

# Lighting Guide

Drs. Foster & Smith Educational Staff



The quality of aquatic life in your aquarium can be directly related to the quality of light. If the correct spectrum and intensity of light is not provided, the survival rate of your plants, corals, or invertebrates will be poor. When designing your aquarium lighting system, your goal should be to duplicate natural conditions. Thanks to recent advancements in lighting technology, this has become an easier task.

All lighting systems generate heat. The more powerful the lighting system, the greater the cooling requirements are likely to be. Regardless of the size or type of your lighting system, your aquarium should be located in a temperature-controlled room to help counterbalance radiant heat.

**Fish-only Aquariums:** Fish, artificial plants, decorative wood and/or ceramics

**Recommended lighting system:** Standard or a Power Compact fluorescent system, LED\*.



A lighting system between 1 to 2 watts per gallon should be sufficient to simulate a day-night cycle in a fish-only aquarium. Because the requirements of a fish-only aquarium are forgiving, you can choose the spectrum of bulb that best suits your preference. Avoid the use of standard hardware store bulbs, however, which promote the growth of brown algae.



**Freshwater Planted Aquariums:** Fish, live plants, decorative wood and/or ceramics

**Recommended lighting system:** Standard fluorescent, T-5 HO, VHO, Power Compact, Metal Halide/HQI, LED\*.



Most of the freshwater aquatic plants available on the market originally came from shallow areas of rivers in Central and South America. Though the water there is generally murky, the plants experience full-spectrum light. Depending on the specific species of plants you plan to acquire, and the depth of your tank, you will need a standard fluorescent lighting system between 2 and 5 watts per gallon. Purchase only plants which your lighting system will support.

The heat generated by most of the more powerful lighting systems required for live plants is considerable. If necessary, raise the fixture slightly above the cover to provide extra space to promote air circulation. A small cooling fan can be used to efficiently dissipate heat from the fixture.

**Marine Reef Aquariums:** Fish, invertebrates, corals, and live rock

**Recommended lighting systems:** T-5 HO, VHO, Power Compact, Metal Halide/HQI, LED\*.



Many corals and invertebrates rely on light for a major portion of their nutrition, but the amount each type requires varies dramatically. In the wild, many corals come from depths of 15 to 65 feet where the light is extremely intense. However, many other corals have adapted to low-light conditions by hiding themselves within the reef for safety.

To correctly light a reef aquarium that is 24" deep or less, use a lighting system between 4 to 8 watts per gallon. Of course, you can relax requirements significantly by choosing to house only corals and invertebrates that require low levels of light, as well as non-photosynthetic invertebrates.

Many LPS (large polyp stony) corals are found at deeper depths, below 65 feet. Many corals at these depths fluoresce. They use blue light at these depths because of the ability of water to filter out the various spectrums. Because metal halide and other reef aquarium lighting systems generate substantial heat, they often require cooling. Hot air surrounding bulbs can be removed by fans. Removing this heat can increase the usefulness of your bulbs as heat adversely affects their life span. Ideally, the room temperature can be maintained at a level to counterbalance the radiant heat absorbed directly by the water. If not, a chiller may be needed.

### Lighting Innovations

The most significant recent improvement in lighting systems is the advent of electronic ballasts that operate with less heat, and deliver much longer bulb life. Bulbs too have evolved. A wide range of light spectrums and intensities are now available, and in compact sizes that provide you far more set-up options. Most importantly, systems can now closely replicate the lighting that organisms experience in the wild.

## Energy efficient lighting options

- **T-5 High Output (HO) Fluorescent Systems**

*High output, tiny size - the most advanced fluorescent lighting available!*

With only a 5/8" diameter, thin T-5 HO Fluorescent bulbs produce almost twice the brightness of standard fluorescents. In addition to their brightness, you can also fit more of these slim bulbs into the same amount of space.



## LED (Light Emitting Diode)

As a relative "newcomer" to the world of aquarium lighting, [LED light fixtures](#) are often subject to confusion and misconceptions. LED technology employs a radically different approach to light generation. LEDs emit light as energized or excited subatomic particles pass through a semiconductor material. This distinct process of light generation called electroluminescence requires FAR LESS energy to produce brilliant light for an energy-efficient choice to aquarium lighting.

When concerned with supporting photosynthetic aquatic life, hobbyists should look for PAR values of LED fixtures. PAR or Photosynthetically Active Radiation designates a spectral range of light that photosynthetic organisms utilize during photosynthesis. Keep in mind that PAR values vary at different depths and distances from the LED light source. In other words, the same LED fixture will have multiple PAR values capable of supporting different species with different light requirements. Due to the relatively complex nature of expressing PAR levels and a lack of standardization, not all manufactures will provide PAR information the same way. To determine which LED aquarium light fixture is right for you, please refer to our handy [LED Lighting Comparison Guide](#).

## Lighting Overview

Bulb Type	Watts	Bulb Life	Kelvin Rating	Benefits	Limitations	Typical Use
Incandescent	7-25	2-4 months	Varies with color of bulb	Inexpensive; multiple colors	Narrow spectrum; lower light intensity; high heat	Small fish only; beginner's startup kits
			3,000°-	Wide range of colors,	Not ideally suited for	Fresh or saltwater community aquarium or

<u>Standard Fluorescent</u>	15-40	0-10 months	20,000°K; actinic	SIZES, aesthetic; efficient; cool; inexpensive	photosynthetic plants or invertebrates	mini or micro reef with low light corals and plants
-----------------------------	-------	-------------	-------------------	--	--	---

<u>T-5 HO Fluorescent</u>	24-54	16-24 months	6,000°-11,000°K; actinic	Longevity; high intensity; small size; cool running	Not ideally suited for aquariums more than 24" deep	Reef less than 24" deep; freshwater planted
---------------------------	-------	--------------	--------------------------	---	---	---

<u>VHO Fluorescent</u>	75-165	4-18 months	10,000°K; actinic	Large selection of sizes; longer bulb life than standard fluorescent	Higher heat - may require a chiller	Reefs less than 24" deep; freshwater planted
------------------------	--------	-------------	-------------------	--	-------------------------------------	--

<u>Compact Fluorescent</u>	10-130	12-28 months	5,000°-10,000°K; actinic	Longevity; high intensity; wide spectrum range; compact	May produce higher heat - may require a chiller	Reefs less than 24" deep; freshwater planted; marine aquariums
----------------------------	--------	--------------	--------------------------	---	---	--

<u>Metal Halide</u>	70-1000	6-18 months	4,000°-20,000K°	Highest intensity; wide spectrum range	Higher heat - may require a chiller; possible UV radiation	Reefs or freshwater aquariums more than 24" deep; photosynthetic corals and invertebrates
---------------------	---------	-------------	-----------------	--	--	---

<u>*LED (Light-Emitting Diode)</u>	0.05-5	Up to 50,000 hours	Varies with LED array	Extremely energy efficient, generating more lights using less energy	Sensitive to heat damage. Maintain proper ventilation and place away from light fixture or devices that run hot	Versatile use as an accent light, supplemental light or even as the primary light source for all freshwater and marine aquariums including coral reef aquariums.
------------------------------------	--------	--------------------	-----------------------	--	---	--

## Conclusion

Duplicating natural lighting conditions greatly increases both survival and growth rates of aquatic life, and enables you to enjoy it in a more realistic ecosystem. When selecting your lighting system, be sure to evaluate both the initial and operating cost. Select fixtures that use electricity frugally and will not require frequent bulb changes. It is usually worthwhile to pay a bit more for those with lower operating costs.