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# MARINE AQUARIA

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## ABSTRACT

There are many uses of maintaining marine aquaria. Considering the world trade of US\$ 4.5 billion, there is tremendous potential for exporting marine ornamental fishes from India. The sequences for setting up a marine aquarium such as designing and preparation of tank, biological filtration system, aeration, decoration of tanks, sterilization, lighting, maintaining water quality and feeding the fishes etc are discussed.

## INTRODUCTION

Tropical marine ornamental fishes have vivid and striking colouration, multitude of shapes and sizes and are amenable to the confinements of the aquarium. Developments in the aquarium design technology and accessories over the last decade made aquarium keeping relatively easier although it is still a cost intensive activity. Before setting up a marine aquarium one should understand some facts about these fishes and their habitat.

Marine fishes come from a very stable environment with a natural stability that cannot be exactly duplicated in the confines of the modest home aquarium. Their natural environment change very little and as a result marine fishes have not evolved a wider tolerance to cope with any such change. Most of the marine ornamental fishes are reef dwellers and simulating a reef in the aquarium with plenty of hideaway is essential for the maintenance of these fishes. A step-by-step practical sequence is given below for setting up a marine aquarium.

## PRACTICAL USES OF MARINE AQUARIA

### **Education**

Marine aquaria provide an opportunity to the common man to understand about the fragile biodiversity of our coastal waters. They give an idea about the habitat, movement, feeding habits, breeding habits and inter-species relationship. Marine aquaria are learning centres where rare and sensitive animals are displayed with an objective of imparting information about our marine ecosystem to the children, scholars, teachers and general public.

### **Developing hatchery technologies and creating employment in the rural sector**

Marine aquaria function as an excellent broodstock rearing facility. Central Marine Fisheries Research Institute has developed the Vizhinjam Marine Aquarium as its broodstock rearing facility for many species of clownfishes and damselfishes and as a result breeding technologies have been developed for these species making CMFRI as a pioneer in the field of ornamental fish

research. All over the world marine aquaria are functioning as breeding centres of rare and commercially important marine ornamental fishes. Considering the world trade of \$ 4.5 billion in ornamental fish trade there is tremendous potential for exporting marine ornamental fishes from India. However, wild caught marine ornamental fishes, if exported, will result in the destruction of reef ecosystem as witnessed in many Asian countries. The only alternative is to develop hatchery technologies of marine ornamentals and export them to the international market. Such a strategy will give India a cutting edge in marine ornamental fish trade in the world market. Coupled with this, a planned development in the freshwater ornamental fish culture will give immense employment opportunity to the rural people.

Many people have a false notion that marine aquaria are difficult to maintain and unaffordable to the ordinary man. This was infact true many years ago. But studies conducted recently enabled us to develop relatively simple techniques for maintaining these fishes in the aquaria. Equipments required for aquara maintenance is available at relatively cheaper rates in the internal markets now and marine ornamental fishes are also available in many aquaria shops now. All these factors help us in setting up marine aquaria at affordable rates.

## **DESIGNING AND PREPARING THE TANK**

Marine aquaria need to be sufficiently large so that even if some minor problems occur it will not largely affect the fishes. Tanks can be designed for individual requirements suiting every interior. Tanks can be fabricated using suitably thick glass using silicone sealant. After pasting and drying, the excess sealant is removed and washed thoroughly with salt water. If the tank is to be placed against a wall, the backside can be painted blue or a background poster showing coral reefs and fishes can be used. Once the tank is ready, it can be placed on a suitable stand or platform. While selecting a stand care must be taken to provide sufficient space in the stand for housing the external equipments. This will give a neat and tidy look to the tank.

### **Biological filtration system**

Biological filtration system is an essential part of the marine aquarium. The filter plate must cover the whole of aquarium and the height from the bottom glass should be at least one inch. This will ensure maximum filtration and also reduce anaerobic pockets.

Fit the airlift tubes and make sure that they are firmly attached to the filter plate. In air operated filters the airline should be connected to the bottom portion of the airlift tube. Connect the other airlift tube also similarly. If you are using a power assisted biological filter connect the power head to the top portion of the airlift tube allowing the pump to remain underwater. If you are using an external power filter connect the flow pipe to the top of the tube at a later stage.

