CONSTRUCTION AND MANAGEMENT OF AQUARIUM

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CERTIFICATION

This project has been read and approved as meeting the requirement for the award of National Diploma (ND) in Agricultural Technology, Institute of Applied Science (IAS), Kwara State Polytechnic, Ilorin, Kwara State, Nigeria

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DEDICATION

I dedicate this project to Almighty God who has been there right from the beginning to this very point, special dedication also to my ever supportive parents, Mr & Mrs Olaleye and my lovely brother, Olaleye Fisayo, for their relentless support and compassion towards me during my academic section.

Further more, l want to dedicate this project report to my supervisor, Mrs Alege Omowumi Rkayat. and lectures for their continual impact of knowledge.

To God be the Glory.

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I also want to thank my dear family, whose unwavering encouragement, financial assistance, tolerance, and understanding have been the cornerstone of my success.

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ABSTRACT

This project focuses on the construction and management of a sustainable aquarium, highlighting the intricate balance between aquatic life and ecosystem maintenance. The aquarium's design incorporates advanced filtration systems, water quality monitoring, and species selection to create a thriving environment for diverse aquatic species. Effective management strategies, including water parameter control, feeding regimes, and habitat maintenance, ensure the health and well-being of the aquatic inhabitants. This project demonstrates the importance of careful planning, precise execution, and ongoing management in creating a thriving aquatic ecosystem, providing valuable insights for aquarium enthusiasts, researchers, and conservationists.By implementing effective management strategies, this aquarium promotes the health and well-being of its inhabitants, serving as a valuable resource for aquatic enthusiasts and researchers.

Through careful design, species selection, and ongoing maintenance, this aquarium provides a thriving environment for diverse aquatic species, highlighting the importance of conservation and sustainability in aquatic ecosystems.

CHAPTER ONE

1.1 INTRODUCTION TO AQUARIUM

Constructing an aquarium can be a rewarding hobby, providing a unique environment for aquatic life. When planning and designing an aquarium, it's essential to determine the size and type of tank you want, whether it's freshwater, saltwater, or reef. According to AquaHabitat (2022), choosing a suitable location for the aquarium is crucial, taking into account factors such as space, lighting, and electrical outlets.

Once you've planned your aquarium, it's time to choose the right equipment. The Aquarium Guide (2020) recommends selecting a suitable tank and stand that fits your space and budget. A reliable filtration system is also essential, and Aquarium Co-op (2021) suggests choosing a canister filter or sump filter, depending on your tank's specific needs. Lighting is another critical aspect, and The Spruce Pets (2023) recommends using LED or T5 lighting to promote healthy growth and vibrant colors.

After setting up your aquarium, it's crucial to cycle the tank to establish beneficial bacteria. According to Aquarium Science (2024), cycling the aquarium involves monitoring water parameters such as ammonia, nitrite, and nitrate levels. This process can take several weeks, but it's essential for creating a healthy environment for your aquatic life.Once your aquarium is cycled, you can introduce fish and other aquatic animals gradually. The Aquarium Guide (2020) suggests adding decorations such as plants, rocks, and driftwood to create a natural environment. With proper care and maintenance, your aquarium can thrive, providing a beautiful and fascinating display of aquatic life.

2 1.2 STATEMENT OF THE RESEARCH PROBLEM

The construction and maintenance of an aquarium enhances efficiency in the line of farming and reproduction; this research work is tailored to identifying diverse techniques, methods and styles of constructing and managing an aquarium. Thus, it is paramount to identify the most suitable and efficient approach to aquarium tech. that can withstand contemporary challenges.

1. 3 OBJECTIVES OF THE STUDY

The objective of this study is to evaluate the maintenance of an aquarium through avoidance of negative side effects in water quality and prevention of algae growth and diseases for an improved ecosystem.

1.4 SIGNIFICANT OF THE STUDY

The study aims at exploring diverse contemporary approaches to the construction of an aquarium and evaluating efficient method to maintaining disease free ecosystem for the sustainability of such an aquatic life.

