

Introduction : Coral reef ecosystem is one of the most complex and diversify in the ocean. Represented them in a small volume such a tank require some knowledges and skills. Two compartments are necessary : Aquarium and Settling tank.

Light : Corals are in symbiosis with unicellular organisms called zooxanthellae. Zooxanthellae need light to perform photosynthesis and produce simple sugars available for the corals. We estimate the number of Zooxanthellae around 30 000/mm³. The different photosynthetic pigments (chlorophylles, caroténoïdes, xanthophylles), assimilate the light at different wavelength. So the lighting of a reef tank should be included between 300 to 700nm. 1 watt per liter of water is necessary for a healthy and a regular coral growth.

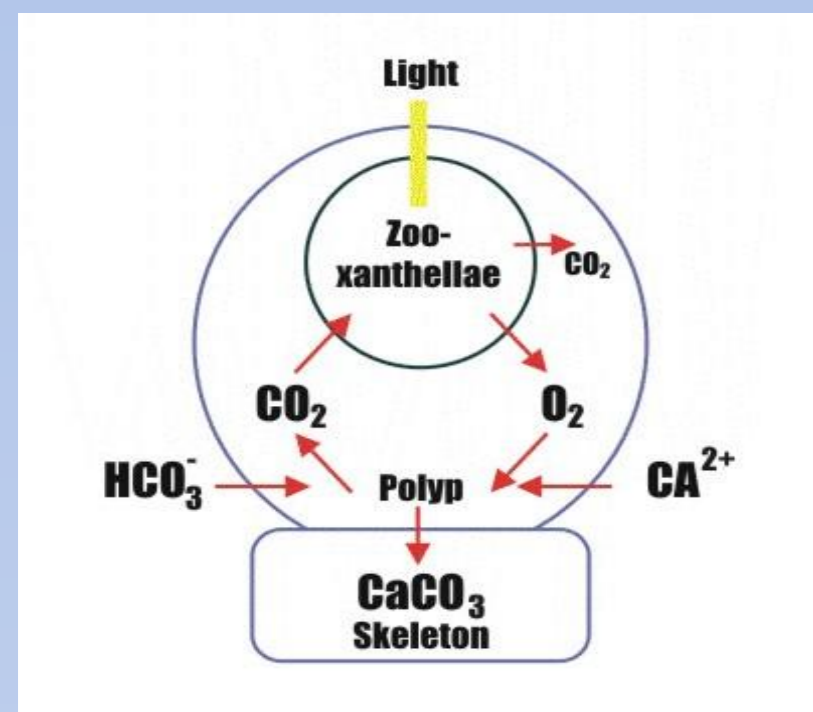


Figure 1 : Swap cycle between Polype and Zooxanthellae.

