D.N.R COLLEGE (A) BHIMAVARAM

DEPARMENT OF AQUACULTURE

PRACTICAL MANUAL

PAPER 6C

AQUARIUM MANAGEMENT AND ORNAMENTAL FISH CULTURE

PRACTICAL SYLLABUS

PAPER 6C

AQUARIUM MANAGEMENT AND ORNAMENTAL FISH CULTURE

1. FRESH WATER ORNAMENTAL FISHES

A.EXOTIC ORNAMENTAL FISHES

1. GOLD FISH 2. ANGEL FISH 3.TIGER BARB 4. SWORD TAIL 5. FIGHTER FISH 6. OSCAR

B.INDIGENOUS ORNAMENTAL FISHES

1. DWARF GOURAMI 2. INDIAN GLASS FISH 3. ZEBRA DANIO 4.LOACH 5. PEACOCK EEL 6. ROSY BARB

II. AQUARIUM PLANTS (6 SPECIES)

III . AQUARIUM ACCESSORIES

IV AQUARIUM SETTING (FRESH WATER)

V. AQUARIUM FABRICATION AND MAINTENANCE

VI.BREDING TRIALS ON SELECTED AQUARIUM FISHES

PAPER 6C

AQUARIUM MANAGEMENT AND ORNAMENTAL FISH CULTURE

PRACTICAL MODEL QUESTION PAPER

Duration:3hs Max.Marks:50

I. Identify the followinf spotters_____ 15 Marks

A) B) C)

II.Write about the Aeraotrs/ filters 10 Marks

III. Identify the following Spotter Aquarium plants 15 Marks

A) B) C)

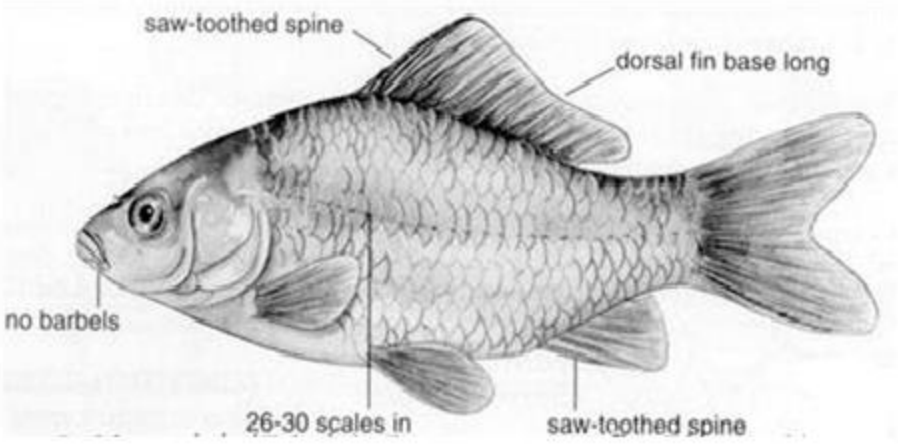
IV.Viva voice 05 Marks

V. Record 05 Marks

CARASSIUS AURATUS

(Gold Fish)

Phylum -	Chordata
Class\ -	Actinopterygii
Order -	Cypriniformes



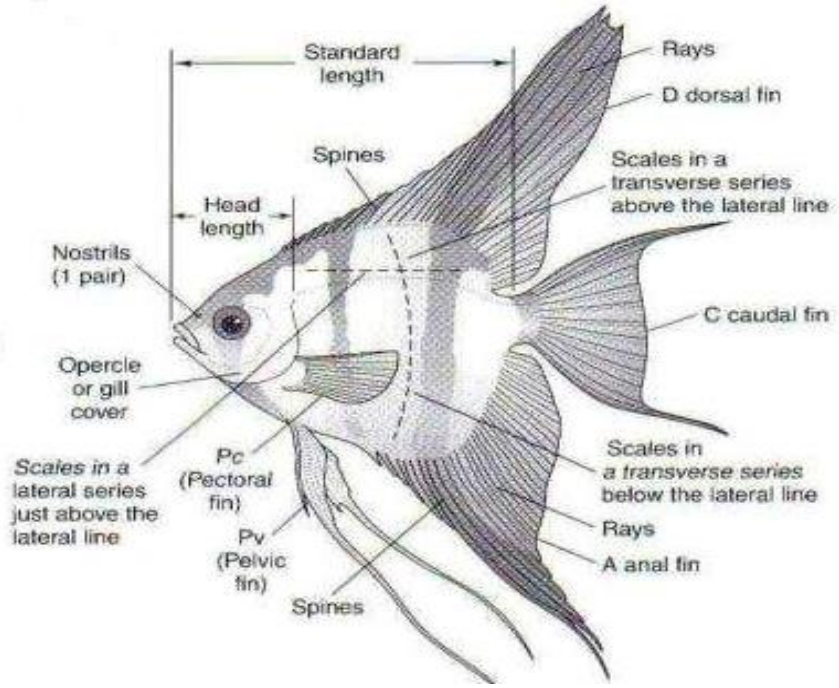
GOLD FISH

- The goldfish (Carassius auratus) is a freshwater fish.
- It is commonly kept as a pet in indoor aquariums, and is one of the most popular aquarium fish.
- Goldfish breeds vary greatly in size, body shape, fin configuration, and coloration (various combinations of white, yellow, orange, red, brown, and black are known).
- When kept in small indoor aquariums, goldfish tend to stay about 1 inch (2.5 cm) to 2 inches (5.1 cm) long.
- Goldfish may grow larger if moved to bigger fish tanks, but they usually do not grow longer than 6 inches (15 cm). In outdoor ponds, and in the wild, goldfish can grow to about 14 inches (36 cm).
- Goldfish have four kinds of cone cells, which are respectively sensitive to different colors: red, green, blue and ultraviolet.
- In the wild, the diet of goldfish consists of crustaceans, insects, and various plant matter.
- They have two otoliths, permitting the detection of sound particle motion, and Weberian ossicles connecting the swimbladder to the otoliths, facilitating the detection of sound pressure.

PTEROPHYLLUM

(Angel Fish)

Phylum- Chordata
Class - Actinopterygii
Order- Perciformes



ANGEL FISH

- Pterophyllum is a small genus of freshwater fish from the family Cichlidae known to most aquarists as angelfish.
- The three species of Pterophyllum are unusually shaped for cichlids being greatly laterally compressed, with round bodies and elongated triangular dorsal and anal fins.
- This body shape allows them to hide among roots and plants, often on a vertical surface.
- Angelfish are ambush predators and prey on small fish and macroinvertebrates.
- Angelfish are one of the most commonly kept freshwater aquarium fish, as well as the most commonly kept cichlid.
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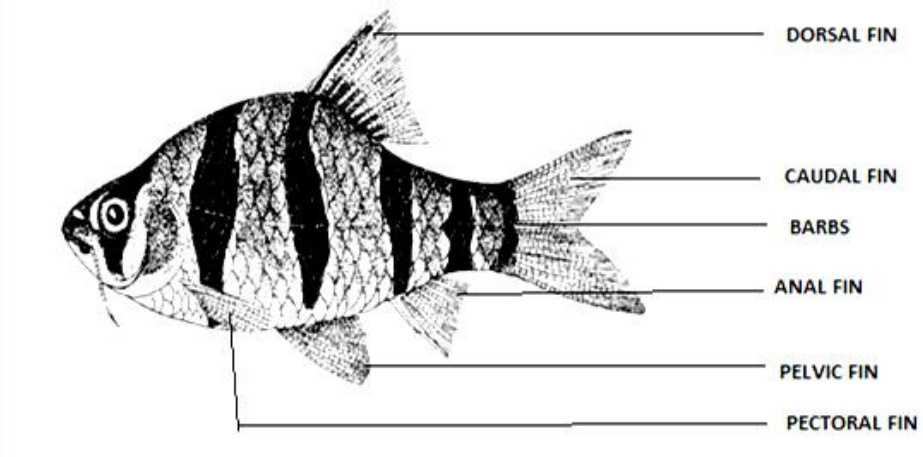
- Angelfish are kept in a warm aquarium, ideally around 80 °F (27 °C), with soft and acidic (<6.5ph) water.
- Freshwater Angelfish with quality genetics are known to live approximately 12 years in captivity.

