Lighting Guide

Drs. Foster & Smith Educational Staff

HOW TO light up YOUR aquatic life

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

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.

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 liverock

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

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.

- **Compact Fluorescent Lighting Systems**
  Bright, efficient, cool - great for every application
  The next generation in fluorescent lighting, compact fluorescent systems utilize a twin-tube design, which results in much greater intensity and higher light outputs than standard fluorescent lamps. Their small size requires only half the space of standard fluorescent tubes, which makes these bulbs particularly appealing. Compact fluorescents have a low operating cost and produce significantly less heat than other intense light sources.

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
Standard Fluorescent	15-40	6-18 months*	3,000°-20,000°K; actinic	Wide range of colors, sizes; aesthetic; efficient; cool; inexpensive	Not ideally suited for photosynthetic plants or invertebrates	Fresh or saltwater community aquarium or mini or micro reef with low light corals and plants
T-5 HO Fluorescent	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
VHO Fluorescent	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
Compact Fluorescent	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

Metal Halide	70-1000	6-18 months	4,000°-20,000K°	Highest intensity; wide spectrum range	Higher heat - may require chiller; possible UV radiation	Reefs or freshwater aaquariums more than 24" deep; photosynthetic corals and invertebrates
LED Moon/ Lunar Light	Approx 1 watt	N/A (Not a light, but a Light Emitting Diode)	N/A**	Low wattage; recreates nocturnal lighting conditions; great for viewing nocturnal inhabitants	Requires one unit per every 24" of aquarium length	Reef or freshwater aquariums

*Depending upon ballast type

**Blue light in the 455-470 nm range depending on model

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.