However, it will also serve as reference material to any scholar in exploration of techniques to constructing and maintaining a conducive aquarium for aquatic lives.

1.5 SCOPE OF THE STUDY

The study tends to cover approaches to constructing and managing an aquarium in exploration of efficient techniques to the sustainability of conducive ecosystem for aquatic lives.

1.6 LIMITATION OF THE STUDY

The study is limited to aquatic lives in the habitat of an aquarium; it also tends to identify different methods and styles for an efficient ecosystem in aquarium management.

1.7 DEFINITION OF TERMS

a) **Aquatic**: The word ‘aquatic’ basically means living or growing in water. It is referred to in biology teaching subjects. On Earth, we have a range of habitats that are made up of water, such as seas, oceans, rivers, lakes, and ponds. In an aquatic system, all the organisms live in or on the water.

b) **Aquarium**:A container (such as a glass tank) or an artificial pond in which living aquatic animals or plants are kept.

2: an establishment where aquatic organisms are kept and exhibited.

c) **Construction**: A sculpture that is put together out of separate pieces of often disparate materials

d) **Management**: The act or art of managing: the conducting or supervising of something

e) **Ecosystem**: The complex of a community of organisms and its environment functioning as an ecological unit

f) **Disease**: A condition of the living animal or plant body or of one of its parts that impairs normal functioning and is typically manifested by distinguishing signs and symptoms

e) **Algae**: Any of a diverse group of chiefly photosynthetic and aquatic plantlike organisms that range from unicellular to large multicellular forms, are typically classified as protists, and include the green, yellow-green, brown, golden-brown, and red algae in the eukaryotes and especially formerly the cyanobacteria in the prokaryotes.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 INTRODUCTION TO THE CONSTRUCTION OF AQUARIUM

The construction of a contemporary aquarium requires interdisciplinary expertise, balancing engineering, biology, sustainability, and visitor engagement. Below is a synthesis of recent scholarly perspectives on critical aspects of aquarium design and operation:

1. Design and Structural Integrity

Modern aquariums prioritize robust structural systems to withstand water pressure and environmental stressors. Acrylic panels are favored over glass due to their lightweight nature, optical clarity, and flexibility (Smith & Lee, 2021). Recent advances in polymer technology enable seamless, curved exhibits that enhance immersive experiences while maintaining safety. Spatial zoning—separating public areas from filtration and life-support infrastructure—is essential for operational efficiency.

2. Life Support Systems (LSS)

Aquarium ecosystems depend on advanced LSS to replicate natural habitats. Recirculating aquaculture systems (RAS) are now standard, integrating mechanical filtration, protein skimmers, and UV sterilization to maintain water quality. Energy-efficient pumps and automated monitoring tools reduce operational costs and mitigate risks of system failure.

3. Animal Welfare and Habitat Simulation Scholars emphasize ethical stewardship in aquarium construction.

4. Visitor Experience and Education

Interactive exhibits, augmented reality (AR), and tactile zones enhance educational outcomes. Acoustics and lighting must be calibrated to avoid disturbing aquatic life while ensuring visitor comfort.

5. Sustainability Practices

Energy Efficiency: Solar panels and seawater heat pumps can reduce energy consumption by up to 40% .

Water Conservation: Rainwater harvesting and closed-loop systems minimize freshwater use.

Eco-Materials: Recycled steel and low-carbon concrete are increasingly adopted to reduce construction footprints.

The construction of a modern aquarium demands a holistic approach, integrating cutting-edge engineering, ecological sensitivity, and visitor-centric design. As Johnson (2023) notes, aquariums must evolve from “specimen displays” to conservation hubs, aligning with global sustainability goals.

2.1.2 Water quality

Quality of water is one of the most significant factors to be considered in aquarium selection. It should be investigated by taking a number of water samples from the proposed water source for laboratory analyses of physical, chemical, biological and micro-biological properties, including health hazards. Water test procedures should be in accordance with the relevant Standard Classification in the country on water quality. From a production point of view, emphasis should be placed on the following:

(i) Physical properties – temperature, colour, odour, turbidity, transparency, suspended solids.

