An Otter Tragedy

Understanding the sea otter's vulnerability to oil has proved costly to all involved

Doug Loshbaugh

A treated otter regains its freedom at Harris Bay in Kenai Fjords National Park in August 1989.

By JANET RALOFF

Sea otters rank among the most popular animals in Alaska's Prince William Sound. They mug endearingly for tourists' cameras, swim with the fluid grace of an aquatic prima ballerina, and cavort like impish tricksters.

These cousins of the weasel also appear to be the most vulnerable of all marine mammals to oil – a point driven home forcefully by the *Exxon Valdez* spill. Its North Slope crude claimed the lives of an estimated 2,800 of the Sound's 14,000 or so resident sea otters, according to Robert A. Garrott of the University of Wisconsin-Madison.

Dramatic efforts to rescue sea otters began almost immediately after the March 24, 1989, spill. Within weeks, rescuers had collected 357 otters and carried them – usually by helicopter airlift – to emergency treatment centers. There, veterinarians and trained volunteers removed surface oil and ministered to the animals' many needs. Following treatment, otters convalesced in sea pens for a month or more.

The five-month operation required the development of new technologies and procedures every step of the way, says Randall W. Davis of Texas A&M University at Galveston, who directed it. And the program paid off handsomely, he asserts. Not only did 197 of the treated otters survive to be released back into the wild, but, he points out, "we also learned a lot." Chief among the lessons, Davis maintains, are concrete strategies to decrease the time and cost needed to rescue otters after the next spill – wherever and whenever it occurs.

Wildlife biologist Lisa M. Rotterman of Enhydra Research in Homer, Alaska, takes home quite different lessons. Among them is her conviction that a sea otter *(Enhydra lutris)* interned for treatment should remain – permanently – in captivity.

Indeed, Rotterman charges, released sea otters may have transmitted a lethal disease to wild otters she has been studying since 1985. At the *Exxon Valdez* Oil Spill Symposium in Anchorage last month, Rotterman reported witnessing an unprecedented die-off in a population of never-oiled otters immediately after the arrival of otters freed from the treatment centers. Many of the treated otters carried a potentially novel herpesvirus – one discovered among them while rescue workers treated them for oil.

Pam Tuomi of College Village Animal Clinic in Anchorage is one of many veterinarians who have difficulty attributing the mysterious die-off of unoiled otters in eastern Prince William Sound to the herpesvirus.

Nonetheless, Tuomi believes the controversy provoked by Rotterman's charges may catalyze a long-overdue self-analysis by the animal-rescue community about whether it really has been doing all it can to prevent well-meaning reintroduction efforts from upsetting a region's ecology. Indeed, she argues, "To me, that is as big an issue as the spill's [direct] effects."

Tuomi

Ulcers on both sides of this otter's dark lower lip are not its only signs of herpes. More subtle – and common – signs of the disease edge the tongue. Tuomi likens the damaged tissues to peeling sunburn or terrycloth fuzz.

The *Exxon Valdez* accident spewed 11 million gallons of oil into Alaska's near-shore waters. Almost immediately, Exxon Company USA vowed to put "the full resources of Exxon" into capturing and rehabilitating as many oiled otters as possible, Davis remembers. But no one knew quite where to begin. There had always been the occasional otter picked up after an oil spill. But now Davis faced the daunting task of spearheading an effort to collect and immediately treat hundreds.

"We needed the facilities of a major aquarium and major veterinary hospital – and had neither," Davis recalls. Moreover, "we didn't yet know the effects of oil." Indeed, he observes, when the first otters arrived, "you could tell they weren't healthy, but you didn't know why."

Lacking a blubbery layer of fat, sea otters survive frigid temperatures by trapping air within their fur. Oil mats their coats, however, eliminating the protective airy blanket. As a result, heavily oiled fur can lose 70 percent of its insulating value.

Some animals might compensate by taking in more calories to burn. But healthy sea otters already consume 25 to 30 percent of their body weight in food

daily. Since those stressed by cold, sickness, or injury eat less, sea otters have a limited ability to compensate for heat loss through food, Davis notes. And that means that unless a heavily oiled sea otter leaves the water, it will die quickly.

Research in the wake of the spill has also shown these otters keenly vulnerable to oil poisoning—through inhalation of hydrocarbon fumes, ingestion of petroleum while grooming oiled fur, and absorption of oil's constituent chemicals through their skin.

