



a pinch of salt

an introduction to marine fishkeeping

At one point or other in your time as a fishkeeper it is likely that you have considered setting up a saltwater tank. For many of us this seems like a leap too far as most of your previous knowledge of fishkeeping is either turned on its head or completely useless. There is a sea of information to read through with differing opinions on the areas of importance and it can get a little overwhelming when you don't know where to start. Here's where I may be able to help.

Having made this very switch from several freshwater community tanks to a pair of successful reef tanks that have been active without losses for over six months I have already done most of the research for you! This article will be aimed at those considering or beginning to make the switch from a freshwater to a saltwater tank and I hope to not only answer some of the more common questions, such as what hardware you can and can't use, but also provide some checklists and shopping suggestions to kick-start your own research.

Before we start I'd like to make a few notes. Firstly on tank types, just like in a freshwater setup you can go for the soft, acidic water of a peaceful Amazonian community or the hard, alkaline waters of the aggressive African cichlid setup, there are options when it comes to a saltwater tank. If you want to just test the waters you can go for what is called a FOWLR setup, which stands for Fish Only With Live Rock, which is almost comparable in cost and upkeep to an expensive cichlid setup. On the other hand you can go all-out for a reef tank complete with dazzling corals and myriad of crawling invertebrates and really break the bank. Then there are your predator tanks, your biotopes, and the list goes on. The second note I would make is about tank size. The same general rule applies here in that larger tanks are easier to maintain, but also a lot more expensive. This is exaggerated further with saltwater tanks in that the costs escalate massively with large setups but also the water parameters are a lot more stable at these higher volumes. However, smaller (nano) tanks are not out of reach even for beginners and the old idea that tanks under 200 litres are undoable for beginners is thoroughly outdated, with successful reef setups getting so much smaller.

With this in mind you should get the largest tank that suits your balance and your needs.

COST

Probably the first thing that springs to mind when considering a marine tank is the cost. Both in the initial tank setup and in stocking the tank there is no denying that saltwater requires substantially more monetary investment even compared to expensive freshwater setups. Not only are the fish themselves more expensive on average but you will be paying for your salt mix for each water change, purified water for top-ups, gadgets to monitor your water parameters and have to lay out massive initial

payments for good lighting and filtration systems in the hundreds of dollars range.

If you are on a tight budget a reef tank of any size cannot be recommended because you will be looking at a couple of hundred just to populate it with enough coral and rock so that it doesn't look bare. Your option here is the aforementioned FOWLR or a fish-only (FO) setup where you need the bare minimum of live rock (though more is obviously preferred) and your fish, negating the high price of coral-friendly light and the live invertebrate costs. The costs of an average, none too fancy FOWLR setup could be compared to a heavily planted freshwater tank with upgraded lighting, a CO2 system and fertiliser dosing or a large African cichlid tank with lots of rock and expensive substrate.

So what can you use from your freshwater setup to minimise the costs of a new marine tank? Your aquarium, whether glass or acrylic, should be suitable to house fresh or saltwater fish. With the exception of some all-in-one systems in which the filtration and/or lighting are not changeable you are not limited by this asset. You can re-use your heater and also any water circulation such as pumps, as well as items like hang-on-back filters that can be configured for use in a saltwater tank. Miscellaneous items like your fish nets, gravel vacuums, glass scrubbers, thermometers (if not metallic) and brushes can be used.



People often start a marine tank to replicate a coral reef

FILTRATION AND WATER CIRCULATION

This is one of the cases where your freshwater knowledge will actually hold you back, as the principles here seek to achieve very different results. Sumps are almost an absolute for tanks over 2 feet and should always be used in these larger setups. This is in contrast to a freshwater tank where a sump is only really used in huge setups and even then it might be considered a bit unnecessary. Sumps will house a lot of extra surface area for beneficial bacteria, filter out waste before it converts to nitrates, aerate the water, add water volume, house beneficial algae and macroinvertebrates and importantly house denitrifying bacteria in media or live rock. For smaller tanks around the two foot and under mark you can consider alternative options, like the DIY refugium.

