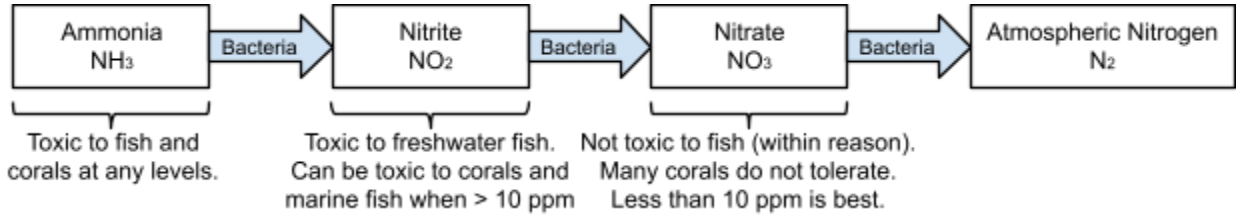
Cycling your Aquarium

All living organisms produce ammonia as a waste product from consuming food. Levels of ammonia can quickly become toxic in our aquariums. Even low levels can cause undue stress to animals such as coral or fish. Ultimately ammonia is converted by bacteria to nitrite, then to nitrate, and finally atmospheric nitrogen. An uncycled tank will not have sufficient levels of bacteria to sustain this process, where a cycled tank will.

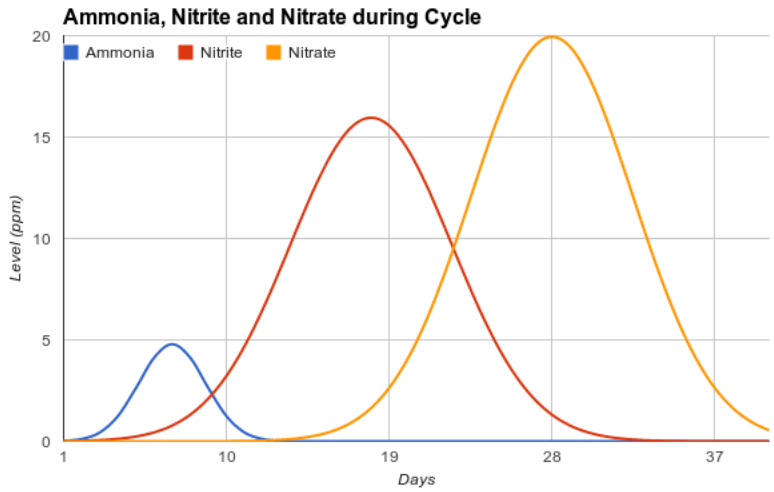
The following diagram depicts the nitrogen cycle:



As a rule of thumb, it is best to wait until ammonia and nitrites have both dropped to zero before adding fish. Wait until nitrates are low or undetectable before adding coral. This also gives the tank time to mature.

The following graph illustrates how the ammonia, nitrite and nitrate levels will change over the course of the cycle. It can take upwards of 20-30 days for a tank to fully cycle. Note: The levels and times are not intended to be accurate and are for illustration purposes only.

The important thing to note is that as bacteria establishes to convert ammonia to nitrite, for example, you will start to see the ammonia levels drop, while nitrite levels will increase. Similarly as bacteria establishes to convert nitrite to nitrate, the nitrite levels will drop while the nitrate levels will increase. Finally, when bacteria to convert nitrate into atmospheric nitrogen establishes, the nitrate levels will drop.



What do I need to cycle my tank?

In order to cycle your tank, you need:

1. A source of ammonia - required to give the bacteria something to start the cycle with.
2. A source of bacteria - required to establish the bacteria population.
3. An ammonia, nitrite and nitrate test kit to measure levels - required to see where in the cycle process you are.
4. Patience. :) - this will be required for any adventures in marine aquarium keeping.

If you are starting a tank using live rock (rock that has been in another aquarium, is from the ocean, or is aquacultured), or live sand you already have a source of bacteria which can be used to cycle the tank. Alternatively if you start with dead rock (ie dry base rock) and dry sand you can get a scoop of sand from another aquarist, or use a raw cocktail shrimp as the ammonia and bacteria source.

If you got ammonia at the BAR New Aquarist workshop, you can use that. If you need to buy more, get “Janitorial Strength Ammonia” from Ace Hardware. This brand is free of dyes, foaming agents, etc.

The table below shows approximately how much ammonia must be added to a size of aquarium to achieve 3 ppm of ammonia concentration in the water, a sufficient level to start a cycle.

Volume (US Gallons)	Ammonia Required (mL)
1	0.11
5	0.57
10	1.14
50	5.68
100	11.36
200	22.71
300	34.07
400	45.42

General instructions:

1. Before adding any salt water to your tank, test your newly made saltwater for ammonia, nitrite and nitrate. This is a good time to verify that your salt mix is good, and that your reverse osmosis unit is operating correctly.
2. Add enough ammonia to achieve 3-5ppm ammonia concentration (use a test kit to determine this).
3. After a few days, test the ammonia again and test every day.
    a. After approximately a week the ammonia level should start dropping.
    b. Test the nitrite at this point, which should be non-zero.
4. Once ammonia has started dropping, add enough every second day to bring it back to the level you started with.

5. At this point, test ammonia and nitrite daily. You should observe nitrite starting to raise.
    a. It will likely take about twice as long for nitrite to start to drop as it did for the ammonia levels to drop.
6. Once the nitrite starts to drop, start testing nitrate daily as well. Once you start seeing nitrates and the nitrite level is near zero you are almost done the cycle.
7. When you no longer record ammonia and nitrite, and nitrate is present, the cycle is complete enough that you may stop adding ammonia and add your first fish.
8. Keep an eye on the levels every other day as the new fish adjusts. In the unlikely event you detect a spike in ammonia, a 50% water change should be performed every day to help get the ammonia levels back down below 0.05ppm.
9. Provided you have sufficient live rock and sand, the nitrates should start to drop. Once they reach near 0 you can begin considering your first coral addition.
10. The key throughout this process is to have patience. With each new fish, coral or invertebrate addition you should monitor your levels to ensure the aquarium adjusts its bacterial carrying capacity appropriately.

Some important notes:

- A death of a fish, coral, or other creature can cause a spike in ammonia and a new mini-cycle to start. If you detect ammonia at any point, aim to perform large 50% water changes daily to bring the levels down and protect the tank inhabitants.
- Over-feeding can also cause a spike in ammonia levels.

What can go wrong?

If your cycle seems to have stopped progressing, here are some common problems:

1. Not having a sufficient “starter bacteria” load. Try getting some more sand or filter material from an established tank.
2. If any of ammonia, nitrite or nitrate gets too high. If you see a lack of progress, a high reading of one of these could cause the cycle to stall. Perform 50% water changes daily to help bring the levels down (ammonia < 5ppm, nitrite < 10ppm, nitrate < 20ppm) and see if the cycle resumes itself.

Use the table below to record your test kit readings as you progress through your cycle.

Date	Ammonia	NItrite	Nitrate
Fresh Saltwater			

If you run into any problems along the way, feel free to start a discussion on the BAR forums. Make sure to include your measurements for freshly made saltwater, as well as your log of test kit readings. These will help other aquarists figure out what might be going on.