Protecting Fur Seals During Spill Response: Lessons from the San Jorge (Uruguay) Oil Spill

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PROTECTING FUR SEALS DURING SPILL RESPONSE: LESSONS FROM THE *SAN JORGE* (URUGUAY) OIL SPILL

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ABSTRACT: *Nearly 5,000 two- to three-month old South American fur seal pups were oiled and/or died as a result of a February 1997, 5,000-metric ton crude oil spill near Punta del Este, Uruguay. After consultation with international experts, the Uruguayan government commissioned small teams (three to five people) of trained military technicians (totaling 30-45 people) who cleaned most of the heavily oiled areas manually using buckets, shovels, small hand tools, specially-treated peat moss, and small driftwood fires. Waste materials were bagged and transported to a mainland facility for treatment. Dead pups were placed into well-marked rocky cemeteries and treated with quicklime. Despite the mortality, the low-technology response was a success because it added no additional injury to the affected populations. Lessons from this international experience are being used to develop cleanup and protection plans for other fur seal rookery areas, including Alaska's Pribilof Islands.*

Introduction

This paper addresses contingency planning to protect fur seals from oil spills. It focuses on details of a highly effective, yet low-technology cleanup campaign.

Like many other marine mammals, fur seals around the world are protected by national and international conventions. Unlike other marine mammals, such as cetaceans and sea lions, but much like sea otters, fur seals depend on their fur rather than blubber for insulation and temperature regulation. Therefore, oiling can cause greater injury to fur seals than to these other mammals. The problem is exacerbated when breeding and pupping colonies are oiled, and even more so when animals stampede through pooled oil as a result of excessive human activity and use of equipment. A February 1997 spill of Candon Seco crude oil on the coast of southern Uruguay, South America (Figure 1), provided direct and dramatic response experience at a fur seal rookery.

