

# Earthquake set the sea to sloshing

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The Associated Press

2-16-90

LOS ANGELES — The deadly earthquake that walloped Northern California last fall triggered a four-foot-high tsunami, a huge undersea landslide and a feeding frenzy by fish in Monterey Bay, scientists say.

The towns of Monterey, Santa Cruz and Moss Landing were lucky the jolt happened near low tide because if the tsunami, or quake-caused sea wave, had happened at high tide "there could have been problems," oceanographer Frank Schwing said Thursday during a telephone interview.

The tsunami, which measured as much as four feet from crest to trough, moved through the bay at a speed of 67 mph just after the big quake, said Schwing, of the National Marine Fisheries Service in Monterey.

Submarine landslides — includ-

ing one two-by-five-miles in size — suddenly exposed buried worms, tiny crustaceans and other creatures. That caused an increase in activity and numbers of flatfish, rockfish and deep-sea perch, he said.

A small unmanned submarine placed in the bay two weeks after the quake found the fish "appeared to be engaging in a 'feeding frenzy' on the newly exposed ... organisms," Schwing and others wrote in a study published in the current issue of *Eos*, an American Geophysical Union publication.

Tsunamis, which often incorrectly are called tidal waves, are sudden rises and drops in water level that sometimes make giant waves crash onto a coastline.

As the Oct. 17 quake happened, the water level in Santa Cruz Harbor dropped about three feet as water rushed out of the harbor,

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probably because the quake lifted underlying ground upward by about four to eight inches, Schwing said.

"People standing there actually saw the water go out," he said. "There was some evidence boats actually hit bottom."

After water levels dropped about three feet at Santa Cruz and Moss Landing, they rose again by about three to four feet, Schwing said.

The tsunami moved across the bay at 67 mph, and "took about 20 minutes to travel the length of the bay from Santa Cruz to Monterey," he said.

He said water levels at Monterey Bay dropped about one foot, then rose about 1.5 feet.

The quake also made water slosh back and forth across the bay every half hour for 24 hours after the jolt, rising by about one foot and then falling by the same amount, he

added.

"It's analogous to having a tub of water, and if you strike the side of the tub, the water is going to bounce back and forth," Schwing said.

He said the tsunami and sloshing were much smaller than the normal tidal variation in Monterey Bay, but the tsunami could have caused damage if it had happened at high tide.

Ground failure, or liquefaction, on the bay floor caused numerous underwater landslides, including the two-by-five-mile slide about 1.5 miles west of Moss Landing. The ground slid into Monterey Submarine Canyon, an underwater canyon about as deep and wide as the Grand Canyon, Schwing said.

Schwing co-authored the study with Jerry Norton, also at the National Marine Fisheries Service, and Cindy Pilskaln, of the Monterey Bay Aquarium Research Institute in Pacific Grove.