PUNTIUS TETRAZONA

(Tiger Barb)

Phylum- Chordata
Class- Actinopterygii
Order - Cypriniformes



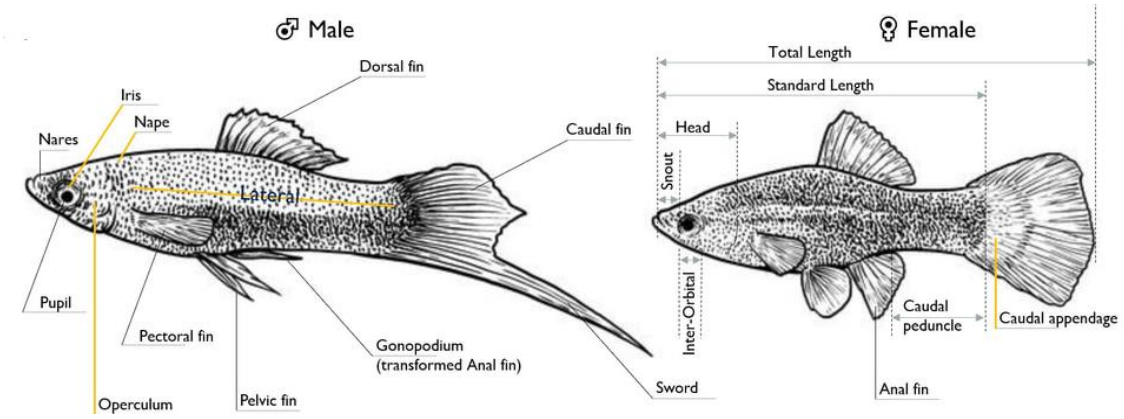
TIGER BARB

- The tiger barb or Sumatra barb (Puntigrus tetrazona), is a species of tropical cyprinid fish.
- The tiger barb can grow to about 7–10 centimeters long and 3–4 centimeters wide, although they are often smaller when kept in captivity.
- Native fish are silver to brownish yellow with four vertical black stripes and red fins and snout.
- Tiger barbs have been reported to be found in clear or turbid shallow waters of moderately flowing streams.
- The tiger barb, an active shoaling fish, is usually kept in groups of six or more.
- They are often aggressive in numbers less than five, and are known fin nippers.
- The tiger barb usually attains sexual maturity at a body length of 2 to 3 centimeters in total length, or at approximately six to seven weeks of age.
- The females are larger with a rounder belly and a mainly black dorsal fin, while the males have a bright, red nose with a distinct red line above the black on their dorsal fins.

XIPHOPHORUS HELLERII

(Sword Tail)

Phylum:	Chordata
Class:	Actinopterygii
Order:	Cyprinodontiformes



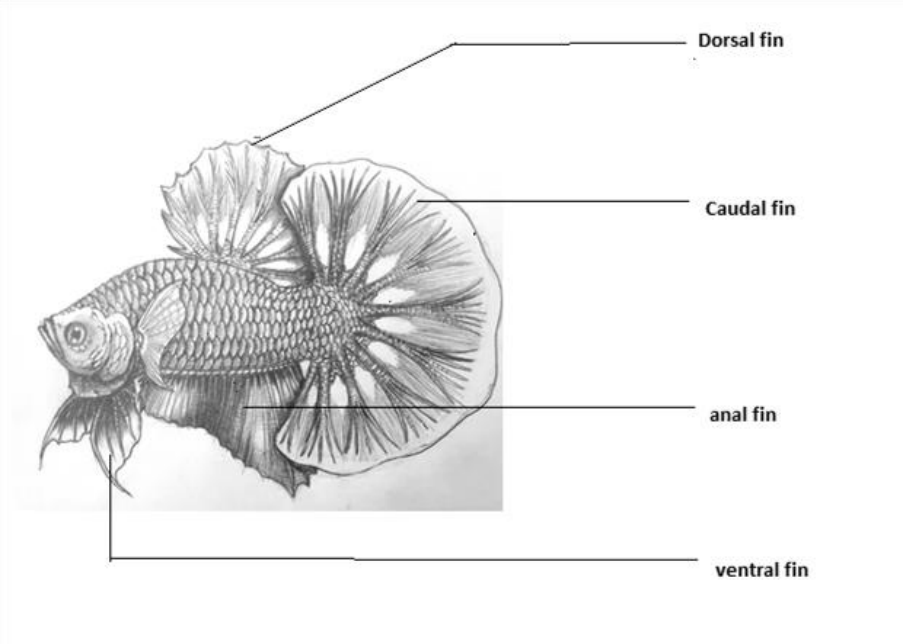
SWORD TAIL

- The green swordtail (Xiphophorus hellerii) is a species of freshwater/brackish fish.
- The male green swordtail grows to a maximum overall length of 14 centimetres and the female to 16 centimetres.
- The name 'swordtail' is derived from the elongated lower lobe of the male's caudal fin (tailfin).
- Sexual dimorphism is moderate, with the female being larger than the male, but lacking the 'sword'.
- The wild form is olive green in color, with a red or brown lateral stripe and speckles on the dorsal and, sometimes, caudal fins. The male's 'sword' is yellow, edged in black below.
- Captive breeding has produced many color varieties, including black, red, and many patterns thereof, for the aquarium hobby.
- All varieties share the dark-red or brown central stripe.
- Its diet includes both plants and small crustaceans, insects, and annelid worms.

BETTA SPLENDENS

(Fighter Fish)

Phylum:	Chordata
Class:	Actinopterygii
Order:	Anabantiformes

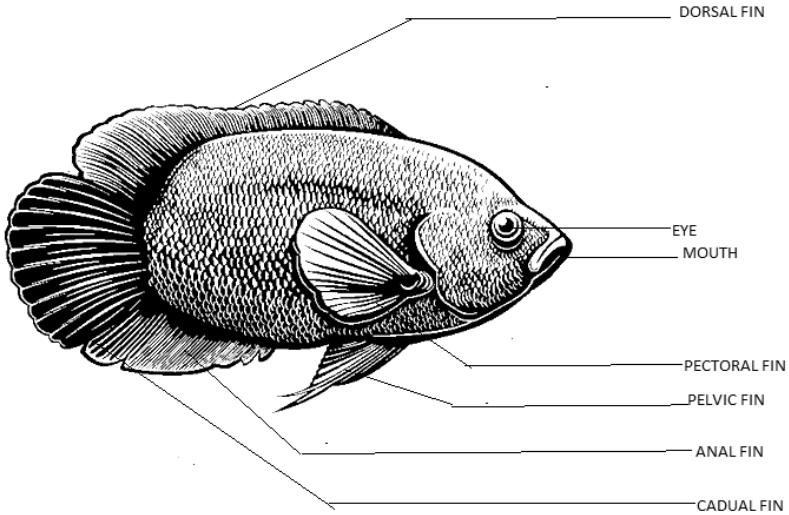


- The Siamese fighting fish (Betta splendens), commonly known as the betta,[2] is a freshwater fish.
- The betta's diverse colours are due to different layers of pigmentation in their skin.
- Colours among captive bettas include red, orange, yellow, blue, steel blue, turquoise/green, black, pastel, opaque white, and multi-coloured.
- Bettas are well known for being highly territorial, with males prone to attacking each other if housed in the same tank; without a means of escape, this will usually result in the death of one or both fish.
- Female bettas can also become territorial towards one another in confined spaces.
- Bettas are exceptionally tolerant of low oxygen levels and poor water quality, owing to their special labyrinth organ, a characteristic unique to the suborder Anabantoidei that allows for the intake of surface air.
- As tropical fish, bettas prefer a water temperature of around 75–82 °F (24–28 °C), but have been observed surviving temporarily at extremes of 56 °F (13 °C) to 95 °F (35 °C).
- When kept in colder climates, aquarium heaters are recommended, as colder water weakens their immune system and makes them susceptible to certain diseases.

ASTRONOTUS OCELLATUS

(Oscar Fish)

Phylum:	Chordata
Class:	Actinopterygii
Order:	Cichliformes



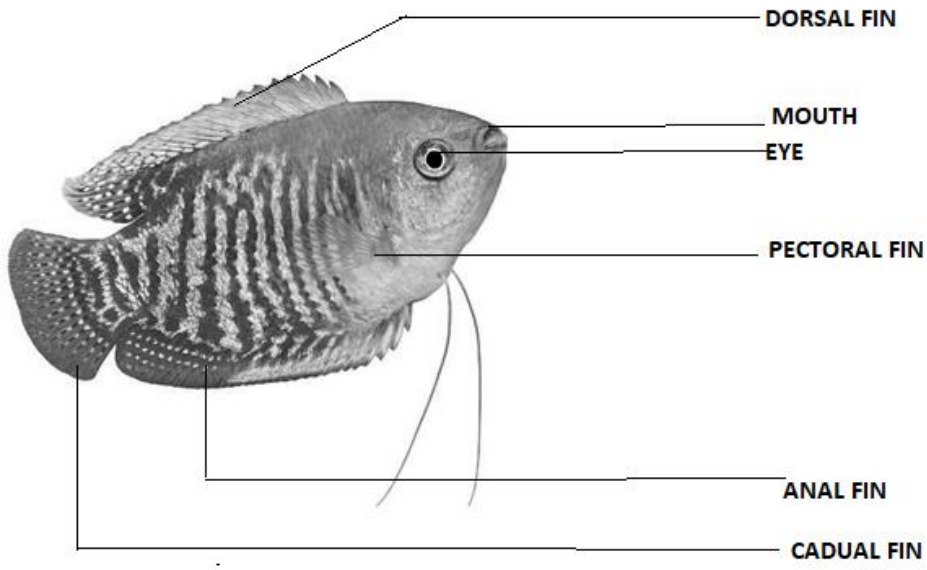
OSCAR FISH

- The oscar (Astronotus ocellatus) is a species of fish from the cichlid family known under a variety of common names, including tiger oscar, velvet cichlid, and marble cichlid.
- Oscar fish are omnivores.
- A. ocellatus examples have been reported to grow to about 45 cm (18 in) in length and 1.6 kilograms (3.5 lb) in weight.
- The wild-caught forms of the species are typically darkly coloured with yellow-ringed spots or ocelli on the caudal peduncle and on the dorsal fin.
- The species is also able to rapidly alter its colouration, a trait which facilitates ritualised territorial and combat behaviours amongst conspecifics.
- These species are sexually monomorphic, males have been suggested to grow more quickly, and in some naturally occurring strains, males are noted to possess dark blotches on the base of their dorsal fins.
- The species reaches sexual maturity around one year of age, and continues to reproduce for 9–10 years.
- Smaller females lay around 300-500 eggs, while larger female oscars can lay about 2,500-3,000 eggs.

