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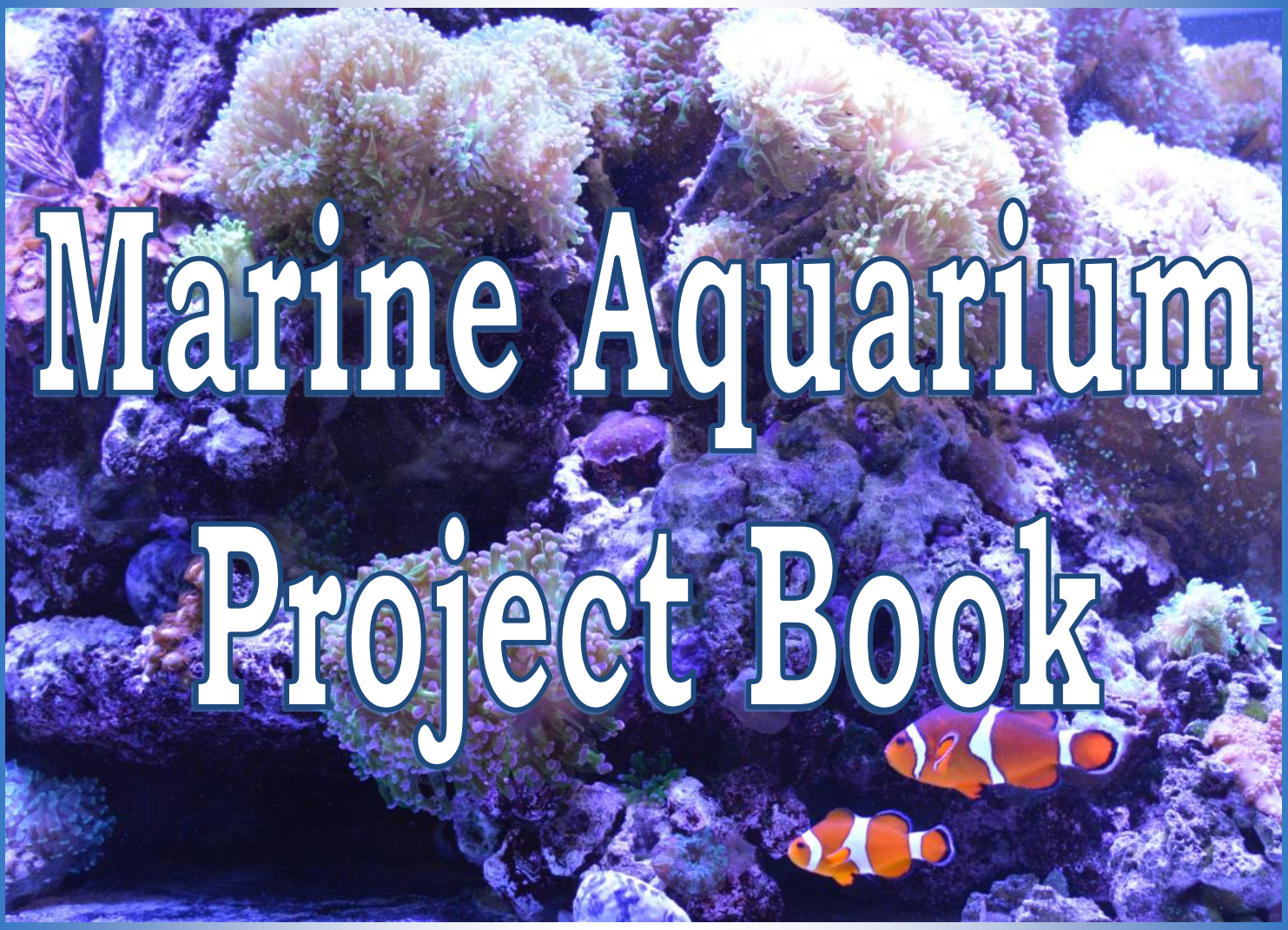

Marine Aquarium Project Book

This book belongs to: _____

County: _____

4-H Club: _____

Date Started: _____

Date Completed: _____

Club Leader: _____

County 4-H Agent: _____

This project book is designed to be utilized alongside EDIS document 4HMEM10, Starting and Maintaining a Marine Aquarium.

Acknowledgments

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Photography: Prudence Caskey

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Introduction to Saltwater Aquariums

You should give careful thought to many different aspects of the aquarium project before deciding to acquire a saltwater or marine aquarium. For example, you will need to determine cost, size, time and placement of the aquarium before beginning the project.

The cost of the initial purchase of the aquarium needs to be taken into consideration at the beginning of the project. The larger the aquarium you choose, the more expensive the start-up and maintenance costs will be. The larger the aquarium, the bigger margin of error you will have with your tank as well. A cost and needs analysis should be preformed before deciding which size tank you will use for this project. Please refer to page seven to record the information regarding cost and needs analysis and the data for your aquarium system.

In this project book we will discuss a 14 gallon and a 29 gallon nano or cube tank. These particular tanks are great for beginners because they are easy to set up and maintain. These tanks include all of the filtration and are truly a "reef ready" type system. The maintenance will be easier with the larger tank. However, the initial cost of sand, water and rock will be higher due to the fact that more of the components will be required to establish the tank.

With a freshwater tank, the tank will cycle, or become ready for fish in usually 24 hours. With the initial set-up of the marine tank, you will find that it takes more than 24 hours for the tank to acclimate. After this time you will be able to add animals. This is a major difference between fresh and saltwater tanks. A saltwater tank will need to go through a nitrogen cycle before fish or other animals can be added which can take up to three to four weeks to complete. You will find more information about the nitrogen cycle covered in Activity Two: Nitrogen Cycle.

A marine or saltwater aquarium will require time to maintain. The size of the tank will determine how much time will be required. The larger the tank, the more it will cost to purchase and maintain, but the time required to maintain it will be reduced. For example, a 29 gallon aquarium would need a 25% or a 7-8 gallon water change every four weeks. A larger tank would need approximately the same 25% water change every four weeks. If we choose a 175 gallon tank, that means we would have to change nearly 44 gallons of water. The larger the tank, the more water you will have to handle.

The placement of the aquarium is vital. You will need to have access to a power outlet. The aquarium should also not be placed near a window or directly in the path of a heater or air conditioning vent.