This is where your old **hang-on-back filter** can come in handy. With a small clip-on light and a handful of macroalgae like chaetomorpha you can make yourself your own mini-refugium. A refugium is usually in the sump and houses the aforementioned macroinverts that will feed your main tank. What it can also house is additional filtration through live rock or deep substrate and a macroalgae that will use the light (on a reverse photoperiod) to oxygenate the water at night time and remove excess phosphates and nitrates from your tank, outcompeting less fancied forms of algae. The catch is that the macroalgae itself becomes a nuisance if let into your display tank so the refugium is necessary to keep it in one place. You can also use it to keep suitable media.

Suitable media for your saltwater tank is again different from what you are used to with freshwater tanks. Sponges and similar mechanical filtration is generally avoided as they turn in to "nitrate factories". In general saltwater life forms are more sensitive to nitrate build-up so you want to remove detritus as soon as possible. How this is achieved will be addressed later but generally sponge filters will do more harm than good. This is true also of canister filters. While they are close to the pinnacle of freshwater filtration there are many arguments to not include them in a saltwater tank, though some do still use them. If you remove the nitrates fast enough they are a great way to remove loose detritus, add to the water flow, and house a lot of media but they do block a lot sooner than in your freshwater setup because of the abundance of life in the saltwater tank.

So what media do you use? The most popular forms are specialised porous media like sintered glass, one example is Seachem's Matrix, which acts like the live rock in housing bacteria that remove the nitrates from the water, and chemical filtration of which there are various types. While some will not work in salt water as they "recharge" there are many commercial products like resins, activated carbon and phosphorous removers that seek to clean your water. Your individual circumstances will dictate how cost effective these products are and in general a new tank will not need them, but the option is always there.



Cleaner shrimps can aid in removing detritus from the tank

Live rock is also something new to freshwater keepers but is a necessity for beginning saltwater aquarists. Live rock is a piece of rubble broken off of a coral reef that houses various forms of life – most importantly bacteria – from the reef and can include both beneficial and nuisance life forms when you bring it home. It is the reason keeping saltwater tanks is a lot simpler and reachable for even beginners now as it aids filtration extremely well. It is very porous and acts as the primary biological filter in your tank, boasting a massive surface area and areas for both aerobic and anaerobic bacteria to live. In a freshwater tank you would be aware that the aerobic bacteria in your sponge and substrate convert ammonia to nitrite and into nitrate, but this added surface area for anaerobic bacteria means that in a saltwater tank that nitrate is then converting into harmless nitrogen gas. Another great benefit is that often the die-off of some of the more sensitive or damaged creatures (visible or otherwise) upon introduction to a new aquarium will produce enough ammonia to cycle the tank. It is recommended you wait 1-2 months for cycling in a reef tank rather than the 1-2 weeks of freshwater setups. In addition it can look great and provides refuge for all life forms in your tank.

So now you know why you want it, but **how much live rock** should you have? And how should you place it? For a FOWLR setup you should aim to have at least one kilogram of live rock (it's sold by weight) per 7-8 litres of water. For a reef tank you want at least double this, but the more the better as long as it fits in the tank and allow for water circulation. Now while it is sold by the kilogram your live rock is not uniformly dense – some lighter "red" rocks may actually be better than an equivalent weight of the standard "green" rocks as they are more porous and can house more bacteria while being significantly lighter in weight. The weight guides mentions should be adequate no matter what rock you purchase. Make sure you set it up in a way that both allows flow but is structurally sound, I am sure there are detailed guides online.

Finally a quick note on the use of pumps or powerheads for **water circulation**. This is a very important aspect especially in reef keeping as it keeps the water uniformly salty and mimics the wave action of the ocean. A well circulated tank should be fully oxygenated (note there is no requirement for air pumps/stones in a saltwater tank) and have no "dead zones" where detritus will build up and produce noxious bacteria and gasses that can threaten the entire tank. It is of utmost importance in your first setup of the tank that you have enough flow and you should aim to have at least 10-20 times the whole water volume per hour turning over in a manner that leaves no section of the tank (even behind the rocks) stagnant.