(ii) Chemical properties – pH, dissolved oxygen, biochemical oxygen demand, free carbon dioxide, alkalinity, salinity, dissolved solids, ammonia, all as regards both useful and toxic qualifies; also whether pollutants of agricultural or industrial origin are present, and if so, to what extent.

(iii) Biological properties – quality and density of plankton. (iv) micro-biological properties – species and quantity of parasites.

2.2.3 Water conditions

Saltwater is typically alkaline, while the pH (alkalinity or acidicity) of fresh water varies more. Hardness measures overall dissolved mineral content; hard or soft water may be preferred. Hard water is usually alkaline, while soft water is usually neutral to acidic. Dissolved organic content and dissolved gases content are also important factors.

Home aquarists typically use tap water supplied through their local water supply network to fill their tanks. Straight tap water cannot be used in localities that pipe chlorinated water. In the past, it was possible to "condition" the water by simply letting the water stand for a day or two, which allows the chlorine time to dissipate. However, chloramine is now used more often and does not leave the water as readily.).

Some aquarists modify water's alkalinity, hardness, or dissolved content of organics and gases, before adding it to their aquaria. This can be accomplished by additives, such as sodium bicarbonate, to raise pH. Some aquarists filter or purify their water through deionization or reverse osmosis prior to using it. In contrast, public aquaria with large water needs often locate themselves near a natural water source (such as a river, lake, or ocean) to reduce the level of treatment. Some hobbyists use an algae scrubber to filter the water naturally.

Water movement can also be important in simulating a natural ecosystem. Aquarists may prefer anything from still water up to swift currents, depending on the aquarium's inhabitants. Water movement can be controlled via aeration from air pumps, powerheads, and careful design of internal water flow (such as location of filtration system points of inflow and outflow) (Crosswell, Tom 2009).

2.1.4 Hydrological characteristics

The most important data needed for aquarium selection can be gathered from such sources as Irrigation Departments or other Water Authorities. The following are needed:

Data for discharge, yield, floods and water elevations of existing water sources (rivers, irrigation channels, reservoirs, springs, etc.).

2.1.4 Materials for the construction

Most aquaria consist of glass panes bonded together by 100% silicone sealant, with plastic frames attached to the upper and lower edges for decoration. The glass aquarium is standard for sizes up to about 1,000 litres (260 US gal; 220 imp gal). However, glass as a material is brittle and has very little give before fracturing, though generally the sealant fails first. Aquaria are made in a variety of shapes, such as cuboid, hexagonal, angled to fit in a corner (L-shaped), and bow-front (the front side curves outwards). Fish bowls are generally either made of plastic or glass, and are either spherical or some other round configuration in shape.

The very first modern aquarium made of glass was developed in the 19th century by Robert Warrington. During the Victorian age, glass aquariums commonly had slate or steel bottoms, which allowed them to be heated underneath by an open-flame heat source. These aquariums had the glass panels attached with metal frames and sealed with putty. Metal-framed aquariums were still available until the mid-1960s, when the modern, silicone-sealed style replaced them. Acrylic aquariums first became available to the public in the 1970s. Laminated glass is sometimes used, which combines the advantages of both glass and acrylic.

Glass aquaria have been a popular choice for many home and hobbyist aquarists for many years. Once silicone sealant became strong enough to ensure a long-term water-tight seal, it eliminated the need for a structural frame. In addition to lower cost, glass aquaria are more scratch resistant than acrylic. Although the price is one of the main considerations for aquarists when deciding which of these two types of aquaria to purchase, for very large tanks, the price difference tends to disappear.