Selecting a Saltwater Aquarium

The most important things to consider when selecting a tank are cost and size. We will be examining two particular tank systems for the purposes of this project book. With this initial project, you will be able to choose any size tank. The examples given will be for a 14 gallon or a 29 gallon nano cube tank. These tank systems are "reef ready" tanks and can be purchased for $200-$300 depending on size. If you prefer a larger system, Red Sea Max offers a system that boasts 175 gallons which can be purchased for approximately $5,000. This is for a more advanced aquarist and should not be your first attempt at a marine or reef aquarium. These systems make an excellent choice for beginners and soft corals.

You may be tempted to buy a used tank. If you purchase a used system, completely clean the system and do not accept any live rock or animals. There are risks associated with purchasing used equipment. A person may be selling their tank because of a bacteria or algae outbreak that they were unable to control. Carefully clean any used tank with a 20:1 mixture of water and distilled white vinegar. Make sure to rinse thoroughly after coralline deposits dissolve.

Know the parts of your aquarium.

Hood

Lights

Filter system

Tank

Stand

Make sure to place it near a power source!

This is an example of a 14-gallon Nano-Cube DX made by JBL.

Essential Elements of the Marine Aquarium

* **Filtration**—with the aquariums we have selected to feature in this project book, the filtration box is included in the structure of the aquarium and built into the back of the system. This is a three part system of suction, filtration and output.
* **Filter Media**—your system comes with filter media called Bio-Balls.
* **Fish**—the selection of fish is vital to the success of your aquarium hobby. As tempting as it is to buy more expensive fish, it is best to begin with Damsels or Blue Green Chromis. Clownfish are also very popular, but can cost $20 each. Always ask for assistance at your local fish stores when selecting new fish. Some fish are considered "loners" and should not be placed with other fish. In addition, some fish are paired with other animals. The pistol shrimp and watchman goby are an example of a symbiotic pairing. Meaning both organisms benefit from the relationship, the shrimp's home is guarded by the watchman goby.
* **Heater**—most tropical fish and reefs will require a heater to maintain the tank at 78˚F at all times. In Florida a heater is not necessary; however, it makes a nice addition to maintain consistency in the system.
* **Lighting**—an essential element of the marine aquarium because a lot of the organisms and plants require lighting to thrive. A bio-cube system uses blue and white or 50/50 lights that will simulate sunlight. Lunar lights can be added to simulate moonlight. Lunar lights are not necessary; however, they can make viewing the tank at night easier.
* **Powerhead**—a powerhead or circulation pump will help to create a current in your tank which will greatly improve your tank's ability to thrive.
* **Protein Skimmer**—this equipment is a foam fractionator. In our mini ocean, this is our version of sea foam. The skimmer will help to remove the foam and other impurities in the system.
* **Rocks**—always be sure to use aquarium grade rocks. Adding rocks from other sources could prove dangerous. Death of livestock or the introduction of unwanted hitchhikers could result.
* **Sand**—will be the base of the aquarium. Live sand with microorganisms can be purchased at most aquarium stores.
* **Stand—**this should be a base that is strong enough to handle the weight of the water, sand and rocks. Stands are usually sold with the aquariums as a pair.
* **Thermometer**—a device that will measure the water temperature in the system.
* **Water**—only reverse osmosis (RO) water should be used in your tank. Never use water from the ocean because impurities could harm your

Cost/Needs Worksheet

Total budget for initial tank set up: _____

Tank Size	14 Gallon	29 Gallon
Initial Cost	$210	$300
Sand	$20	$40
Rock	$40	$50-$75
Water	$20	$40
Livestock	$20-$40	$20-$60
Total Cost	$310-$330	$450-$515

My Aquarium Information

Tank Manufacturer_____

Stand Type_____

Description of Tank Placement_____

_____

_____

Tank Size_____ gallons **Type** (Circle one) Glass Acrylic

Shape of tank_____

Day Lights_____

Lunar Lights (if applicable)_____

Filter_____ **Filter Medium**_____

Powerhead _____

Protein Skimmer_____

Heater/Cooler_____ **Thermometer**_____

Sand _____ **Pounds of Rock**_____ **Pounds of Live Rock** _____

Calculate your tank weight

Weight of stand _____+ gallons of water _____ X 8.6 = _____

+ pounds of sand _____+ pounds of rock _____

= My tank weighs _____ pounds

Timeline for My Aquarium

Indicate on each line when each task was completed.

Week One:

_____ Day One: Set up tank with live rock, live sand and water.

_____ Day Two: Establish filtration and water flow.

_____ Day Three: Tank should be completely clear with rocks and sand visible. Add first fish to initiate nitrogen cycle.

Week Three: Add a cleaner crew.

_____ A selection of snails, crabs and other cleaners should be added to the tank this week.

Week Four: Mapping out a plan and water test.

_____ Start to decide what you plan to have your tank look like and what livestock, if any, you want to add in week six.

_____ Complete water test and record data. Nitrogen cycle should be complete. If not, wait until there are no nitrates or nitrites in your system before proceeding.

Week Five: Change water and affix first coral.

_____ Complete 25% water change.

_____ Affix first coral to rock while water is drained.

Week Six: Coral Aquascaping.

_____ Design a plan for affixing corals in the future as well as plan which livestock, if any, you will add.

Week Seven: Adding additional fish!

_____ Complete water test and record data.

_____ Add your first fish or livestock to tank.

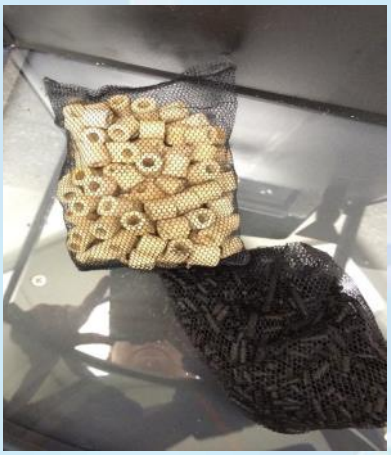
Week Eight: Ongoing maintenance and testing.

_____ Complete 50% water change.

_____ Complete water test and record data.

Day One: Setting up the Aquarium

The placement of the aquarium is vital. Make sure to avoid direct sunlight and placing the aquarium in the path of an air conditioning vent. Also, make certain that the aquarium is placed near an electrical outlet. It will be very hard to move the aquarium once filled with water, rocks and sand.