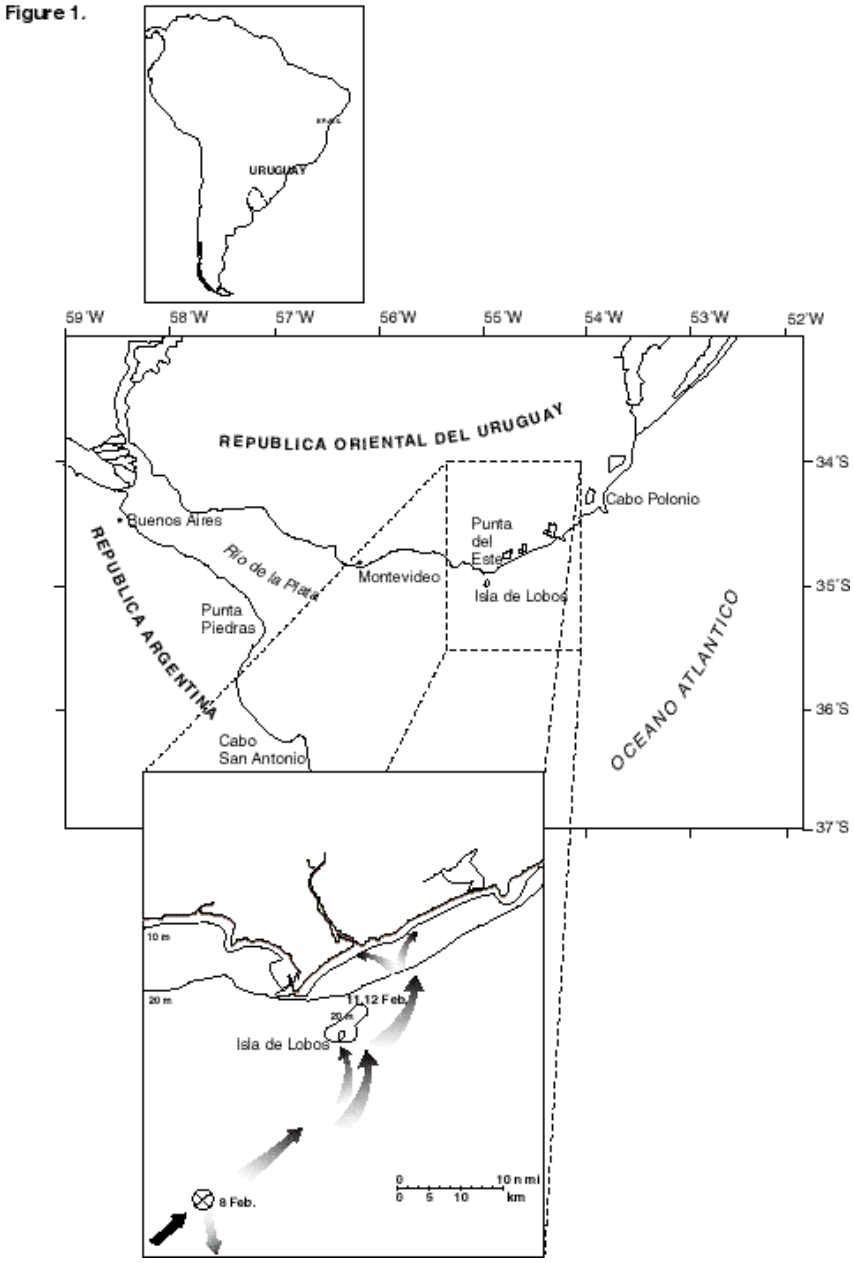

Figure 1. The southeastern coast of Uruguay showing general location (inset), location of Isla de Lobos and track of ship (heavy arrow) and oil slicks (shaded arrows).

The Spill At Isla De Lobos

On February 8, 1997, the oil tanker *San Jorge*, northbound from southern Argentina to Brazil, struck a submerged pinnacle at the northern side of the mouth of the Rio de la Plata estuary (Figure 1) and began releasing an estimated 5,000 metric tons of Candon Seco oil. The oil slicks initially drifted south, away from the South American shoreline. However, on February 10-11, wind direction changed and freshly released oil began moving north toward the Uruguayan shoreline. Dispersant applications were somewhat effective but did not prevent shoreline impact. On February 12-13, a portion of the unemulsified crude oil washed onto the boulder-cobble shoreline at Isla de Lobos, Uruguay, a major rookery for South American fur seal (*Arctocephalus australis*, population, 260,000) and South American sea lion (*Otaria byronia*, population, 10,000; Ponce de Leon, 1997; EcoPlata team, 1996).

Candon Seco is a medium-weight (26.5 API gravity) Argentine crude oil. Analyses of fresh oil indicate that

it has a relatively low (0.5%) aromatic hydrocarbon fraction. Thus, it is somewhat less toxic than other crude oils (Levine et al., 1997).

South American fur seals (males, 140 kg,; females, 55 kg) give birth on Isla de Lobos during the late southern spring (November and December. Thus, the pups (Figure 2) were only a few months old when the oil spill occurred. Milk is the only source of food for pups during their first eight to twelve months on the island. Therefore, pups are at risk of starvation or disease from anything that interrupts daily contact with their mothers. Once oiled, pups may suffer from direct toxicity of the oil, thermal disruption, and starvation. Herding, resulting from excessive human activity, such as during an oil spill response, can increase the number oiled and add additional stress to already oiled animals.

Figure 2. Heavily-oiled two-month old South American fur seal (*Arctocephalus australis*) pup.

The one-square kilometer (sq km) Isla de Lobos, and a nearby islet, are located about 8 kilometers (km) southeast of the tourist center of Punta del Este, the southeastern-most promontory of Uruguay (Figure 1). About 1.2 km, or 30%, of the rocky intertidal shoreline of the island was heavily contaminated with a 10-25 meter (m) band of oil. Within hours, thousands of the 32,000 unweaned, three-month old fur seal pups were heavily oiled. Within a few days, the very active pups and their mothers quickly spread oil 200 meters inland and up to elevations as high as 25 meters above sea level. Many pups were literally dripping with oil (Figure 2).

Initial response and call for assistance. The spill occurred during clear, hot (30°C) summer weather at the peak of both the fur seal pupping season and the tourist season . During the spill and response, thousands of vacationers enjoyed themselves at the nearby sandy beaches of Punta del Este. Oil came ashore along 28 km of these shorelines. Cleanup of the beaches was a high priority; they were cleaned manually without closing the beaches.

