

Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Director, Institute of Marine Sciences, UC Santa Cruz.

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Big waves at sea



The USS Ramapo documented a 112-foot high wave while crossing the North Pacific in 1933.

I think many of us have a fascination with extremes, which is what makes the Guinness Book of Records so interesting and bizarre. Two books have appeared recently on the topic of extreme waves: *The Wave: In Pursuit of the Rogues, Freaks, and Giants of the Ocean* by Susan Casey, and *The Power of the Sea: Tsunamis, Storm Surges, Rogue Waves, and Our Quest to Predict Disasters*, by Bruce Parker. You have to admit that those titles grab your attention, especially living in Santa Cruz, with Mavericks an hour's drive north and Ghost Tree about the same distance to the south.

Perhaps 20 years ago, most of us, even those who study the ocean, had never heard of either. But Mavericks has become a household word on the central coast, and Ghost Tree, off Pescadero Point on the 17-Mile drive, is becoming legendary for huge surf as well. Sadly, big wave riders have died at both, and there is a group of surfers who wait patiently for either to go off each year. Personally, having spent some of my younger years surfing, they scare the heck out of me, and I have absolutely no desire to get out in waves of this size. But there is a fascination to a unique cadre of surfers with riding waves of 30 or 40 feet high, or larger.

This raises several interesting questions, but I'll avoid the human desire question, and instead deal with the waves themselves. How big or high can waves actually get? Well, it depends upon what kinds of waves we're talking about, which is the subject of the two recent books.

If we are talking about surfing and waves that we typically see breaking at Mavericks or Steamer Lane, they are all generated by the wind. Wind blowing across the ocean transfers energy to the sea surface, initially forming small ripples, which over time, if the wind persists, will begin to form discrete waves. The amount of energy transmitted to the ocean surface and, ultimately the height of the waves, depends upon the velocity of the wind, the length of time the wind blows, and the fetch or distance over which the wind blows.

In order to get big waves, we need to have high velocity wind persist for an extended period of time over broad stretches of ocean. While you can get small waves in a pond or a lake, it takes a large water body, like the Pacific Ocean, to crank up big waves. And how big can wind waves get? Its a difficult question to answer, because even most oceanographers that study waves don't have a desire to spend months at sea in modest-sized research vessels looking for the world's largest waves.

The largest wave actually observed and reliably measured to date was in the Pacific in February 1933 and happened under a unique set of circumstances. The USS Ramapo, a 478-foot Navy tanker, found itself in an extraordinary storm on its way from Manila to San Diego. The storm lasted 7 days and stretched from Asia to New York, producing strong winds over thousands of miles of unobstructed ocean. By triangulation on the ship's superstructure as it went down the face of the wave, they measured a wave height of 112 feet from peak to trough. The wavelength or distance between two successive crests was 1100 feet. Wave speed, which is dependent on the wavelength, was calculated at over 50 miles/hour.

The crew of the Ramapo measured the waves and lived to tell about it because their relatively short ship (478 ft) rode over these very long wavelength mountains of water without severe stress. Some of today's much longer vessels have had serious problems in seas of this size, where the length of the ship is similar to the lengths of the waves they are passing through.

The USS Ramapo made numerous runs back and forth across the Pacific and to Alaska during World War II, providing fuel to other Navy vessels. On December

27, 1942 the Ramapo was credited with rescuing the entire crew of the USS Wasmuth, a minesweeper, in heavy seas off Alaska. The Wasmuth was escorting a convey through a large Alaskan storm when two depth charges were ripped from their racks by the huge waves, fell overboard, and exploded beneath the ship's fantail. The blasts carried away part of the stern and the ship began taking on water quickly. Despite the heavy seas, the Ramapo came alongside and for three and a half hours, the tanker remained with the sinking ship and saved her entire crew. There are more big wave stories to come.