Marine Life At Risk From Radiation In Japan (UPDATE)

While the ocean has a high capacity for diluting radiation, the radioactive isotope levels in the sea near Japan's eastern coast bring higher risk of death, mutation, and genetic degradation for marine life than previously predicted. The greatest threat is to the future generations of sea creatures; the radiation could interfere with reproduction and the development of young, causing a collapse of the population. — Global Animal

Aboard a boat pulling a barge with water for Japan's overheating Fukushima nuclear plant Thursday. Photo Credit: Japan Maritime Self-Defence Force via Reuters

National Geographic News, Christine Dell'Amore

If radioactive material from the Fukushima Daiichi nuclear power plant—disabled by the March11 Japan earthquake and tsunami—continues to enter the ocean, marine life could be threatened, experts say.

In the past week, seawater samples taken near the nuclear power plant, on Japan's eastern coast, have shown elevated levels of radioactive isotopes, including cesium 137 and iodine 131, according to the *New York Times*.

All life on Earth and in the oceans lives with exposure to natural levels of ionizing radiation—high-frequency radiation with enough energy to change DNA. Most such genetic damage heals, but the addition of human-made radiation can make it harder for the body to repair broken genes.

Radiation concentrations in the Japanese seawater samples have fluctuated in past days, but on Wednesday the amount of iodine spiked to 3,355 times the legal limit for seawater, Japanese nuclear safety officials told the Associated Press.

That level is the highest so far—and an indication that more radiation is entering the ocean, though how is still unknown, the agency reported. Cesium was also found to be 20 times its safety limit on March 28, according to the *Times*.

Radiation Can Cause "Bizarre Mutations"

Once in seawater, radiation can hurt ocean animals in several ways—by killing them outright, creating "bizarre mutations" in their offspring, or passing radioactive material up the food chain, according to Joseph Rachlin, director of Lehman College's Laboratory for Marine and Estuarine Research in New York City.

"There will be a potential for a certain amount of lethality of living organisms, but that's less of a concern than the possible effects on the genetics of the animals that become exposed," Rachlin said.

"That's the main problem as I see it with radiation—altering the genetics of the animal and interfering with reproduction."

Even so, according to radioecologist F. Ward Whicker, the concentrations of iodine and cesium levels "would have to be orders of magnitude larger than the numbers I've seen to date to cause the kind of radiation doses to marine life that would cause mortality or reductions in reproductive potential.

"I am very doubtful that direct effects of radioactivity from the damaged reactors on marine life over a large area off the coast of Japan will be observed," Whicker, professor emeritus at Colorado State University, said via email.

Likewise, using legal limits to gauge damage to marine life is of little value right now, he said.

To make a "credible assessment" of the risk to marine animals, scientists would have to know the actual concentrations of radioactive iodine in the water and fish or other marine animals off Fukushima Daiichi, he said.

Radiation Hardest on the Little Ones

It's possible that levels of radioactive contamination near the Fukushima nuclear reactors could increase and cause some harm to local marine life, Whicker said.

“If this happens, the most likely effects would be reductions in reproductive potential of local fishes. ... ,” he said.

Marine organisms’ eggs and larvae are highly sensitive to radiation, since radioactive atoms can replace other atoms in their bodies, resulting in radiation exposure that could alter their DNA, Whicker said.

Most such deformed organisms don’t survive, but some can pass abnormalities on to the next generation, Lehman College’s Rachlin said. Either way, the radiation exposure could hurt the population’s ability to survive long-term.

Rachlin thinks the most susceptible critters would be soft-bodied invertebrates such as jellyfish, sea anemones, and marine worms—which can take up the radiation more quickly than shelled creatures—though Whicker said fish may be most at risk.

Whicker added, “I would expect any temporary losses in reproduction in local fish to be offset by immigration of unaffected individuals from surrounding areas that would be impacted to a lesser degree.”

In addition to its threats to reproduction, pockets of radioactive material can can burn fish passing through, hitting them like a stream of searing water, Rachlin said.

Complicating matters is the fact that predator species in the Pacific such as tuna and sailfish are already stressed by overfishing, according to Rachlin.

“I’m concerned—this is the spawning season. ... If this impacts the survivorship of the young and larvae, this will be a further insult.”

Radiation Threat Here to Stay?

According to chemical oceanographer Bill Burnett, “In the short run [the radiation] could have some definite negative impacts” on marine life.

“The good news is the half life [of iodine] is only eight days,” added Burnett, an expert in environmental radioactivity at Florida State University.

So “if they stop the source of radioactive leakage, this is going to be a short-term problem.”

However Fukushima Daiichi's leaking cesium is potentially more serious, since that isotope takes 30 years to decay, Burnett said.

Radiation Can Travel Up the Food Chain

There could also be some movement of radiation up the food chain if animals eat irradiated plants and smaller, radioactive animals, Rachlin said.

In particular, plants such as kelp can quickly absorb iodine, FSU’s Burnett said.

There’s a possibility that the devastation of towns in northeastern Japan caused by the earthquake and tsunami also released toxic metals such as lead into the soil and water, according to Texas Tech University ecotoxicologist Ron Kendall.

Previous studies have shown that metals can work in concert with radiation to suppress immune systems in vertebrates, making them more vulnerable to disease, Kendall said.

It’s a “big issue for the environment and human health because of the widespread destruction. It takes me back to New Orleans after Hurricane Katrina—this to me is even more complicated with the radiation.”

Ocean Resilient Against Radiation

The ocean has a “tremendous capacity” for diluting radiation, Colorado State's Whicker noted.

“It also has resilience, in the sense that the area would recover over time as the situation improves and as the radioactivity decays and disperses.”

“But I should caution that we have not had much opportunity to study the effects of very large releases of radioactivity into marine ecosystems,” he said. The best data comes from nuclear weapons tests in the Pacific in the 1950s and 1960s.

Texas Tech’s Kendall also pointed out that there’s not much known about radiation in seawater.

“The dose makes the poison,” he said, “and the more concentrated the radiation, the more potential effects. It’s something we definitely need to monitor.”

Added Lehman’s Rachlin: “If it’s a one-shot pulse, OK, not a problem.

But if the radiation leaks continue for several months, Japan may be dealing with a more serious blow to marine life, he said.

The coastline, after all, isn’t Chernobyl, he said. “We can’t cement [over] that whole area.”

http://news.nationalgeographic.com/news/2011/03/110331-japan-radiation-health-mutations-nuclear-animals-ocean-science-world/

More Stories You Might Like:


Radiation And Wildlife: The Impact On Animals


Four-Legged Solace: Pets Comfort Survivors


Two-Legged Heroes For Japan's Animals (Gallery)


Japan: This Week In Animal Rescue (PHOTOS)


Dazed Animals Still Found In Empty Japanese Cities


Rescue Groups Race To Save Japan's Pets

Posted by Samantha Ellis on Apr 13 2011. Filed under JAPAN ANIMAL RESCUE, SEA, TOP ANIMAL NEWS.You can follow comments through RSS 2.0.