Acrylic aquaria are now the primary competitor with glass. Prior to the invention of UV stabilization, early acrylic aquaria discolored over time with exposure to light; this is no longer the case. Acrylic is generally stronger than glass, weighs less, and provides a certain amount of temperature insulation. In colder climates or environments, it is easier to achieve and maintain a tropical temperature and requires less capacity from an aquarium heater. Acrylic-soluble cements are used to directly fuse acrylic together. Acrylic allows for the formation of unusual shapes, such as the hexagonal tank. Compared to glass, acrylics are easier to scratch; but unlike glass, it is possible to polish out scratches in acrylic.

2.1.6 Styles adopted in building Aquarium tank

Objects used for aquariums include: coffee tables, sinks, gumball machines and even toilets. Another such example is the MacQuarium, an aquarium made from the shell of an Apple Macintosh computer. In recent years, elaborate custom-designed home aquariums costing hundreds of thousands of dollars have become status symbols—according to The New York Times, “among people of means, a dazzling aquarium is one of the last surefire ways to impress their peers.”

2.1.7 Aquarium size and volume

An aquarium can range from a small glass bowl containing less than 1 litre of water to immense public aquaria that house entire ecosystems such as kelp forests. Relatively large home aquaria resist rapid fluctuations of temperature and pH, allowing for greater system stability. Beginner aquarists are advised to consider larger tanks to begin with, as controlling water parameters in smaller tanks can prove difficult.

Unfiltered bowl-shaped aquaria are now widely regarded as unsuitable for most fish. Advanced alternatives are now available. In order to keep water conditions at suitable levels, aquariums should contain at least two forms of filtration: biological and mechanical. Chemical filtration should also be considered under some circumstances for optimum water quality. Chemical filtration is frequently achieved via activated carbon, to filter medications, tannins, and/or other known impurities from the water.

Reef aquaria under 100 litres, have a special place in the aquarium hobby; these aquaria, termed nano reefs (when used in reefkeeping), have a small water volume, under 40 litres .

Practical limitations, most notably the weight of water (1 kilogram per litre) and internal water pressure (requiring thick glass siding) of a large aquarium, restrict most home aquaria to a maximum of around 1 cubic metre in volume (1000 L, weighing 1,000 kg or 2,200 lb). Some aquarists, however, have constructed aquaria of many thousands of litres.

Public aquariums designed for exhibition of large species or environments can be dramatically larger than any home aquarium. The Georgia Aquarium, for example, features an individual aquarium of 6,300,000 US gallons (24,000 m3).

2.1.8 Aquarium Components

Filtration system in a typical aquarium: (1) intake, (2) mechanical filtration, (3) chemical filtration, (4) biological filtration medium, (5) outflow to tank

The typical hobbyist aquarium includes a filtration system, an artificial lighting system, and a heater or chiller depending on the aquarium’s inhabitants. Many aquaria incorporate a hood, containing the lights, to decrease evaporation and prevent fish from leaving the aquarium (and anything else from entering the aquarium).

Combined biological and mechanical aquarium filtration systems are common. These either convert ammonia to nitrate (removing nitrogen at the expense of aquatic plants), or to sometimes remove phosphate. Filter media can house microbes that mediate nitrification. Filtration systems are sometimes the most complex component of home aquaria.

Aquarium heaters combine a heating element with a thermostat, allowing the aquarist to regulate water temperature at a level above that of the surrounding air, whereas coolers and chillers (refrigeration devices) are for use anywhere, such as cold water aquaria, where the ambient room temperature is above the desired tank temperature. Thermometers used include glass alcohol thermometers, adhesive external plastic strip thermometers, and battery-powered LCD thermometers. In addition, some aquarists use air pumps attached to airstones or water pumps to increase water circulation and supply adequate gas exchange at the water surface. Wave-making devices have also been constructed to provide wave action.

An aquarium's physical characteristics form another aspect of aquarium design. Size, lighting conditions, density of floating and rooted plants, placement of bog-wood, creation of caves or overhangs, type of substrate, and other factors (including an aquarium’s positioning within a room) can all affect the behavIor and survival of tank inhabitants.

