Topic Name

Study the Nervous System of frog

Presented by

Mr. P. P. Pathare

Head,

Department of Zoology,

SHRI MULIKADEVI MAHAVIDYALAYA, NIGHOJ

Tal- Parner, Dist-Ahmednagar

Introduction

The nervous system includes:

(i) A central nervous system comprising the brain and spinal cord,
(ii) A peripheral nervous system consisting of cranial and spinal nerves arising from the brain and spinal cord respectively and
(iii) An autonomic nervous system made of two ganglionated sympathetic nerves.

Central Nervous System:

A. Brain:

The brain of frog is elongated, bilaterally symmetrical, white coloured structure safely situated in the cranial cavity of the skull. It is surrounded by a thin, pigmented and vascular connective tissue membrane, the piamater, which is closely applied with the brain.

The brain of frog is divisible into three main parts:

(i) Forebrain or Prosencephalon;
(ii) Midbrain or Mesencephalon;
(iii) Hindbrain or Rhombencephalon.

(i) Forebrain:

It is the largest part of the brain consisting of a pair of anteriorly directed olfactory lobes, a pair of cerebral hemispheres, and a diencephalon.

(a) Olfactory Lobes:

The olfactory lobes are anterior small, spherical structures which are fused together in the median plane. Each lobe gives off an olfactory nerve and possesses a small cavity rhinocoel or olfactory autricle.

(b) Cerebral Hemispheres:

The two cerebral hemispheres are long, oval structures separated from olfactory lobes by a slight constriction. They are wider behind and narrower in front. They are separated from each other by a deep median longitudinal fissure. Each cerebral hemisphere has a large lateral ventricle or paracoel which is continuous anteriorly with the rhinocoel. Posteriorly the lateral ventricles communicate with each other and with the ventricle of diencephalon called diocoel by an opening, the interventricular foramen or foramen of Monro. The nerve cell bodies form masses around the lateral ventricles and lie in layers. Fibres of the olfactory, tactile and optic impulse reach the cerebral hemisphere which may act as correlating centres but the hemispheres are largely olfactory in function.

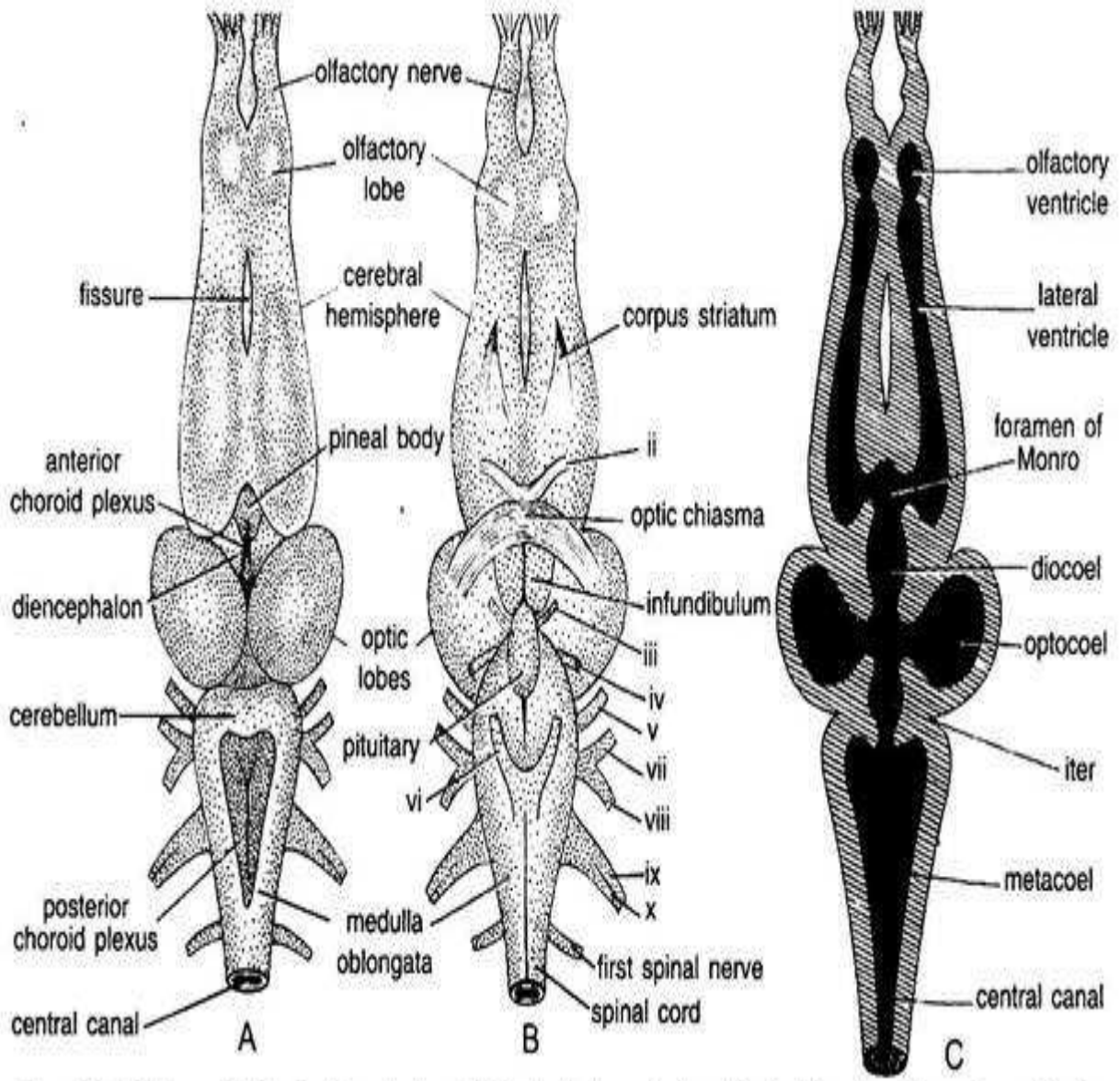


Fig. 18.49. Frog. Brain. A–Dorsal view; B–Ventral view; C–Longitudinal horizontal section of brain showing ventricles.

(c) Diencephalon or thalamencephalon is a short unpaired structure of the forebrain situated behind the cerebral hemispheres. Its lateral walls are thick called optic thalami (singular thalamus) and its thick floor is called the hypothalamus. Its roof is thin and lined with a vascular membrane, the anterior choroid plexus.

Behind it arises a hollow, thin-walled stalk, called the pineal stalk which terminates dorsally at the brow spot. The pineal stalk or epiphysis, which originally was continuous with the brow spot, becomes constricted off from it in early larval life. On the ventral side of diencephalon is the optic chiasma or crossing of the optic nerves which go the eyes. Just behind the optic chiasma is a flattened bilobed infundibular lobe or infundibulum extending posteriorly and divided by a median longitudinal groove.

(ii) Midbrain:

It is well developed consisting of two dorso-lateral large rounded optic lobes. The optic lobes are centres for impulses coming from the eyes. Their cavities are called optocoel or optic ventricles communicating with each other and the fourth ventricle behind through a narrow cavity, the iter or aqueduct of Sylvius.

Below the optic lobes are present two thick longitudinal bands of nerve fibres, called the crura cerebri. These connect diencephalon and medulla. These form the floor of midbrain.

Lying transversely between the diencephalon and optic lobes is a band of nerve fibres called posterior commissure.

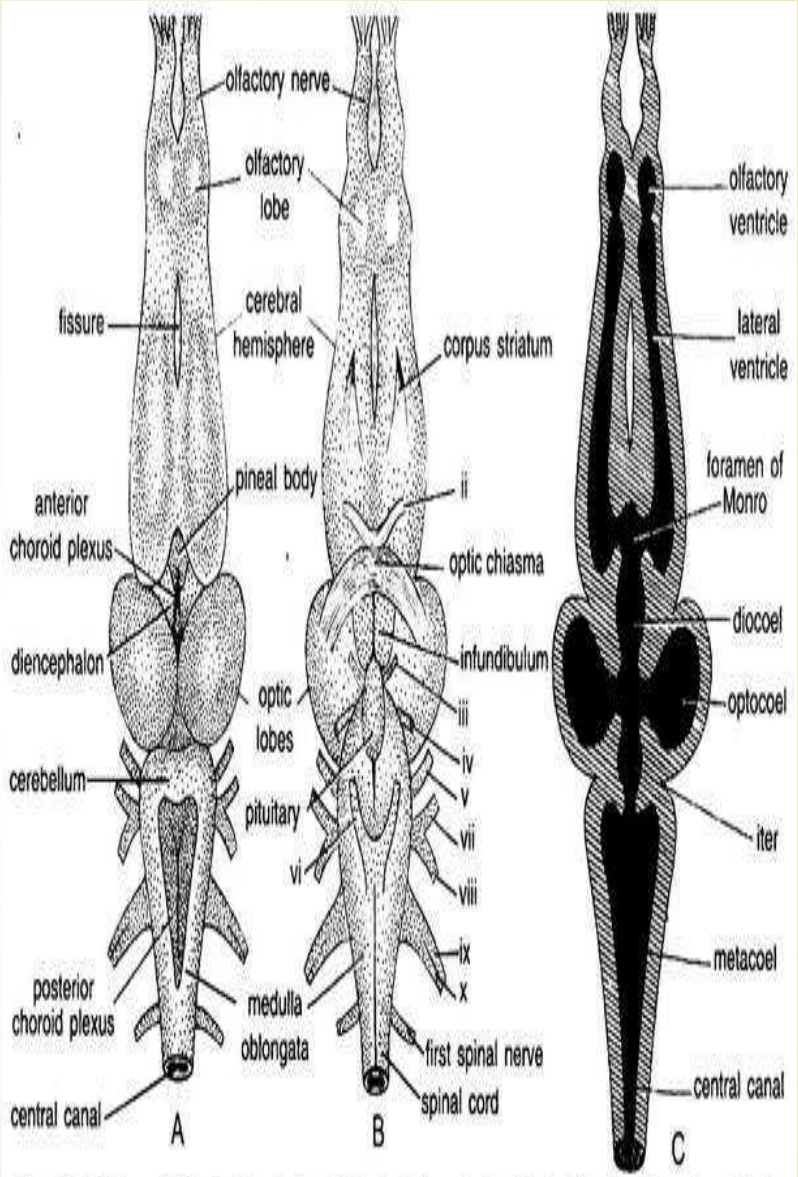


Fig. 18.49. Frog. Brain. A–Dorsal view; B–Ventral view; C–Longitudinal horizontal section of brain showing ventricles.

(iii) Hindbrain:

It consists of the cerebellum and the medulla oblongata:

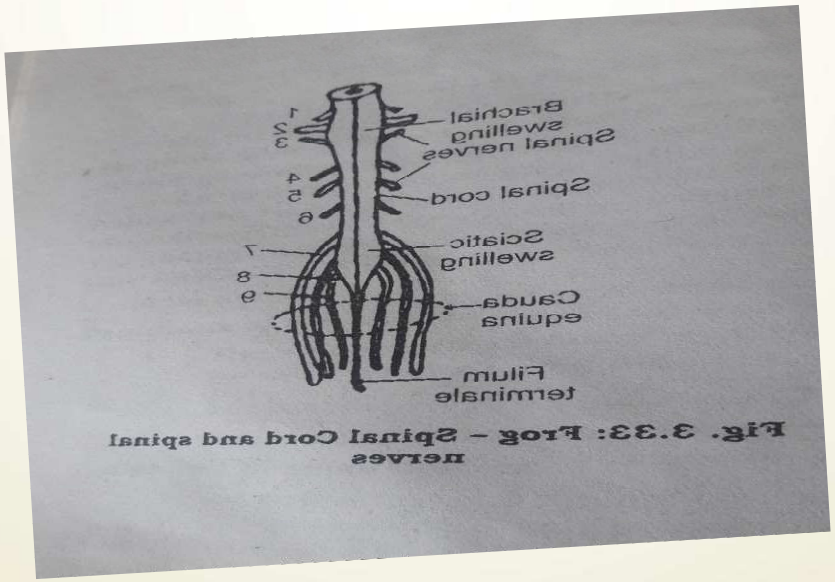
(a) The cerebellum is a rudimentary narrow transverse solid band lying dorsally immediately behind the optic lobes. Its function is probably to regulate the vestibulo-oculomotor system controlling movements of the eyes,

(b) Medulla oblongata is short and somewhat triangular structure which is simply a widening of the spinal cord.

