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Dangers lurk deep for all ocean creatures from oil

By Craig Welch
Seattle Times environment reporter

She has poor skin, bad fur and massive nasal mite infestations — a sign that her immune system isn't up to snuff.

She stays way too wet and way too cold because her grooming is inefficient, and she must eat to excess just to stay warm.

And then there are the weird head spasms.

"She'd be looking one way, and her head would jerk back," said C.J. Casson, life-sciences curator at the Seattle Aquarium. "At first we thought the tic was just nerves. Now she actually gets tremors."

Nuka the sea otter, a popular attraction at the aquarium, has been this way since she was plucked, covered with oil, as a newborn pup from Alaska's Prince William Sound in 1989.

No one can say if spilled crude from the Exxon Valdez directly caused Nuka's stunning array of health woes. But her problems are consistent with the toxic effects of oil, and they offer a glimpse of the dangers lurking below the surface in the Gulf of Mexico.

Scientists, for the moment, don't expect as many goo-splattered birds and animals to wash ashore struggling or dead in the Gulf as they saw in Alaska in 1989. Instead, they fear the greatest impact of BP's spill will be out of sight and more insidious — longterm, widespread marine-life sickness and disease, what biologists call "sublethal effects."

The millions of gallons of oil moving about under water have the potential to spark deformations in newborn fish, damage immune systems in creatures as diverse as dolphins and oysters, alter the genetic tissue of marine mammals, inflame the lungs of endangered sea turtles and spark new cancers in a host of others.

"The historic poster animals for an oil spill — the black-covered birds and sea otters — we're not seeing tons of them and probably won't," said Greg Bossart, a marine pathologist and chief veterinarian at the Georgia Aquarium in Atlanta.

"The changes we'll see will be more subtle, but they're going to be far more profound. They'll impact the entire ecosystem from the surface to one mile down, from the smallest plankton to sperm whales.



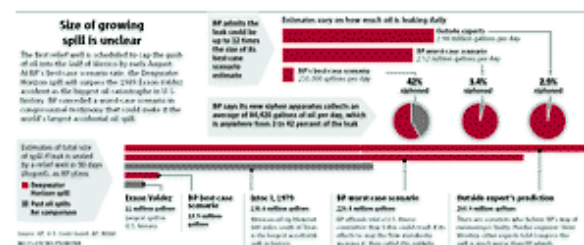
ALAN BERNER / THE SEATTLE TIMES

Nuka the sea otter, at the Seattle Aquarium, was found as a pup covered with oil after the 1989 Exxon Valdez spill. Her array of health woes offers a glimpse of dangers below the surface in the Gulf of Mexico.



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Workers hired by BP rake up globs of oil on Louisiana beaches. Oil can smother grasses and algae and alter the oxygen content of marine waters.



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"We're talking about something that could alter the stability of the marine food web. There's just no frame of reference for how big this could be."

Suite of chemicals

The Exxon Valdez spill became a sort of wetlab for marine toxicologists, and researchers spent years learning how the complex suite of chemicals that make up oil — particularly polycyclic aromatic hydrocarbons (PAHs) — can affect ocean creatures. Most visible were the birds and otters that died from hypothermia when oil coated their fur or feathers, or were poisoned after ingesting petroleum while grooming.

But equally hard hit was a transient pod of killer whales. Several of the whales died later, presumably from inhaling toxic vapors or eating oiled seals. More troubling still: No whale from the pod has reproduced since.

Other disturbing things happened below the surface. Pink salmon and herring could swim away, but the eggs they deposited in nearby streams or on algae didn't survive because oil caused embryos to fill with fluid.

Later, scientists studying zebrafish learned that was because PAHs damage a fish's developing heart. The results have been repeated with fish in all types of oceans — minnows, flounder, Japanese sea bass, an Australian rainbow fish.

"The heart in a fish is one of the first organs to become functional," said John Incardona, a marine toxicologist with NOAA's Northwest Fisheries Science Center in Seattle. "It starts beating early, and if it doesn't get built right, it disrupts their ability to feed."