An aquarium can be placed on an aquarium stand. Because of the weight of the aquarium, a stand must be strong as well as level. A tank that is not level may distort, leak, or crack. These are often built with cabinets to allow storage, available in many styles to match room décor. Simple metal tank stands are also available. Most aquaria should be placed on polystyrene to cushion any irregularities on the underlying surface or the bottom of the tank itself that may cause cracks.

2.1.9 Aquarium maintenance

Large volumes of water enable more stability in a tank by diluting effects from death or contamination events that push an aquarium away from equilibrium. The bigger the tank, the easier such a systemic shock is to absorb, because the effects of that event are diluted. For example, the death of the only fish in a 11-litre, tank causes dramatic changes in the system, while the death of that same fish in a 400-litre tank with many other fish in it represents only a minor change. For this reason, hobbyists often favor larger tanks, as they require less attention.

Several nutrient cycles are important in the aquarium. Dissolved oxygen enters the system at the surface water-air interface. Similarly, carbon dioxide escapes the system into the air. The phosphate cycle is an important, although often overlooked, nutrient cycle. Sulfur, iron, and micronutrients also cycle through the system, entering as food and exiting as waste. Appropriate handling of the nitrogen cycle, along with supplying an adequately balanced food supply and considered biological loading, is enough to keep these other nutrient cycles in approximate equilibrium.

An aquarium must be maintained regularly to ensure that the fish are kept healthy. Daily maintenance consists of checking the fish for signs of stress and disease. Also, aquarists must make sure that the water has a good quality and it is not cloudy or foamy and the temperature of the water is appropriate for the particular species of fish that live in the aquarium.

2.2 Nitrogen cycle

Of primary concern to the aquarist is management of the waste produced by an aquarium's inhabitants. Fish, invertebrates, fungi, and some bacteria excrete nitrogen waste in the form of ammonia (which converts to ammonium, in acidic water) and must then either pass through the nitrogen cycle or be removed by passing through zeolite. Ammonia is also produced through the decomposition of plant and animal matter, including fecal matter and other detritus. Nitrogen waste products become toxic to fish and other aquarium inhabitants at high concentrations. In the wild, the vast amount of water surrounding the fish dilutes ammonia and other waste materials. When fish are put into an aquarium, waste can quickly reach toxic concentrations in the enclosed environment unless the tank is cycled to remove waste (Kingson, 2010).

2.2.0 The process

A well-balanced tank contains organisms that are able to metabolize the waste products of other aquarium residents. This process is known in the aquarium hobby as the nitrogen cycle. Bacteria known as nitrifiers (genus Nitrosomonas) metabolize nitrogen waste. Nitrifying bacteria capture ammonia from the water and metabolize it to produce nitrite. Nitrite is toxic to fish in high concentrations. Another type of bacteria (genus Nitrospira) converts nitrite into nitrate, a less toxic substance. (Nitrobacter bacteria were previously believed to fill this role. While biologically they could theoretically fill the same niche as Nitrospira, it has recently been found that Nitrobacter are not present in detectable levels in established aquaria, while Nitrospira are plentiful.) However, commercial products sold as kits to "jump start" the nitrogen cycle often still contain Nitrobacter.

2.2.1 Biological load

The biological load, or bioload, is a measure of the burden placed on the aquarium ecosystem by its inhabitants. High biological loading presents a more complicated tank ecology, which in turn means that equilibrium is easier to upset. Several fundamental constraints on biological loading depend on aquarium size. The water's surface area limits oxygen intake. The bacteria population depends on the physical space they have available to colonize. Physically, only a limited size and number of plants and animals can fit into an aquarium while still providing room for movement. Biologically, biological loading refers to the rate of biological decay in proportion to tank volume. Adding plants to an aquarium will sometimes help greatly with taking up fish waste as plant nutrients. Although an aquarium can be overloaded with fish, an excess of plants is unlikely to cause harm. Decaying plant material, such as decaying plant leaves, can add these nutrients back into the aquarium if not promptly removed.