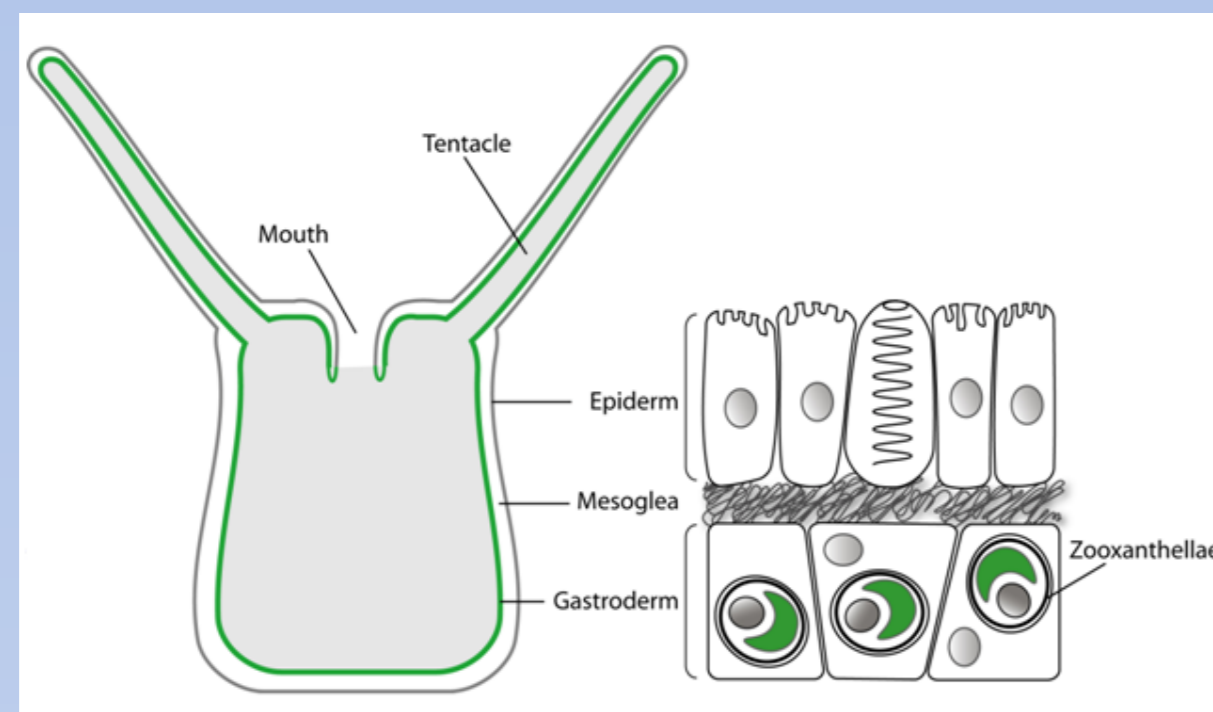


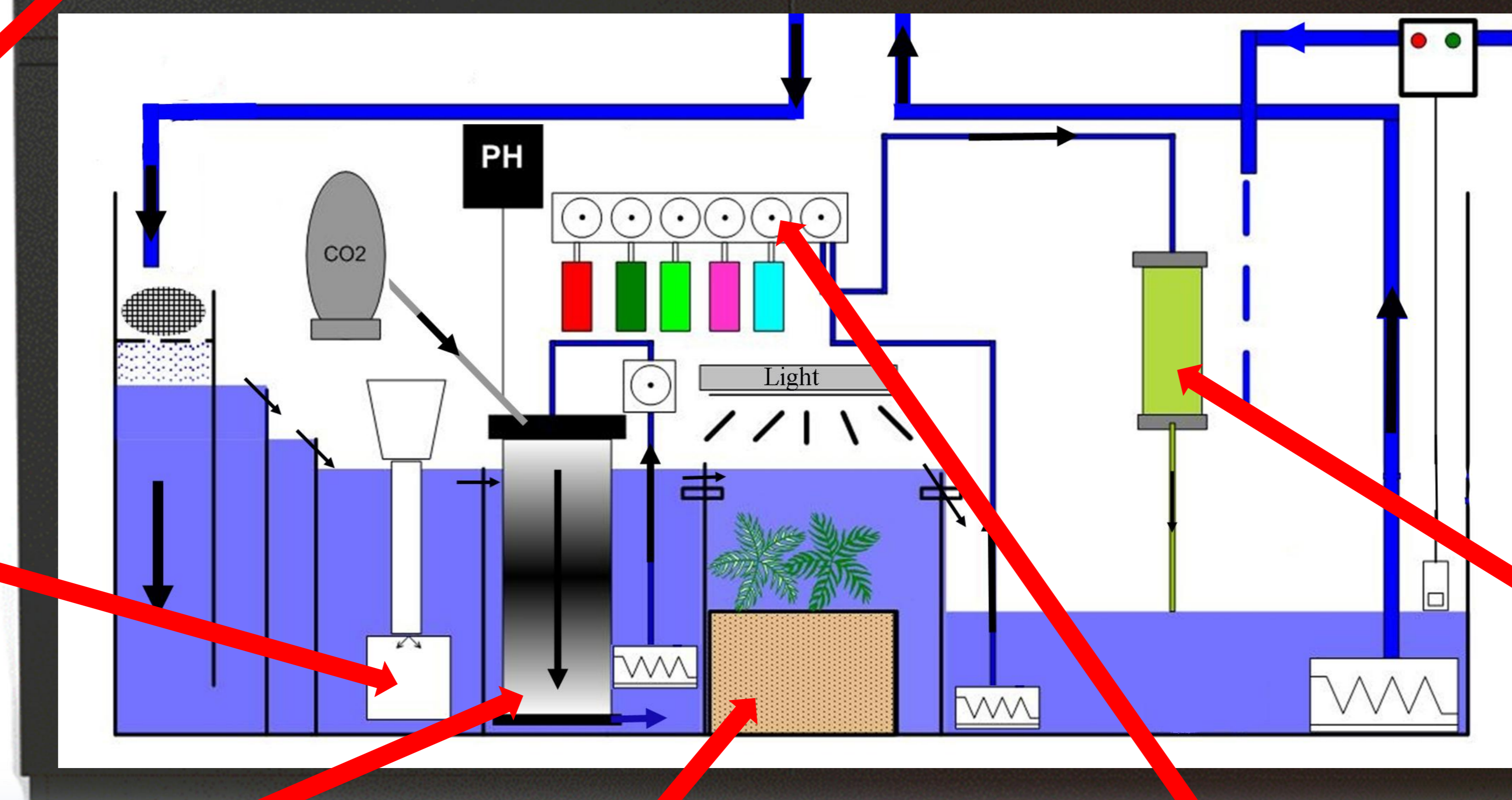
Figure 2 : Cross-section of an polype

Water : Salt water is made by human thanks to synthetic salt enriched in nutriment (Calcium, Magnesium, Iodine, etc.). "Aquarist" mixing about 35g of this salt with 1L of pure water. It's necessary to change approximately 20% of the volume of the reef tank each 2 weeks.

Tank : Reef tank have a wide range of capacity. From 40L to 32 million of liter (the world's largest aquarium). Usually built of glass, but sometime for the largest made of modified plexiglass (scratchproof). The thickness of glass is 10mm minimum until few centimeter for larger.

Protein Skimmers: It's the second part of filtration, called physical filtration. It allows to evacuate protein of water made by fish, and corals and which are not wiped out by biological filtration. It's principle, complex, uses chemical and physical proprieties. But application is easy, it consist in produce a pillar of air and mix with surrounding water. It's action produce foam load with undesirable elements. Next aquarists have just need to take off the foam. Protein Skimmers is in service all the time.

Calcium Reactor: Because many species in reef tank have need high concentration of calcium (about 480mg per litter), for their growth principally. Aquarists are force to adjust concentration in seawater with the help of Calcium Reactor because quantity of calcium bring with water change are not sufficient. Principle is easy, aquarium water go through a tube fill up with aragonite and dissolve the calcium rock. For intensify dissolution, carbon dioxide are add in water, it permit to increase Ph, making water more acidic. ($\text{CaCO}_3 + \text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{Ca}^{2+} + 2(\text{HCO}_3^-)$).