### **Adding the filter bed and tank decorations**

Coral sand and thoroughly cleaned corals are ideal for using as bed material and decorations. Corals and coral sand also helps to maintain the pH in the tank. Coral sand and corals may contain dead organisms hence they need thorough cleaning before using it in the tank. Spread the

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biggest pieces over the biological filter to an even depth (2-3 inches) and place a plastic general tidy mesh over this material to prevent the fine sand seeping down and clogging the filter plate. Add more substrate towards the backside so as to give a gentle slope towards the front. Now it is time for you to add coral pieces and rocks as decorations. The best way to decorate your tank is by building a reef in your tank. Sceneries of coral reefs are available in all the aquarium shop for using as background pictures. Take one as your model and try to re-create it in your tank. Care may be taken to provide plenty of hide away in the reef. This will help the fish to take shelter during night hours.

### **Heating and aeration**

Heating may be required during the winter months and also when fishes are having infections. Combined heater thermostat unit are available in the market. Select one depending upon your tank size. Each heater is provided with plastic clips and suction discs. Using this connect the heater diagonally on the back glass wall. Adjust the thermometer for your tank's requirement. Connect the supply wires to the plug pins provided in the aquarium top.

Aeration helps to increase the oxygen content of the water. Low O<sub>2</sub> levels stress the fishes, which will result in decreased level of feeding, diseases and eventual death. Aerators of various capacities are available in single lobe and double lobe models. Take one with sufficient air output and of less vibration and sound. Air pump may be placed above the water level to prevent water flowing back in to the air tube when the power is off. You can also use a no-return valve in the airline. Place the air stone in the back of the tank behind the corals and conceal it completely but reasonably accessible for cleaning and replacing the air stone.

## **OTHER FILTRATION EQUIPMENTS**

There are different types of internal and external filtration equipments.

### **Internal filters**

Most of the internal filters are mechanical filters and some are provided with "Bio balls" to partly perform as a biological filter also. Internal filters when fitted may be selected according to its pumping output. Select a filter, which will filter the entire volume of water at least once every hour. Use good quality suction discs to attach the filter on to the glass wall of the aquarium and connect the filter to the plug pin socket provided in the aquarium top.

### **External canister filter**

External canister filters perform mechanical, chemical and biological filtration of the tank water and thereby maintain the aquarium in excellent condition. External canister filters will have three types of filter media. (1) Filter sponge or floss on the top to remove floating or suspended dirt materials, (ii) Activated carbon for chemical filtration to remove dissolved noxious gases (ammonia, H<sub>2</sub>S etc.) and (iii) Ceramic pieces or bio balls for Biological filtration using nitrobactor and nitrosobactor bacteria attached to the ceramic pieces or bio balls. The water from

the tank flows into the tank by gravitational force and returned to the tank by the pumping action of the pump in the filter. External filters can be fitted in two ways.

- i) In one method, the tank water is drawn through the filter bed to the canister and returned into the tank directly. This method increases the efficiency of the biological filter. This method is commonly used in all aquariums.
- ii) In the another method, the tank water is drawn directly from the tank and the return flow is directed in to the airlift pipes of the biological filter. Under this method there is always a gentle current from the bottom of the tank to the top and all waste materials are brought in to the tank water, which is removed from it by the intake pipes. A spray bar may be used to distribute the return flow uniformly across the top of the tank. This will help to dispense the carbon dioxide and also provide additional aeration in the tank. External canister filters may be fitted away from the tank but below the water level.

### **Ultraviolet sterilizers**

Ultra violet sterilizer uses U.V. radiation to destroy harmful pathogenic organisms present in the water. There are different models available in the market; one can be selected according to the water volume of the tank. U.V. sterilizer can be fitted slightly away from the tank in the rear side or on the aquarium top. When an external canister filter is connected to the tank the return flow pipe can be connected to the U.V. sterilizer and sterilized water can be sent back to the tank. Care must be taken to replace the U.V. lamp once its life is exhausted.

### **Protein skimmers**

The organic matter from aquarium water is skimmed off by making use of the natural tendency of the surface active dissolved organic matter to stick to the air molecules. When air-water interface is created within the aquarium water, organic matter is removed. Air bubbles are introduced in to the vertical tube of the protein skimmer (contact tube). The organic matter is absorbed by the air and is carried to the top of the skimmer. Here the foam collapses in to a yellowish liquid, which is then discarded. Protein skimmers help the water to remain clear and clean.

### **Ozonizer**

Ozone ( $O_3$ ) is an unstable form of oxygen ( $O_2$ ). The extra atom of oxygen readily separates from the molecules and oxidizes toxins and other compounds in the aquarium water. The oxidizing action also makes ozone an effective disinfectant. It kills the bacteria and other free-swimming microorganisms that come into close contact with the air. Ozone is produced by passing air over an electrical discharge in a device known as ozonizer. Ozone should not be used directly inside the tank but can be used in a protein skimmer or an external canister filter.