In recent years, scientists in Alaska have taken the research further, exposing the embryos of migrating salmon to ever smaller doses of oil. At minuscule doses, the fish survived and swam out to sea normally, but 40 percent fewer fish came back. Results were the same each time they tried the experiment.

"In the Gulf you have all those deepwater fish that produce free-floating embryos," Incardona said. "And you also have massive oil plumes moving around."

Scientists after Exxon Valdez also marveled at oil's ability to work through the food chain. Some clams and mussels metabolize hydrocarbons slowly, and oil showed up in them at chronically elevated levels for years. Those shellfish were eaten regularly by Harlequin and Barrow's goldeneye ducks and sea otters, all of which saw dramatic population declines in oiled areas a decade later. Even otters born *after* the Valdez spill lived shorter lives in areas that had been heavily oiled.

Dynamic time in Gulf

Ron Kendall, director of the Institute of Environmental and Human Health at Texas Tech University, toured the tide flats along the Gulf Coast last week. Far offshore, bluefin and yellowfin tuna were migrating beneath floating mats of seaweed. Nearshore, herons and terns and pelicans fluttered among the grasses.

"This is a very dynamic time in the Gulf — everything is nesting or laying eggs or reproducing," Kendall said. "People don't realize how fragile it is. You take out the shellfish or the wetlands or the floating seagrasses, there goes the base of the food chain."

And oil can do damage in many ways. It can smother grasses and algae and alter the oxygen content of marine waters. Fish can inhale it through their gills. In animals of all types it can affect neurological systems, livers and kidneys. The ingestion of oil by warm-blooded animals can even change their metabolism.

Scientists soon will get test results back from samples of crabs, shrimp and oysters, some of which feed off the bottom or by filtering water. Many Gulf birds are plunge-divers that eat these invertebrates, but other fish and mammals eat them, too.

Nuka feeds at the Seattle Aquarium. A survivor of the Alaska oil spill, she receives special care and is given crab and clam brought to her from clean waters.

Day on the Gulf

Federal role: Louisiana Gov. Bobby Jindal called for the Obama administration to take from BP the job of stopping the spill and cleaning up the oil.

Oil tax: Congress prepared to quadruple — to 32 cents a barrel — a tax on oil used to help finance cleanups. The increase would raise nearly \$11 billion over 10 years.

Dispersant: BP defied an Environmental Protection Agency order to halt the use of Corexit 9500, the long-term effects of which are unknown. Rep. Jerrold Nadler, D-N.Y., called on the EPA to force BP to use a less toxic chemical.

Plugging the well: BP is preparing an exercise called "top kill" that will shoot heavy mud and cement into the well. BP officials estimated the chance of success at 60 percent to 70 percent. If that fails, BP officials said a small containment dome likely would be used in a bid to cap the well.

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"As a scientist, it's just so hard to get your head around it," Kendall said. "You get oil on a pelican, and it's hard for them to fly or survive. But what about the reproductive cycle of a tuna? What happens to sperm whales that swim through those plumes?"

Endangered Kemps Ridley, loggerhead and leatherback sea turtles already are washing up dead on beaches in larger-than-normal numbers, but Barbara Schroeder, an ecologist with NOAA Fisheries, has other worries, too. PAHs can burn turtles' skin, eyes, nose and lungs, increasing the odds of life-threatening infections later. Turtles also tend to feed on anything that might resemble food, including tar balls. That can cause ulcers, bleeding and malnutrition.

"Will females be able to make eggs? Will they develop properly?" Schroeder asked.

For now, these questions remain mysteries that not even Nuka the sea otter can help answer.

At the Seattle Aquarium, Nuka receives special care. Biologists help her fight off mites. She is fed a bounty of crab and clam brought to her from clean waters. Handlers lay out mats of algae so she doesn't have to haul herself onto chilly rocks.

But the Gulf's creatures have to fend for themselves in an environment no one really understands.

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