Its cavity is also triangular called fourth ventricle or metacoel which is joined in front to the iter but posteriorly it is continuous with the central cavity of the spinal cord. Its roof is thin, vascular and thrown into folds called the posterior choroid plexus.

B. Spinal Cord:

The medulla oblongata continues behind as spinal cord, lying in the neural canal of the vertebral column. It is short, somewhat flattened dorsoventrally and terminates behind the lumbar swelling in a tapering narrow thread called filum terminale lying in the urostyle. The filum terminale with the nerve roots on either side is sometimes called cauda equina as it looks like a horse tail. It presents two enlargements during its course, one at the level of the forelimbs where nerves for arms arise and one far behind at the level of hindlimbs where nerves for hindlimbs arise.



Functions of Different Parts of the Brain:

Brain is the only centre for the immediate control of all vital activities as it receives impulses from different parts of the body through sensory nerves and issues orders through motor fibres to different parts of the body for appropriate action.

i. Cerebrum:

The pallium of cerebral hemispheres controls the activities of the olfactory, tactile and optic organs, whereas the cerebral hemispheres coordinate the activities of the neuro-muscular mechanism of the body, but these are supposed to be the seat of intelligence and voluntary control in higher animals.

ii. Diencephalon region of the brain controls the metabolism of the fats and carbohydrates and also regulates the genital functions.

iii. Optic lobes and optic thalami are supposed to be concerned with the sensation of sight and the control of the movement of the eye muscles.

iv. Cerebellum controls the mechanism of the automatic movements and also brings about coordination in movements of locomotion. It is in correlation with the medulla oblongata and regulates complex muscular movements of the body.

v. Medulla oblongata is an important nerve centre. It has nerve centres of all reflex functions and, thus, regulates particularly those functions of the body which are not directly under the control of the will like heart beating, respiration, swallowing, taste, hearing, sound production and secretions of various digestive juices.

THANK YOU

Topic Name

4. General topics:

Presented by

Mr. P. P. Pathare

Head,

Department of Zoology,

SHRI MULIKADEVI MAHAVIDYALAYA, NIGHOJ

Tal- Parner, Dist-Ahmednagar

4.1 Migration in fishes;

What is Migration:

In ecology, it is an animal behaviour of mass of movement of animals from one place to another. The purposes for migration varies accordingly with the types of animals.

Migratory behaviour of fish is a regular phenomenon.

Their journey is purposed mainly for feeding and reproduction.

Types fish migration on the basis of needs:

1. **Alimentary or Feeding migration:**

The fish start the migration for search of feeding ground. It occur when food resources get exhausted.

2. **Gametic or spwaning migration:**

it occur during breeding season in search for the suitable spawning ground.

3. **Climatic or seasonal migration**: migration in search for suitable climatic condition.

4. **Osmo-regulatory migration:** migration for water and electrolytes balance from sea to fresh water and vice-versa.

5. **Juvenile migration:** it is larval migration from spawning ground to the feeding habitats of their parent.

Movement of fishes during the migration

1. Drifting movement: It is a passive movement of fish along with water currents
2. Dispersal movement: It is a random locomotory movement of fish from a uniform habitat to diverse direction.
3. Swimming movement: It is an orientated movement of fish either toward or away from the source of stimulus.
4. Denatant and Contranatant movement: It is an active swimming movement. Denatant movement is swimming with the water current while contrantant movement is swimming against water current

Types of fish migration

The migration of some fishes is a regular journey and is truly an innate animal behaviour.

Fish migration are classified into following types:

1. Diadromous migration:

it is the migration of fish between sea and fresh water. As we know, most of the fishes are restricted to either fresh water or sea water. Changes in habitat may causes osmotic imbalance in those fishes. However some fishes regularly migrate between sea and fresh water and have perfect osmotic balance, they are the true migratory fish.

This migration is of two types-

i. Anadromous migration:

it is the migration of marine fishes from sea to fresh water for spawning. Fishes spend most of their life living and feeding in sea. They only migrate during breeding season to the river for spawning ground.

Eg. Salmon, Hisla, Lamprey etc.

Salmon migrate for breeding during winter from sea to river. While migrating, some physiological changes occurs:

Salmon migrate for breeding during winter from sea to river. While migrating, some physiological changes occurs:
– stops feeding during journey
– changes colour from silver to dull reddish brown
– gonads mature
They select suitable spawning ground and make a saucer-like nest in which female lays eggs and male releases smelt over them. Juvenile larva hatched out from the egg known as Alevins. Alveins then transform into parr and metamorphosed into adult when return to the sea.

ii. Catadronous migration:

It is the migration of fresh water fishes from river to sea during breeding season for spawning. Eg. Eel (Anguilla spp)
Both European eel (Anguilla anguilla or Anguilla vulgaris) and the American eel (Anguilla rostrata) migrate from the continental rivers to Sargasso Sea off Bermuda in south Atlantic for spawning, crossing Atlantic Ocean.
Before and during migration some physiological changes occur in their bodies:

7. Peristaltic movement propels the food particles into the digestive tract and the pyloric valve is involved in preventing the movement of food backward from the stomach.

8. The food which is partially digested in stomach then proceeds in to the small intestine, where most part of the digestion occurs.

9. Stomach is divisible into duodenum and ileum.

Small intestine (Duodenum)

1. It is situated in the loops supported by mesentery. It is u shaped about 3-5 cm long.
2. Main function of S. I. is Pancreatic juice is secreted from the pancreas and bile through the gallbladder from the liver to the small intestine, which helps in completion of digestion.
3. Absorption of the digested nutrients in digestive system of a frog occurs in small intestine.

– deposit large amount of fat in their bodies which serves as reserve food during the journey

– Colour changes from yellow to metallic silvery grey.

– Digestive tract shrinks and stops feeding

– Eyes get enlarged and vision sharpens. Other sensory organs also become sensitive.

– Skin serves respiratory organ.

– Gonads get matured and enlarged.

The lay eggs in suitable spawning ground and are fertilized by males. After spawning they die. The larva hatch out and develop into young ell and finally return to river.

2. Potamodromous migration:

it is fresh water migration of fresh from one habitat to another for feeding or spawning.
Eg. Carps, catfish
3. Oceanodromous migration:

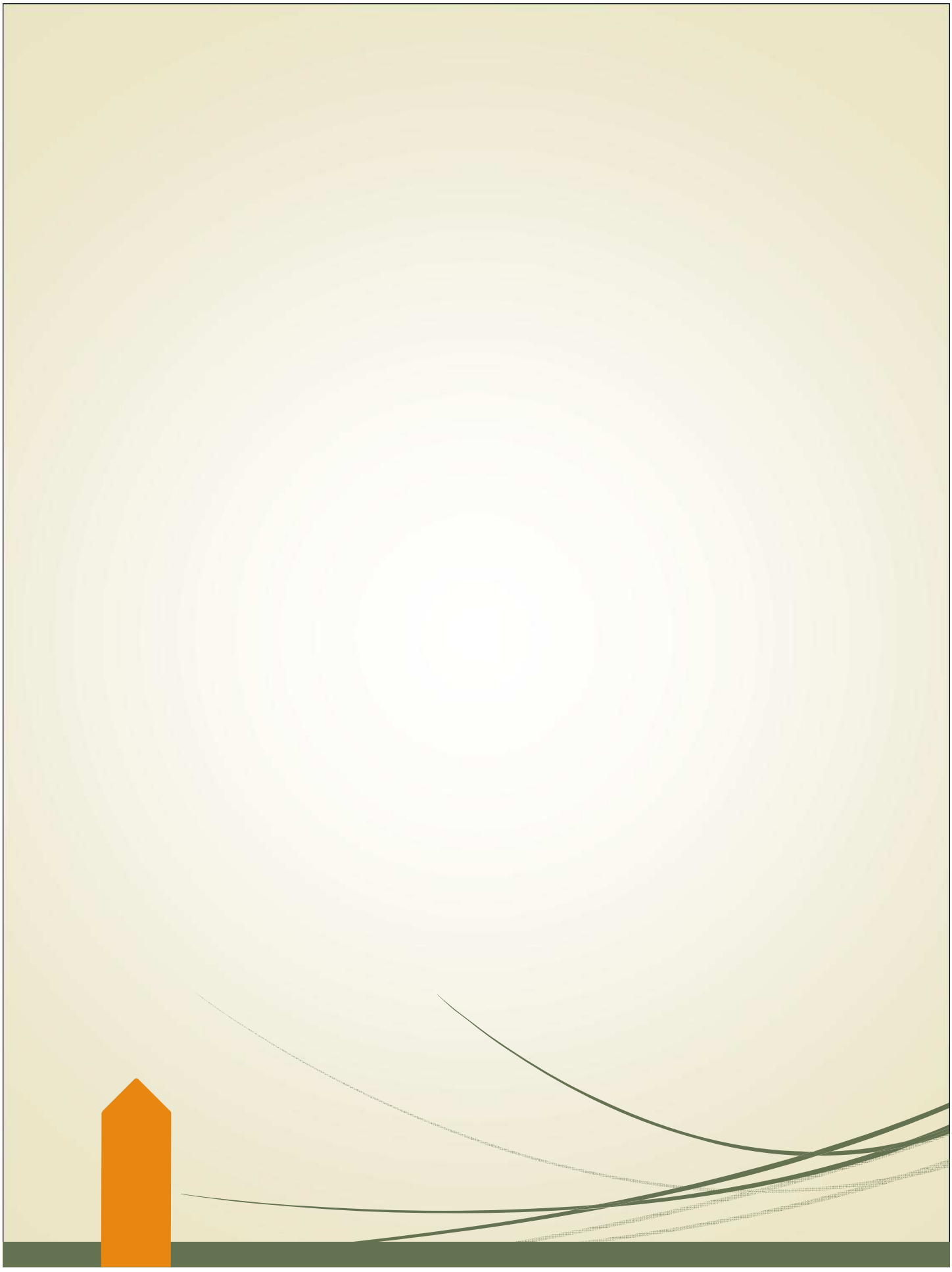
It is the migration of fish within sea in search of suitable feeding and spawning ground.
eg. Clupea, Thummus, Tuna

Pancreas

1. The *pancreas* plays a role in digestion as well. It is a small strip of cream-colored tissue near and parallel to the stomach.
2. Pancreatic secretions are passed into the small intestine through the common bile duct.
3. These juices include many enzymes like trypsin, lipase, amylase, chymotrypsin, etc.

Intestinal glands

This help the digestion of food present in small intestine.