Thomas P. Lipscomb, chief of veterinary pathology for the Armed Forces Institute of Pathology (AFIP) in Washington, D.C., and his co-workers investigated the nature of that oil toxicosis as part of the largest and most detailed study yet of tissues from oiled marine mammals. Their analysis included 51 oiled and six apparently unoiled otters who died in rehabilitation centers, five oiled sea otters found dead in the wild, and six apparently healthy otters from an unoiled region of Prince William Sound.

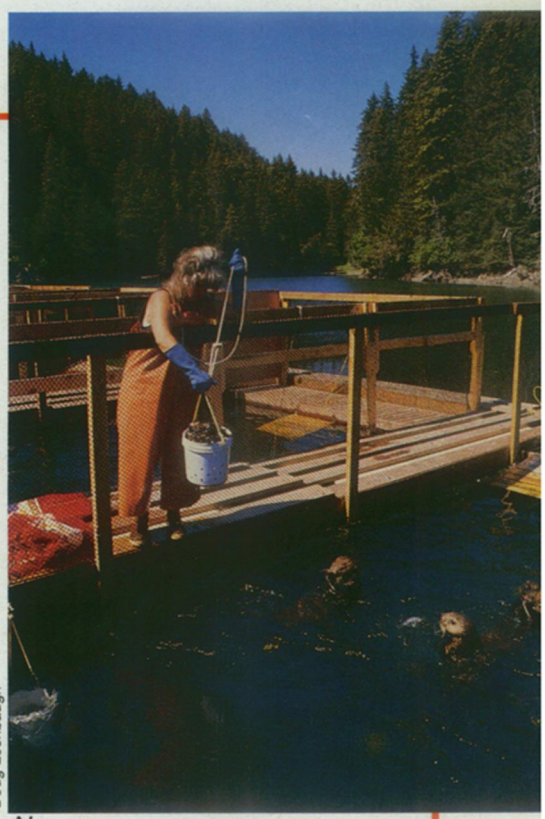
Interstitial pulmonary emphysema — bubbles of air within the connective tissue that supports the lung—proved the most common oil-related syndrome, Lipscomb says. Seen in 73 percent of heavily oiled animals, it showed up in only 45 percent of moderately oiled otters and just 15 percent of lightly contaminated animals — those sporting a light oily sheen on their fur. What caused this lung condition — usually seen in animals with pneumonia—remains unknown, he adds.

Lipscomb's team also correlated oil exposure with gastric hemorrhages, accumulations of lipids (fats) in liver cells, and the death of cells in the liver — a primary organ of chemical detoxification.

R. Keith Harris, also of AFIP, reports that autopsies of sea otters that succumbed at treatment centers soon after their capture showed a number of more general problems, including shock, convulsions, anorexia, anemia, lymphopenia (decreased white blood cells, typical of stress), diarrhea, elevated potassium (common in diarrhea victims), and hypoglycemia (typical of animals that experience shock or stop eating).

As a result, the pathologists found it hard to fully separate symptoms of direct oil toxicity from indirect problems brought on by a general feeling of sickness, stress, and fear.

Many animals did exhibit high concentrations of petroleum hydrocarbons in their blood. However, the extent of "external contamination did not necessarily correlate with internal contamination," notes Terrie M. Williams of International Wildlife Research in Kailua, Hawaii. At the recent Anchorage meeting, for instance, she reported on five otters with identical degrees of external oiling. As-



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Nancy Brown feeds mussels to sea otters at the Little Jakolof prerelease center at Kachemak Bay.

That may be true, Davis says. However, he adds, the decision on whether to write off oiled otters must rest with elected public officials. Such a policy must be set before the next spill, he says, "and then when that spill inevitably occurs, [the U.S. Fish and Wildlife Service] has to have the guts to stand by its decision. Because there are going to be a lot of very nasty photographs and television videos of little, furry, sick, and dying animals." — *J. Raloff*

What does 'rehabilitating' an otter cost?

Long after the last sea otter left the treatment centers in Alaska's Prince William Sound, Randall W. Davis asked Exxon Company USA to calculate what the rescue effort had cost. Its final tally: $18 million—or an average of $50,420 for each of the 357 sea otters that had entered the centers. Immediately, Davis recalls, a "hullabaloo broke out with questions about whether it had been worth it."

