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THE OIL SPILL IN PRINCE WILLIAM SOUND, ALASKA

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Abstract: Following the Exxon Valdez oil spill in Prince William Sound Alaska, on March 24, 1989, treatment centres for sea otters were set up at Valdez, Seward and Homer. Otter survival rates were lower at Valdez than at Seward, probably because the animals collected were closer to the spill in time and space, and oil toxicity was at a maximum. Otters collected in Prince William Sound were predominantly female and pregnant or lactating. Weathered oil persists in otter habitats throughout the spill zone - long term studies are underway to assess the effects of this.

On March 24, 1989, the Exxon Valdez oil tanker ran aground on Bligh Reef in northeastern Prince William Sound, spilling more than 11 million gallons of crude oil. The spill was the worst of its kind in North America, and in terms of the quantity of wildlife affected, it was probably the worst of its kind in the world.

For three days after the spill, calm seas and light winds buoyed hopes that the large oil slick could be contained; however, on March 27, strong northeasterly winds rapidly pushed the slick southwesterly into important wildlife habitats. Within days, oil had moved out of the southwestern corner of Prince William Sound into the Gulf of Alaska where it was picked up by the westerly flowing Alaska Coastal Current. Slicks of oil were carried along the south coast of the Kenai Peninsula to Cook Inlet and across to the Kodiak Archipelago and Alaska Peninsula. Oil sheen and mousse were eventually seen as far west as Chignik and the Shumagin Islands, a distance of more than 700 km from the spill site.

Sea otters were probably the most abundant and ubiquitous of marine mammals inhabiting coastal waters in the path of the oil spill. Because they rely on a thick coat of fur to trap air for insulation, sea otters are considered one of the most sensitive marine mammals to oil contamination. Concern for their well-being in the wake of the oil spill resulted in a massive and sometimes controversial effort to capture and clean sea otters that came into contact with oil. Two otter treatment centers, one in Valdez and one in Seward, were established to wash, treat and hold sea otters. The Valdez treatment center opened 6 days after the spill began; the second treatment center opened later in May. A third otter facility was established near Homer to hold otters prior to release back into the wild. An intensive effort was also made to collect as many marine birds and mammal carcasses from the oil spill zone as possible. Carcass collection centers were established in Valdez, Seward, Homer, and Kodiak.