Make sure you read all of the instructions that come with your new aquarium. The media packets will need to be added to the back of the aquarium in the filter area. The filter system is explained in detail on the following page.

Water, water, everywhere!

When selecting the water for your tank, only use reverse osmosis (or RO) saltwater. This water has been purified to the point where there are essentially zero total dissolved solids. This means there is nothing in this water to grow nuisance algae or cyanobacteria. Never use water from the ocean, bay or sound.

Why so Cloudy?

Don't worry! It is perfectly normal to have milky water for the initial set-up. If you are using live sand, the microorganisms in the sand will be stirred up and create water that looks dirty. The water will settle and be crystal clear by day two or three.

Day Two: Understanding Filtration and Water Flow

Let's get to know the filtration system that came with our tank. Below is a picture from the Coralife BioCube Instruction Manual.

Chamber 1 is the input for the filtration system. Water is pulled through intakes on the back wall and travels through the filtration system. This is where a protein skimmer or heater can be placed.

Chamber 2 holds your Bio-Balls and filter cartridge. This is known as your wet/dry filter system.

Chamber 3 is where your water pump is housed. This is also the output for your system.

The wet/dry return output will provide some water movement for the tank. It's recommended to add additional movement with a powerhead or circulation pump. Powerheads are only recommended for tanks over 20 gallons. A small circulation pump works great for the 12 or 14 gallon sized nano tanks.

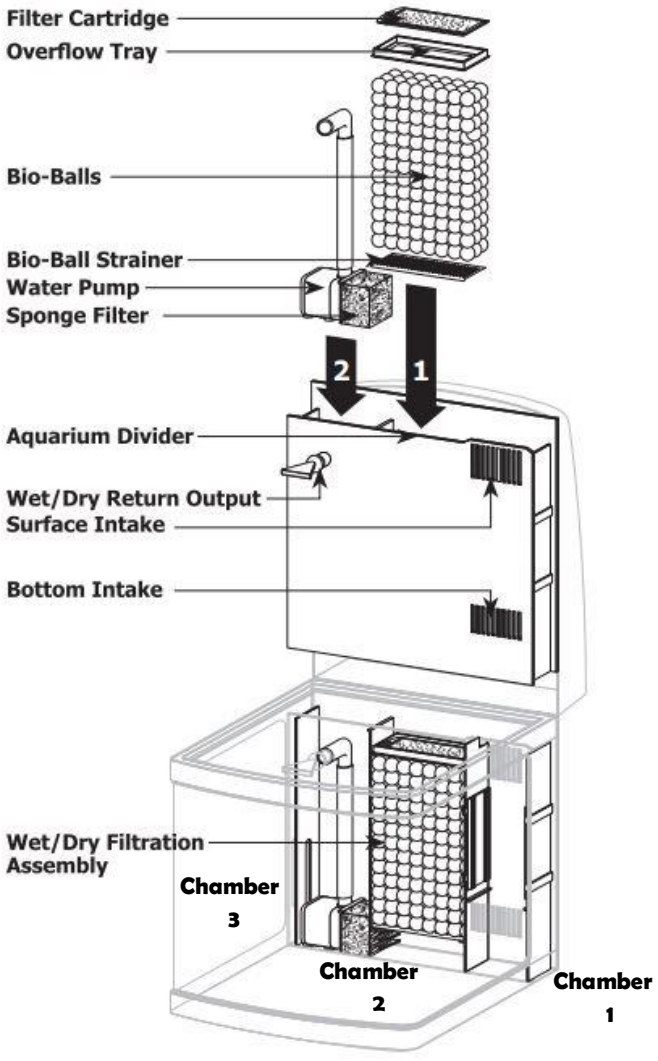


Photo Credit: Coralife BioCube 29 Instruction Manual

Types of Filtration

Mechanical:

Bio-Balls in chamber 2 provide your mechanical filtration.

Chemical:

The Filter Cartridge is an activated carbon packet and is located on top of Chamber 2. This provides your chemical filtration.

Biological:

Your live rocks and live sand will provide your biological filtration.

Day Three:
Live Rocks and Sand Should be Visible!

This is a great time to adjust the rocks and make sure the sand is where you would like it. The water flow will create a current in your system. Over the next few days you can make minor adjustments to make sure that the flow is not blowing sand onto rocks. One of the problems with creating current is that a misplaced powerhead or circulation pump can create holes in the sand.

Week 1-3: Nitrogen Cycle

To initiate the nitrogen cycle, buy a "first fish." This is usually an inexpensive fish to jump start the nitrogen cycle. Damsels or Chromis are a great initial purchase for this purpose.

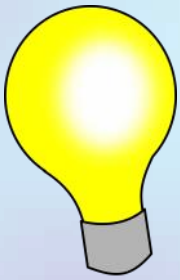
Definition: The nitrogen cycle is the natural process through which nitrogen is incorporated into food by photosynthetic organisms. These organisms are consumed directly or indirectly by other organisms and subsequently excreted, acted upon by bacteria and made available again for plant nutrition.

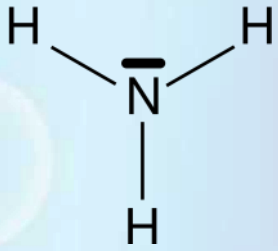
In an aquarium the establishment of the nitrogen cycle is often referred to as the break-in cycle, start-up cycle, or cycling the tank. The cycle begins once fish are introduced into the tank.

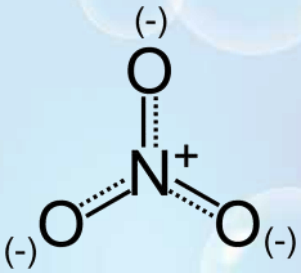
Use the letters of each step to label the diagram on page 13.

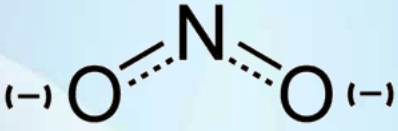
A. Nitrates are naturally removed by changing the water.
B. Waste from fish create ammonia (NH_3).
C. Larger fish eat smaller fish and produce waste.
D. Smaller fish eat microorganisms in your tank and are known as the cleaner crew.
E. Phytoplankton and other microscopic organisms eat waste.
F. Bacteria eats the Nitrites (NO_2) and they become Nitrates.
G. Plants and phytoplankton use light to sustain life.
H. Nitrates (NO_3) are created from ammonia by good bacteria on live rocks.