LIGHTING

Lighting is often marked as the single **most important** piece of equipment when setting up a reef tank, and indeed it should be far and away the most expensive component to your tank. However, we will not go into great detail here as that is a topic for an entirely new article but I will touch on the various types and requirements. Many corals require advanced lighting that even the most high tech planted tank cannot come close to – metal halides and powerful LEDs will bring out the best in those rare stony corals. However, most beginners can get away with **power compact lighting** or T5VHO, or very high output fluorescent lights. While these may end up just as expensive as LEDs in the long run due to running costs and bulb replacements they do make an attractive first option just while you wrap your head around lighting a reef tank and coral requirements.

You may come across various rules of thumb such as "watts per gallon/litre" to simplify the light required in a wattage versus tank volume ratio. Typical values might be **1-1.5 watts per litre for low light corals** such as many of the soft corals, and as much as **2.5 watts or more per litre for light intensive corals**. As always treat these values as a rough estimate to accompany your own research. Remember that exceptionally deep tanks or where corals are placed at the bottom of the tank may mean you need stronger light to penetrate, and shallower tanks may not need as much; or corals at the top of the water column should be light loving corals. You will also need to pay attention to the spectrum or colour temperature as although the sun is around the 5500K mark the water will filter a lot of the light towards the red end of the spectrum before it reaches corals on a reef. This means that shallower water corals prefer closer to 10,000K and deep water corals like 20,000K. Your blue or actinic light tubes will also be a feature in your light fittings and they are a supplemental lighting beneficial to your corals but also to the aesthetics of the tank, promoting that glowing, iridescent colour you see in well kept reef tanks.

FO or FOWLR aquariums do not need such intense lighting and in most cases the stock fixture that comes with most aquariums is adequate, or even your old T5 or T8 fixture for your plants if used with a bulb between 6500K and 10,000K in colour temperature. Operating the aquarium lighting on a shorter light schedule of only 8 hours per day will help prevent nuisance algae growth.



Fish-only tanks can still provide a dazzling array of colours and there are many options for any tank size

MAINTENANCE

Another point of concern for convert freshwater fishkeepers is the maintenance requirement of a saltwater tank, so I will briefly mention it here. Water changes are a lot more involved in a saltwater tank as not only do you need to mix up your salt with purified water (or buy seawater that has been filtered) but you want to make sure it has high enough buffering capacity and pH much like when you make a water change in an African cichlid tank.

Topping up must be done with **RO/DI water** (reverse osmosis/deionised water which can be purified or distilled water if you can confirm that there is no copper). This can be extremely expensive for larger tanks so the purchase of a quality RO/DI unit is strongly encouraged as soon as possible. Having said this, water changes can be less frequent as the reef is a more "complete" ecosystem as represented by the fact it removes nitrates so well. This means water changes in a very mature and well-established reef tank are used predominantly to replenish minerals such as calcium and magnesium that are utilised and exhausted by corals. A water change once per month is a common schedule for many reef keepers. It may be tempting to top-up with treated tap water but I can assure you from experience it is not worth it! Even very good tap water contains a concoction of harmful metals, minerals and dissolved nutrients that wreak havoc in your reef tank, encouraging massive algal blooms and sick invertebrates.

Other maintenance can include cleaning algae, which generally builds up more frequently than in a freshwater tank and checking salinity which changes every day with evaporation. Feeding is again more involved as you must account for the filter-feeders and corals as well as the fish and invertebrates, often requiring multiple feeds per day. You should also quarantine all new fish and acclimate them to your levels of salt.

LIVESTOCK

Saltwater tanks are constantly evolving as dormant creatures grow up or live rock brings new critters into the mix. The vast array of livestock available will impress even freshwater fishkeepers who have done it all. However, saltwater tanks are really unforgiving of overstocking. Where you might push the stocking limits of a freshwater tank if you have a very aged filter and lots of plants, doing so is taking a massive risk in a saltwater tank as the water parameters can fluctuate so readily.