THANK YOU

Topic Name

Study the Circulatory System of frog

Presented by

Mr. P. P. Pathare

Head,

Department of Zoology,

SHRI MULIKADEVI MAHAVIDYALAYA, NIGHOJ

Tal- Parner, Dist-Ahmednagar

Introduction:

1. Circulatory or vascular system is the transport system by which materials such as food, oxygen and wastes are carried from one part of the body to other parts. The conveying medium of C. System is a liquid called blood.
2. This is forced by a central pumping organ, the heart, through blood vessels.
3. The large blood vessels carrying blood away from the heart are the arteries.
4. These break up into smaller bran-ches as they pass farther away from the heart.
5. The smallest branches penetrate into the tissues of the body and break up into very fine, thin-walled channels called capillaries. The capillaries unite with one another to form a close network surrounding the tissue cells. 6) The blood is collected from the other end of the network by another kind of vessels called veins. A vein receives other veins as tributaries, and thus increasing in size the veins bring the blood back to the heart.

The circulatory system is made up of two separate systems:

1. The blood vascular system and
2. The lymphatic system.

1. Blood-Vascular System:

The blood-vascular system has three main components:

(a) The blood,
(b) The heart, and
(c) The blood vessels, i.e. arteries and vein

(a) The blood

1. The blood is a reddish liquid flowing through the blood vessels.
2. It consists of a coloured ground substance called blood plasma and solid cells called blood corpuscles.
3. The corpuscles are suspended in the plasma.
4. The blood plasma is mostly watery.
5. Many substances are found in solution in the blood plasma.
6. These include mineral substances, food, waste products, hormones, gases, etc. It is the chief transporting medium.

The corpuscles are of three types:

(a) Red blood cells or erythrocytes
(b) White blood cells or leucocytes
(c) Blood platelets or thrombocytes.

1. **The erythrocytes R.B.C**
2. The erythrocytes are oval, biconvex, nucleated cells about 15 to 20 micro in size (one micron = 1/1000 mm.)
3. They carry the coloring matter of the blood, an iron-containing protein called hemoglobin.
4. The hemoglobin has a remarkable affinity for oxygen and is, therefore, useful in the transport of gas during respiration.
5. There are about 4 to 5 lakhs of erythrocytes in a cubic millimetre of blood which serve for transporting oxygen.

2. The leucocytes W.B.C

1. The leucocytes are less numerous than the erythrocytes, numbering about 4 to 5 thousands in a cu. mm. of blood.
2. They are small, colour-less nucleated cells capable of changing their shape like an amoeba.
3. They may creep out through the thin-walled capillaries to engulf and remove foreign bodies from the tissues. Thus the leucocytes are the scavengers (is remove her) of the body. Leucocytes, are scavengers, soldiers and porters of the body.
4. They destroy bacteria and protect the frog against invading microbes. Moreover, they can ingest fat globules from the small intestine and carry them into the circulating blood.

3. The thrombocytes (Blood Platelets)

1. The thrombocytes are small spindle-shaped nucleated cells which are often designated as the blood platelets.
2. They break down when the blood is shed, and release an enzyme which helps in the clotting or coagulation of blood.
3. Further bleeding is prevented when a blood vessels is injured.
4. In the adult frog, the blood corpuscles are mainly manufactured by the bone-marrow.

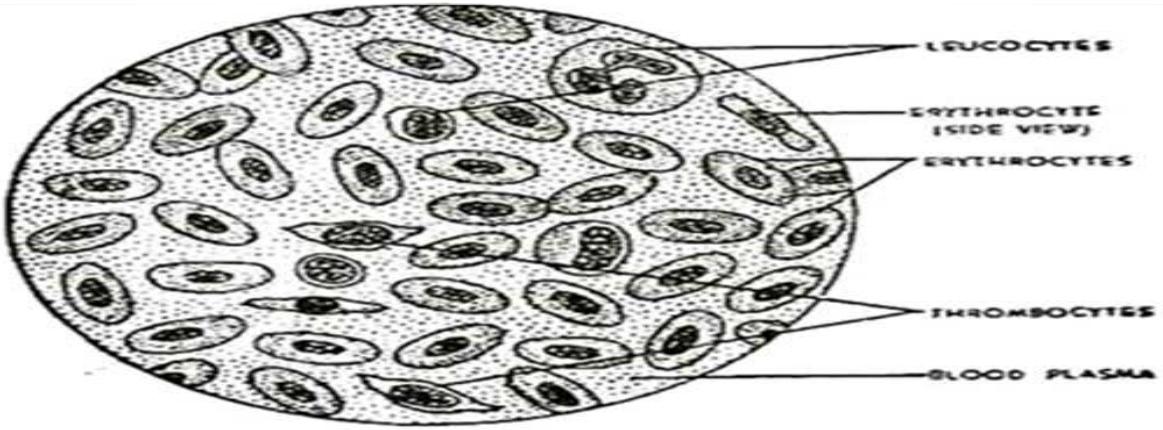


Fig. 26. A drop of toad's blood (highly magnified).

(b) Study of Frog Heart:

1. The heart is the central pumping station for the circulation of blood. It is a hollow, pear-shaped, muscular organ which is situated in the anterior part of the body cavity, in front of the liver.
2. It is completely enclosed in a transparent bag of membrane, called pericardium.
3. The broad base of the heart is directed forwards, whereas the narrow apex points towards the posterior end and lies between the two main lobes of the liver.
4. The heart is mainly composed of three chambers: a thick-walled, conical ventricle and two thin-walled auricles, right and left.
5. There are two other smaller chambers: a thin-walled triangular sinus venous on the dorsal side, opening into the right auricle, and a thick-walled tubular conus arteriosus ventrally, connected to the base of the ventricle.

1. **The sinus venosus**
2. The sinus venosus is a thin-walled sac-like chamber which is situated on the dorsal side of the heart. It is more or less triangular in shape with the three caval veins opening into its three corners. These veins carry deoxygenated blood into the sinus.

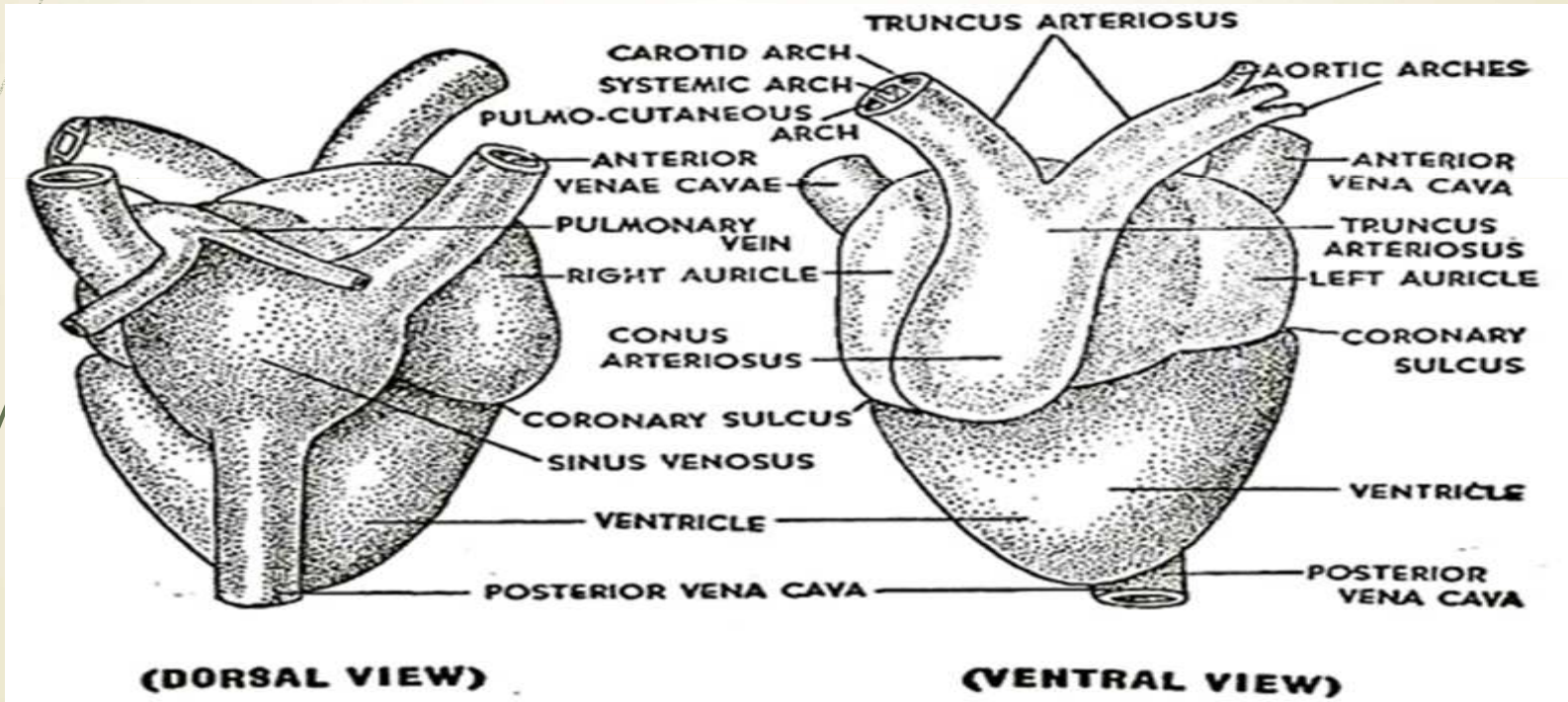


Fig. 27. Heart of toad.

2. **The two auricles**

1. The two auricles, right and left, form the base of the heart. They are separated from the ventricle by a narrow groove. The right auricle is larger than the left; it receives deoxygenated blood from the sinus venous through the sin auricular aperture. The left auricle receives oxygenated blood from the lungs through a small opening, the aperture of the common pulmonary vein. The two auricles communicate with the ventricle by a common opening, the auriculo-ventricular aperture, which is guarded by the auriculo-rventricular valves.

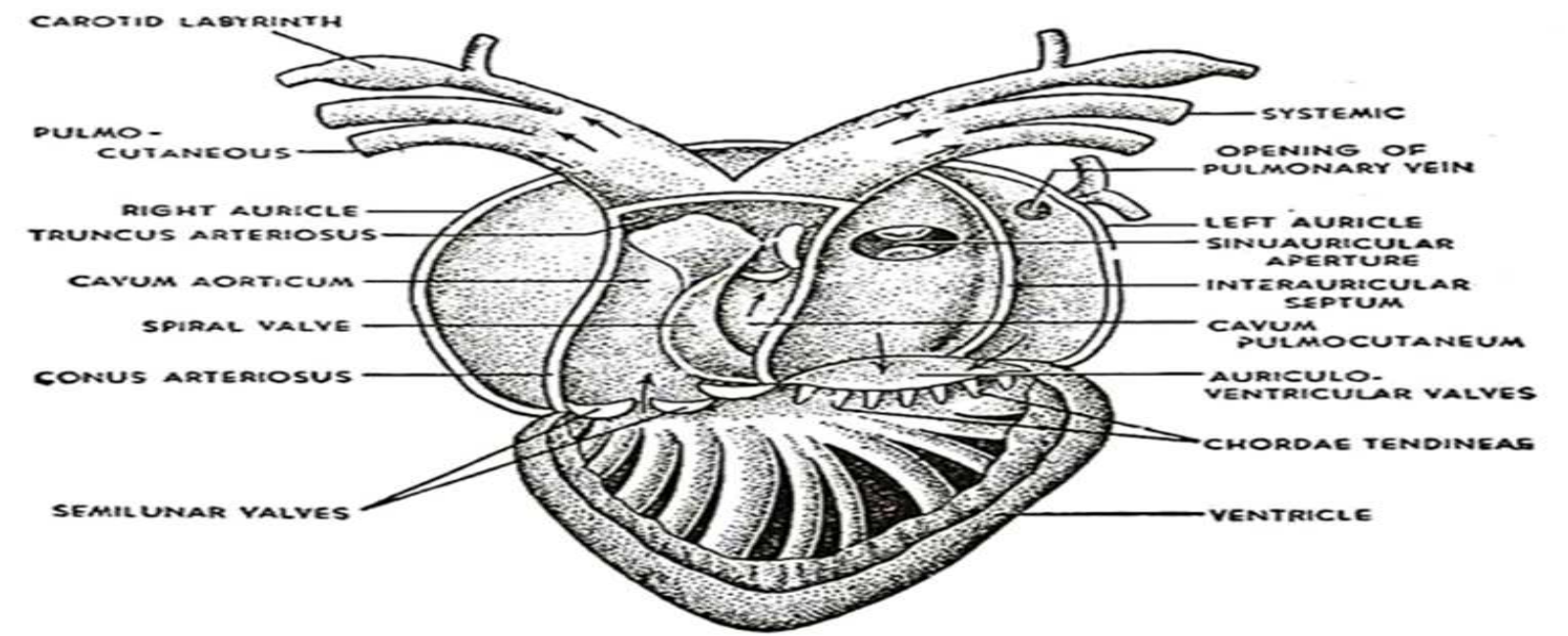


Fig. 28. Internal structure of the heart (Arrows indicate direction of blood-flow).

