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Radioactive Fish Near Fukushima Suggest Ongoing Contamination

Bottom-dwelling fish continue to be found with high levels of radioactive elements, potentially coming from leaking radioactive water or contaminated sediments

By David Biello | Thursday, October 25, 2012 | 2 comments

The fish off Fukushima remain radioactive more than a year after the earthquake and subsequent tsunami triggered three meltdowns at the Daiichi nuclear power plant. In fact, bottom-dwelling greenling fish caught in August 2012 bore the highest levels of radioactive particles seen to date—25,000 Becquerels per kilogram. (A becquerel is a unit of the rate of radioactive decay—or radiation emitted by a substance.) That is 250 times higher than current Japanese safety standards, a key reason fishing off Fukushima remains prohibited.

The findings suggest that contaminated water is still leaking from the stricken power plant, the sea bottom itself is now laced with radionuclides, or both. Concentrations in the ocean water itself remain below any human health concern but they do pass into fish that swim through those waters.

"When fish 'drink' they take [cesium] and other salts up from the water they are swimming in, that accumulates in the muscle tissue," explains marine chemist Ken Buessler of the Woods Hole Oceanographic Institution, who compiled the analysis of publicly released Japanese fisheries data and published it in *Science* on October 26. But the fish also shed that cesium if they swim in uncontaminated waters, as has been seen in tuna that migrated from near Japan to near San Diego, suggesting that levels in fish should decrease over time. For this reason, most of the fish caught off Japan's northeastern coast are not radioactive. But roughly 40 percent of bottom-dwelling fish, such as flatfish or halibut, caught off the coast adjacent to Fukushima bear radionuclides above the Japanese food safety standard of 100 becquerels per kilogram.*

According to a response to questions from *Scientific American* that was prepared by staff at the U.S. Nuclear Regulatory Commission, ingesting fish at that level "would only produce a dose that is a small fraction of the dose that people receive from natural levels." For example, as Buessler notes, fish caught off Japan in June 2011 boasted levels of potassium-40—a naturally occurring radionuclide—10 times higher than those of radioactive cesium from Fukushima.

Radioactive cesium decays by emitting what's known as a beta radiation, a negatively charged particle that is easily blocked by metal, plastic or wood—but not skin. In particular, ingesting beta-emitting radioactive elements is "a concern," according to the NRC. "Beta



RADIOACTIVE FISH: Some source of radioactive contamination is causing bottom-dwelling fish, like the greenling pictured here, to absorb high levels of radionuclides.
Image: Flickr.com / Brian Gratwicke

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particles released directly to living tissue can cause damage at the molecular level, which can disrupt cell function." Plus, beta particles are small enough to travel far in the body, causing damage far and wide.


U.S. safety guidelines from the Food and Drug Administration permit foods to bear 1,200 becquerels per kilogram of radioactive cesium, but the FDA declined to comment for this article. "The more restrictive action taken by the Japanese seems reasonable for the population living close to Fukushima because they receive radiation doses from other sources, including non-fish food, drinking water and land surface contamination," the NRC staff writes. "Based on the FDA and [World Health Organization] recommendations, eating fish contaminated at 100 Bq/kg would result in a small and acceptable exposure to radioactive cesium."

Because it takes decades for radionuclides to decay, fishing off Fukushima is likely to remain prohibited for many years. Exactly how long is uncertain, especially as the Tokyo Electric Power Company continues to struggle to contain and clean up millions of liters of contaminated waters at the Fukushima Daiichi nuclear power plant. And local waterways continue to wash radionuclides out to sea. "For the record, I was in Japan this past July and ate all types of seafood," says Buessler, who will hold a public colloquium on the findings November 14 at the University of Tokyo with colleagues. "The fisheries data like [those] shown here are used to keep certain areas and types of fish out of the markets. The question we can't answer is when will this no longer be of concern."

**Correction (10/26/12): It is 40 percent of bottom-dwelling fish, not all fish, caught near Fukushima that bear concentrations above Japanese safety standards.*

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