Corals really have no freshwater equivalent and the colours they bring are equally unmatched. They do bring additional maintenance as often you will find each coral has different light, positional, flow, and feeding requirements as well as the potential to sting surrounding competition. There are both soft and hard type corals and in-depth information on their types and care are probably best left to another article.

Fish in the saltwater tank are more often than not captured by hand from the wild. While many species have been bred in the aquarium, the saltwater world does not yet have the luxury of mass captive bred species like your neon tetras and bristlenose fish. This means they really need to be quarantined and well acclimated to your water conditions via drip acclimation. Feeding can also be an issue as fish plucked straight from the wild are only ever used to eating live foods. While some species are more open to feeding on pellets than others, you will often have to gradually get your fish used to pellet food using frozen foods and cultivating live species like mysis shrimp, brine shrimp and copepods.

Non-sessile **invertebrates** (that is, invertebrates that move around) are very sensitive to salinity, nitrates and metals such as copper. You must confirm that an invert is reef-safe or not reef safe if you plan to add it to your reef tank as some of them are predators of corals and even fish. Ornamental shrimps are some of the most interesting, attractive and expensive additions you can put in your reef tank as they hunt amongst the liverock for scraps of food or even clean your fish of dead skin and parasites. Crabs and lobsters are rarely reef safe but can be included with some faster moving fish or in their own tank, and some invertebrates come in on live rock as pests such as the feared mantis shrimp.

The **clean-up crew** (CuC) is one of the first things you will add to your tank and is more varied and efficient than those sharing the name in the freshwater tank. A good clean-up crew will keep your glass clean of film algae, your rocks clear of filamentous algae, and your deadzones free of detritus. Snails, shrimps, sea slugs and hermit crabs can all form part of a well rounded clean-up crew and will be one of the first additions to your tank. Some rough guides for a clean-up crew might be 1 hermit and 2 snails for each 10 litres of a reef tank, depending on how much other stock you have. You are not limited to just snails and crabs though, so look for opportunities to add brittle stars or sea hares for something a little more exotic. Remember they still add bioload!



This article has just brushed the surface of the information out there that you will want to know before you start your tank but I hope it has addressed some of the common concerns or points of interest to freshwater enthusiasts. I strongly encourage you to conduct your own research based on some of the main topics covered here in order to get started. On the following pages I will provide a couple of lists and even sample tank setups with costing included to further aid your own research whether it is out of interest or if you intend to start a tank of your own!



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TO DO

- Daily: Multiple feeds
- Daily: Check health and feeding of all tank inhabitants
- Daily: Check temperature and salinity
- Daily: Turn lights on and off for required time
- Daily: Empty the protein skimmer cup
- Weekly: Top up with RO/DI water
- Weekly: Monitor nitrates, pH
- Weekly: Mix saltwater for next water change
- Weekly: Remove excess algae and clean glass
- Fortnightly: Clean filters
- Fortnightly: 20-25% water change

SHOPPING LIST

- Aquarium and sump
- Lighting system
- Protein skimmer
- 2 x Powerhead
- s or pumps
- Live rock
- RO/DI unit
- Substrate (Crushed coral, live sand or sand)
- Extras like fish nets, scrapers, brushes, gloves, buckets, vacuums, replacement media, quarantine tank, etc.
- Saltwater mix
- Hydrometer or refractometer
- Heater and thermometer
- Test kits
- Marine fish and coral foods
- Supplements

SAMPLE TANK

\$1000 beginner **soft coral** reef tank



Aquarium 60cm x 30cm x 30cm (57L)
Various prices from Capital Aquatics
Day 1

A two foot tank is suitable for a beginner and will not require a sump. There is plenty of room for soft corals, some shrimp and a fish or two and a little room for error with regards to water parameters. Add a stand and hood if desired.



Ecotech Coral Glue 30ml
\$19.95 from Age of Aquariums
Day 1

Get a head start on your reefscape by gluing your live rock together. Also useful for when you get your first coral frags.