## **LIGHTING**

In a reef aquarium you need to encourage the growth of desirable algae, which requires very good illumination in the tank. But if you want maintaining only a clinical tank diffused lighting will be sufficient.

## Types of lighting

**Tungsten Lighting:** Ordinary house hold incandescent lights can be used in aquaria which is cheap in cost, but the main problem is that they do not provide optimum light spectrum for plant growth. Moreover unwanted heat will be generated in the aquarium.

**Fluorescent lighting:** Fluorescent lights are the most suitable form of aquarium lighting. They give an even light and is cheap to run and do not generate heat in the tank. Fluorescent lights are available in different light spectrum outputs. For example Growlux tubes are designed to promote plant growth and they have the red and blue parts of the colour spectrum accentuated. These lights also give the fishes more intensified colours, although the overall light output is low. Actinic tubes provide ultraviolet light, which is important for invertebrates in the aquarium. When used in association with conventional tube lights, they make the fishes highly attractive.

**Spotlights:** When light is required at specific targets spotlights can be used. For example sea anemones and some other invertebrates requires very good amount of light and a spotlight will enhance their growth and colouration. Suitable spotlights can be chosen from a variety of types, including mercury vapour, metal halide, high-pressure sodium discharge etc.

### Mercury vapour lamp

These lights give a bluishwhite appearance and give a seabed effect. However, these lamps will not exhibit the fishes in their best colours.

### Metal halide lamps

Metal halide lamps are also referred to as tungsten-halide lamps or quartz halogen lamps. They produce more intense light than ordinary tungsten light. Tungsten evaporated from the filament at high operating temperature combines with the halogen vapour within the quartz envelop of the lamp.

## PREPARING THE WATER AND FILLING THE TANK

For preparing sea water, synthetic salts are available in the market. Before mixing up the salt calculate the water volume of the tank and then prepare exactly equal quantity of water. To produce thousand liters of waters you required 35 kg salts. Since the synthetic salt are very costly, seawater, if accessible, is advised for marine aquarium setting.

When natural seawater is used care must be taken not to collect it from the surf region as it can contain faecal and other organic contaminants. Collect the water from slightly offshore area. Filter this water to remove all suspended particles and store it in a black container for a few days. All suspended particles will settle in the bottom and you can remove the water without disturbing the bottom. Salinity of the water may be tested on a weekly basis to make sure that the salinity remained between 33.7% to 36.3% (specific gravity: 1.025 to 1.027) in the aquarium. Fluctuations in salinity can give physiological stress to the fishes that eventually leads to

diseases. A variation in salinity and specific gravity occurs due to evaporation. Only pure water is lost due to evaporation and these losses should be compensated with freshwater.

### **pH of water**

The pH of the water is a measure of acidity or alkalinity. It is measured on a logarithmic scale. Values below 7 are acidic in nature and above 7 are alkaline in nature. The pH should be maintained between 7.9 to 8.3. A fall in pH indicates the aging of the water and at least 20% of the tank water should be changed immediately.

### **Maintaining water quality**

Marine fishes are highly intolerant to poor water quality and sudden changes made in the medium. New fishes when introduced in to an already existing tank succumb to diseases although it may not affect the resident fishes. The marine aquarium needs regular monitoring of pH, ammonia, nitrite, copper etc. Relevant kits are available in the market to test various parameters. The best way to maintain salinity is to mark the water level when the tank is initially set and top up any water loss by using freshwater (not seawater) periodically. Periodic checking up of the above parameters with regular water topping will ensure healthy life of the fishes.

### **Filling the tank**

Whether you are using synthetic salt or natural seawater, allow the water to mature and then use it for filling up the tank. Place a small basin bucket in the middle of the tank and pour the water into it gently. Allow the water to overflow the basin and slowly fill up the tank without disturbing the corals and other decorations. Allow the water level to rise to the maximum.

### **Final check up**

Fill up the external canister filter and U.V. sterilizer directing water through the return flow pipe. This is a simple process best achieved by removing the return tube to the aquarium at the appliance end and sucking at the outlet from the filter or sterilizer. When water is filled, reconnect the return tubes, making sure that all water hose connections are tight. Connect the supply cable from the top panel to the mains and switch on.