2.2.2 Calculating capacity

Limiting factors include the oxygen availability and filtration processing. Aquarists have rules of thumb to estimate the number of fish that can be kept in an aquarium. The examples below are for small freshwater fish; larger freshwater fishes and most marine fishes need much more generous allowances.

- 3 cm of adult fish length per 4 litres of water (i.e., a 6 cm-long fish would need about 8 litres of water).[60]

- 1 cm of adult fish length per 30 square centimetres of surface area.

- 1 inch of adult fish length per US gallon of water.

- 1 inch of adult fish length per 12 square inches of surface area.

2.2.3 Other factors affecting capacity

One variable is differences between fish. Smaller fish consume more oxygen per gram of body weight than larger fish. Labyrinth fish can breathe atmospheric oxygen and do not need as much surface area (however, some of these fish are territorial, and do not appreciate crowding). Barbs also require more surface area than tetras of comparable size.

Oxygen exchange at the surface is an important constraint, and thus the surface area of the aquarium matters. Some aquarists claim that a deeper aquarium holds no more fish than a shallower aquarium with the same surface area. The capacity can be improved by surface movement and water circulation such as through aeration, which not only improves oxygen exchange, but also waste decomposition rates.

Waste density is another variable. Decomposition in solution consumes oxygen. Oxygen dissolves less readily in warmer water; this is a double-edged sword since warmer temperatures make fish more active, so they consume more oxygen.

In addition to bioload/chemical considerations, aquarists also consider the mutual compatibility of the fish. For instance, predatory fish are usually not kept with small, passive species, and territorial fish are often unsuitable tank mates for shoaling species. Furthermore, fish tend to fare better if given tanks conducive to their size.

For planted freshwater aquariums, it is also important to maintain a balance between the duration and quality of light, the amount of plants, CO2 and nutrients. For a given amount of light, if there is insufficient number of plants or insufficient CO2 to support the growth of those plants, so as to consume all the nutrients in the tank, the result would be algae growth.

2.2.4 Aquarium classifications

From the outdoor ponds and glass jars of antiquity, modern aquaria have evolved into a wide range of specialized systems. Individual aquaria can vary in size from a small bowl large enough for only a single small fish, to the huge public aquaria that can simulate entire marine ecosystems.

Another classification is by temperature range. Many aquarists choose a tropical aquarium because tropical fish tend to be more colorful.[64] However, the coldwater aquarium is also popular, which is mainly restricted to goldfish, but can include fish from temperate areas worldwide and native fish keeping.

Aquaria may be grouped by their species selection. The community tank is the most common today, where several non-aggressive species live peacefully. In these aquaria, the fish, invertebrates, and plants probably do not originate from the same geographic region, but tolerate similar water conditions. Aggressive tanks, in contrast, house a limited number of species that can be aggressive toward other fish, or are able to withstand aggression well. Most marine tanks and tanks housing cichlids have to take the aggressiveness of the desired species into account when stocking. Specimen tanks usually only house one fish species, along with plants, perhaps ones found in the fishes' natural environment and decorations simulating a natural ecosystem. This type is useful for fish that cannot coexist with other fish, such as the electric eel, as an extreme example. Some tanks of this sort are used simply to house adults for breeding (Raskoff et al 2005).

Ecotype, ecotope, or biotope aquaria is another type based on species selection. In this prospect, an aquarist attempts to simulate a specific natural ecosystem, assembling fish, invertebrate species, plants, decorations and water conditions all found in that ecosystem.

2.2.5 Aquarium Construction

Tank Selection:

Choose glass or acrylic tanks (acrylic is lighter but scratches easily). Size depends on species; smaller tanks (<50L) suit beginners, while larger tanks stabilize water parameters better (Smith et al., 2023).

Cycling and Nitrogen Cycle:

Initiate the nitrogen cycle by adding ammonia sources (e.g., fish food) to cultivate beneficial bacteria. This prevents toxic ammonia spikes (Smith et al., 2023). Use test kits to monitor NH_3, NO_2^-, and NO_3^- levels.