API pH High Range Test kit
\$9.90 from Age of Aquariums
Day 1

You will need to test the pH of your saltwater mix.



Red Sea Hydrometer / Thermometer
\$32.95 from Age of Aquariums
Day 1

Your specific gravity test and thermometer in one, from a trusted brand.



Red Sea Salt 10kg
\$54.95 from Age of Aquariums
Day 1

Make 300 L of quality synthetic sea water. Don't skimp on salt mix quality or you risk adding unnecessary phosphates!



Coral Sand 2mm
5kg
\$20 from Age of Aquariums
Day 1

An aragonite based sand will help buffer your water hardness and pH, as well as provide a home for various reef critters.



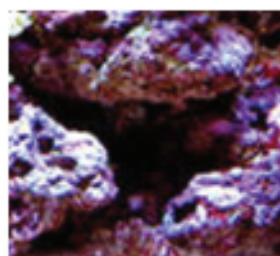
Aleas HM-2101 600lph submersible pump
\$12 from Age of Aquariums
Week 1

Great amount of flow if properly positioned, and combined with the outflow from the AquaClear filter there should be a lot of surface agitation and no dead spots.



API Reef Master Test Kit
\$48.50 from Age of Aquariums
Week 1

Has everything you need to test except the pH, and none of the useless tests that other kits contain.



Premium Live Rock (8kg)
\$12 per kilo from Canberra Marine
Week 1

High quality live rock for an affordable price is available if you take the time to look. There will be minimal pest creatures but great life and good coralline algae growth.



Hydor THEO 100w
\$36.95 from Age of Aquariums
Week 1

No use taking risks when it comes to hundreds of dollars worth of coral. Get a trusted heater brand with more than enough wattage.

SAMPLE TANK

Continued



Ocean Nutrition Formula 2 Marine Pellet Small
\$14.95 from Age of Aquariums
Month 1

One of the best quality pellets in terms of ingredients and consistency out there. Even this 100 gram tub will last you a long time with 2-3 fish.



AquaClear 70 HOB filter
\$79 from Age of Aquariums
Month 1

Perfect for converting into a refugium, just add chaeto and a clip on light! Adjustable flow and a big media area make this a no-brainer.

Aqualina Double Compact reflector
24inch
and Catalina 10K/actinic 55w bulbs
\$205 from Age of Aquariums
Month 1

Two 55w bulbs will provide your soft corals with enough light to thrive, with room to get a few of the less demanding stony coral types.



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UP Aqua Clip on LED
\$35 from Canberra
Aquatic
Month 1



It's no use saving a few dollars on the slightly cheaper but much inferior products. This LED is designed for plant growth and so is perfect for your chaeto in the AC70 filter.



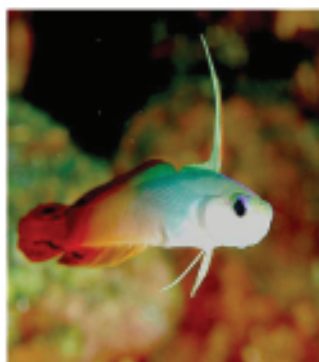
First live fish - Tank raised ocellaris clownfish
\$40 from Canberra Marine
Month 2

Almost too common, but still a perfect choice for beginners. As they are tank raised they are hardy and feed readily, often from your hand!



First live coral - Pulsing Xenia
Order from Canberra Marine
Month 2

The ubiquitous beginner's coral. Pulsing xenia can be beautiful and interesting with their pulsating yet aren't fussy about water conditions or lighting.



Second live fish - Firefish
\$40 from Canberra Marine
Month 3

Sometimes shy but a beautiful and characterful fish nonetheless, the firefish is not the ideal beginner fish but is perfectly suited to this smaller aquarium size. Watch them display by flicking their thread-line fins as they dart between your live rock.



Second live coral - Red mushroom rock
\$35 from Canberra
Marine
Month 3

Once you start with mushroom corals you will not want to stop, trying to collect every colour and variation and bringing endless colour to your tank.