TRICHOGASTER LALIUS

(Dwarf Gourami)

Phylum:	Chordata
Class:	Actinopterygii
Order:	Anabantiformes



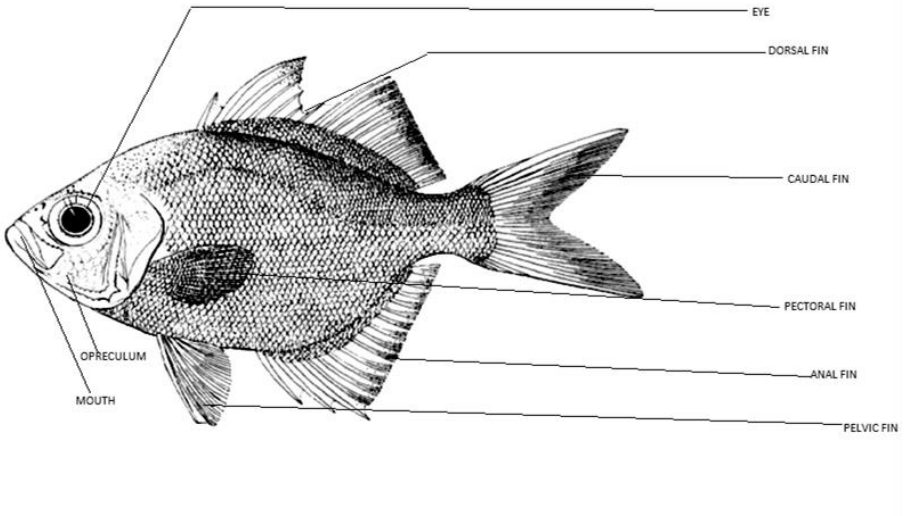
DWARF GOURAMI

- Dwarf Gourami are one of the most popular freshwater fish.
- Dwarf gouramis are generally peaceful fish.
- The average Dwarf Gourami size ranges approximately between 3.5 inches and 4.5 inches.
- Dwarf Gourami cave an expected lifespan of up to 4 years.
- Dwarf Gourami are labyrinth fish which means they have to get their oxygen from the surface. They have an organ that is very similar to lungs which they use to take in oxygen.
- Male dwarf gouramis in the wild have diagonal stripes of alternating blue and red colors; females are a silvery color.
- Besides the difference in color, the sex can be determined by the dorsal fin. The male's dorsal fin is pointed, while the female's is rounded or curved.
- Colour variations are bright blue, flame red,. turquoise / neon blue, featuring stripes of dark red and bright blue.

PARAMBASSIS RANGA

(Indian Glass Fish)

Phylum:	Chordata
Class:	Actinopterygii
Family:	Ambassidae



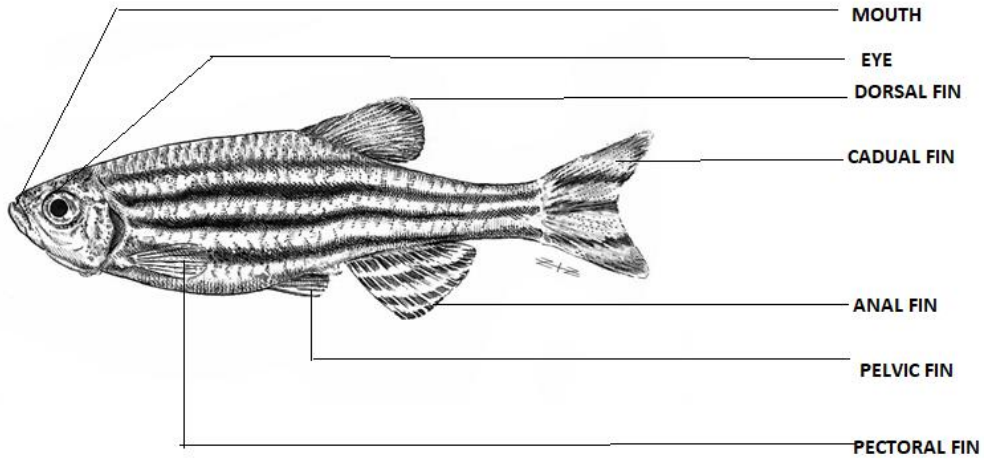
ROSY BARB

- The rosy barb (Pethia conchonius) is a subtropical freshwater fish.
- This species of barb grows up to 6 inches (14 cm) in length.
- Juveniles possess large, deeply forked tails, which are large in proportion to their body.
- Their colour becomes bolder during their mating periods.
- Males have more vibrant colours and females are slightly plumper and females do not have any black colour in their fins while males do.
- They may weigh up to 340g (12 ounces) when fully grown but can weigh much less during adolescence.
- They are mature at 63.5mm (2.5 inches).
- In the wild their omnivorous diet consists of worms, insects, crustaceans, and plant matter.
- They have a lifespan of up to 5 years.
- The rosy barb is an active, peaceful species well-suited for a community aquarium

DANIO RERIO

(Zebra Fish)

Phylum:	Chordata
Class:	Actinopterygii
Order:	Cypriniformes



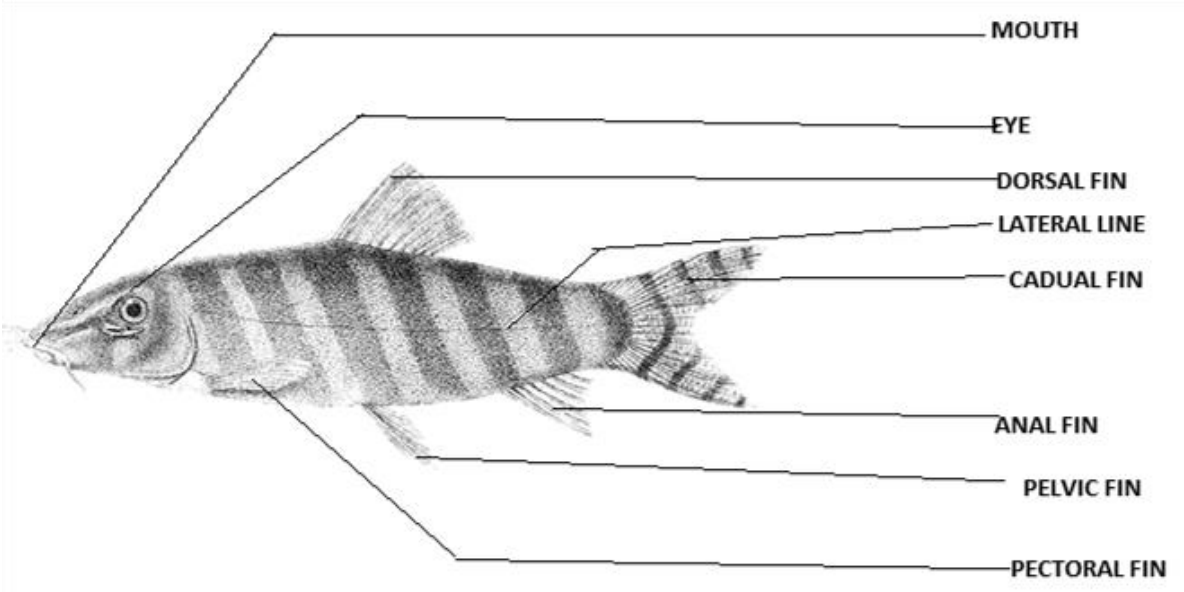
ZEBRA DANIO

- The zebrafish (Danio rerio) is a freshwater fish
- The zebrafish and zebrafish larva is a suitable model organism for drug discovery and development.
- The zebrafish is named for the five uniform, pigmented, horizontal, blue stripes on the side of the body, which are reminiscent of a zebra's stripes, and which extend to the end of the caudal fin.
- Its shape is fusiform and laterally compressed, with its mouth directed upwards.
- The male is torpedo-shaped, with gold stripes between the blue stripes; the female has a larger, whitish belly and silver stripes instead of gold.
- Adult females exhibit a small genital papilla in front of the anal fin origin.
- The zebrafish can reach up to 4–5 cm (1.6–2.0 in) in length, although they typically are 1.8–3.7 cm (0.7–1.5 in) in the wild with some variations depending on location.
- Its lifespan in captivity is around two to three years, although in ideal conditions, this may be extended to over five years.
- Zebrafish are omnivorous, primarily eating zooplankton, phytoplankton, insects and insect larva.