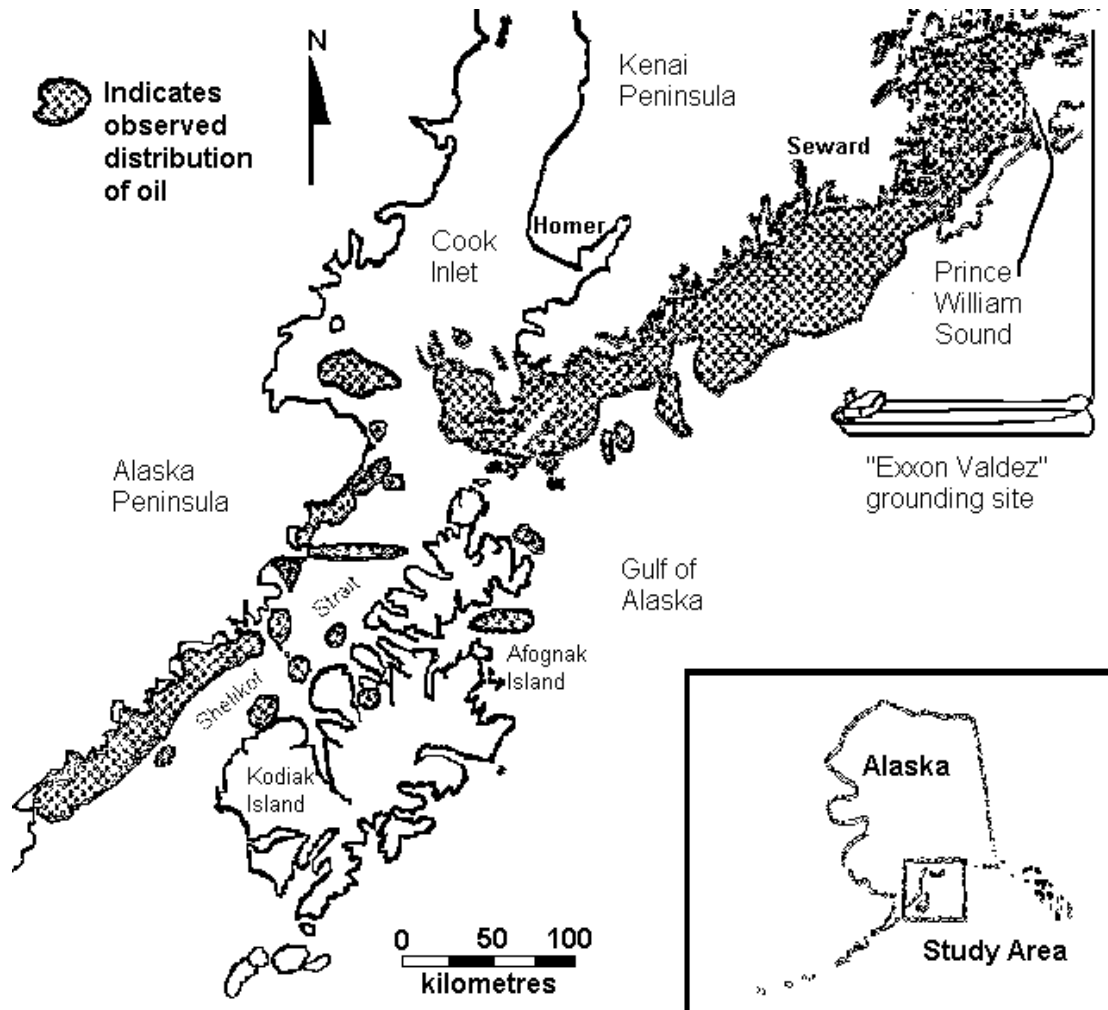


Figure 1: Composite map of the distribution of 'Exxon Valdez' oil observed on aerial overflights between 24 March and 29 May, 1989. Absence of oil on map does not necessarily mean that oil did not occur in an area - only that it was not observed (e.g. due to weather constraints on flying or visibility). Figure courtesy of John Piatt.

There was a 7-day lag between the time of the grounding of the Exxon Valdez and the arrival of oiled and dead otters in Valdez. This lag reflects both the time it took Exxon and government agencies to notify and mobilize people, boats, and aircraft for a response and the delayed movement of the oil slick into wildlife-rich habitat. The lack of facilities for caring for oiled wildlife and the lack of contingency planning were painfully evident at the outset. The first oiled sea otter arrived in Valdez on 30 March, just hours after a makeshift treatment center came on-line. Within three weeks of the spill, nearly 85% of the sea otters that were to be caught in Prince William Sound had been admitted to the Valdez treatment center. The majority of sea otters admitted to the Seward treatment center had been caught by the ninth week after the oil spill. A total of 329 sea otters were admitted to the Valdez and Seward treatment centers; 48% of those were from the Kenai Peninsula, 30% were from Prince William Sound, 6% were from Kodiak, and less than 1% were from the Alaska Peninsula. About 58% of the sea otters admitted to the Valdez treatment center died compared to only 15% mortality at the Seward treatment center. While it is tempting to conclude that the disparity in mortality between the two centers represents superior treatment and handling protocol for sea otters that were admitted to Seward (and in fact the Seward center was developed with the deficiencies of the Valdez center in mind), it more likely results from the fact that most of the sea otters exposed to oil immediately following the spill, when the oil was most toxic, were from Prince William Sound and were admitted to Valdez. Nearly all the sea otters rated as heavily oiled were admitted to the Valdez center from Prince William Sound and 73% of those died. Most of the sea otters admitted to the Seward treatment center were rated as lightly oiled. In general, survival of otters captured during the first two weeks following the spill was low (<25%), but increased rapidly to about 45% through week three and to more than 70% thereafter. Necropsy of sea otters that died in the otter treatment center indicate that exposure to oil, particularly soon after the spill, resulted in acute pathological effects including pulmonary emphysema, subcutaneous emphysema, hemorrhagic enteritis, and liver and kidney dysfunction.

Results of the massive effort to capture, clean, and rehabilitate sea otters indicate that mortality was particularly acute in Prince William Sound within the first three weeks following the spill. During this period, the oil was more toxic and more widespread in habitat occupied by sea otters, resulting in a high probability of exposure to oil. Outside of the Sound, the probability of otters becoming exposed to oil was lower than in the Sound, and the oil was more weathered and less toxic. Sea otters admitted to the Seward treatment center were generally in much better condition than those brought to Valdez and consequently their survival was higher.

A summary of the results from the otter treatment centers provides an incomplete picture of the effects of the oil spill on sea otter populations. An unknown number of sea otters died after they came into contact with oil. To date, 885 sea otter carcasses have been recovered in or adjacent to the oil spill zone. About 58% of those were from Prince William Sound, 21% from the Kenai Peninsula, 18% from the Kodiak Archipelago, and 5% from the Alaska Peninsula. Most of the carcasses were recovered early in the spill period; by 19 May, 70% of the carcasses had been cataloged. Preliminary analysis of the sex and age composition of the sea otters that died following the spill suggest that adults predominated in Prince William Sound and along the Kenai Peninsula; pups were more prevalent in the collections from the Kodiak Archipelago and Alaska Peninsula. Female was the predominant sex of sea otter carcasses collected in Prince William Sound and along the Kenai Peninsula. Of the adult female carcasses collected from all areas, more than 60% were classified as pregnant or lactating at the time of death.

No estimates of the total number of sea otters killed as a result of the Exxon Valdez oil spill are currently available. Based on oiling status, up to 80% of the carcasses collected thus far may represent oil spill-related mortality. Analysis of a carcass recovery experiment conducted at Kodiak Island and analysis of pre- and post-oil spill surveys for sea otters in the oil spill zone may allow us to put some bounds on a future estimate of mortality.

Weathered oil persists in many habitats occupied by sea otters throughout the oil spill zone. Long term studies to investigate the effects of the spill on sea otters are underway in Prince William Sound where the impacts from the spill were most acute.