Meanwhile, to minimize disturbance and stampedes on Isla de Lobos, Uruguay's marine mammal managers at the Instituto Nacional de Pesca (INAPE), quickly placed restrictions on visitors and aircraft overflights. On February 14, 1997, on request from the Government of Uruguay, the United Nations Development Program (UNDP) requested assistance from the National Oceanic and Atmospheric Administration's Hazardous Materials Response and Assessment Division in Seattle. A NOAA team, consisting of a Scientific Support Coordinator, a fur seal expert from the National Marine Fisheries Service National Marine Mammal Laboratory and an ecologist, were dispatched to Uruguay. In Uruguay, the NOAA team joined other international experts from Canada, England, and Spain during the week of February 19-13, 1997.

General plan. Under the leadership of managers from the Instituto Nacional de Pesca (INAPE),

representatives of the various national and international agencies (including Environment Canada and the International Tankers Owners Pollution Federation) met, conducted field and shoreline assessment surveys and field tested and evaluated clean-up alternatives. There were several major issues to resolve: (1) how clean is clean enough? (2) how to clean the oil to minimize further oil-animal contact and stampedes; (3) how to minimize, process and/or transport oily waste; and (4) how to deal with the expected increasing numbers of carcasses of dead pups and adults.

The primary response goal was to protect remaining unoiled animals by quietly, calmly and quickly removing pooled oil. The goal was not aesthetic; it was not necessary initially to remove stain, just pooled oil, coating, and oil in porous gravel.

Aggressive, mechanized cleanup actions were ruled out as too intrusive. Bioremediation was ruled out as ineffective, too long-term, and too intrusive. However, small field trials showed that loose, dried specially-treated hydrophobic Canadian peat moss (Sphag-sorb and Oclansorb) was very effective in absorbing pooled oil and oil coating on boulders. The peat moss would be used together with other manual methods. Restrictions on aircraft overflights and visitors were to continue; however, the media and officials would be brought on site in small planned groups. The only mechanical equipment allowed on the island was a small front-end loader to be used for transporting supplies, peat moss, and waste material between the staging sites and the island's single pier.

Efforts would be made to minimize the production of waste material. Oil and oily waste would be hand-carried to collecting cites, loaded onto ships (landing craft), and transported back to the mainland.

Although only a few dead pups were observed during the second week of oiling, the mortality was expected to be high, perhaps up to 3,000 to 5,000 of the 30,000 pups. Many oiled pups would be dying during the course of the cleanup. However, rehabilitation was discouraged. It would be logistically impossible to clean thousands of dying pups on a remote island; such a venture would result in very low survival. Further, separation of unweaned pups from their mothers would guarantee their death. It was also agreed that the cadavers should neither be transported to the mainland nor dumped at sea. The preferred alternative was to collect carcasses into cemeteries and treat them on the island with quicklime to accelerate decomposition.

It was also recommended that monitoring be implemented to document the recovery of the injured populations.

These and other considerations were summarized in a NOAA report filed at the end of the consultation period, but before the actual cleanup began (Levine et al., 1997).

The cleanup. The following information is summarized from a detailed cleanup report prepared by INAPE mammologist A. Ponce de Leon (Ponce de Leon, 1997).

On February 23, eleven days after initial oiling, the Uruguayan government transported 33 sailors of the Corps of Naval Fusileros (Gunner Corps) and their supplies to the INAPE station on Isla de Lobos. On February 26, INAPE arranged for the media and reporters to observe the state of the island before cleaning. They also observed cleanup activities including use of peat moss.

A small storm that occurred on February 19-20 helped remove some of the stranded oil. Over the next 35 days, the military and marine mammal people broke up into small cleanup teams of three to five people each. Each team cleaned most of the heavily oiled areas manually using buckets, shovels, rakes, small hand tools, Canadian peat moss sorbent, and small driftwood fires.