Label the Nitrogen Cycle.









Week Three: Adding a Cleaner Crew

Adding your cleaner crew is vital to a healthy tank. These little creatures will help clean up your tank as soon as the nitrogen cycle is complete. Do not add them too soon! They eat what they clean and if there is nothing to clean, there is nothing to eat! All of the cleaners listed are reef safe.

Let's get to know some cleaners!

Cleaner Shrimp

Cleaner shrimp are great little carnivorous scavengers. Always be careful which type you choose; not all cleaner shrimp are reef safe. This scarlet cleaner is a great reef-safe cleaner. Others include peppermint shrimp, sexy anemone shrimp, bumblebee shrimp and the colorful harlequin shrimp.

Starfish

Not all starfish are reef safe. The best rule is that if they have long, skinny legs, they will do great in a reef system. The brittle and serpent stars make an excellent choice for reefs. The thick-legged chocolate chip starfish is one to avoid if you have corals. They will bulldoze their way through your tank and destroy your aquascaping!

Urchins

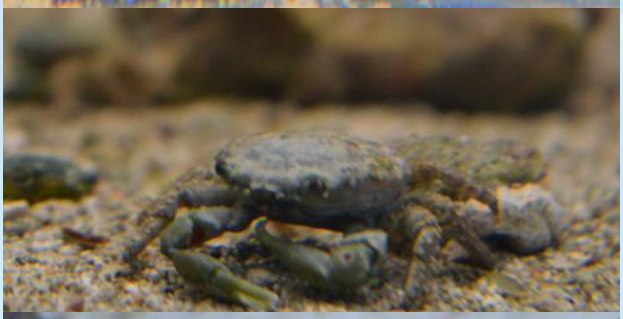
These are great cleaners for the glass. Be warned that they can eat all of that wonderful purple coralline algae you have been trying to grow on your live rocks.

Turbo and Astraea Snails

If your tank is under 50 gallons, only a few snails are needed to keep your glass crystal clear. A turbo snail (left) is a very large snail. These snails are about the size of a ping pong ball. They may be too bulky for a small tank. Instead, several Astraea snails (right) would be a great substitution. They will both eat cyanobacteria and are hungry herbivores.

Bumblebee Snails

These are wonderful ornamental snails. They will clean the sand as well because they like to burrow. They also love to eat detritus!



Emerald Crab

These small crabs will clean a tank in a hurry. One problem that can arise with them is they will eat smaller fish and will move unattached corals. They are known as the bulldozers of the cleanup crew. They are not light-footed creatures, which can be annoying.

Hermit Crabs

There is a huge variety of hermits available. The trick is to make sure the one you choose is reef safe. Blue and red-legged, staghorn, blue knuckle, coral, and zebra-legged are all examples to choose from. They are tremendous cleaners and fun to watch!

Burrowing Crabs

These little guys are inexpensive and do a wonderful job cleaning the whole tank. They will even burrow into the sand to make sure it is clean.

Week Four: Mapping out a Plan

When determining what creatures or fish to add to your aquarium, you should think about your expectations for your tank. A reef system is very enjoyable and a fun underwater garden. If you would rather, a natural tank is also a great idea. Here are several ideas for tanks.

Some aquarists only want corals and some cleaners but never add a fish. The choice is up to you. Begin thinking about what you plan to do with your tank after the nitrogen cycle is complete. Visit fish stores for ideas and look online to be inspired.

Check with your local fish store to inquire if there is a marine aquarist club in your area. Many times hobbyists will get together and hold a "frag swap" which is a meeting where you can swap or purchase inexpensive corals for your tank. These members are also full of information and always willing to share.

Let's compare these two photos. The photo to the left is a new tank set up at day three. Water is clear and flow is established. The live rock is positioned and the tank begins to grow. Below we can see the well-established tank with several types of coral and livestock.

This is the same tank one year and 10 months after initial set-up. You can see how much it has changed! The coral will grow and change. You must allow for these changes when planning for your tank.

This particular tank has no fish and the only livestock are a Snowflake Moray Eel and a Pink-tipped Anemone. Other fish would be eaten by the eel, as he will eat anything he can catch and that will fit in his mouth. This is not as easy as it sounds because he is blind! Most fish would be safe from him if he weren't so fast.

Remember, it is a great idea to look at many other tanks before you start to buy corals. Once you decide what you want from your system, it will be more enjoyable if you have an end result in mind and a goal to head toward.

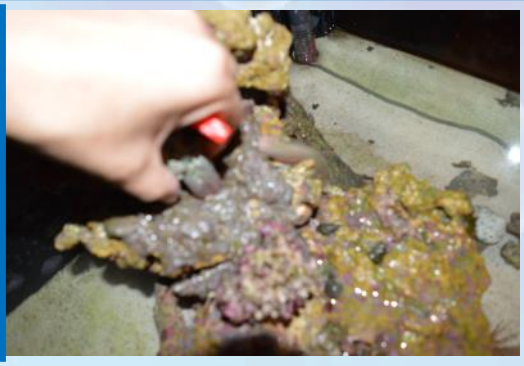
Here is an example of a well-established reef tank.
Can you name any of the corals in this picture?

Week Five: Change Water & Affix Coral

This week we will complete a water change and glue some coral in place while the water level is low enough to expose the rock.

First, syphon enough of the water to expose the rock you plan to glue onto. This may be as much of 75%. Remember, this is not 75% of 29 gallons, because the sand and rock take up a portion of the tank. In this case, it is about 13 gallons. This is also a good time to clean the sand and glass. Make sure to stir the water up before starting.