Refuge: This small space can be useful for the reproduction and the growth of algae, larval fish or the young coral cutting in a safety place without predators.

Dosing Pumps : Those little pump can add at precise time step an quantity of nutrient (Magnesium, trace-element, etc.).

Circulation pump: In reef tank it's necessary to simulate natural condition of water circulation to keep the good health of all species. It allows oxygenation, mix nutrient and above all it allow keep water homogeneity. Moreover some species of fish or coral need current for live (filter feeder for example). The power of circulation pump must be 40 times the volume of the aquarium.

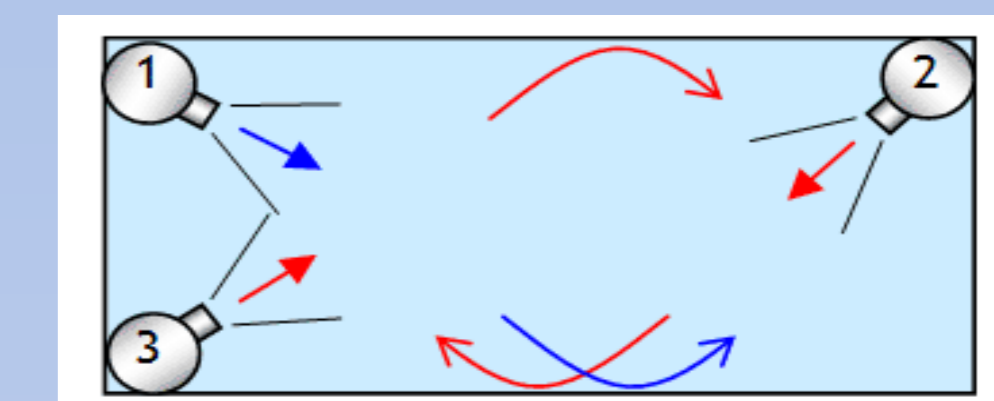


Figure 3 : Drawing of water circulation induce by circulation pumps.

Live Rocks: LR is natural rock take off the ocean near reefs. It can be, bleached corals skeletons or made by calcareous organisms, but they are the same significant porosity. It's allowed to microscopic organism like bacteria to reach the center of LR. Why? LR are THE biological filter of reef tank because they hosts both aerobic and anaerobic nitrifying bacteria required for the nitrogen cycle that processes waste (leftovers, vegetal remain, faeces, etc.), so they maintain clean water. On surface there are aerobic bacteria (Nitrosomonas and Nitrobacter) which make nitrification ($\text{NH}_4 \rightarrow \text{NH}_3 \rightarrow \text{NO}_3$). Inside there are anaerobic bacteria which make denitrification ($\text{NO}_3 \rightarrow \text{N}_2$). It's the first part of filtration, called biological filtration.