3. The ventricle

1. The ventricle is the thick-walled conical chamber which is situated behind the auricles.
2. Its posterior bluntly pointed portion forms the apex of the heart.
3. The ventricular cavity is greatly reduced by a number of interlacing muscle fibres which arise from its own wall.

4. The conus arteriosus

1. The conus arteriosus is the stout tube which arises ventrally from the base of the ventricle and passes obliquely towards the left.
2. It is continued forwards as the arteriosus which is the base of the main artery for carrying the blood away.

The deoxygenated blood is pumped through the cavum pulmocutaneum and the oxygenated kind through the cavum aorticum.
The two kinds of blood enter different arterial arches and are carried to different places.

1. Arterial Circulatory System:

The arteries and their branches form the arterial system. The truncus arteriosus is the main artery originating from the conus. It at once divides into right and left branches.

Each of these trunks splits into three arterial arches:

(i) The carotid anteriorly,

(ii) The systemic in the middle, and

(iii) The pulmocutaneous posteriorly.

Thus, there are three pairs of arterial arches for supplying blood to different parts of the body. The carotids supply the head region, the systemic supply the trunk and limbs, and the two pulmocutaneous supply the lungs and skin.

(i) Carotid Arches and their Branches:

1. The carotid arch, on each side, proceeds outward and forward. It soon bifurcates into an inner branch called external carotid artery and an outer branch, the internal carotid artery.
2. Inside the labyrinth, the carotid arch breaks up into numerous minute vessels which reunite at the other end.
3. The external carotid artery supplies blood to the floor of the buccal cavity, tongue and outer side of the head.
4. The internal carotid artery turns backward and comes very close to the systemic arch of the same side, to which it is tied by a small amount of fibrous tissue, the carotid ligament. Finally, it turns forward to enter the skull through a foramen and is distributed to the brain and its coverings.

(ii) Systemic Arches and their Branches:

1. The systemic arch sweeps outward. It then curves round the oesophagus to reach the dorsal side, where it joins with its fellow of the opposite side to form a median artery called dorsal aorta.
2. Thus, the two systemics form an arterial ring round the oesophagus.

Each systemic gives out the following branches:

(i) A short laryngeal artery to supply the voice-box;

(ii) An occipito-vertebral artery which breaks up into oraches for supplying the pharynx, the back of the head, the vertebral column and the spinal cord;

(iii) A stout sub¬clavian artery which proceeds outward to supply the shoulder and forelimb of the same side;

(iv) the left systemic gives off an additional twig, the oesophageal artery, to the oesophagus. The right systemic has no oesophageal branch.

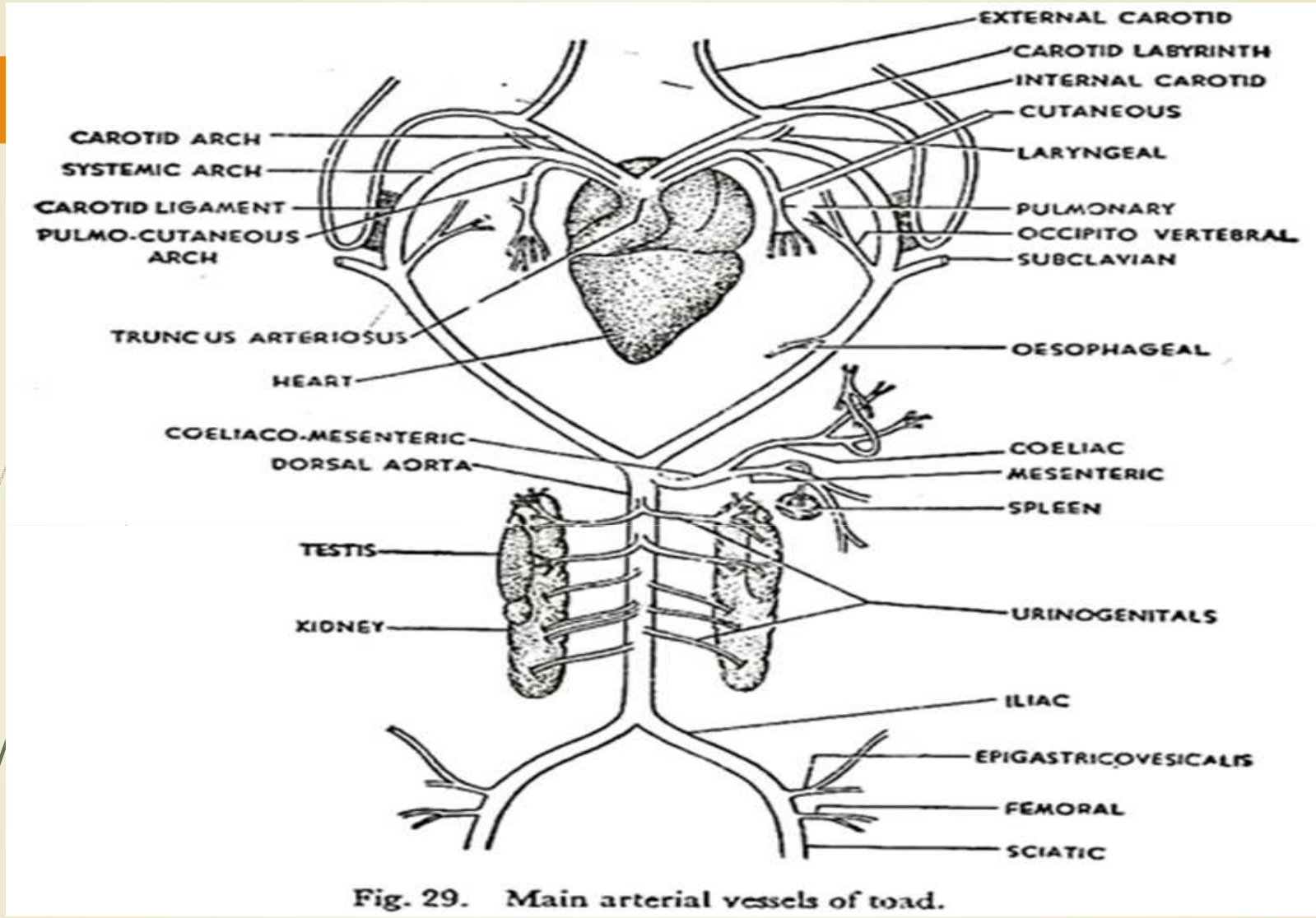


Fig. 29. Main arterial vessels of toad.

(iii) Pulmocutaneous Arches and their Branches:

1. Two pulmocutaneous arches carry deoxygenated blood to the lungs and skin for aeration.
2. They are the hindermost and the shortest of the arterial arches.
3. Each arch passes outward and then backward.
4. A very slender branch is given out to supply the skin.
5. This is the cutaneous artery. The main trunk then runs into and supplies the lung of the same side as the pulmonary artery.

2. Venous Circulatory System:

1. The veins and their tributaries constitute the venous system.
2. The arteries break up into smaller and smaller branches, and these branches merge into a network of thin-walled, hair-like vessels, called capillaries.
3. The capillaries merge into small veins, which join to form larger veins.
4. **The venous system of toad may be subdivided into three separate groups**:

(i) The pulmonary,
(ii) The systemic, and
(iii) The portal.

(i) Pulmonary Veins:

1. Two pulmonary veins carry deoxygenated blood from right and left lungs.
2. The right and left pulmonary veins unite to form a common pulmonary vein, which opens into the left auricle on the dorsal side.

(ii) Systemic Veins:

1. These are represented by the three large veins or venae cavae draining into the corners of the triangular sinus venosus.
2. They carry deoxygenated blood from all parts of the body except lungs.
3. Two of the venae cavae are situated anteriorly; these are the right and left precavals.
4. A single postcaval is found posteriorly, opening into the apex of the sinus venosus.

Each precaval vein is formed by the union of three tributaries:

(a) External jugular,

(b) Innominate, and

(c) Subclavian.

(a) **The external jugular** vein is formed by the union of two tributaries—a lingual vein bringing blood from the tongue, and a mandibular vein from the jaws and snout.

(b) **The innominate vein** is also formed by the union of two tributaries—an internal jugular from the interior of the skull, and a subscapular from the back of the shoulder.

(c) **The subclavian** vein is similarly formed by the union of two veins—a brachial from the forelimb and a muscoccutaneous from the skin and muscles. In toad, the skin is an accessory respiratory organ.