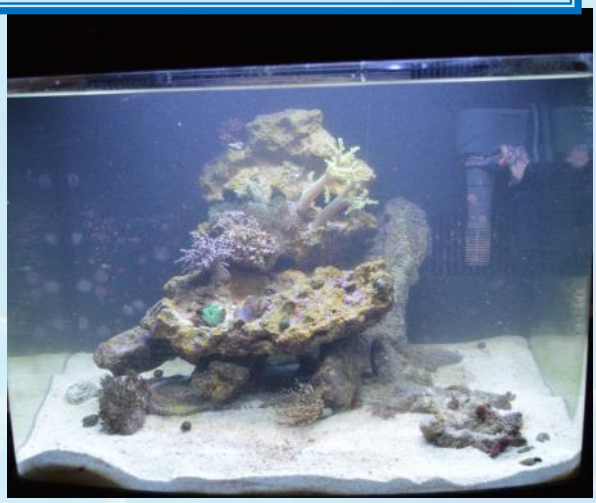
Hold the coral in place a few seconds after applying the glue. Many stores sell special glue for corals. Underwater putty is also available for hard or stony corals.



Refill the tank water into the filter system. Pouring your water on your exposed rock and coral could be harmful to your animals living there. Pour slowly.

After the tank is refilled, it may take an hour or two before the water clears up. Make sure to record the water change and always mark your calendar for the next water change.

Good maintenance is the key to success with a saltwater tank.



Selecting Corals

Below are a few excellent corals for beginner tanks. As you and system become more advanced, other corals can be added. Always remember that corals are alive and the group or colony that you initially purchase will not stay the same size. Start out small and allow for growth in your tank.

Mushroom coral makes a very good beginner coral and will grow easily. Mushrooms also are available in many colors. They are not a fast-growing coral.

Colonies of Star Polyps (left) and Zooanthids (right) are available in a variety of colors. Some variations are more common and for that reason they are more affordable. It is best to begin with an inexpensive colony as your tank is adjusting. Be careful where you place them because they spread.

Tree coral is available in many colors. This is a hardy, slow-growing coral that can add color right where you want it! It can also be carefully separated and be attached throughout the tank.

Xenia is an easy-to-grow coral. Russian Blue and Pulsing are two common varieties. Be aware that these corals are inclined to grow so well that they will take over a tank. They will grow on almost every surface and spread quickly. If you want a full tank in no time, they are an excellent choice. Use caution because you may not be able to remove them without draining the tank.

Week Seven: Adding Additional Fish

This week we will select our new fish and add them to the tank. It is vital that you pair your fish with the correct type of tank you have. If you decide to have corals, you will need to make sure that you selected a reef-safe fish. There are many fish that will fall into this category. Let's take a look at how to add our fish.

Always remember to float the fish and any other livestock you add to the tank. This will allow for the animals to get used to the temperature before they are released into the tank. Be prepared for them to hide initially. They will come out in time.

Newly released fish will seek cover until they are comfortable with their new environment. It is best if you can release them later in the day, so that they have some time to get acclimated by morning. Feeding will help bring them out into the open.

Here's our new clown fish! Don't expect a clownfish to bond to an anemone. They usually will not because they are bred in tanks and have never seen one!

Fish Identification

Royal Gramma Basslet

Clownfish

Blue Chromis

Yellow Head Jawfish

Yellow Angelfish

Yellowtail Damsel

Kupang Damsel

Firefish Goby

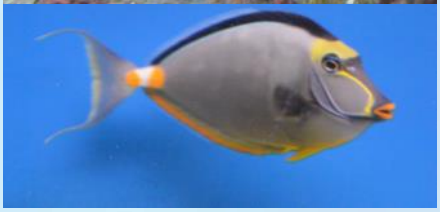
Domino Damsel

Blue Damsel

Green Mandarin

Huma Triggerfish $

Hawaiian Nasu Tang $$$



Clown Triggerfish $$

If a fish has no $ next to its name, it costs less than $50.

$=Over $50
$$=Over $100
$$$=Over $200

Week Eight: Testing Equipment

Here is an up-close look at the *Sera aqua-test box*. This kit will test for pH, Ammonia (NH_3), Nitrites (NO_2), Nitrates (NO_3), Iron (Fe), Phosphates (PO_4), Copper (Cu), Carbonate Hardness (kH), and Calcium (Ca). You will commonly only test for the last four on the list if a problem arises. This complete kit retails for about $100. An essential kit is shown on the left. It will test for the first four on the list and costs $25-$30. Most fish stores will test your water for little or no cost until you can get your own kit.

Your water should be tested every four weeks or if a problem arises.

What am I Testing For?

Ammonia (NO_3): Naturally occurring when organisms are present in a tank. This is the first step of the nitrogen cycle. As soon as ammonia is presented through waste, the biological conversion to nitrites will begin. The result should be a zero reading.

Calcium (Ca): Calcium is used by the corals and other animals to grow their shells. This level should be between 380-450 ppm (parts per million).

Carbonate Hardness (kH): This is a great combination test to determine if your tank should be tested for calcium or magnesium. If your tank has a kH over 8˚-12˚, you should test calcium and magnesium.

Copper (Cu): Copper test is not run on a regular basis. The result should be zero.

Iron (Fe): This test is not commonly performed. It should be run if problems with algae in your tank arise.

Magnesium (Mg): A magnesium test is preformed to diagnose an outbreak of Bryopsis algae. This is a specialty test that can be preformed at a fish store. If you have an algae outbreak, a test kit can be purchased for approximately $15-$25 and can be used 30 times.

Nitrite (NO_2): Nitrites should have a zero reading after the nitrogen cycle is complete. Bacteria called nitrosomonas absorb ammonia and release it as nitrites.

Nitrate (NO_3): Nitrates are the final stage of waste breakdown. There should be no nitrates in the water after the nitrogen cycle is complete.

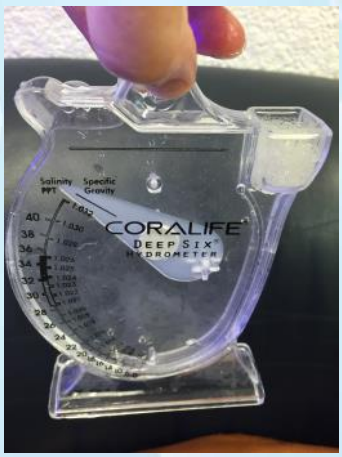
pH: This is a measurement of how acidic or base your water is. Monitoring the pH is important if you have animals in your tank that require a more acidic or a more base environment.

Phosphate (PO_4): Phosphates are food for algae and you want to keep them in check. The result should read zero as well. If you have an algae outbreak, check your phosphates.