SERPENTICOBITIS CINGULATA

(Serpent Loach)

Phylum:	Chordata
Class:	Actinopterygii
Order:	Cypriniformes



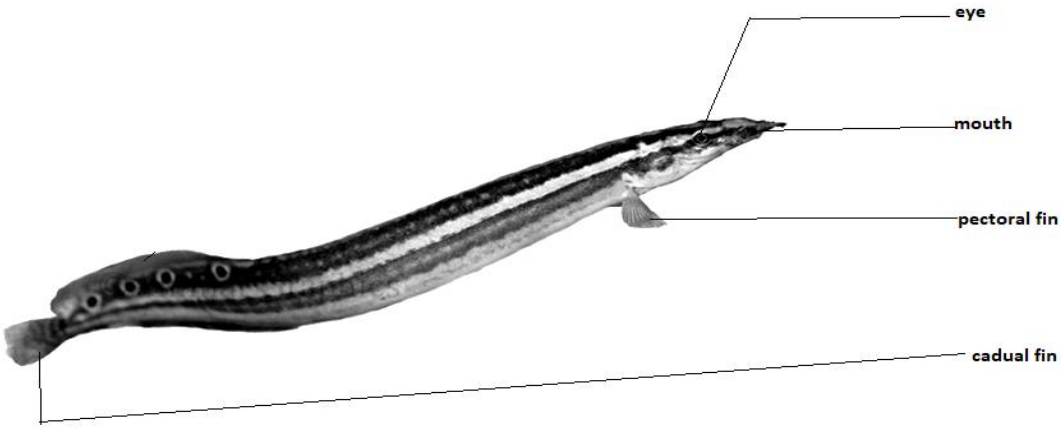
LOACH

- Loaches are freshwater, benthic (bottom-dwelling) fish. It is an omnivore.
- A typical loach has very small scales and three to six pairs of whiskerlike barbels around its mouth.
- Loaches are hardy, usually nocturnal fishes that inhabit both still and flowing waters.
- They use their barbels to comb the bottom for worms, insect larvae, and other food.
- In low and stagnant ponds, they may swallow air at the surface, their intestines then absorbing the oxygen and thus aiding respiration.
- Several Asian loaches are popular aquarium fishes.
- The clown loach (Botia macracanthus), an orange fish about 13–30 centimetres (5–12 inches) long and marked with three vertical black bands, and the kuhli loach (Pangio kuhlii), a pinkish, eel-like species about 8 centimetres long, marked with many vertical black bands.
- Lifespan of a loach can be 3-14 years.

MACROGNATHUS SIAMENSIS

(Peacock Eel)

Phylum:	Chordata
Class:	Actinopterygii
Order:	Synbranchiformes



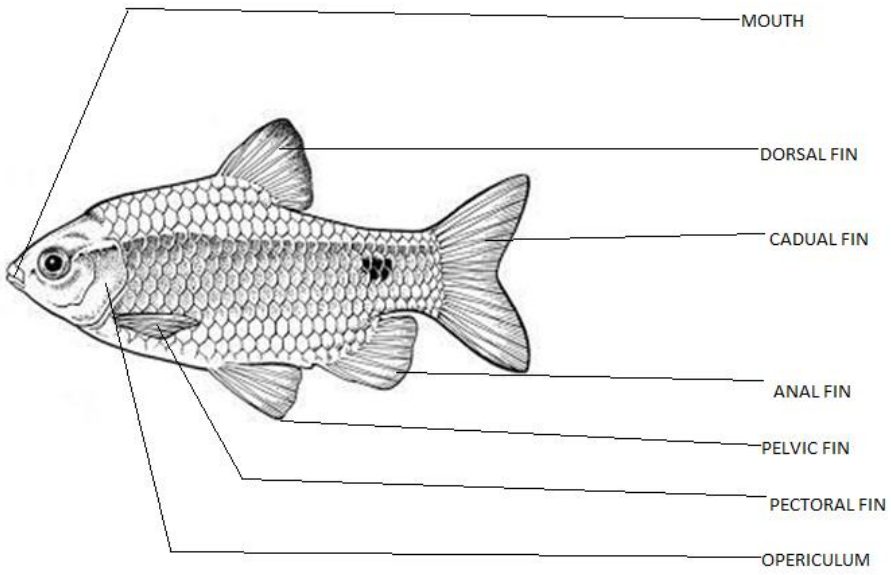
PEACOCK EEL

- The Peacock Eel is a spiny eel found in freshwater habitats.
- They are commercially important as food and aquarium fish.
- The peacock eels is found in slow-moving or still bodies of water such as swamps, canals, and ponds.
- These fish lack scales and require a soft substrate to burrow into, such as sand, mud, or silt.
- They breed during the wet season when adjacent forests flood. Larvae reach 8 cm (2 in) in length in approximately 60 days after hatching.
- Their main diet is small crustaceans, annelids, and fish.
- This eel can grow up to 30 cm (12 in) in length, although 20 cm (8 in) is more common.
- Males and females are hard to tell apart through external means.
- The typical peacock eel lifespan is anywhere between eight and 18 years.

PETHIA CONCHONIUS

(Rosy Barb)

Phylum:	Chordata
Class:	Actinopterygii
Order:	Cypriniformes



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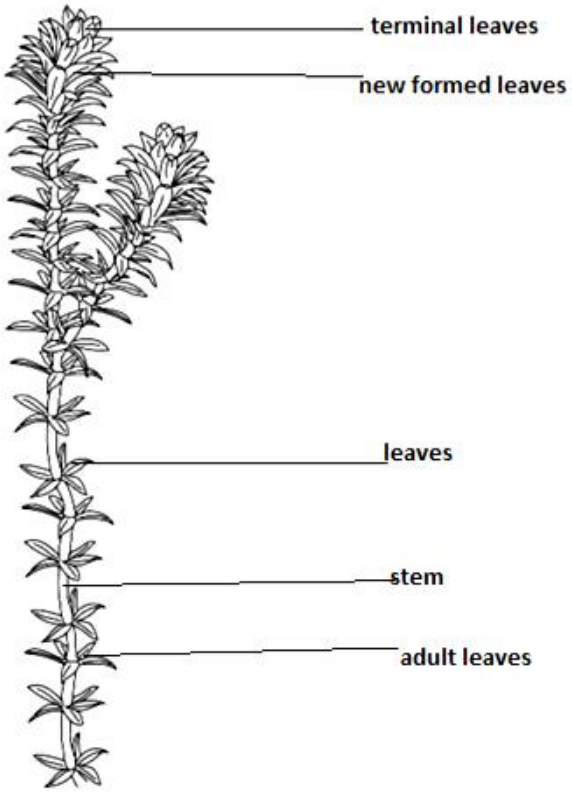
HYDRILLA VERTICILLATA

(Water Thyme)

Clade:	Tracheophytes
Clade:	Angiosperms
Clade:	Monocots



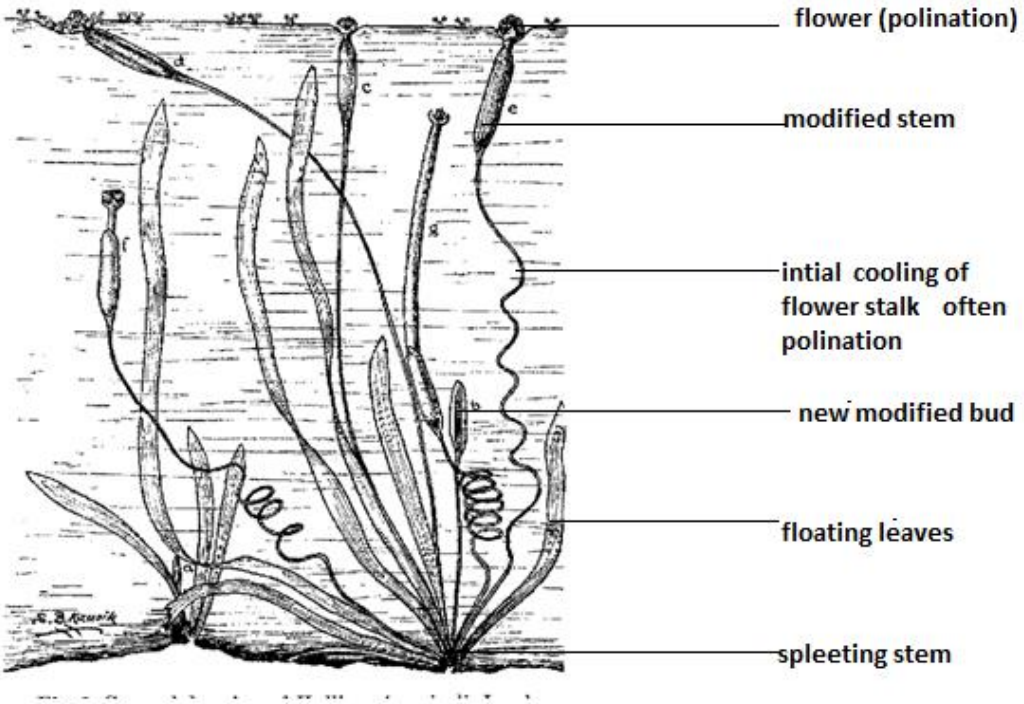
HYDRILLA

- Hydrilla (waterthyme) is a genus of aquatic plant, usually treated as containing just one species, Hydrilla verticillata.
- The stems grow up to 1–2m long.
- The leaves are arranged in whorls of two to eight around the stem, each leaf 5–20 mm long and 0.7–2 mm broad, with serrations or small spines along the leaf margins; the leaf midrib is often reddish when fresh.
- It is monoecious (sometimes dioecious), with male and female flowers produced separately on a single plant; the flowers are small, with three sepals and three petals, the petals 3–5 mm long, transparent with red streaks.
- It reproduces primarily vegetatively by fragmentation and by rhizomes and turions (overwintering), and flowers are rarely seen.
- They have air spaces to keep them upright.
- Hydrilla has a high resistance to salinity compared to many other freshwater associated aquatic plants.
- Hydrilla is known to have many digestive and health benefits. The plant contains vitamins, minerals, and antioxidants, as well as being useful for fighting indigestion. The plant is also known for its extremely high concentration of calcium, vitamin B-12, iron and magnesium.