(iii) Portal Veins:

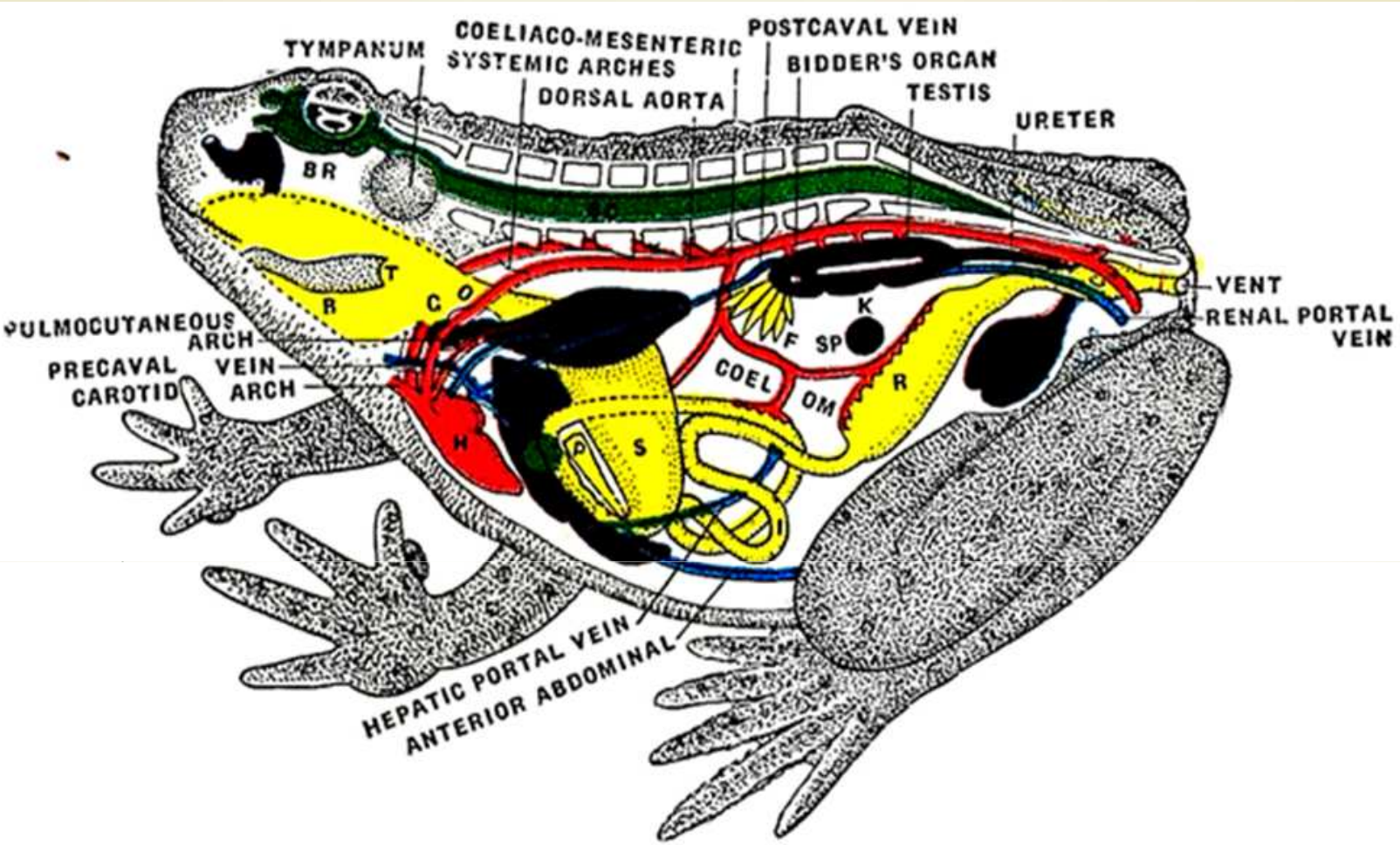
A portal vein begins in capillaries and ends in capillaries before the blood which travels through it is returned to the heart.

There are two portal systems in the toad:

(A) Hepatic portal system, and

(B) Renal portal system.

1. In the hepatic portal system, venous blood collected from capillaries at the posterior part and from the gut filters through capillaries in the liver on its way back to the heart.
2. In the renal portal system, venous blood collected from capillaries in the posterior part of the body passes through capillaries in the kidneys on its way back to the heart.



Organ system of a male toad.

B=buccal cavity; BR=brain; C=cloaca; F=fat body; G=glottis; H=heart; I=small intestine; K=kidney; L=liver; LU=lung; N=nasal chamber; O=oesophagus; P=pancreas; R=rectum; S=stomach; SC=spinal cord; SP=spleen; T=tongue; U=urinary bladder.

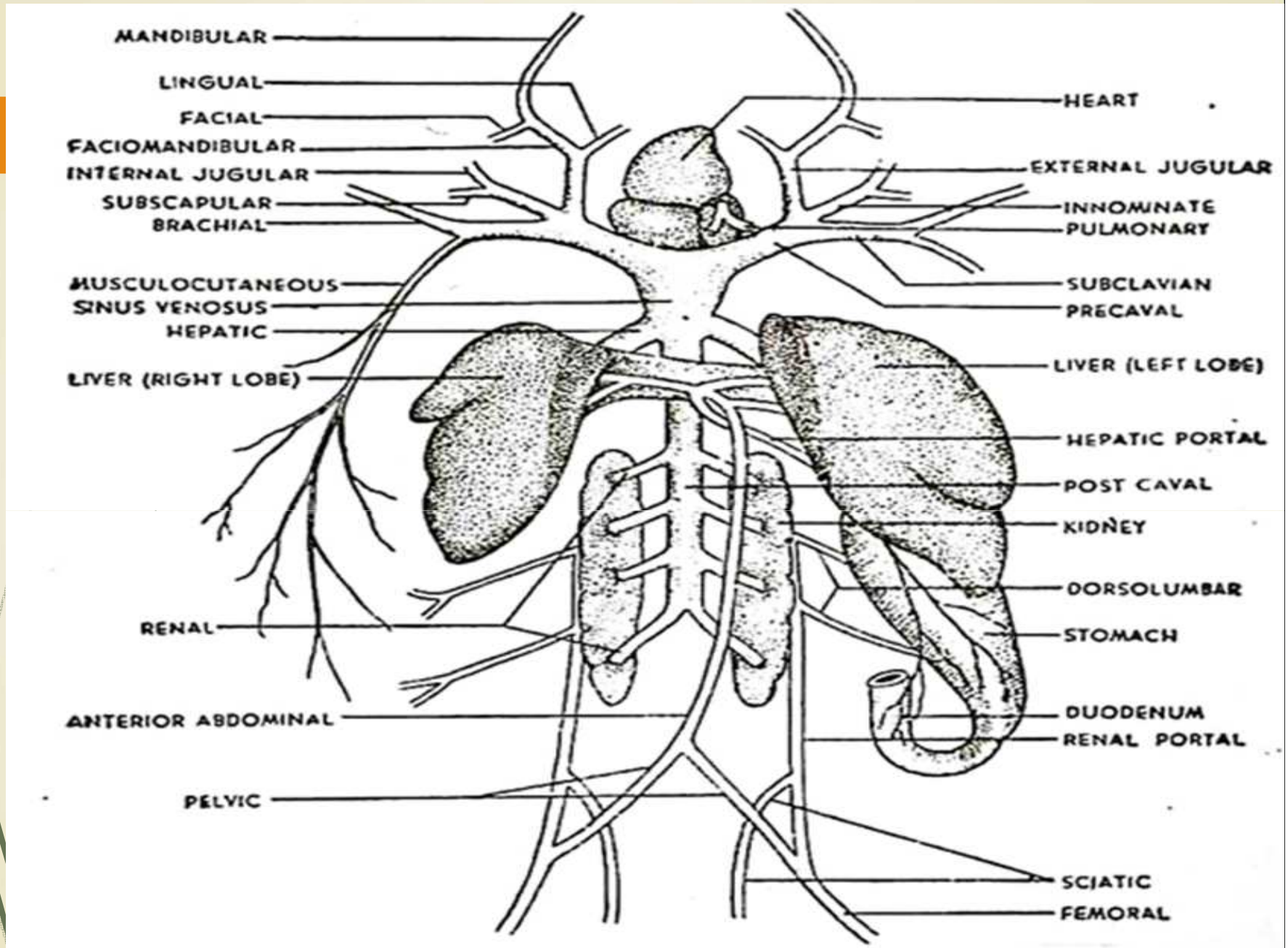


Fig. 30. Venous system of toad.

THANK YOU

Topic Name

Introduction to Sericulture and Study Of different types of Silk moths

Presented

Mr. P. P. Pathare

Head,

Department of Zoology,

SHRI MULIKADEVI MAHAVIDYALAYA, NIGHOJ

Tal- Parner, Dist-Ahmednagar

History of Sericulture-

1. The origin and history of sericulture is very old and is a miracle of silk.
2. Legendary Professor- Testify give a clue that a chiness express xi-Ling- Shi was at the root of the discovery of natural silk in the year 2640 B.C. Since sericulture is a hidden in China for thousands of years. Because death penalty was the lawful step meted to the exporters of the silk in china during that time.
3. The art of sericulture consequently was smuggled out to Europe by two Europian monks carrying the silkworm egg and mulberry seeds in their walking from the west, came through the Silk Road to the south-east Asian country.

1. Longest commercial route of the ancient world Marco polo also described clearly in his book name “I 1 Million” about the silk trade in China and its export to Europe via the Silk Road sericulture became wide spread over the countries.

History of Indian Sericulture Industry

1. The silk Commerce is proliferates in India during the medieval period (13th to 16th centuries.) the Indian silk was very popular in Mughal Empire and then it's get golden days in Marathas Empire.

2. Under the Moughals, silks from Kashmir and Bengal were exported mainly by the Moors, who during the 14th and 15th centuries transmitted it to Europe in India during the British Government; the foundation for the modern silk industry was established.

3. The East India Company saw the immense trade potential of Indian Silk, and silk products and started trade in it in 1670. From them, it has increased continuously throughout the British region.

1. Liberal tax-exemption schemes encouraged farmers to plant mulberry. Funds have allocated for special research schemes. Separate sericulture departments have created in Karnataka (1911) and Madrass (1919).

2. The British government had pinpointed the qualitative defect of Indian silk and tried to boost it by bringing experts to update the rearing and reeling techniques. In 1771, the ‘China worm’ was introduced with the idea of improving cocoon quality.

3. That time British government was government encourages the addition to land under sericulture. The government also promoted a higher wage structure for processing raw silk.

Introduction to Sericulture:

1. Silk is a way of life and the ceremony is not fulfilled without silk in the India.
2. It is an indivisible part of Indian culture and traditions.
3. Silk is Nature’s gift to mankind and a commercial fiber of animal origin other than wool.
4. The rearing of silkworm larva for production of natural raw silk is known as sericulture.
5. Sericulture is an agro-based cottage industry; sericulture is fits very well for rural area of India.

1. Sericulture is a labour demanding agro-based industry it is homogeneous to India in tropical area cover largest part of country where unemployment is a serious problem.
2. So in India, sericulture is one of the highest ranking agro and forest based cottage industry. Sericulture provides gainful employment to more than seven million Indian people and earning a gainful foreign exchange up to Rs. 400 to 500 corers /annum.
3. Today India is the second largest raw silk producer country in world and also has the distinction of being the world's largest consumer of silk.
4. In developing countries such as India, china, etc. the agriculture and agro-based industries play an essential role in the improvement of rural economy of country.

Study of different types of silk moths

1. India is a house of a vast variety of silk group which also consist of an incredible diversity of silk moths**.**
2. India has a unique country producing all 5 type of silk.
3. India has capacity to achieve the unique a producer of all the five commercially traded varieties of natural silks such as Mulberry, Tasar, Oak Tasar, Eri and Muga.

1. Mulberry Silk- *Bombyx mori* L.

1. Mulberry silkworm is completely domesticated insect and is never found in wild, which has been exploited for over than 4000 years.
2. The bulk of the commercial silk produced in the world is mulberry silk that comes from the domesticated *Bombyx mori* L. which larva is voracious feeder they feed the leaves of the mulberry (*Morus sp.*) plant.
3. *Bombyx mori* is produce pure white and yellow colored cocoon.
4. The cocoon is well size, weights and continuous thread of silk.


alamy stock photo
X60CTG
www.alamy.com

2. Tasar silk

1. Tasar silk is belong to genus *Antheraea* and they are all wild in nature they produces cocoon is copperish in colour, coarse in nature and is mainly used for furnishing and interiors.
2. Secreted by the Tropical Tasar silkworm, *Antheraea mylitta* which found on Asan and Arjun Plant.
3. Tassar silk occupies the third position. China is largest producer of tasar silk.
4. Rearing is done on naturally growing trees in the forests and is the main stay for many tribal communities in India it's distributed in states like Jharkhand, Chattisgarh, Orissa, Maharashtra, West Bengal and Andhra Pradesh etc.