Salinity: Basically, this is how much salt is in the water. The more salt, the higher the number. This can be expressed in parts per thousand (ppt) or in specific gravity which is a number between 1.000-1.032. A reef tank should be 34 ppt or have a specific gravity of 1.026.

Temperature: Constantly monitor your temperature especially if you have a heater. The temperature for a reef tank should be between 76˚F-83˚F.

Specific Gravity



Too Much Salinity

Specific Gravity measures the amount of salinity or salt within the water. Too much salt in the water will starve the organisms of oxygen. Specific Gravity is measured with a hydrometer which can be purchased at an aquarium store for around $10.

Correct Salinity

Record Your Findings

Date	Specific Gravity	Date	Specific Gravity

Don't Forget!

As water evaporates from your tank, top off the tank with fresh reverse osmosis (RO) water only! The salt has not evaporated. If you continue to add saltwater, the salinity will be too high and your tank will suffer loss of organisms.

Testing Forms

	Ammonia	**Calcium**	**Nitrate**	**Nitrite**	**pH**	**Phosphate**	**Salinity**	**Temperature**	**Magnesium** Less commonly used
Normal Range Date:	<0.1 ppm	380-450 ppm	< 0.2 ppm	< 0.2 ppm	7.8-8.5 OK 8.1-8.3 is better	< 0.03 ppm	35 ppt sg = 1.026	76-83° F	1250-1350 ppm
1/1/2017	*0*	*400*	*0*	*0*	*8.2*	*0*	*1.025*	*80°*	*1300*

Glossary

Algae

Growths of plant-like organisms. Some algae may look like plants but they are not plants. There are many different types, shapes and colors of algae.

Alkaline

Refers to the pH of water. Water with a pH higher than 7 is said to be an alkaline.

Ammonia

Chemically known as NH_3 and is a toxin that can build up in an aquarium. It is released naturally by fish. Ammonia is step one in the nitrogen cycle and is removed by bacterial action where it is transformed into nitrite. t can also be removed by mechanical filtration.

Aquascaping

The art of designing your aquarium. It involves arranging aquatic plants, rocks, stones or driftwood. The design is up to the individual and can have unlimited possibilities.

Aragonite

A mineral that contains calcium which is found in rock, gravel or sand. Aragonite is commonly used in marine and saltwater aquariums.

Bacteria

Bacteria are single-celled, microscopic organisms. Some beneficial bacteria can be used to filter the water by breaking down and consuming waste in an aquarium system.

Ballast

A power source required for aquarium lights. These are located in the hood.

Bio-Balls

Plastic balls of various sizes which have complex designs. They are used as part of the biological filtration in an aquarium. The more surface area they have, the more area the beneficial bacteria has to grow.

Biological Filtration

Natural filtration for an aquarium that uses bacteria to break down waste as part of the nitrogen cycle.

Bivalve

A shelled animal whose shell is comprised of two halves usually connected by a flexible hinge. Scallops and clams are examples of bivalves.

Blue Green Algae

Cyanobacteria that forms a blue-green slime that can cover surfaces in an aquarium. This can easily be removed by syphoning during water changes.

Bryopsis Algae

This is a hair type algae that can come to your tank as a hitchhiker. Be careful where you buy your livestock. Never bring home something from the wild.

Calcareous

Anything containing calcium carbonate. Calcium carbonate is used to help maintain a high pH in aquarium water.

Calcification

The extracting of calcium from the seawater by corals and coralline algae. Calcium is then deposited in the form of calcium carbonate.

Calcium

(Ca) A mineral that makes up most corals and other calcareous organisms. In your reef tank, maintain calcium levels between 380 and 480 mg/l (miligrams per liter). This can be achieved through regular water changes and by using calcium additives.

Calcium Carbonate

($CaCO_3$) a chemical compound often used as a calcium supplement. It can be added to aquariums to increase the general hardness (GH) of the water.

Carbon

A substance used for filtration in an aquarium. It is ideal for removing large numbers of toxins in the water as well as maintaining the clarity of the water.

Chemical Filtration

Filtering the water with chemicals such as carbon and protein skimmers is the chemical filtration in the overall filtering system.

Chromatophores

Color pigmentation cells in the skin of marine animals. They are used by some fish and invertebrates to change colors which allows them to hide from predators.

Compatibility

This refers to how well fish and other animals are likely to get along. Damsels for instance can be very aggressive and should not be overcrowded in a tank. Remember, big fish eat little fish. Use caution when additional animals are introduced to your aquarium.

Copepods

Tiny crustaceans found in marine aquariums. Copepods can reproduce in an aquarium system and make a great source of live food for your fish.

Coral

Marine invertebrates in the class Anthozoa of phylum Cnidaria. Corals commonly live in small colonies of many identical distinct polyps. Some corals secrete calcium carbonate to create a hard skeleton, while others are called soft bodied corals.

Coralline Algae

A form of algae that creates a calcareous crust like coral. Coralline algae is colorful and can occur in bright pink, purple and red colors. It is sought after in a reef tank, and can be made to grow on rocks and desired surfaces by maintaining correct levels of alkalinity, pH and calcium levels. Because it will also grow on the glass, it can be a struggle to clean. Regular scraping can keep coralline algae under control.

Coral Sand

This is a white to light colored sand made up of crushed coral. It can also be called live sand if microorganisms are present.

Crustaceans

Hard-shelled invertebrates including crabs, lobsters, shrimps and barnacles.

Cyanobacteria

Type of microscopic, photosynthetic organisms that can form large colored mats in an aquarium. Traditionally blue-green in color, they sometimes are red, brown, dark green or black. Easily removed by syphon during a water change. Testing can determine the cause and additives can be used to correct the problem.

Diatoms

A single-celled organism that forms brown algae on aquarium glass or rocks. Their shells are formed from silicate, which can be found in non-purified water. Always use reverse osmosis (RO) purified water in your aquarium. Never add water from the ocean to a reef tank. There are microscopic diatoms present that will ruin your ecosystem.

Detritus

Waste from aquarium inhabitants. This will accumulate in gray piles in the tank. While syphoning during a water change, detritus can easily be removed. Bumblebee Snails are also great for cleaning up detritus.

Filter

There are three main types of filters: biological, chemical or mechanical. They work differently to remove unwanted particles or compounds from your aquarium's water.