Adjust the airflow from the air pumps to operate the biological filter and air stones. Check the functioning of the power heads, canister filter and U.V. sterilizer. Put on the lights. Allow your tanks to run for a few days. Check the pH, ammonia, salinity and oxygen levels in the tank. Under normal circumstances in a new tank ammonia levels tend to rise and then to stabilize. If the biological filter is provided with a doze of cultured bacteria, ammonia in the tank gets oxidized into nitrites and then to nitrates very fast and under such condition tanks tend to stabilize much faster. Once the tank is stabilized you can introduce fishes into the tank.

### **Introducing fishes**

In a new tank it is advisable to introduce new fishes in a single batch. Condition the tank temperature with that of the fish bag, which can be done by keeping the fish bag in the tank for about 30 minutes and then allow the fishes to swim into the tank. Never allow the water inside the

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bag to flow into the tank. Observe the fishes carefully to see whether any fish is under stress. If any fish is showing signs of stress immediately remove it. While selecting the fishes, select fishes without injuries and diseases. If the fishes are happy inside the tank they will be swimming leisurely exploring the coral crevices and other decorations.

### **Compatibility**

Some fishes exhibit aggressive territorialism even in the confines of aquarium. Very often aggressiveness does not show itself when the tank is brightly lit but when the lights are turned off and the fishes settle down for the night, territorial squabbles may occur. This is the reason for providing enough swimming space and an array of refuges for all the fishes in the tank.

### **Feeding**

Open water feeders feed confidently, taking feed in midwater or from the tank bed. Whereas reef grazers confine feeding to the reef wall and crevices. Some may hide in the crevices during daytime and occasionally come out and feed. Sedentary organisms are unable to move out and feed and hence they are to be fed regularly.

## **SOURCES OF FOOD**

**Prepared foods:** Prepared foods can be used in many ways. Flaked foods are easy to use. Larger fishes accept large flakes but for smaller fishes the flakes need it to be crushed. Tablet form of food or suspension foods are also available in the market.

**Fresh meat foods:** Meat of mussel, prawn, crab and fish is ideal. Although there is a chance of fouling the water, the main advantage of feeding with fresh meat is that they contain valuable trace elements.

**Frozen foods:** Many types of frozen feed are produced commercially for fish keepers which provide the bulk of the diet for many fishes. Ideal frozen food include mysis, krill, cyclops, tubifex worms, squid, clam and crab eggs. Commercial packers freeze it with gamma ray to ensure that it is free from pathogens. The advantage of frozen food is that it can be stored and used later if the food is not readily available.

**Freeze dried foods:** The freeze drying process has made it possible to preserve many natural foods for fish in captivity. Small aquatic animals such a tubifex worms, bloodworms, brine shrimp and krill are available in freeze dried form and provide an excellent alternative to flaked food.

**Live foods:** Many live foods fed to freshwater fishes can also be used in marine system. Marine fishes will accept daphnia, tubifex worms or chopped earthworms, brine shrimps and prawns. Juveniles are an excellent disease free and nutritious food for marine fishes. Live freshwater fish fry also can be used as an excellent live feed. Care must be taken not to give sick fishes as feed.

**Fresh vegetable foods:** It is essential to give vegetable material in the marine fish diet, since many fishes are naturally herbivores. Algae provide the most natural form of vegetable food for marine fishes. Algae can be grown in the marine aquarium or in a small aquarium separately. You can scrape algae from the rocks and use as food.

**Feeding methods:** It is important to understand the feed requirement of the fishes before evolving a feeding method. The best method will be feeding little by little until the fishes stop taking any more feed. Feeding may be restricted to once or twice a day. Always remove the wastes of previous feeding before feeding fresh foods. Sea anemones need not be fed as frequently as fishes. One way of encouraging other fishes to feed is to use trained fishes. Sergeant majors and damsels are excellent trainer fishes.

## REGULAR MAINTENANCE

A daily checking of all parameters in your tank will help you to maintain your aquarium in excellent condition. There are a number of checks to do daily. These are : i. Head count, ii. Temperature (24 -28), iii. pH-level should be between 7.9 to 8.3, iv. Ammonia, v. Nitrite, vi. Specific gravity (when fresh toppings are done make sure specific gravity is between 1.020 to 1.023).

## Emergency measures

There are a number of emergency situations an aquarist can face like power failures, equipment failure, tank damage etc. Always have one or two battery operated aerator to tideover power failure. A large bin of 100-150 litre capacity may be kept available for meeting any contingency of tank damage.