3. Muga silk worm

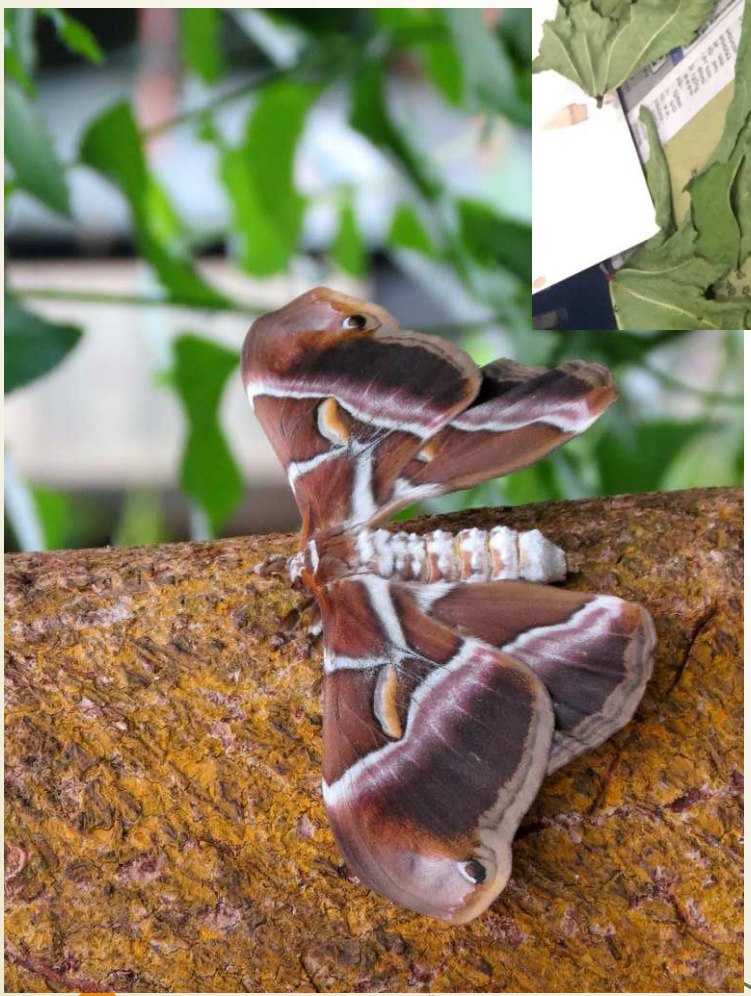
1. Muga silk is golden-yellow in colored; the Muga silk thread is very attractive and very strong in nature.
2. Muga silk is secreted by *Antheraea assama* that feeds on aromatic leaves of naturally growing Som and Sualu plants.
3. Muga silk is Exclusive produce of India, primarily the state of Assam where it is the preferred attire during festivities.
4. This silk is having good market value because silk is use for making of marriage and festive occasions the ladies garments such as Mekhala.

4. Eri silk worm

1. Eri silk is a silk spun from open-ended cocoons and secreted by the domesticated silkworm, *Samia Cynthia ricini* that feeds mainly on plant of castor leaves, they produces a white and brick red colored silk.
2. But the problem of Eri silk is the thread is non-continuous not a uniform so cocoon is cannot properly reeled.

5. Oak Tasar worm

1. Oak silk is wild in nature they produces cocoon is copperish in colour, coarse in nature and is mainly used for furnishing and interiors.



THANK YOU

Topic Name

Study of Life cycle of Mulberry Silkworm (Bombyx mori)

Presented

Mr. Popat P. Pathare

Head,

Department of Zoology,

SHRI MULIKADEVI MAHAVIDYALAYA, NIGHOJ

Tal- Parner, Dist-Ahmednagar

External Features of Mulberry Silkworm:

1.The adult moth is about 25.00 mm long with a wing-span of 40.00 to 50.00 mm.

2. The female silk moths are larger than the males.

3. The moth is quite robust and creamy-white in colour.

4. The body is distinctly divisible into three regions, namely head, thorax and abdomen.

5.The head bears a pair of compound eyes, a pair of branched or feathery antennae and the mouth parts.

6. The thorax bears three pairs of legs and two pairs of wings.

7. The cream-coloured wings are about 25.00 mm long and are marked by several faint or brown lines.

8.The entire body is covered by minute scales.

Life Cycle of Mulberry Silkworm:

1. The silk moth is dioecious, i.e., the sexes are separate.

2.Fertilisation is internal, preceded by copulation. The development includes a complicated metamorphosis.

Stage 1 - EGG: Incubation 7-10 days

1. After fertilization, each female moth lays about 300 to 400 eggs. These eggs are placed in clusters on the leaves of mulberry tree.
2. The female covers the eggs by a gelatinous secretion which glues them to the surface of the leaves.
3. The eggs are small, oval and usually slightly yellowish in colour. The egg contains a good amount of yolk and is covered by a smooth hard chitinous shell.
4. The egg of *Bombyx mori* is a very small and hard structure about the size of a pin head and resembling a poppy seed.

Eggs of Silkworm

1. The egg shell provides a protective covering for embryonic development.
2. When the eggs are first laid, they are light yellow in colour and later the eggs become darken to a blue-grey within a few days.
3. After laying the eggs the female moth does not take any food and dies within 4-5 days.
4. In the univoltine (a single brood per year) they may take months because overwintering takes place in this stage but the multivoltine broods come out after 10-12 days.
5. From the egg hatches out a larva called the caterpillar.

Stage 2 - Larva: 45 days (5 instars)

1. The larva of silkworm moth is called caterpillar larva. The newly hatched larva is about 4.00 to 6.00 mm in length.
2. It has a rough, wrinkled, hairless and yellowish white or greyish worm-like body. The full grown larva is about 6.00 to 8.00 cm in length.
3. The body of larva is distinguishable into a prominent head, distinctly segmented thorax and an elongated abdomen.
4. The head bears mandibulate mouth and three pairs of ocelli.
5. The larva is the vegetative stage where growth takes place.

Larva of Silkworm

1. The larva of *Bombyx mori*, commonly called a ***silkworm, (caterpillars)***.
2. During growth, the larva moults four times. The period between successive moults is called an ***instar.***
3. The caterpillars have segmented appearance with strong mandibular jaws.
4. Throughout the five instars the larva keeps on consuming the mulberry leaves.

6.The salivary glands (silk glands)are fully grown and silk concentrate gets secreted out of this gland.

Stage 3 - Pupa : 15 days

1.The full-grown larva now stops feeding and hides itself in a corner under the leaves.

2. It now begins to secrete the clear and sticky fluid of its salivary glands through a narrow pore called the spinneret situated on the hypo pharynx.

3. The sticky substance turns into a fine, long and solid thread or filament of silk into the air.

4. The thread becomes wrapped around the body of the caterpillar larva forming a complete covering or pupal case called the cocoon.

5. The cocoon-formation takes about 3-4 days.

6.The cocoon serves a comfortable house for the protection of the caterpillar larva for further development.

7. The pupa lies dormant, but undergoes very important active changes which are referred to as metamorphosis.

8.The larval organs such as abdominal pro-legs, anal horn and mouth parts are lost. The adult organs such as antennae, wings and copulatory apparatus develop.

9.The pupa finally metamorphoses into the imago or adult in about 2-3 weeks time.

Silk Cocoon

1. The secreted silk spins is known as silk cocoon.

2. The silk cocoon serves as protection for the pupa.

3. Cocoons are shades of white, cream or yellow in colour.

4. After a final moult inside the cocoon, the larva develops into the brown, chitin covered structure called the pupa.

5. Metamorphic changes of the pupa result in an emerging adult moth.

Stage 4 –Adult: 5 - 7 days

1. The adult moth emerges out through an opening at the end of the cocoon in about 2 to 3 weeks time, if allowed to live.
2. Immediately before emergence, the pupa secretes an alkaline fluid, that softens one end of the cocoon and after breaking its silk strands, a feeble crumpled adult squeezes its way out.
3. Soon after emergence, the adult silk moths mate, lay eggs and die.

