What is there to gain from gain?

Measured in decibels, antenna gain is not a fixed quantitative value, but rather a ratio related to an antenna's effective radiated power (ERP).

In simple terms, an antenna's decibel (dB) rating can be regarded as its radiation pattern. The most common antenna-type used on sailboats, a 3 dB gain antenna has a much more circular transmit and receive pattern than that of the eight-foot 6 dB antenna found on most powerboats (see illustration below).

Gain also effects transmit power. For every 3 dB increase in an antenna's gain rating, the effected radiated power of the antenna doubles. Thus, a 6 dB gain, 8-foot VHF antenna has double the ERP of a 3 dB gain sailboat antenna, and the elliptical shape of the signal radiation pattern of a long-stick antenna with 9 dB gain has twice the ERP of the 8-foot 6 dB antenna. On a calm day, a 9 dB antenna will transmit beyond a 3 dB or 6 dB gain antenna mounted at the same height above deck. But with the increase in antenna gain, attributed to the antenna's elongated radiated beam pattern, comes a tradeoff: The signal will more easily fade when the antenna is used in a rolling sea. Because the beam pattern of a 9 dB gain antenna is elongated, when a vessel rolls, the "service area" of the 9 dB gain antenna dips toward the waterline and effectively puts VHF communications out of range until the antenna is once again level with the horizon.

Communication in the 150Mhz marine VHF band is generally regarded as line-of-sight. And although it is important to install an antenna that has as much gain as your particular vessel can physically and practically support, antenna height remains the single most important factor in effective transmission of VHF signals. A 3 dB gain antenna on top of a sailboat mast will easily outperform a 6 dB gain antenna on a center console powerboat. It should be noted that on a center-console RIB or other small boat, a 3 dB gain sailboat antenna would not perform nearly as well as an 8-foot, 6 dB antenna.

To determine communication range expressed in miles, you take the square root of the height of the VHF antenna above the waterline and multiply it by a factor of 1.42. Do this same calculation for the shore station or other boat that you are trying to talk to and add the two numbers together to arrive at the maximum distance over which the two radios can communicate.

Mounting an antenna higher on a boat will usually require a longer coaxial cable run, and a longer coaxial cable means increased signal loss. Still, even if you double the antenna's mounting height—and increase the cable length accordingly—the overall range increases by approximately 25 percent.

Most of the 8-foot 6 dB antennas tested have radiating elements (the part of the antenna that transmits and receives the radio waves) that are 5/8 of a wavelength long, arranged in a co-linear or stacked configuration. Because marine antennas have to be omni-directional, this design has proven to be the most efficient at radiating the radio signal less toward the sky and more toward the water's surface for maximum boat-to-boat range.

The round "beam" of the 3 dB antenna makes it effective when the boat is heeled. The narrower signals will either shoot skyward or into the water on a heel.