In truth, he now reflects, everyone knew it would be expensive, but they never thought about the cost. Exxon had instructed his team to do all they could, and they did. Moreover, he notes, "We never saw the money. We simply made requests"—to hire some boats to pick up oiled otters, for example—"and things got done." It turns out that Exxon bought the services of those vessels for about $4,000 a day. Construction crews — already highly paid in Alaska — earned double and triple their usual pay working overtime in an around-the-clock effort to build the emergency treatment centers.

The operation could have been mounted for perhaps just $5 million, Davis now estimates, if contingency plans and treatment facilities had existed prior to the spill. And before long they will exist — both in California and in Alaska.

Prompted by the *Exxon Valdez* spill, California's legislature put a tax on oil entering the state. A small portion of those revenues, which are earmarked for programs to respond to future oil spills, will finance a rehabilitation center for oiled wildlife, especially sea otters. Because of their experience in Alaska, Davis and Terrie M. Williams were hired as the primary consultants for the facility's design. Groundbreaking may begin early next year.

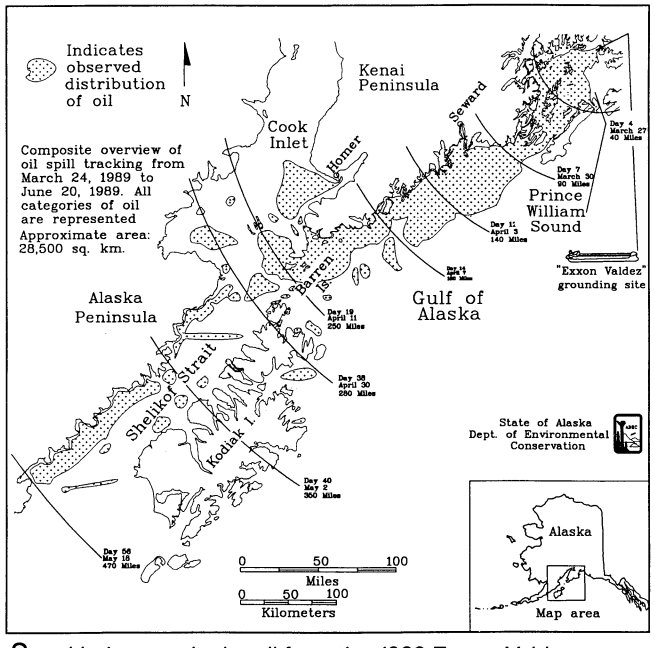
Alaska responded to the *Valdez* episode by making oil companies that do business in the state develop a wildlife protection and spill-response plan. At present, Alaska's Department of Fish and Game is considering a recommendation to hold such companies responsible for stabilizing oil-injured sea otters within 24 hours and initiating rehabilitation procedures within 72 hours. The industry can meet such deadlines only by maintaining a permanent, dedicated facility, Davis says—one that might do double duty as an educational center between crises.

Like California, Texas has decided to develop a spill-response fund through a tax on oil. Some small share of that fund helped finance a new, Galveston-based Texas Oiled Wildlife Response Program, which Davis helped create.

Such programs still beg the question of when treating an oiled animal becomes too costly. "What the *Exxon Valdez* oil spill showed is that we're not very successful at saving animals that were really very oiled," maintains Terry R. Spraker of Colorado State University. As a result, he says, "I don't think we're going to do wild populations much good by rehabilitating some of these animals."

says of their blood revealed a wide range of hydrocarbon tainting – from a low of 20 parts per million to a high of 800.

Overall, these findings suggest there might exist a generic regimen that would benefit all oiled otters: antibiotics, a vitamin and mineral supplement, and prompt administration of fluids. The fluid replacement is especially important, Davis notes, because "sea otters don't ordinarily drink water." While their bodies need fluids, they can't swig saline liquids – so they derive the moisture they need from food. And since dehydration can depress appetite, replenishing fluids may be all it takes to perk up an otherwise failing sea otter, Davis observes.



Marshall Kendziorek/Alaska DEC

Speckled areas depict oil from the 1989 Exxon Valdez *spill. Curved lines depict leading edge of oil plumes. They show, for instance, that by day 7, oil had begun exiting Prince William Sound and entering the Gulf of Alaska.*

Experience also suggests that the benefits of treatment won't always outweigh the stress it imposes on wild otters. Where's the cutoff? "Any animal that is vigorous enough to elude easy capture should probably be left in the wild," Davis says – "unless that animal is in the path of an oncoming oil slick. Then you might consider a preemptive capture to get the animal out of harm's way – not to a rehabilitation facility, but to some floating pen" where it can ride out the threat.

