Environment

Janet Raloff reports from Anchorage, Alaska, at the Exxon Valdez *Oil Spill Symposium*

Some bird populations soaring down

Following the *Exxon Valdez* oil spill in 1989, wildlife biologists succeeded in surveying from boats approximately 100 different types of near-shore birds in Alaska's Prince William Sound and compared their findings to tallies made at similar times of the year in 1972-73 and 1984. Overall, postspill estimates indicate, at least 11 species — from murrelets and loons to crows and cormorants — have undergone a sound-wide population decline, reports Karen K. Laing of the U.S. Fish and Wildlife Service in Anchorage.

When she and her colleagues compared the 1984 estimates to the 1989 through 1991 surveys, population declines at oiled sites appeared to exceed those at unoiled sites among loons, harlequin ducks, scoters, black oystercatchers, Arctic terns, and mew gulls. Among the most significant declines: Loon and scoter populations at oiled sites were 86 percent lower than expected and harlequin ducks 76 percent lower than expected. A few studies by other researchers of individual species — especially harlequin ducks, oystercatchers, and guillemots — indicate that the spill played a direct role in depleting these and presumably other marine bird populations.

Laing says the "statistically rigorous" sampling design employed in her analyses has rarely been used for estimating marine bird populations. "This study served to demonstrate its feasibility," she says, and to identify species at special risk.

Brain lesion helps explain seal loss

Harbor seals — one of Prince William Sound's most common marine mammals — appearently suffered heavily from the *Exxon Valdez* oil spill, says Kathryn J. Frost, a biologist with Alaska's Department of Fish and Game in Anchorage. Even before the spill, she notes, these seals had undergone a dramatic and unexplained population decline. But 1992 aerial surveys showed that while seal counts outside spill-affected areas had fallen 18 percent from 1988, numbers at oiled sites had dropped 34 percent. Frost also presented data indicating that oil may have doubled or tripled the mortality of pups born in affected regions in the year of the spill.

Since 1975, harbor seals in the Sound have plummeted from perhaps 13,000 animals to 2,500 in 1991. Because spill-assessment teams recovered only 18 harbor seal carcasses following the supertanker accident, many scientists initially questioned the impact of oil on the seals' current low population, Frost recalls. Indeed, she notes, until this spill, marine mammal experts had speculated whether seals were even at risk from oil. Anecdotal evidence suggested the animals would avoid visible oil and that petroleum probably wouldn't stick to any that swam through it.

"But harbor seals violated the conventional wisdom," Frost now reports. Not only did they swim regularly through contaminated waters, but they also hauled out to rest or bear young on spill-blackened beaches. Depending on the site, 50 to 100 percent of the seals in oiled regions of the Sound also acquired oil-stained pelts. Initially appearing as "black hats," the oiling soon developed into dark capes. Many animals ended up covered in a viscous black coat that lasted until they molted in the fall. These oiled seals also exhibited behavioral anomalies that observers said gave the animals the appearance of being sick, lethargic — even drugged.

But since dead seals sink, Frost says biologists couldn't rely on body counts to gauge spill-related mortality. So her team obtained permission to kill and autopsy 28 of the federally protected animals over a two-year period. These included 12 seals collected before molting.

All bodies appeared normal when examined externally, she says. Assays of internal contamination, however, showed that concentrations of hydrocarbon breakdown products were seven to 12 times higher in the bile of seals from oiled regions than in seals from other areas in the Gulf of Alaska. Because body enzymes detoxify hydrocarbons, the exposed animals carried low concentrations in most tissues other than blubber, mammary tissue, and milk.

The real surprise, Frost says, and the "most significant finding was lesions in the brains" of seals exposed to oil. Veterinary pathologists observed a swelling of the myelin sheath that protects nerves — primarily in the thalamus, a brain relay center for nerve impulses. Resembling damage seen in humans who die from sniffing glue or hydrocarbon solvents, this abnormality could have caused a "confusion" of sensory information, Frost says. Disoriented animals would be "predisposed to drowning," she notes, particularly if they lost the ability to distinguish up from down or to tell when to breathe. In justifying the sacrifice of animals for this study, she notes that beached carcasses decompose too rapidly for scientists to identify such evidence of oil exposure.

While not conclusive, she says, the brain data offer strong circumstantial evidence that oil claimed the lives — probably by drowning — of 300 to 350 harbor seals, or 30 percent of those who hauled out onto oiled beaches during the spill.

A (killer) whale of a mystery

In just three years, 14 killer whales vanished from a band of 36 summer "residents" — known as the AB pod — of Alaska's Prince William Sound. Biologists assume that a resident gone from its pod a year or more is dead, notes Craig O. Matkin of the North Gulf Oceanic Society in Homer, Alaska. Because a pod this size typically loses only one or two members annually, the size of AB's losses "is absolutely unprecedented," notes Marilyn E. Dahlheim of the National Marine Fisheries Service in Seattle. It's also highly suspicious, the pair note. Matkin has observed the AB pod since 1984 and says the first sign something had gone wrong — seven missing whales — occurred just six days after the *Exxon Valdez* spill.

Biologists have distinguished two characteristic types of killer whales — transients and residents. Although transients sport a somewhat wider, more pointed dorsal fin than residents, the distinction rests primarily on social structure. Resident killer whales are unique among cetaceans in forming lifelong communities containing one or more mothers and their offspring, Matkin notes. The unusual stability of resident pods permits fairly accurate lifespan estimates for these long-lived, long-distance travelers.

Though pods as large as AB occasionally divide into smaller units, those splits invariably occur along matrilineal lines, not within a family unit, Dahlheim points out. The 13 whales apparently lost over 1989 and 1990 came from six of the pod's seven maternal families. Since there is virtually no emigration from resident pods, and since Matkin's team has had so many encounters with AB that they can recognize individual whales by their unique dorsal-fin patterns, "we are very confident that the animals missing represent mortalities," he says.

Though the team spotted six killer whale pods in the spill during 1989, they observed unusual losses only in AB. However, Dahlheim says, AB appears to have come into contact with the oil earliest, when some of its more volatile — and toxic — constituents may still have been present. As whales usually sink when they die, the biologists have no bodies to autopsy for confirmation of oil-related syndromes. Nevertheless, Dahlheim speculates that the 1989 losses may have resulted from direct inhalation or skin exposure to oil, and the following year's disappearances from effects of chronic exposure. However these deaths occurred, Dahlheim says, "the whole social structure of this pod has been totally disrupted."