Adult of silkworm

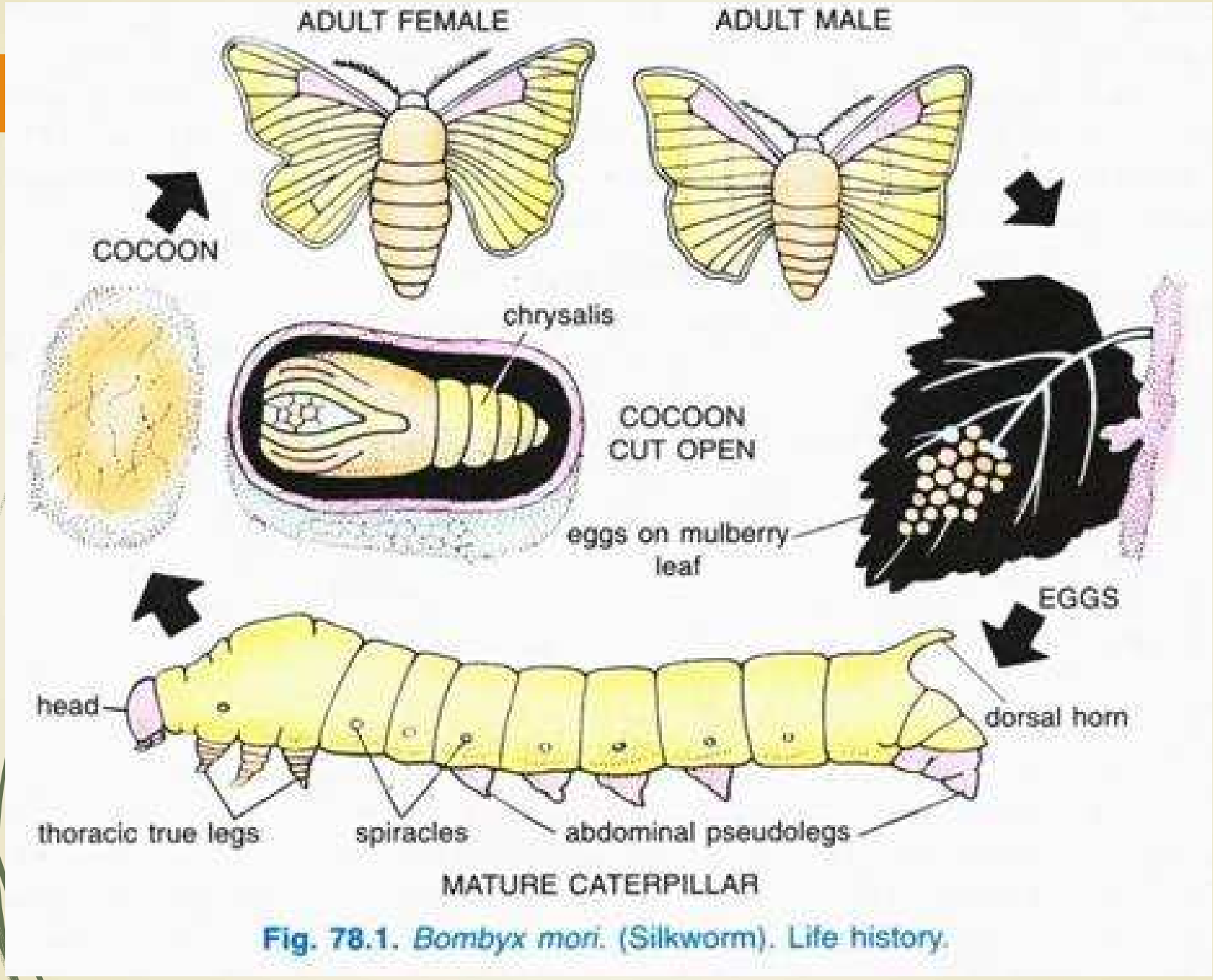
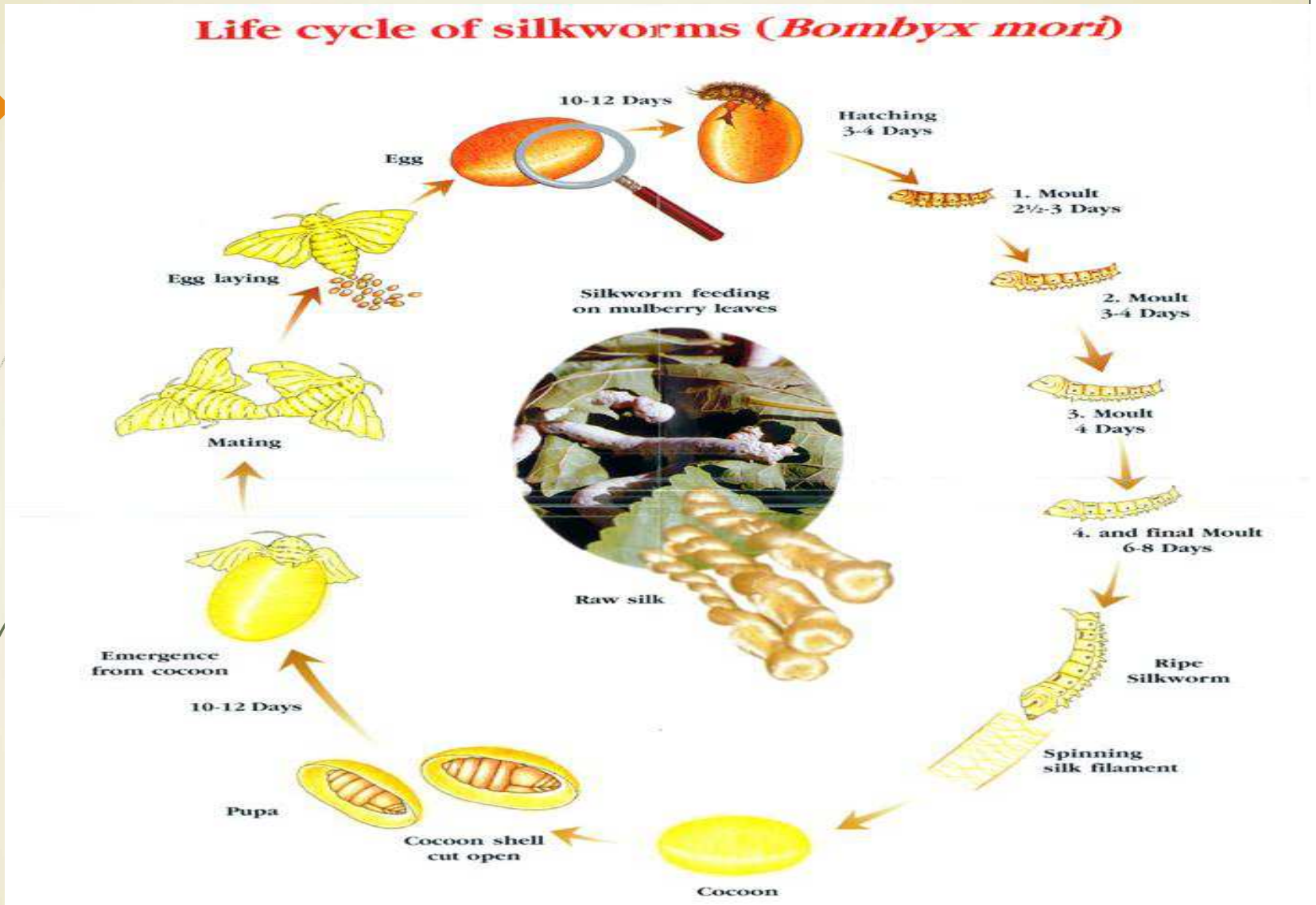
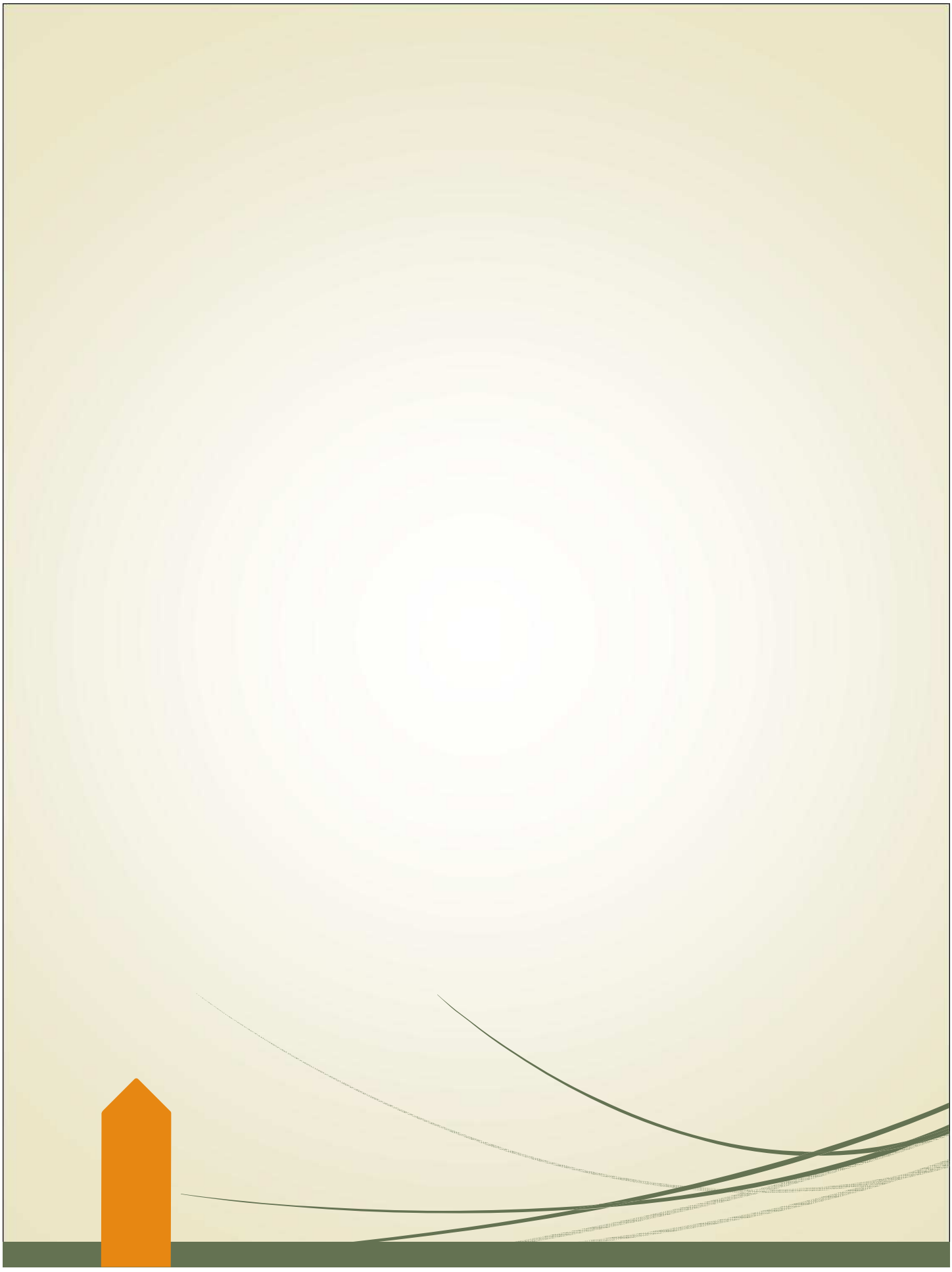


Fig. 78.1. *Bombyx mori.* (Silkworm). Life history.

Life cycle of silkworms (*Bombyx mori*)




THANK YOU



Rearing Equipments

i) **Rearing house:** The rearing house should meet certain specification, as the silk worms are very sensitive to weather conditions like humidity and temperature.

ii) The rearing room should have proper ventilation optimum temperature and proper humidity.

iii) It should be ensured that dampness, stagnation of air, exposure to bright sunlight and strong wind should be avoided.

iv) **Rearing stand:** Rearing stands are made up of wood or bamboo and are portable. These are the frames at which rearing trays are kept.

v) A rearing stand should be 2.5 m high, 1.5 m long and 1.0 m wide and should have 10 shelves with a space of 20 cm between the shelves.

vi) The trays are arranged on the shelves, and each stand can accommodate 10 rearing trays.

iii) **Ant well:** Ant wells are provided to stop ants from crawling on to trays, as ants are serious menace to silk worms.

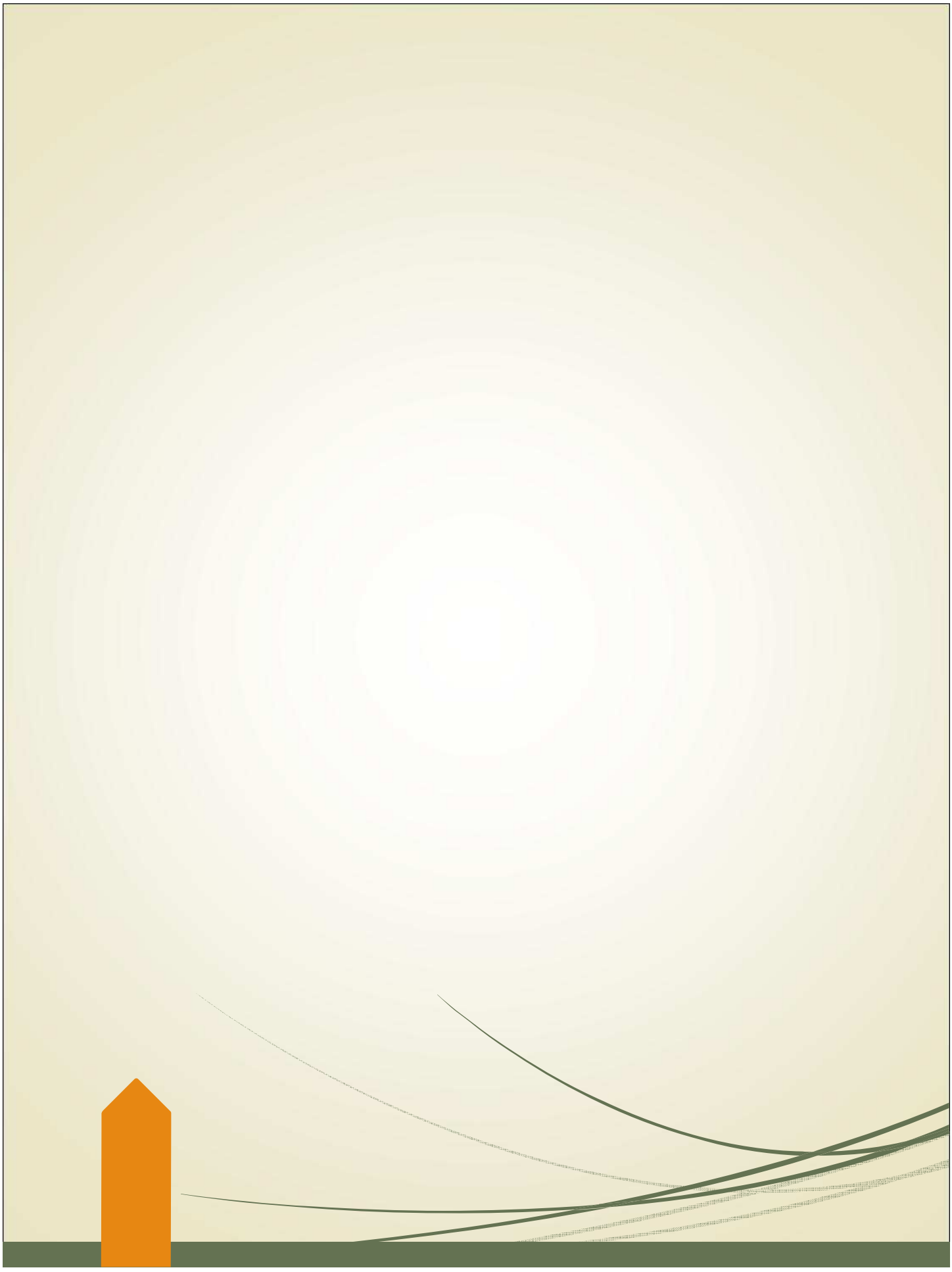
2.They are made of concrete or stone blocks 20 cm square and 7.5 cm high with a deep groove of 2.5 cm running all round the top.