VALLISNERIA

(Eelgrass Or Tape Grass)

Clade:	Tracheophytes
Clade:	Angiosperms
Clade:	Monocots



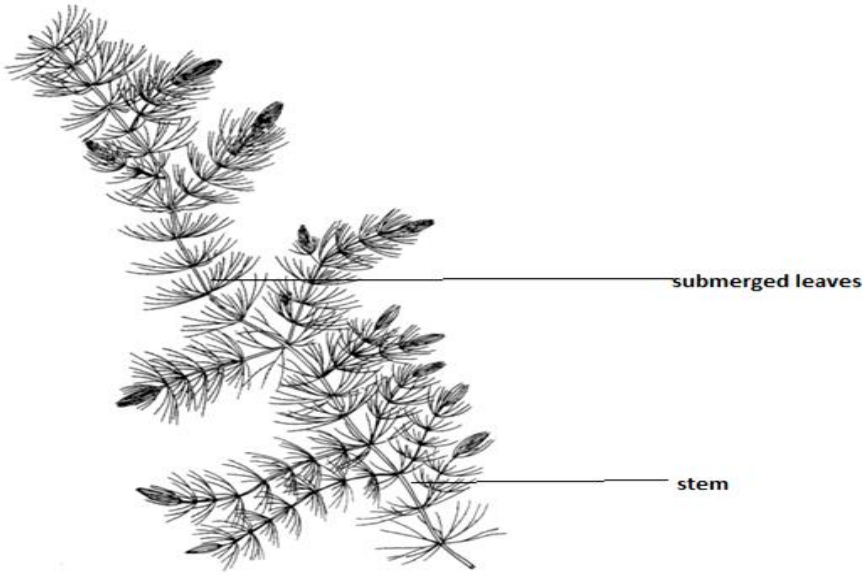
VALLISNERIA

- Vallisneria is a genus of freshwater aquatic plant, commonly called eelgrass, tape grass or vallis.
- Vallisneria is a submerged plant that spreads by runners and sometimes forms tall underwater meadows.
- Leaves arise in clusters from their roots. The leaves have rounded tips, and definite raised veins.
- Single white female flowers grow to the water surface on very long stalks.Male flowers grow on short stalks, become detached, and float to the surface.
- It is dioecious, with male and female flowers on separate plants. The fruit is a banana-like capsule having many tiny seeds.
- Sometimes it is confused with the superficially similar Sagittaria when grown submerged.
- This plant should not be confused with Zostera species, marine seagrasses that are usually also given the common name "eelgrass".
- Vallisneria has arched stems which cross over small obstacles and develop small planters at their nodes.

Ceratophyllum demersum

(**hornwort)**

Clade:	Angiosperms
Order:	Ceratophyllales
Family:	Ceratophyllaceae



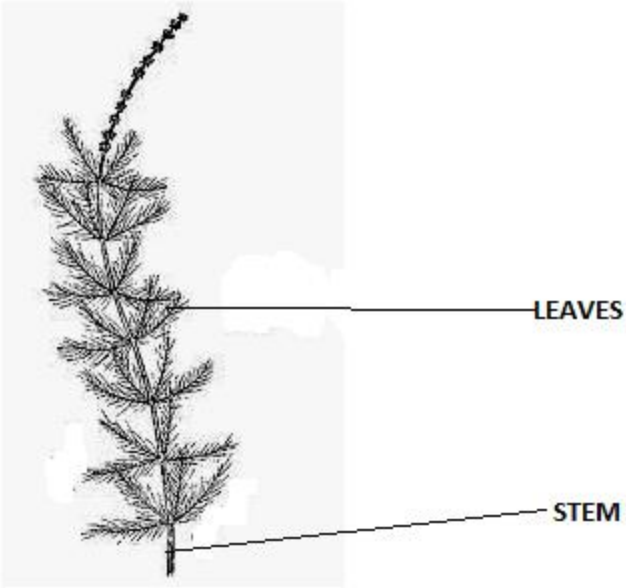
CERATOPHYLLUM

- Ceratophyllum is a aquatic flowering plants commonly found in ponds, marshes, and quiet streams in tropical and in temperate regions.
- They are usually called coontails or hornworts.
- Ceratophyllum grows completely submerged, usually, though not always, floating on the surface, and does not tolerate drought.
- The plant stems can reach 1–3 m in length.
- At intervals along nodes of the stem they produce rings of bright green leaves, which are narrow and often much-branched.
- The forked leaves are brittle and stiff to the touch in some species, softer in others.
- Roots are completely absent and are missing even in the embryonic stage, but sometimes they develop modified leaves with a rootlike appearance, which anchor the plant to the bottom. Also stomata are missing.
- The flowers are small and inconspicuous, with the male and female flowers on the same plant.

MYRIOPHYLLUM

(water milfoil)

Clade:	Tracheophytes
Clade:	Angiosperms
Clade:	Eudicots



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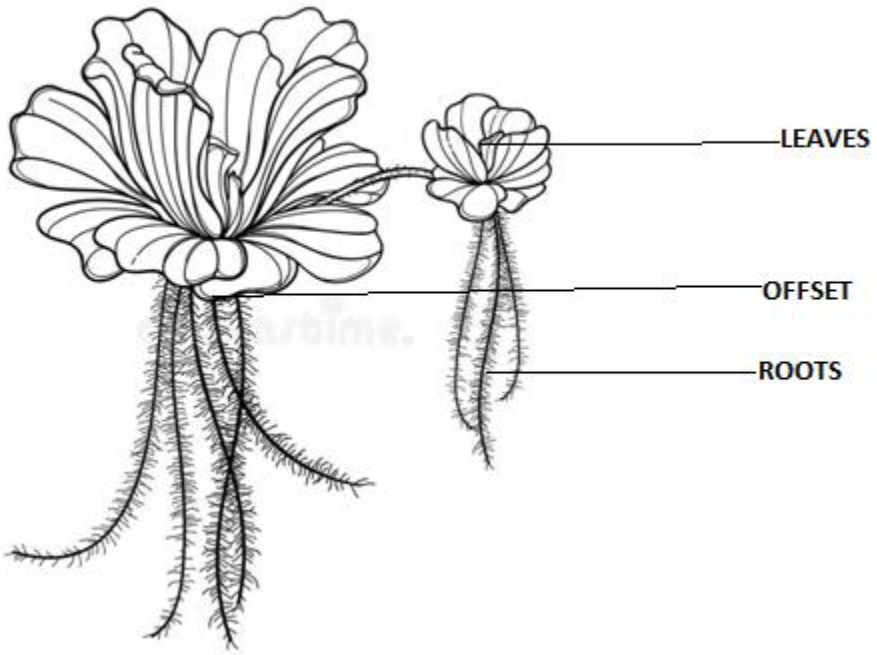
MYRIOPHYLLUM

- Myriophyllum is a flowering plant, a vascular dicot, commonly called parrot's-feather and parrot feather watermil foil.
- Parrot feather is a perennial plant. Parrot feather gets its name from its feather-like leaves that are arranged around the stem in whorls of four to six.
- The emergent stems and leaves are the most distinctive trait of parrot feather, as they can grow up to a foot above the water surface and look almost like small fir trees.
- The woody emergent stems grow over 5 feet long and will extend to the bank and shore.
- As the water warms in the spring, parrot feather begins to flourish.
- Parrot feather reproduces asexually.
- New plants grow from fragments of already rooted plants.