Removal and burning of pooled oil. The first task was removal of liquid oil in puddles located among rocks using jars and plastic pails. Although the initial plan was to transport liquid oil off the island, workers soon discovered that the oil could be burned. Fires were started between boulders using driftwood. Oil was slowly added at high temperature, where it burned efficiently.

Removal of oiled sand and gravel. There were pockets of oily sand and gravel between boulders at two sites. Oil penetration increased from three centimeters (cm) during the first few days to 15 to 35 cm ten days later when cleanup began. Oiled sand and gravel was extracted manually using shovels and rakes, and placed in plastic trash bags. The bags, containing no more than 8 kilograms (kg) each, were carried to staging areas and placed on nylon tarps to prevent recontamination. The small front-end loader was used to transport them to the island dock. Finally, they were moved by LST landing craft to the Port of Punta del Este, loaded onto trucks, and taken to special land farm disposal area on the property of the national oil company, ANCAP. Sand and gravel cleaning required 12 days of work and generated 41.6 tons of waste material for treatment on the mainland.

The role of peat moss. As indicated above and in Ponce de Leon (1997), Canadian peat moss greatly aided the cleanup. Sixty tons of peat (Sphag sorb and Oclansorb), packaged in nylon and paper bags, was delivered to the island and distributed by front-end loader and workers to several work areas. It was proportionately distributed based on estimated amount of oil in each area. The peat moss was spread by hand by three to five persons, standing upwind. In soft substrate the peat was mixed with gravel, and then the gravel/peat/oil mix was removed by shovel. In practice, the yield of oil and effectiveness increased when the peat was spread periodically in fine layers. The peat was also efective in absorbing oil in small puddles. Use of peat moss was also helpful on sticky oil coat on hard substrate boulders and large cobble. Scrapers and wire brushes were primarily used to remove sticky coat. Then peat was rubbed in by hand, absorbing remaining film. All peat was collected to the extent possible.

Cadavers. As predicted, over 4,000 oiled fur seals died during the course of the cleanup. Eight

"cemeteries" inland of the four most contaminated and populated shoreline segments were used to collect and treat cadavers. The "cemeteries" were located only over depressions with a solid (non-porous), rocky base. Dead fur seals were placed between layers of quicklime and, where appropriate, surrounded by low rock walls. It was expected that the quicklime would rapidly decompose the soft tissue and also degrade the attached oil. Each cemetery was fitted with a tall flag pole observable from a long distance. On two occasions, cadavers were burned over driftwood fires.

Rehabilitation. Despite the agreement not to rehabilitate oiled fur seals, several non-government organizations (NGOs) insisted on some animal cleanup activity. Of 41 pups transferred to three NGOs for cleaning, only three (7%) survived into late March (Ponce de Leon, 1997).

Results of the cleanup. Video and photographs taken at the end of the cleanup period in late March, 1997, show dramatic differences and document the effectiveness of the cleanup. Paired before/after landscape and close-up photos show how dark, coated and stained rocks and outcrops were transformed to light-colored surfaces (Ponce de Leon, 1997).

Fur seals were rarely disturbed by the cleanup process. This was evident in photographs and video taken during the course of the cleanup and reviewed by the authors. For example, in contrast to the typical shoreline scene showing dozens to hundreds of people and tractors, cleanup scenes of Isla de Lobo show mainly numerous scattered groups of fur seals and sea lions and occasionally one, two, or three people in the foreground.

A minimal amount of waste material was generated and transported to shore. Oil burning and in-situ cemeteries greatly reduced waste generation and attendant handling problems on the mainland.

Thus, the cleanup response was quietly and calmly completed in one- and-one-half months. International representatives revisited Uruguay on several occasions following the spill and cleanup. Representatives from NOAA's Natural Resource Damage Assessment Center visited the site in early February 1998, one year after the spill (Chapman et al., 1998). They observed that the cadavers in the cemeteries had been completely degraded to white flaky bones. The only concern noted was that the combination of quicklime and Sphag-sorb during the decay process lead to extremely high temperatures and a potential for spontaneous combustion.