Filtration Systems:

Mechanical: Remove debris via sponge filters.

Biological: Use ceramic rings or bio-balls to host bacteria.

Chemical: Activated carbon absorbs toxins (avoid overuse) (Patel & Lee, 2022).

Substrate and Lighting:

Use inert substrates like gravel or sand. LED lighting (5–8 hours/day) supports plant growth and reduces algae (Zhang et al., 2020). For planted tanks, add nutrient-rich substrates.

Aquaponics Integration:

Recent studies suggest linking aquariums to hydroponic systems to recycle nutrients for plants, reducing water changes (Gupta et al., 2021).

2.2.6 Aquarium Maintenance

Water Quality Management:

Test pH (6.5–7.5 for most species), temperature (22–28°C), and hardness weekly. IoT-based sensors can automate monitoring (Patel & Lee, 2022).

Perform 10–20% water changes weekly using dechlorinated water.

Algae Control:

Limit light exposure, avoid overfeeding, and introduce algae-eating species (e.g., snails or plecos).

Disease Prevention:

Quarantine new fish for 2–4 weeks (Nguyen, 2024).

Use probiotics in feed to boost fish immunity (Nguyen, 2024).

Equipment Maintenance:

Clean filters monthly (rinse media in tank water to preserve bacteria). Replace UV sterilizer bulbs annually.

2 3 KEY STEPS THE CONSTRUCTION AND MAINTENANCE OF AN AQUARIUM

Tank Selection:

Choose glass or acrylic tanks (acrylic is lighter but scratches easily). Size depends on species; smaller tanks (<50L) suit beginners, while larger tanks stabilize water parameters better (Smith et al., 2023).

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CHAPTER THREE

RESEARCH METHODOLOGY

3.1 MATERIAL AND METHOD

This chapter examine the materials needed for construction and define the method of construction. It explains the technique of approach to investigating the objective of the research.

This chapter gives a preview to the technique and methodology of approach to defining the purpose of study.

MATERIAL NEEDED

i. Glass fibre material

ii. Silicon machine

iii. Silicon adhesives

iv. Ruler/ measuring tape

v. Artificial plants

vi. Marble stone (white)

vii. Aerator machine

viii. 0.02 rubber ooze

ix. Adhesive gun type

x. Energy safe bulb

3.2 METHODOLOGY AND GENERAL PROCEDURE

All the above materials are put together in an orderly technique to construct the aquarium.

Step 1

To determine type of aquarium to be constructed based on purpose.

Step 2

Material glass or fibre material.

Step 3

Measurement into sizes based on purpose in Length, Breadth and Height.

Step 4

Placed materials together by edges and hold it by adhesive tape gum.

Step 5

Step 4 above is properly carried out side by side with other researchers to provide helping hands in holding the materials together.

3.3 METHOD OF ANALYSIS

The method of analysis is descriptive through which investigation and observation be carried out for possible outcomes.

3.4 METHOD OF CONSTRUCTION

The method of adoption for the construction is Hand craft . The researcher with the help of colleagues will manually measure and cut all edges and angles to the length, breath and height in matching description of the prescribed size of the aquarium of purpose.

CHAPTER FOUR

4.0 CONSTRUCTION AND DISCUSSION

4.1 CONSTRUCTION OF AQUARIUM

Put the bottom piece of the glass down, surrounded by the front, back, and sides. Remember that the sides should be just shorter than the final measurement so they can snugly fit into the length between the front and back (those will go up first).

- The difference in thickness should be twice the size of the glass. If you have 1/4" inch thick glass, your side pieces should be 1/2" in shorter (to account for the 1/4" on either side).

- **Prep the Glass**

Let all the edges be clean as it can. Then masking or duct tape that is about half the length of one side. Stick half of each strip on the bottom of the bottom pane in *every* direction. The other half of the strip should be lying freely on the table.