Terry R. Spraker of Colorado State University in Fort Collins also would avoid treating animals too sick to survive. Spraker, one of the veterinary pathologists recruited to assess the Alaskan spill's impacts, notes that a large share of the seriously oiled otters delivered to rehabilitation centers – perhaps 80 percent or more – died. "A good percentage of the ones that were ultimately released either had been very lightly oiled – and probably would have survived in the wild – or had not been oiled at all," he told SCIENCE NEWS.

"A tremendous amount of money was wasted on animals that were going to die," Spraker says. "While it made us feel good to be trying to help them, all we really did was prolong their agony." It would have been more humane, he now argues, to have simply euthanized such animals. He hopes that next time around, rescue teams will have the fortitude to do that.

Determining which animals need care most urgently remains difficult. Assays of hydrocarbons in the blood – a useful dosimeter of oil exposure – currently must be sent away for analysis, which may take weeks. However, Davis notes, once rescue teams can conduct such assays on site, triage should improve dramatically.

Finally, Davis concedes, experience now suggests that "it's better to release these animals back to where they had been living" – something rescuers did not do with otters treated after the *Valdez* spill. Many animals captured in oiled areas of western Prince William Sound were later released into never-oiled regions on the sound's eastern side or along the Kenai Peninsula (see map). For reasons unknown, transplanted sea otters suffered unusually high mortality rates, Davis notes. "It may be stress. It may be unfamiliarity with the feeding areas. We just don't know."

Rotterman and others see additional threats in such transplantation. And the herpes incident illustrates just one.

To gauge the success of the sea otters' rehabilitation, veterinary surgeons implanted radiotransmitters into the abdomens of 45 of the healthiest animals slated for release. Tuomi, working the wards at the Seward, Alaska, treatment center, was called in to rescue one of the animals being prepped for an implant when its tongue flopped over, blocking its airway. "As I pulled the tongue out [of the airway]," she recalls, "I said, gee – what's this?" She stared at big ulcers on the underside of the animal's tongue. They were the first hint that otters might suffer from a herpesvirus.

A subsequent check of other captive otters showed that many of them bore similar lesions – both in their mouths and to a lesser extent on their genitals. The virus responsible was tentatively identified – on the basis of size and shape – as a herpesvirus, notes Harris of AFIP. That immediately raised the question: Did the animals become infected at the center, or was this a stress-induced reactivation of some earlier infection in the wild?

Veterinarians responded by opening the mouths of sea otters from Sitka to the Aleutian Islands and biopsying any suspicious lesions.

When microscopic study of the viruses from many of the animals fit the profile of a herpesvirus, Harris reported last month, "the decision makers felt pretty comfortable that the virus was already out there [in wild otters] and that it was therefore appropriate to release the [treated] otters."

But Spraker calls that "bad policy." Why? The microscopy used to identify the virus couldn't prove that the apparently endemic microbe in the wild matched the strain – and virulence – of the virus seen in otters at treatment centers, he says. Even if the virus were identical, he argues, releasing into the wild so many animals with active, virus-shedding lesions might have set off an epidemic by overwhelming the resistance of animals accustomed to encountering only low-level exposures.

Finally, Spraker says, even if the herpesvirus proved harmless, its eruption in captured animals might signal severely compromised immune systems. Such animals could contract and spread other infections they happened to encounter through their food, water, or handlers.

If rescue teams intend to release animals treated in captivity, Spraker says, they "must maintain a really strict quarantine on captured animals – and hold them for the shortest time possible."

"I agree [that] practical quarantine procedures should be routine" for wild animals undergoing treatment, Davis says. He acknowledges that such procedures weren't standard, however, in the first two weeks or so of operations at the Alaskan rehabilitation centers.

Indeed, Tuomi recalls, "both for our protection and the animals', we should have been wearing rubber gloves. That's now part of our [veterinary] protocol – but it wasn't at the time [of the *Exxon Valdez* spill]."

Another point on which all members of the otter-rescue teams seem to agree: Public efforts should focus on developing laws, procedures, and industrial practices to minimize the chance that another major spill will occur.

Spraker puts it succinctly: "Prevention is better than a cure." □