Filter Medium

Any substance used in water filtration systems to remove impurities or organic wastes from the water. Sponges and Bio-Balls are a couple of examples.

Foam Fractionation

A process of skimming or removing proteins from water through the use of foam. This is the filtration method used by protein skimmers. Many people call it protein skimming; however, foam fractionation is the correct term.

"Frag"

Slang for a coral fragment. A "frag" is a small piece of coral. Sometimes this can often include small colonies of several polyps or a single polyp. Frags are usually mounted on a small piece of metal, plastic or other material called a frag plug. Frags are a great way to start out in the hobby. New coral can be added to a tank for a relatively inexpensive price. Frag Swaps are held throughout the country which is an excellent way to add new and exotic corals to your system.

General Hardness (GH)

An overall measurement of the concentration of calcium, magnesium and other ions. It is measured in degrees and the desired range is between 5˚ to 10˚. The higher the degree, the harder water will be.

Gills

Membranes fish use to absorb dissolved oxygen from the water during respiration.

Heater

A standard piece of equipment used to heat the water in an aquarium. Heaters vary in size, wattage and style. Heaters are an excellent way to maintain the temperature in you aquarium system.

Herbivore

An animal that eats plants. Herbivores are vital to your healthy aquarium because they can assist with keeping algae controlled.

Hydrometer

A device used to measure the specific gravity or salinity of your aquarium.

Impeller

Small fan that is located inside the motor of the pump.

Invertebrate

An animal with no skeleton or backbone.. Many animals that live on coral reefs are invertebrates. This includes mollusks, crustaceans, worms and corals.

Krill

Tiny, shrimp-like marine invertebrates. Krill is regularly sold in aquarium stores either as live food, frozen or freeze-dried.

Live Rock

Rocks cultivated from farms that usually have a variety of sea life attached or living in them. Including nitrifying bacteria, sponges, algae, coralline algae, worms, and starfish. Live rock is commonly used in reef aquariums because it contains beneficial bacteria that can help filter the water through nitrification.

Live Sand

Sand that contains beneficial bacteria and other sea organisms. Live sand is used in reef aquariums because it contains bacteria that can help filter the water through nitrification.

Marine Aquarium

An aquarium that keeps marine plants and animals in a contained environment. Also known as a saltwater aquarium, a marine aquarium is usually set up to reproduce a marine environment such as a coral reef.

Magnesium

An elemental metal that plays a critical role in the chemical and biological processes in the marine aquarium. Magnesium is important for the the skeleton forming process of stony corals and other invertebrates.

Mechanical Filtration

A water filtration method that uses filtering medium to remove particles from the water.

Microalgae

Small microscopic types of algae such as the green algae and hair algae often present in marine aquariums.

Nano Reef

A small marine aquarium that is typically less than 20 gallons. Nano reefs can be more challenging to keep because of the small water volume.

Nitrate

NO_3 the final product in the nitrogen cycle. There should be no nitrates in the water after the nitrogen cycle is complete.

Nitrification

The progression by which bacteria changes ammonia into nitrite and then nitrite into nitrate. This is the basis of the nitrogen cycle.

Nitrifying Bacteria

Naturally occurring bacteria that change ammonia or ammonium into nitrite or change nitrite into nitrate as part of the nitrogen cycle. Nitrifying bacteria are a key component of a biological filter for an aquarium.

Nitrite

(NO_2) Nitrites should have a zero reading after the nitrogen cycle is complete. Nitrites are the bacteria that consumes the ammonia that comes from the waste.

Nitrogen Cycle

The nitrogen cycle is the natural process through which nitrogen is incorporated into food by photosynthetic organisms. These organisms are consumed directly or indirectly by other organisms and subsequently excreted, acted upon by bacteria and made available again for plant nutrition.

Oxygen Reduction Potential (ORP)

This is a simple measurement of the water's ability to cleanse itself.

Parasite

An organism that nourishes itself with the tissues of another organism. Parasites are one of the main reasons aquariums have disease.

pH

This is a measurement of how acidic or base your water is. Monitoring the pH is important if you have animals in your tank that require a more acidic or a more base environment.

Phosphate

A nutrient that can cause uncontrolled growth of algae in the aquarium. It can also be toxic in high concentrations and must be kept to a minimum in coral reef aquariums. Phosphate can be easily removed by a number of commercially available filter media.

Photo period

The amount of time each day that the aquarium lights are turned on.

Phytoplankton

Microscopic plants found drifting in saltwater. Phytoplankton embody the bottom of the food chain in the ocean.

Plankton

A general term used to denote both phytoplankton and zooplankton.

Powerhead

A small pump that is fully submersible. It is used inside an aquarium to provide water movement to simulate wave movement.

Protein Skimmer

An additional filtering device that uses bubbles to create foam and remove organic wastes from the aquarium. This is an essential piece of equipment for maintaining good water quality in a reef tank.

Quarantine Tank

Often called a hospital tank. This is a separate tank which allows for sick or injured fish to be placed away from the rest of the healthy fish. This allows the injured or sick fish time to heal without spreading disease or becoming the victim of more aggressive fish.

Reverse Osmosis (RO)

An advanced procedure for filtering water for use in an aquarium. This technique works by pushing water under pressure through a special membrane. Reverse Osmosis (RO) can produce very pure water, but it is a slow process and can only filter small amounts at a time. Many aquarium stores make RO water available for purchase. RO water can be fresh for topping off after evaporation or ready to add RO saltwater.

Salinity

A amount of salt in seawater, measured in parts per thousand (ppt). Natural seawater has a salinity of about 35 ppt.

Specific Gravity

The proportion of concentration of salt in a given liquid to that of pure water. Specific gravity is used to measure the salinity of seawater as compared to distilled water. Distilled water has a specific gravity of 1.000 while natural seawater has a S.G. of about 1.025. Marine aquariums should have a specific gravity of 1.026.

Sponge Filters

A type of filter that provides both mechanical and biological filtration. Particles are removed from the water as it passes through the sponge. Microorganisms growing on the surface of the sponge also eradicate toxic substances from the water.

Sweeper Tentacles

Extended stinging appendages used by some aggressive hard corals to sting other nearby corals in order to gain territory and growing space.

Syphon

A length of tube that can use gravity to move water from one location to another. This is the best way to remove water from your marine aquarium during a water change. The syphon hose can be used to target and remove nuisance algae during a water change.