PISTIA

(water cabbage, water lettuce)

Clade:	Angiosperms
Clade:	Monocots
Order:	Alismatales



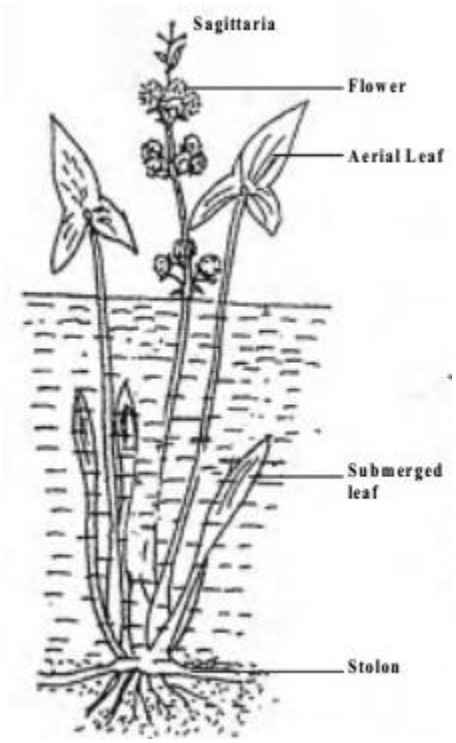
PISTIA

- Pistia stratiotes is a perennial monocotyledon with thick, soft leaves that form a rosette.
- It floats on the surface of the water, its roots hanging submersed beneath floating leaves.
- The leaves can measure 2 – 15 cm long and are light green, with parallel venations and wavy margins.
- The surface of the leaves is covered in short, white hairs which form basket-like structures that can trap air bubbles and increase the plant's buoyancy.
- The spongy parenchyma with large intercellular spaces in the leaves also aids the plant in floating.
- The flowers are dioecious, lack petals, and are hidden in the middle of the plant amongst the leaves.
- Pistia stratiotes are found in slow-moving rivers, lakes, and ponds.

The species also require slightly acidic water in the pH range of 6.5 - 7.2 for optimal growth

SAGITTARIA LATIFOLIA

Clade:	Angiosperms
Clade:	Monocots
Order:	Alismatales



SAGITTARIA LATIFOLIA

- Sagittaria latifolia is a plant found in shallow wetlands and is sometimes known as broadleaf arrowhead,duck-potato,Indian potato, katniss, or wapato.
- Sagittaria latifolia is a variably sized perennial, ranging from 2 to 20 metres in length and growing in colonies that can cover large areas of ground.
- The roots are white and thin, with the green and white mother plant producing white tubers ranging from 0.3 to 1 m long and 0.15 to 0.6 m deep, covered with a purplish skin.
- The plant produces rosettes of leaves and an inflorescence on a long rigid scape.
- It can be found in wet areas such as ponds and swamps.
- The plant has strong roots and can survive through wide variations of the water level, slow currents and waves.
- It displays an affinity for high levels of phosphates and hard waters.
- This plant is vulnerable to aphids and spider mites.

2.Aquarium equipment & accessories:

To keep aquarium tank looking beautiful and clean it needs regular maintenance. To perform the maintenance tasks, different types of equipment are used, as listed below;

1.Aerator(Air pump) Air pump simply provides continuous turbulence through air bubbles in the aquarium water that helps in diffusion of oxygen from atmosphere into the aquarium water. This aeration may be decorative equipment. Air pumpis also necessary for running the filtration system.

2**. Filters** Filters remove the accumulated metabolites generated by the fish in the aquarium. This process of removal of waste is called filtration. Through filtration, a stable and healthy environment is maintained in the aquarium. These filters are of three types depending upon their filtration processes: Mechanical filtration removes debris, detritus, uneaten food, dead plant matter and other suspended solid particles. Chemical filtration removes chemicals and heavy metal traces. This type of filtration is useful for dealing temporary problems Biological filtration converts obnoxious gases in to non- toxic substances through bacterial action.

Filter media: Different materials are used in the filters. Filter media is the gut of filter. They perform one or more of the water cleaning functions such as mechanical filtration, chemical filtration and biological filtration.

DIFFERENT TYPES OF FILTERS

Internal filters

a). Under-gravel filter: It is most popular filter. It is simple, cheap and occupies less space and easy to install.

b). Foam filter: It is simple cylindri- cal box with holes both on the top cover and in the base. It contains thick layer of foam and an airlift pump tube. This filter is simple, easy to install and maintain. When foam gets dirty, it is rinsed in clean running water and again placed in the box.

c**). Sponge filter**: It is an internal form of biological filtration. These are inexpensive and simple to maintain. Sponge filters are the best choice for aquariums where a gentle flow of water is required (breeding tanks)

d). Box filter: It is a small box filled with carbon and filter floss. This unit is kept inside the aquarium and powered by an air pump. Box filters are designed for both mechanical and chemical filtration. These filters are best choice for the tanks raising fry and fish breeding purpose

External filter

a). Trickle filter: It consists of a series of trays with holes in the bottom. A part is filled with filter media. It can be fixed above or below the aquarium. It is extremely efficient filter, easy to clean but its trickling noise may be annoying. It performs mechanical filtration.

b). Power filter: It is quite suitable for large aquaria which are heavily stocked and re- quire high turnover of water. It can be fitted inside or outside the tank. It performs both biological and mechanical filtration. The fil- tering material needs regular cleaning.

c). Fluidized bed filter: This filter performs purely as biological filtration. Fluidized bed filters are columns of sand held in suspension by a flow of water from the tank. These filters are d…

3. DECORS(Interior designing accessories)

1.Gravel**:** Gravel of appropriate type can create a pleasant habitat for fish. Most important function of gravel is to provide home for beneficial bacteria. Gravel bed improves the quality of water. Gravel bed provides aesthetic appearance. It also provide safe home for fishes laying eggs. Gravel bed is a store house of infusorians, which is a good food for fry.

2.Artificial plants

3.Live plants

4.Decorative / ornaments: These enhance the overall presentation and also help for hiding. These include substrate, sand, gravel, bogwood, marbles, terracotta flower pot, artificial rock, rocks, aquatic plants (real / fake) and fun furnishing pirate chests which open and close when connected to an air stone **3. Lights**Aquarium lights play a key role amoralin maintaining water quality and promoting stress free environment. Lights are used to illuminate tank. Lighting replicate natural environment. It promotes plant growth .

4.Feeding equipment

Aquarium fish feeders are electric or electronic devices that are designed to feed aquarium fish at regular intervals. They are often used to feed fish when the aquarist is on vacation or is too busy to maintain a regular feeding schedule.

Fish feeders are usually clamped to the wall of the tank just over the water. Most designs consist of a hopper which is loaded with a variety of dry food, a timer which rotates the hopper at regular intervals (dispensing food in the process), and a method of setting the interval between feeding and the amount of food dispensed. Some designs have individual small hoppers. Whilst this limits the absolute number of feeds, it does allow for more accurate dosing, and delivery of mixed, (both flake and pellet), foodstuffs, which are often important for community tanks.

Most feeders can dispense flake, pellet, or freeze dried food

5.Heaters: It keeps theaquarium temperature stable and within the safe range

6. pump;Air pump simply provides continuous turbulence through air bubbles in the aquarium water that helps in diffusion of oxygen from atmosphere into the aquarium water. This aeration may be decorative equipment. Air pumpis also necessary for running the filtration system.

7.Lights. Aquarium lights play a key role amoralin maintaining water quality and promoting stress free environment. Lights are used to illuminate tank. Lighting replicate natural environment. It promotes plant growth

4.AQUARIUM SETUP

Making an aquarium tank is not a difficult task and also it does not require any sophisticated equipment or any kind of specialised skill. A little bit of workmanship. Two persons are required with almost same workmanship, patience and interest can make aquarium tank during leisure time at home. The most popular aquaria are the glass tanks bonded by silicon sealant. In this type of tank, frames are not needed and it is less cumbersome to make.

Materials required: The materials required for making an all glass aquarium are as follows:

1.Glass panes

2.Silicon rubber, squeezing gun and

silicon sealant gel.

3.Polythene sheet

4.Adhesive tapes

5.Sharp knife or a razor blade

6.Glass cutter

7.Scale

8.Carborandam stone/Grinding stone

Method of making:

First, the required size of aquarium tank is decided. The panes of glass for making the aquarium should be of high quality. The thickness of glass will depend on depth of the tank. Normally, for 30 cm deep water column the glass pane should have a thickness of 5 mm.

After having selected the glass, required sizes of glass panes are cut accurately using a scale and a glass cutter. An even and plain surface are selected for making the aquarium. A polythene or an old newspaper sheet is spread on the surface of the selected place. The bottom glass is placed on the plane surface. A thick string of silicon rubber sealant is applied along edge of back surface. First, the back panel is raised and the sealant is squeezed out with the help of silicon gun along the edges carefully. Next, the sealant is applied similarly on the edges of bottom and back glass panes. The side glass is placed on the laid silicon and carefully joined the back panel glass with side glass. The sealant is applied at all the edges of glass panes from outside. The front glass panel is placed and joined carefully with the bottom and side glass panel. All the corners are fixed with tape from outside to give extra support during setting. The seal- ant is smoothened at the inside joints

with the finger. The sealant is left to get hardened atleast for a day.When the tank gets set, extra sealant if any is removed with a sharp knife or a blade. The aquarium is checked for any leak.

A cover for the tank is essential to prevent falling of dust, escape of fish by jumping out and also for holding the electrical fittings. It can be of wood or galvanized iron or aluminium, in the shapes as per the choice. The inside of the cover should al- ways be painted white or coated with aluminium foil to facilitate better light reflection. The top side of the cover can accordingly be painted with some colour, matching with the room where the aquarium is going to be placed.