Impact on the seal and sea lion populations. As predicted, few of the 10,000 to 12,00 sea lions (*O. byronia*), including pups, were oiled or otherwise damaged by the spill. In part, this may be due to the fact that much of their population was on the protected (unoiled) side of the island (Levine et al., 1997; Ponce de Leon, 1997).

As of March 26, 1997, Ponce de Leon (1997) reported that 4, 738 dead fur seal pups had been collected. The actual mortality was presumably higher than this. Levine et al. (1997) predicted that, if pup oiling was 100% in the most oiled areas, up to 8,500 pups might die. This "worst-case" would have been about 27% of the total 1996-97 pup year class of 32,000 animals. As of this writing, analysts are still working with the data. However, recovery of the population over the next several years is expected to be good. This South American fur seal colony has been expanding during the past decade. The natural annual pup mortality is about 15% of production. The colony has also experienced harvesting mortality in the past four hundred-plus years (Ponce de Leon, 1997). From 1987 to 1991, about 5,200 to 5,800 yearlings and pups were harvested annually (Levine et al., 1997). This is within the range of mortality caused by this oil spill. Thus, the prospects for recovery are good. Monitoring is underway to document this.

Conclusion and implications for other fur seal rookeries

Although thousands of fur seal pups died during this oil spill, the response should be considered a success because it added no additional stress to the situation. Minimizing human activity, overflights, and use of heavy equipment resulted in no herding or stampede activity or other sources of stress. Treatment of waste material and cadavers on site resulted in minimal waste generation and transport. Mortality in the range of natural and harvest mortality suggests that the prospects for population recovery are good.

Fur seal colonies in North America and other parts of the world are also at risk of injury from oil spills. Over seventy percent of the world population of Northern fur seal (*Callorhinus ursinus*) breeds on the Pribilof Islands of Alaska, in the eastern Bering Sea. Of these, about 80% breed on St. Paul Island (NMFS, 1993). Over 200,000 females, 200,000 pups, and tens of thousands of juvenile and adult male fur seals are ashore on rookeries and haulouts at the peak of the reproductive season. Due to concentration of a significant portion of the northern fur seal population in this small geographic area, oil spills in the Pribilof Islands could result in catastrophic, population-level impacts and perhaps threaten the species. Major harbor development projects on both St. Paul and St. George islands are expected to result in dramatic expansion in fishing activity near the Pribilofs in the near future. The concomitant increase in risk of oil spills, including much higher risk of spills occurring during the months when fur seals are present and most vulnerable to impacts, is of great concern to NOAA resource managers.

NOAA's National Marine Fisheries Service and Office of Response and Restoration are currently developing an oil spill response strategy for protecting northern fur seals in the Pribilof Islands. The remoteness of this and other fur seal rookery sites demands on-site preparedness. The new strategy is expected to rely primarily on on-site preparedness and low-technology techniques as employed at Isla de Lobos, Uruguay.

Is the response in Uruguay a model for fur seal contingency planning elsewhere, including the Priblof

Islands? From a general point of view we believe the answer is yes. The Uruguay experienced emphasized the importance of minimal human interference and minimal waste generation. These are two guidelines that should be included in any large marine mammal rookery contingency plan. Questions may arise with respect to the transferability of specific aspects of the response at Isla de Lobos. For example, the Pribilofs climate is less hospitable than Uruguay's to prolonged human exposure. Another is the type of oil or fuel: it is unlikely that the Pribilof Islands will experience a spill of crude oil. However, spills of fuel oils (Bunker C, No. 2, and diesel) have already occurred (Whitney and Yender, 1997) and more may be expected.

Residents near other fur seal colonies, such as the Pribilof Islands, are naturally concerned about protection of their seal populations and are likely to be among those on-scene available to assist in a response and cleanup activity. At the Pribilofs and elsewhere, residents and managers should be made aware of the response in Uruguay.

Acknowledgments

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Biography

Dr. Alan J. Mearns is an ecologist, Senior Staff Scientist, and leader of the NOAA Office of Response and Restoration's Biological Assessment Team in Seattle, Washington. He and his teammates have provided assistance at numerous spills in the U.S. and abroad. They continue to monitor recovery of Prince William Sound shorelines following the 1989 *Exxon Valdez* oil spill.

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