Symbiotic

A phenomenon where two different organisms live together in a mutually beneficial relationship. Both creatures provide each other with food, protection or some other survival need. An excellent example in the wild is an anemone and clownfish. The anemone offers protection to the clownfish within its stinging tentacles and the clownfish delivers the anemone with scraps of food. In the marine aquarium clownfish often do not pair with anemones. The main cause is due to the fact that clownfish are raised in captivity and are not exposed to anemones at an early age.

Trace Elements

Elements that naturally occur in trivial quantities in your aquarium. These are required for survival by many reef organisms and include barium, calcium, iodine, lithium, molybdenum, and strontium.

Trickle Filters

A purification system where water is dripped over filter medium that is exposed to the air. The air aids to improve the nitrification process. The filter medium usually consists of small plastic balls or strips of plastic. Bio-Balls are used in the systems we discuss in this project book.

Turnover

The amount of water that is filtered by a system. The higher the turnover rate the more beneficial it is for reef tanks.

Vertebrate

Animals that have a backbone and a skeleton. For our purposes this will include fish, sharks and jawless fish.

Water Change

The practice of swapping a portion of aquarium water with a fresh saltwater mix. It is suggested that 20 to 25 percent of the water be changed each month in a reef tank. Remember to only add reverse osmosis or RO water back to the system at this time. This is an excellent way to remove a large amount of impurities in a short amount of time.

Wet/Dry Filter

Part of the biological filtration system that is exposed to the air to aid in the nitrification process. This system is contained in chamber 2 of our aquarium system. Water flows down into the filter and over a filter medium where microorganisms remove pollutants. The water is then pumped back up into the tank. A mechanical filtration medium may also be used in a wet/dry filter.

Zooplankton

Tiny microscopic animals often present in seawater. The larval stages of many fishes and invertebrates are included in this category.

Zooxanthellae

Tiny plants that live in a symbiotic relationship with certain corals, clams and some sponges. They receive nutrients from their host and provide a food source in return. They are the reason for the brilliant colors in corals and clams.

4-H Story

Record your experience during this project.

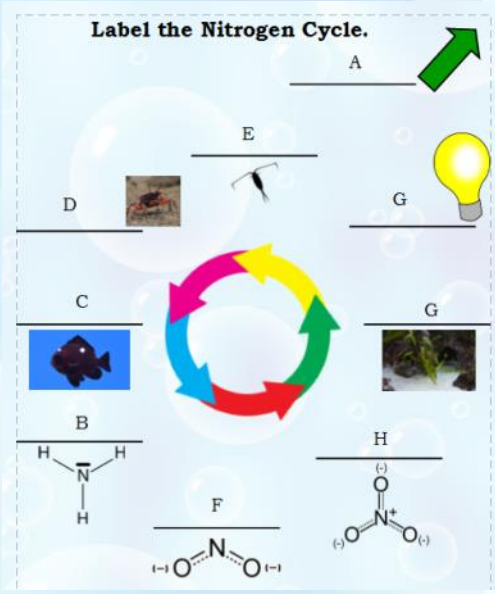
Project Photos

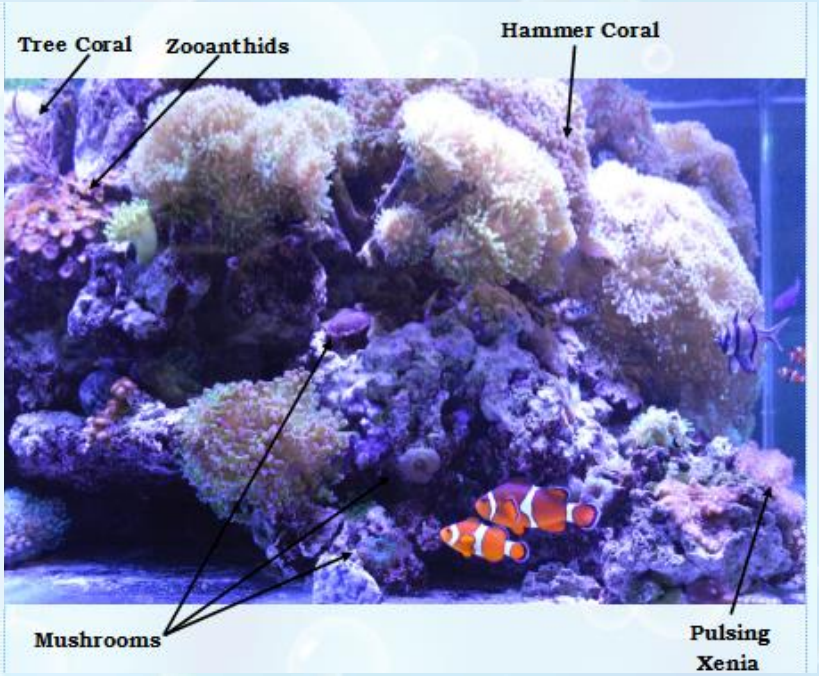
Project Photos

Project Photos

Project Photos

Answer Keys





Additional Resources

Electronic Data Information Sources:

4-H Member's Guide: Starting and Maintaining a Marine Aquarium
http://edis.ifas.ufl.edu/pdffiles/4H/4H02400.pdf

Websites

Marine Aquarium Societies of North America
http://masna.org

Reef 2 Reef
http://www.reef2reef.com/

Florida Marine Aquarium Society
http://www.fmas1955.org

Books & Publications

Coral Magazine
http://www.coralmagazine.com/

The Coral Reef Aquarium: From Inception to Completion
(Oceonographic Series) by Tony Vargas (Author), Julian Sprung (Editor)
ISBN-10: 1883693306 ISBN-13: 978-1883693305

Reef Hobbyist Magazine
http://www.reefhobbyistmagazine.com/

Works Cited

"Glossary of Aquarium Terms." - Saltwater Aquarium Guide on Sea and Sky. N.p., n.d. Web. 21 July 2016.

"Reef2Reef Forums." Reef2Reef Forums. N.p., n.d. Web. 2015.

4-H Pledge

*I pledge my **head** to clearer thinking,*

*My **heart** to greater loyalty,*

*My **hands** to larger service, and*

*My **health** to better living for my club, my community, my country and my world.*