Precautions:

1. The aquarium tank is not moved unless it is properly set.

2. Glass panes of gauge are selected according to the size specifications of the aquarium.

3. The measurement of the base pane must conform well to the dimensions of the aquarium.

4. The sealant must be laid in a continuous string, making a bubble-free bond, if the bond is not bubble-free, leak may occur.

Setting up of a freshwater aquarium:

Having a freshwater aquarium is a wonderful way to bring nature into home/ work place. Before setting up of a freshwater tank, it is ensured that the following items are readily available.

• Good quality glass tank

•Lighting arrangement

• Decoratives

•Live plants

•Stand

•Gravel/sand/ coloured stones

•Air pump (with stones)

•Filters

•Hood

•Heating arrangement

•Driftwood

•Water

Aquarium stand is placed horizontally on the even floor at selected location. The glass tank is gently wiped using wet filter wool or a clean damp cloth and the tank is rinsed with clean lukewarm water. Glass aquarium is placed on the stand, ensuring that the tank is fit into the stand firmly and properly. The under-gravel filter is placed on the tank bottom with the holes facing down so that they do not get clogged by gravel. A layer of sand / gravel with a thickness of 2-3 inches is kept on the bottom of the tank. A medium sized sand or gravel is ideal. This gravel is spread with a slope from back to front. About 8 kg of sand or gravel are enough for 60 x 30 cm aquarium. Before use, the sand/ gravel, decoratives and live plants should be rinsed in clean running water. Sand or gravel bottom of the aquarium tank helps in creating a simulated natural environment and it facilitates fixing of aquarium plants and support their growth.

The bog wood, rocks and other decoratives are placed on the gravel aesthetically and hiding places are provided for the fish. The filter and heater are set up and positioned properly if necessary. Live plants can simply be pressed into the gravel. Gently fill the aquarium tank with clear potable water, using a plate or bowl on the gravel surface to break the force of water and to prevent the disturbance to the gravel bed. The hood with light arrangement is placed. The air pump and lamps are connected & then the hood is placed to cover the aquarium. All the equipments are run to check, if everything is working properly as expected and let it run for 2-3 days. Working of all the equipments in the aquarium is ensured before conditioning / cycling the tank. Then creating conditions for bacteria that breakup the organic wastes is an inevitable requiren ent for a successful aquarium. Cycling is of two types.

1. A bit of fish food is dropped in the tank and filtration is run. The bacteria in the environment that accidentally got into the tank in small numbers will start consuming the feed and multiply. Initially the ammonia levels are built-up,

gradually after 10-14 days ammonia levels will come down and nitrites will be built-up. After another couple of weeks, the concentration of nitrites will also be reduced to zero and now the tank is said to be cycled. It is ready for the release of fish. The cycling process usually takes 30 - 45 days.

2. Another method for initiating cycling is to introduce couple of hardy fishes which are fed in the aquarium for 30 - 45 days. Healthy fish are selected having clear eyes, erect and undamaged fins with intact scales and translucent body with active swimming behaviour.

5.Fabrication and setting up of aquarium.

Introduction

Ornamental fish tank is otherwise called an aquarium. An aquarium is a set up in which ornamental fishes of aesthetic value are displayed for recreation.

Different types of ornamental fish tanks

Aquarium can be made of materials like glass, concrete, wood, fiberglass acrylic sheet etc., depending on its location, cost and durability. Glass tank They are either all glass tanks or metal framed ones. In the metal (steel or iron) framed tanks glass panels are held in place with putty (battery compound). On the other hand in all glass tanks, glass walls are fitted together edge-to-edge using silicone rubber adhesive. Nowadays, all-glass tanks have completely vanished due to the popularity of metal-framed tanks, which are known for their slim appearance and suitability for keeping marine fishes also. Shape of aquarium tanks The shape of the aquarium tank may be circular, square, rectangular, oval, hexagonal or octagonal. However, rectangular tanks are preferred as they provide sufficient area for free swimming of the fishes.

Materials required for construction of tank

Silicon gel

Squeezing gun

Glass panes with required size

Construction of all glass aquarium tank

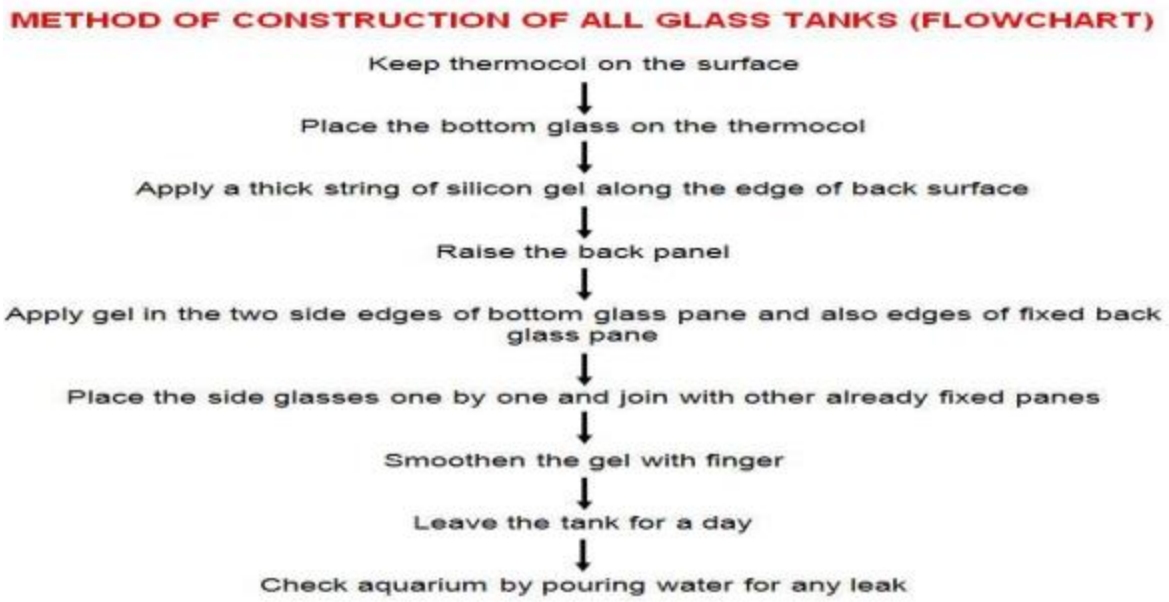
These are constructed with only glass sheets. Rectangular all glass tanks are made with a glass wall thickness of 5 – 10 mm. In all glass tanks, the cut glass walls are fitted together with synthetic rubbery sealent called silicone gum. Prior to fabrication of the tank, sidewalls of the tank are arranged so as to have the desired shape. The glass walls are tied with a rope in order to keep the correct shape of the tank. Then the bottom sheet of the tank is kept flat below the arranged sidewalls so

as to get the desired and correct shape of the tank. A cut thermocol sheet is kept at the bottom to rest the temporarily tied glass sheets. Now the silicone sealent is evenly applied all along the inner vertical and horizontal cut ends with the help of a hand applicator. Care must be taken to see that the joining ends of the glass pieces are free of oil, moisture or stains. A good sealent compound binds the glass walls in 10 to 20 minutes. However, a curing time of about 10 hrs is required to keep the set tank in position and water should be poured only after 24 hours.

Seating the tank

Soon after curing, the tank is kept on a firm wooden or slotted iron stand. The base of the stand should be even and smooth, as irregular placing of the stands would break the tank bottom. A uniform sized thermocol is also used in between the tank and stand surface to safeguard the tank from pressure.

Method of construction of all glass tanks



Aquarium maintenance:

Unlike natural water bodies, an aquarium is a closed aquatic micro-environment known to be 'microcosm'. It is quite different from nature. Fish produce metabolic wastes continuously; uneaten food gets decayed and potentially harmful products are slowly built up in an aquarium. This alters the water quality in the aquarium. It is therefore required to maintain the water quality in ideal condition. The following aspects are essentially attended for proper maintenance to keep the fish happy, active and healthy

Daily:

•The activeness and healthiness of fish are observed.

•The functioning of equipments (heating, filtering and lighting) are checked.

•Temperature is checked. - Uneaten food is removed by siphoning, if necessary (use of live feeds and biological filters does not necessitate this step of removing uneaten food).

•The water is filled into the required level

•The fish are fed (morning and evening) preferably with

Weekly checks:

•Partial water change (10-25%) is attended.

•Water tests for ammonia, nitrite and pH are done.

•The aquarium is cleaned.

•The pre filter sponge is rinsed in clean running water

Monthly checks:

•*Water change @ 25% is done.*

•Cleaning the aquarium is attended.

•The aquarium cover is checked.

•Lighting fixtures are verified.

•The live aquatic plants are pruned.

•The disposable mechanical filter media are replaced.

Bimonthly checks:

•Remove dirt and debris from

•Bio filter over flow box

•live feeds.

•Hoses

•Return pump

•Power head

• Thermometer

•Heater

Annually:

•The UV bulbs are replaced.