Figure 4 & 5 : Pics of Live Rocks.

UV filter : Between 100 – 280 nm, an UV filter kills the major parts of micro-organisms present in the water. The inflow of water has to be clean without particles before the entrance in the UV filter. Flow velocity is adjusted to be optimal, for instance 8 watts for a tank around 180L, the optimal flow velocity is around 725L per hour.

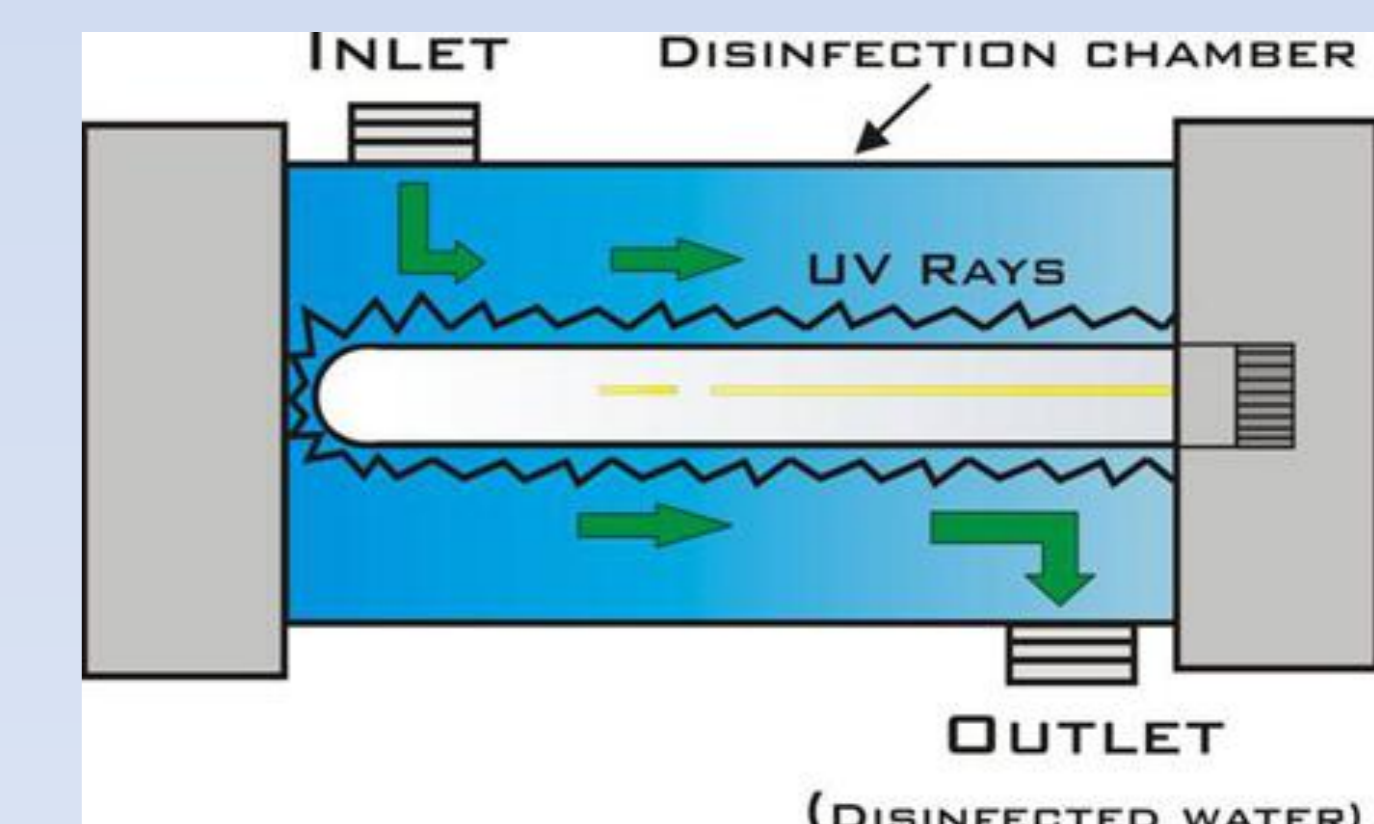


Figure 6 : Drawing of UV Filter.

Conclusion : To keep corals in good health for a long term, all those equipments are require. Moreover, for a short term (sampling), a simple bucket will be fine.