3.The legs of the rearing stands rest on the centre of well filled with water.

iv) **Rearing tray:** These are made of bamboo or wood so that they are light and easy to handle.

2.These are either round or rectangular.

3. on the shelves, and each stand can accommodate 10 rearing trays.



Hibernation (Winter sleep) :

1. During hibernation frog respires through skin (cutaneous respiration) only.
2. Hibernation is a common response to the cold winter of temperate climates. After an animal finds or makes a living space that protects it from winter weather and predators, the animal's metabolism slows dramatically, so it can "sleep away" the winter by utilizing its body's energy stores.
3. When spring weather arrives, the animal "wakes up" and leaves its hibernaculum to get on with the business of feeding and breeding.

(5) Aestivation (Summer sleep) :

During this period frog takes rest and recuperates its energy.

Moulting : The frog sheds off almost once a month its skin during its active life in the form of small casting. This phenomenon is known as moulting.

6) Camouflage or Colouration :

The frog is capable of changing its body colour with the change in its surroundings.

It can not only avoid its enemies but can catch its prey unnoticed.

Breeding :

The male frog jumps on the female frog and holds her tightly with the help of his fore-limbs.

Gripping of the female by the male is also very much aided by the presence of nuptial pads.

This sexual embrace is called the amplexus.

Fertilization is external.

During development, a fish like tailed tadpole is produced, which respires with the help of gills and feeds upon vegetable matter.

King Cobra vs Frog _ Frog Jumping To Escape From Snake Hunting But Fail.mp4

ray tree frog color change.mp

THANK YOU

To study the Pests and Diseases of Silkworm

Presented by

Mr. P. P. Pathare

Head,

Department of Zoology,

SHRI MULIKADEVI MAHAVIDYALAYA, NIGHOJ

Tal- Parner, Dist-Ahmednagar

PESTS OF SILKWORM

Silkworm is domesticated insect are attacked by number of pests out of this the following parasites and predators cause destruction of silkworms.

Dermestid beetles: *Dermestes cadeverinus* larvae and adults feed on cocoons

Other predators include ant, lizards, rats, squirrels, birds etc.

Uzi flies*: Tricholyga bombycis* (diptera) ; young maggots bore into the body of silkworms and live in and eat fatbody for about a week , causing the death

DISEASES OF SILKWORM

- 4 major diseases:
- **Pebrine**: protozoan (*Nocema bombycis*) produce pepper like spots on body, and larvae become wrinkled skinned and sluggish
- **Flacherie**: bacterium(*Bacillus thuringensis sotto*) causes putrification of body and body becomes black-green
- **Muscardine**: fungus (*Beauveria bassiana*) cause white muscardine in humid condition, while *Spicaria parssina* cause green muscardine. *Iscaria farinose* cause yellow muscardine. Hyphae come out from intersegmental membrane all over the body of the larva
- **Glasserie**: *Borrelina virus* cause swelling of segment and skin rupture

TECHNICAL DIVISION

- This involves the extraction and purification of silk fibres from cocoon
- This is the last step for sericulture
- This is the energy consuming and time consuming step.
- In this, only 30-40% cocoon (pupae) of the rearing tray are allowed to complete their life-cycle, while rest are used for obtaining silk fibers
- This is the post-cocoon process
- 1kg of silk = 5500-6000 cocoons

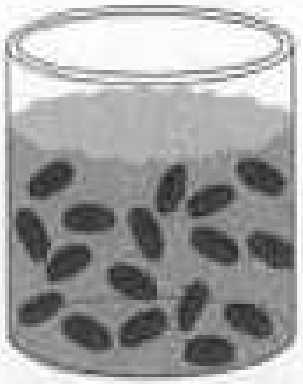
REELING OF SILK

- **Harvesting:** it is removing and selecting operation of cocoons from mountages and sell them to market or to transport to reeling industry
- **Reeling:** removal of silk thread; about 58% of the silk in each cocoon is relable, remainder is used as silk waste and formed into spun silk. Raw silk is boiled, scoured, steamed and purified as follows:
- **Cocoon drying**: steam stifling (process of killing) of cocoons is done to kill pupae so that intact cocoon can be used for reeling. Hot air stifling and sun drying is also very common
- **Cocoon boiling**: it is a common practice for swelling, softening and to some extent dissolution and removal of sericin and gum. Its is purified by acid and fermentation.
- **Brushing:** by brushing the outer surface of cocoons manually or mechanically, the free end of silk filament(brins) is recognized. It is the essential operation for reeling the entire intact thread.
- **Reeling methods:** unwinding of silk thread from cocoon is done by country charkha. The free ends of silk filament of 5-10 cocoons are picked together, fixed on reeling appliance and twisted into a single thick thread. The silk obtained is called **spun silk**

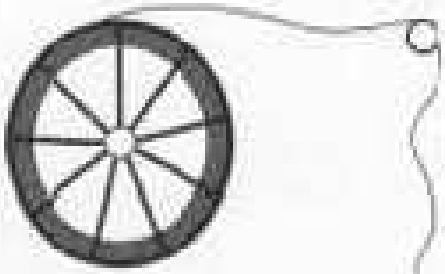
Silkworm

Silk cocoon

Only the healthiest moths are used for breeding. Caterpillars spin silk around itself, eventually encasing itself completely.



Once the cocoons are stoved to kill the chrysalis, they are soaked in hot water to loosen the sericin trapped in the fibers.



Eyelet

Cocoon

The end of the silk fiber is threaded through an eyelet and reeled to a wheel.

Crepe de chine

Crepe

The silk thread is washed with oil or soap, dried, and twisted. The type of twisting determines the texture of the fabric.

CENTRAL RESEARCH INSTITUTE OF INDIA

- Central Sericulture Research and Training Institute, Mysore (Karnataka).
- Central Sericulture Research and Training Institute, West Bengal
- Central Tasar Research and Training Institute, Ranchi (Jharkhand).
- Central Silk Technological Research Institute (CSTRI), Bangalore (Karnataka).

OPPORTUNITIES

- Sericulture being cottage industry plays an important role in employment generation and poverty alleviation.
- It is one of the most profitable activities in rural sector.
- Availability of indigenous technology at low coast
- Regular and quick returns
- Large demand and popularity of hand woven silks in the west
- Strong domestic demand coupled with use of silk garments on festive occasions.
- Large production gap to meet the domestic demand.
- Scope for establishing the large production units and organized sector.
- Effective utilization of the by products will be more effective.

Thank You

Topic Name

Study of any five equipment's use in Sericulture

Presented by

Mr. P. P. Pathare

Head,

Department of Zoology,

SHRI MULIKADEVI MAHAVIDYALAYA, NIGHOJ

Tal- Parner, Dist-Ahmednagar

Rearing Equipment's:

i) Rearing house:

1. A separate house is ideal for rearing of silkworm

2. The rearing house should have sufficient number of windows to permit cross ventilation.

3. Provision should be made to make it air tight for proper disinfection.

Rearing house has to be built in such a way to provide optimum temperature of 26-28º c and RH of 60-70% for the growth of silkworm at minimum operational cost.

4. The rearing house should meet certain specification, as the silk worms are very sensitive to weather conditions like humidity and temperature.

5. The rearing room should have proper ventilation optimum temperature and proper humidity.

6. It should be ensured that dampness, stagnation of air, exposure to bright sunlight and strong wind should be avoided.

To Avoid:

* Damp condition
* Stagnation of air
* Direct and strong drift of air
* Exposure to bright sun light and radiation

To Ensure:

* An equable temperature and humidity
* Good ventilation.

Features:

1. Rearing house should be built depending on the brusing capacity and the method of rearing.
2. The rearing area of 2 sq.ft/ dfl for floor rearing and 3 sq. ft/ dfl for shoot rearing is the general criteria.
3. Rearing house should have a main rearing hall, an ante room (8 x 8 ft) and leaf preservation room. Maintaining a separate chawki room (a must for two- plot rearing system; rearing room of size 10’ x 14’ with a height of 9-10 ft for an acre of garden) ideal.

1. Rearing house should face east-west direction.
2. Rearing house should have facilities to maintain the required environmental conditions.
3. Growing trees around rearing house helps to maintain favourable environment
4. Rearing house should be constructed taking consideration he following points such as effective is disinfection, washable floor, etc.

Rearing house:

2. Rearing stand:

i) Rearing stands are made up of wood or bamboo and are portable.

ii) These are the frames at which rearing trays are kept.

iii) A rearing stand should be 2.5 m high, 1.5 m long and 1.0 m wide and should have 10 shelves with a space of 20 cm between the shelves.

iv) The trays are arranged on the shelves, and each stand can accommodate 10 rearing trays.

Rearing stand with Rearing tray:

3. **Rearing tray**:

1. These are made of bamboo or wood so that they are light and easy to handle.

2.These are either round or rectangular.

3. Each stand can accommodate 10 rearing trays.

3. **Rearing tray:**

4. Chopping board:

1. The chopping board is made up of soft wood it is used as a base for cutting leaves with knife to the suitable size required for feeding the worms in different instar stages.

5. Chopping Knife:

1. Chopping knives are used for cutting the mulberry leaves .

2.They are usually 0.3-0.5m long with a broad knife blade and a wooden handle .

3. Two sized knives small and large for copping small pieces for younger instars and large pieces for older instar are needed.

4. Chopped leaves falling on the mat are better collected in an enameled receptacle.

6. Feathers:

Bird feathers preferably white and large are important items of silkworm rearing room. These are used for brushing newly hatched worms to prevent injuries.

7. Chopsticks :

1. Chopdticks are tapering bamboo rods meant to pick up younger stages of larvae to ensure their hygienic handling and preventing from injuries. 2. These are made of bamboo approximately 17.5-20cm long and tapering to one end.

8. Ant well:

1. Ant wells are provided to stop ants from crawling on to trays, as ants are serious menace to silk worms.

2.They are made of concrete or stone blocks 20 cm square and 7.5 cm high with a deep groove of 2.5 cm running all round the top.

3.The legs of the rearing stands rest on the centre of well filled with water.

THANK YOU