•The decorative items are cleaned.

•The plants are fertilized.

CLEANING EQUIPMENT

•Aquarium cleaning require a few specialized tools

•Two buckets are required for aquarium cleaning

•A siphon, water conditioner, algae scrubber, filters brush, aquarium safe-glass cleaner, soft cloth and two small towels & scissors to trim the plants.

•Remove dead plants with tweezer

•Power gravel vaccum cleaner

•Algae scrubber

•chemicals

For maintenance the following items are required

•Water test kit

•Aquarium salt

•Malachite green/ Formalin

•Methylene blue

•Copper sulphate

• One or two antibiotics (oxytetracyclin or penicillin) .

• Feed mixed with an antibiotic

•Copper sulphate remedy for parasites

• Chlorine bleach for disinfection

•Small hand net.

6. Breeding trails on selected aquarium fishes

Introduction

• Fish have developed many different ways for gaining nearness of sperm and egg to each other in order to facilitate and insure their union.

• For external fertilization proximity of two individuals of the opposite sex for spanning is the most common means employed

• In pairing some fishes come side by side in actual contact and simultaneously EMIT eggs and sperm.

• In other instances the main twice his body around female in a semicircle

• For internal fertilization several devices have a evolved in fishes.

• Most common among them is the placement of sperm by the male into the reproductive tract of the female in the process of intromission.

• Release of this sex products at the right time by both sexes guarantee the proximity of eggs and sperms.

• This is brought about in many fishes by definite curtship behaviour.

• Aquarium fishes will breed in captivity only when all the aquarium conditions such as temperature, light, quality of water are in ideal conditions.

• Most fishes do not breed continuously.

• The following clues will help one to identify the actual breeding pair.

1. The sides of the fish fill out and female packed with eggs, become especially plump.

2 colouring become more intense.

3. male may display to the female with rigid outstretched fins.

4. The tend to become more active in exploring possible spawning sites.

1. Breeding of gold Fish:

Gold fish attains sexual maturity at the age of 1-2 years in natural conditions. Maturity can be exam- ined by its physical characters. Maturation depends on health status, nutrition, etc. Spring is the best time to breed gold fish. Gold fish spawns when there is a change in the weather. Sometimes placing the brooders in new waters often induces them to spawn, irrespective of the water temperature. Gold fish breeds 5-6 times in a year. Usually gold fish spawn once in a month from April to August. Warmer weather is ideal for spawning.

Selection of brood fish and mature males:

Healthy fishes weighing about 40 - 100 g. are ideal. Two year old males and three year old females are good for successful breeding. While selecting brood fish and mature males, colour, brightness, body shape and size of fins are to be considered. Brooders and mature males are segregated and maintained in cement tanks separately.

Feeding of brood fish and mature males:

Brood fish and mature males are fed twice a day with live feed (tubifex) and artificial feed (rice bran and groundnut oil cake or soya bean meal with minerals) @ 10% of the body weight. Out of the total feeding per day. 35% has to be is given in the morning, 40% in the afternoon and the rest 25% in the evening. During noon time formulated feeds are advisable. Live feed is more important for maturation. Feeding with live feeds for 2-3 weeks give good results.

Identification of sex in mature fish:

Sex identification is the most important task for successful breeding. Sexual dimorphism is ob- served in mature fishes only.

Male fish: Body is thinner, longer and symmetrical in shape. Tubercles / bumps are seen on the operculum; sometimes tubercles appear on the fins, head and even on gills when they are ready to breed. Abdomen is slender, smaller and firm having a ridge. Pectoral fins are pointed and longer com- pared to the females. They are aggressive in nature.

Selection of brooders and mature males

Mature males and brooders in ripe condition are selected. To enhance success rate, more males than females should be used. Two females and three males are ideal for breeding success.

Breeding equipment:

A breeding tank of 80-100 litres capacity, a hatching tank of 40 - 80 litres capacity, a heater (if neces- sary), a 40 mm mesh cloth hapa /screens, live plants/, aeration arrangement(aeration tubes and air stones), a sponge filter, meth- ylene blue and small net are essentially required for breeding.

Breeding tank set up:

Setting up of a new tank with ideal water conditions is prerequisite for successful breeding. The tank should be cleaned and sundried before filling with water. Water depth should be 8-12 inches. Live plants and well washed artificial spawning mops are placed in the tank for collecting eggs. Tank size should be maintained according to the size and number of brood fish. Tanks should be kept outside (sun light hits the tank water) to enhance the success rate of spawning and hatching. Simultane- ously the hatching tank should also be prepared for hatching facility.

Conditions that favour breeding are

-Length of the day.

-Low pressure weather.

-Change in water conditions especially temperature.

Spawning:

Brood fishes are first released in the morning hours in well repared breeding tank. On the same day in the evening hours, mature male Eggson plants and mops sh are introduced into the tank.

Male and female fish move in pairs for hours together. Male fish chas- s the female fish and male takes a position below the posterior region of the male for poking her abdomen. The female swims near the live plants and Dawning mops and releases eggs in batches. When the male notices the gs, it swims over the area and sprays the milt to fertilise them.

All the eggs are attached to the leaves of live plants and spawning mops because of adhesive nature. The fertilized eggs are translucent and unfertilised eggs are cloudy opaque in nature. Each female fish may lay 2,500-3,000 eggs in batches. Fungus will grow very quickly on the unfertilized eggs and the infection spreads very fast to the fertilized eggs too if the water is stagnant. Hence, water circulation and aeration are arranged. Gold fish have a tendency to eat their own eggs. The eggs are therefore removed from the tank as soon as possible and to transfer them into a separate tank already prepared for hatching.

Hatching:

The eggs are gently flushed in clean water before releasing into the hatching tank. The hatching tank should have similar water condition of the main breeding tank. The water depth should be maintained at 6-7 inches. Use heater to raise the temperature slowly if necessary (especially in indoortanks)Tank bottom is covered with fine sand or smooth gravel. Filteration system is essential for getting good realisation and better survival. Good aeration is needed for hatching. Add a few drops of methylene blue to the hatching tank water to avoid any fungal infections. Fertilized eggs hatch within 2-4 days depending on water temperature. Temperature range of 20°C -21°C is ideal for hatching. Newlyhatched hatchlings draw nourishment from their yolk sacs.

For the first couple of days young babies lie on the bottom of the tank or cling to the plants or walls of the container and show vertical move- ment due to weight of yolk sacs and do not need any food. Later they start swimming horizontally around and accept food as mouth clefts are formed by this time. Water circulation is maintained either by using a hapa in the tank or by arranging a screen of 40 mesh at the outlet. Arranging a 40 mesh hapa is a better option.

2.Betta (fighter fish)

Selection of brood fish and mature males:

Before breeding one should have an idea of the final tail type and colour to be achieved because the colour and tail type depend on selection of parent fish only.

Bright coloured and healthy fish are selcted for breeding. The bettas are Selected with long and undamaged fins to attract the female. The ideal age of the fish is 6-8 months for breeding. The brooder and mature male should be of 6-7 cm in length. It is preferable to have males and females approximately of same size and age for breeding purpose.

Feeding of mature fish:

Betta attains sexual maturity at the age of 6-8 months. Brooders and mature males should be well fed before releasing them in to the breeding tank. High protein live feeds such as Tubifex worms, black worms, and brine shrimp are fed.

Identification of male and female

Male:

Male betta fish develop brilliant colouration during breeding period. They have long flowing fins. The males are larger than females. Male betta fish have more distinct beard. They are very ag- gressive in nature.

Female:

Female bettas are not highly coloured when compared to males. Horizontal bars appear when they are stressed or frightened. Stripes and an egg spot will appear on the body during breeding period. The fins are very short in females.

Setting up of breeding tank:

Bettas are egg layers and bubble nest builders. So, the breeding tank should be setup accordingly. Tank with 20 litres of water with 3-5 inches of water level is suitable for breeding. Ideal temperature for breeding is 26.7°C. Care should be taken to avoid the toxic gases like ammonia and nitrite in the tank waters. Water movement should be kept minimal so that the bubble nest will not be disturbed Sponge filter and air pump are used in the tank. Floating plants or objects should be placed in a tank so that the bubble nest is adhered to the floating plants/objects and also protect the female from aggressive male. The tank is covered with plastic sheet to provide protection to fry from cold wind. Separate tanks are maintained to keep male and female bettas before breeding.

Spawning:

Males and females are introduced inthe tank 1:1 ratio. If any aggressive behaviour is observed, the female is removed and tried after a few days, Sufficient hiding places should be provided for the escape of female from male. Mating will begin by embracing each other. Male flip the female upside down to place the vent close to each to improve the chance of fertilization. Male starts building bubble nest to attract the female to copulate. Then female will release the eggs. While releasing the eggs, female look paralysed, float sideways looking almost dead. Male starts to scoops the eggs and put them in nest one by one. After recovery female may help the male to put the eggs in the nest but there is a chance of eating eggs by female. Hence, it is better to remove the female after releasing of eggs. Males look after the eggs until they hatch by mouthing them and blowing more bubbles. Sometimes it builds a new nest and moves all the eggs into it.