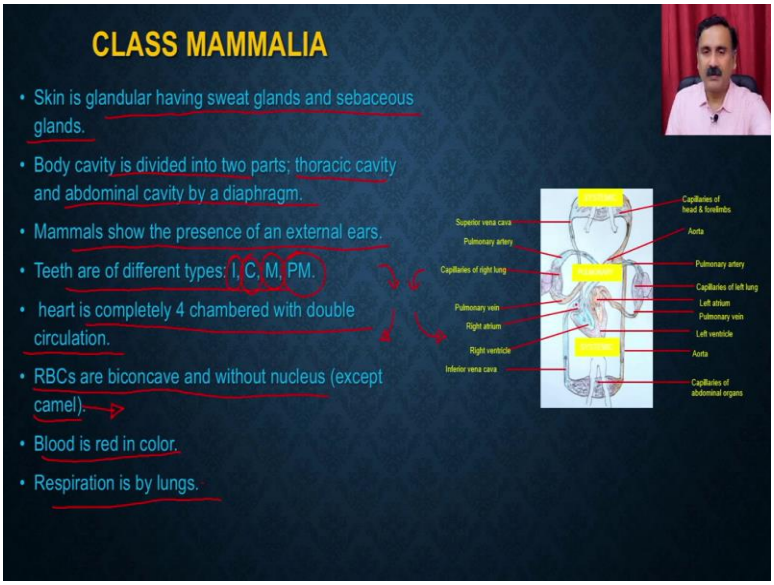

Then in the class mammals the brain is highly developed, cerebrum shows the transverse band called as a corpus callosum. The optic lobes are better developed than the olfactory lobes few mammals are oviparous such as duck billed platypus. So, these are the primitive mammals. So, that is why they are actually oviparous some mammals have the pouches for the development of young ones these mammals are called as the marsupials for example the kangaroos.

You might have seen the kangaroos that how they are actually protecting their young ones by keeping them into skin made pouches. The most mammals are placental and the viviparous.

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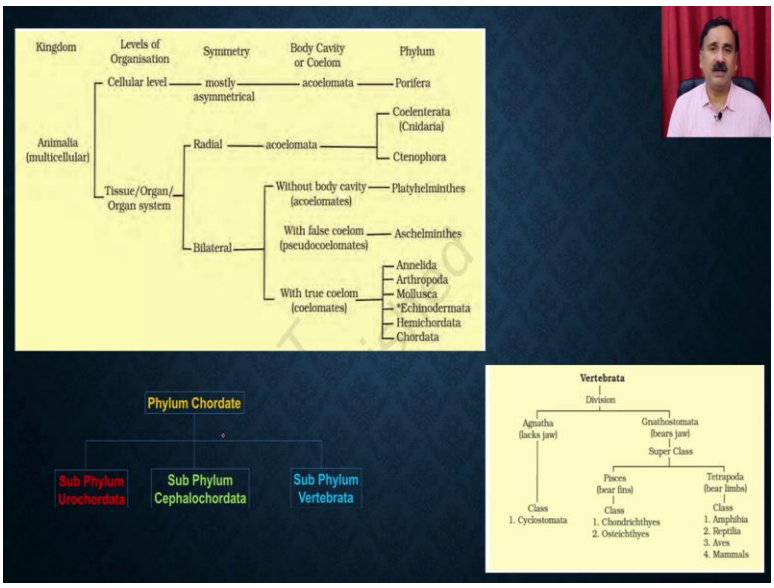

So, so far what we have discussed we have discussed about the classifications of the animals we have what we have discussed, we have initially started with the very simple, classifications where we said that if the level of augmentation is cellular, and the symmetry is mostly asymmetrical, and the body cavity is acoelomate, then the phylum is going to be Porifera. So, there are different criteria which we have discussed in the beginning and are based on those criteria the whole animal kingdom is being divided.

And ultimately, we have also discussed about the chordata and within the chordata, we have discussed about the sub phylum urochordata, sub phylum cephalochordata and then we have discussed about the sub phylum vertebrate. And within the vertebrate also we have discussed about the a Agantha or the jaw lack the animals which do not contain the jaw or Gnathostomata the animals which actually containing the jaw.

And within that also we have the super classes like the Pisces or the Tetrapoda and then we have also discussed about the different characteristic of the animals which are present within the Tetrapoda whether it is the Amphibians, Reptilia, Aves or the mammals.

So, with this I would like to conclude my lecture here in our subsequent lecture we are again going to take the example of plants and how we can be able to use that to explain you how the classification of the animal is actually for the classification of the organisms are actually been done. So, with this I would like to conclude my lecture here. Thank you.