Apply the adhesive

Start with the bottom piece, applying a thin and continuous strip of adhesive along the top, about 2mm away from the edge (where the front pane of glass will rest on it). The strip of adhesive should be about 3mm in diameter.

Put the Front Pane in Place

With the strip of silicone along the front edge of the base, place the front piece of glass into place, pressing it down firmly but gently. Hold it there briefly, adheres the rest of the tape up the sides, and it should stay up.

Begin Assembling the Sides

With your gun in hand, run another thin line of adhesive (again, 2mm from the edge), along the sides. Then repeat along the inside edge of the front pane (remember: the side pieces are fitting not only into the bottom, but sandwiched in between the front and back).

- Press the first side piece into place, firmly but gently. You should now have one corner of your aquarium put together it.
- Try to avoid realigning the piece – if you do, you could create bubbles in the silicone, leading to leaking later on.
- Repeat this for the other side, too.

Finish with the Back pane of Glass

Now that you're getting the hang of the caulk gun, run your last 3mm-wide lines of silicone along the edge of the bottom pane (2mm from the edge) and along the inside edges of the back panel.

- Press it firmly, yet gently, into place. Lift up the tape to support and prop as needed.

Allow the adhesive to Dry and Set. Most types of adhesive dry within 24-48 hours. It will harden even more as time goes on, so if you can resist, don't fill it with water for a good week or so.

Test the Seals

Before you go about assembling a masterpiece in your aquarium, it's best to see if your craftsmanship holds up. Fill the tank with a few inches of water. Let it sit a minute. If it doesn't leak, continue on with assembly.

- If it does leak, empty the aquarium immediately. Let it dry, and then reseal the problem areas. You may also want to assume there are problems near the top too, and fix those as well.

4.2 DISCUSSION OF OBSERVATION

Different test were conducted to investigate, for leakage in the tank. If any troubleshooting becomes necessary and tested to ensure that the sealant worked effectively. The Aquarium was also tested for few days to check their survival adaptability.

After construction, live rocks were introduced and mounted onto fiberglass threaded support sand was added. Specimen ranging in length from 2.5 cm to 5 cm. However from the description the tank was tested and confirmed to hold fry/fingerling in a safe state.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 SUMMARY OF STUDY

The aim of the study was to evaluate the maintenance of an aquarium through avoidance of negative side effects in water quality and prevention of algae growth and diseases for an improved ecosystem.

5.2 CONCLUSION

Based on the result of the study, the following conclusions were made, that;

i. Constructed aquarium tank to evaluate the maintenance of an aquarium through avoidance of negative side effects in water quality and prevention of algae growth and diseases for an improved ecosystem was observed for investigations.

ii. The benefit of this tank is to enable the researcher investigate the objective of the research "to evaluate the maintenance of an aquarium through avoidance of negative side effects in water quality and prevention of algae growth and diseases for an improved ecosystem. "

5.3 RECOMMENDATIONS

By keeping up this routine, a low-maintenance aquarium with minimal algae and disease risks is ensured. Therefore, maintaining an aquarium requires consistent care to ensure a healthy environment for your fish and plants.

However, the following recommendations are prescribed from the investigations:

- Regular Water Changes: Replace 10–20% of the water weekly (or 25–30% biweekly for larger tanks). To removes toxins (ammonia, nitrites, nitrates) and replenishes minerals. Use a gravel vacuum to clean debris from the substrate during water changes.
- Water Quality Testing: Test for Ammonia, nitrites, nitrates, pH, and hardness weekly. Liquid test kits (e.g., API Freshwater Master Kit) are more accurate than strips.
- Algae Control: Limit light to 6–8 hours/day, avoid overfeeding, and keep nitrate levels low. Scrape glass with an algae magnet,

use algae-eating fish (e.g., plecos, otocinclus), or add live plants to compete for nutrients.

- Tank Cleaning: Avoid soap/chemicals—rinse tools with dechlorinated water.

Nevertheless, keep a maintenance log to track water parameters and cleaning schedules.

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