Oil and Hawaiian Seabirds
by DAVID CAMERON DUFFY and LINDA ELLIOTT

The Hawaiian archipelago supports 22 seabird species, with approximately six million breeding individuals and a total population of fifteen million (Harrison 1990). These birds are exposed to a wide array of threats, including human disturbance, habitat loss, predation from introduced land mammals, pollutants and accidental catch during fishery operations (Harrison 1990), as well as the more recent spectre of climate change (Baker et al. 2006). Oil can also be a significant threat to seabirds in many marine areas (Croxall 1977). Given the recent major oil spill resulting from the Deepwater Horizon disaster in the Gulf of Mexico, it seemed appropriate to review oil spills in Hawaiian waters, to examine how prepared Hawai'i is for a major spill, and outline ways to improve the state's readiness should a spill occur.

Reported oil spills have been less frequent in Hawaiian waters than in many more temperate areas. Reasons may include the archipelago's relatively light marine traffic and lack of navigation hazards compared to the rest of the world. However, even in these waters, tankers can get into trouble. The Exxon Houston (490,000 barrels; one barrel equals 42 gallons) and Star Connecticut (250,604 barrels) somehow ran aground off of Oahu in well-charted and lighted waters (Washington Post: 4 March 1989; 8 November 1990), fortunately with only minor spills.

Historically, the most significant spills were those associated with the 1941 Pearl Harbor attack. The sunken U.S.S. Arizona remains a major future pollution hazard as its hull continues to corrode (Lenihan 1989), as do other sunken World War II era vessels off both the main and northwestern islands. Although data on recent oil spills are often difficult to obtain (Pfund 1992), on average 100 spills of more than a few gallons are reported annually in Hawai'i (Morgan 2006), and there have been 13 discharges larger than 238 barrels (10,000 gallons) between 1982 and 1997 (U.S. Coast Guard 2006).

Not counting World War II, at least two major spills have occurred in Hawaiian waters. In the Northwestern Hawaiian Islands, the Irene's Challenge was lost 80 km north of Lisanski in 1977 with 238,000 barrels of crude oil (approximately equally to the Exxon Valdez oil spill in Alaska); and the Hawaiian Patriot with 715,000 barrels (approximately 3x the Exxon Valdez oil spill) was lost south of Necker Island, also in 1977 (Steiner and Townsend 1997). The spill from the Irene's Challenge at one point covered an area of 32 x 8 km (Demarest and Elliott 1997), although no oiled birds were ever reported from the disaster. Finally, the Omni Yukon exploded in 1986 southeast of Midway, just three days after unloading 550,000 barrels at Oahu (Steiner and Townsend 1997).

The number of oiled seabirds reported after spills in Hawaii are minor compared to those from temperate waters. Of note for seabirds, however, have been the T/B Hana spill which discharged 1,000 barrels of Bunker C, fouling windward Oahu in 1987 and resulted in 15 birds oiled of which 4 died (U.S. Coast Guard 1987) and the Tesoro spill in 1998 of 119 barrels of Bunker C off Barber's Point resulting in 34 birds oiled and found alive and 20 dead (Elliott 2006). Flint and Elliott (1997) report an additional 246 oiled seabirds from 51 'mystery spills' in the Northwestern Hawaiian Islands. In all, fourteen species of seabirds have been reported oiled in the Hawaiian archipelago (Demarest and Elliott 1997).

The small number of seabirds reported killed per spill results in part because, compared to temperate species, Hawaiian birds do not spend much time on the water (Ainley 1977), which reduces their exposure to oil. Many Hawaiian seabirds also only return to land to breed, often in very remote areas, do not have nest sites where they can be easily observed, or dead birds wash up on inaccessible shorelines. Thus measuring the effects of oil spills on birds is difficult (Demarest and Elliott 1997; Ford 1999). The spills of the Irene's Challenge and Hawaiian Patriot off the Northwestern Hawaiian Islands may have killed tens of thousands of seabirds, but there was no one there to count them.

Prevention

The spill of the Exxon Valdez in 1989 in Alaska galvanized public opinion, leading to the Oil Pollution Act of 1990. The act made the vessel owner/operator responsible for the costs of the spill and restoring damaged resources; required contingency planning; equipment to allow facilities, locations and individual vessels to respond to a worst case scenario; and states to impose their own liabilities (e.g. Hawai'i Superfund Law, 1991). The International Convention for the Prevention of Pollution from Ships (MARPOL) set standards for tankers.

Oil tankers and their operations in U.S. waters are now probably much safer than they were a decade ago. Single hull tankers will be phased out by 2015 and replaced by double hulls, although the value of these has been questioned, as has the future availability of double hulled tankers (Toronto Globe and Mail July 20, 2000). Good seamanship remains the best...
line of defense for preventing spills from tankers. With these safeguards, the greatest risk of spills now probably comes from "foreign-flagged non-oil-carrying vessels" which have less oversight than tankers, but still carry considerable amounts of mixed petroleum products (Helm et al. 2006).

The passages between the main islands are potentially hazardous because of rough seas and strong currents. The Kaiwi Channel between Oahu and Molokai is especially dangerous, at least in terms of the economic damages that would result from any spill, because its currents set toward Oahu (Pfund 1992). To reduce the risk of oil spills, the Coast Guard petitioned the International Maritime Organization (Marpol) in the 1990's to close all channels in the main islands to tanker traffic, except for the wide channel between Oahu and Kauai. This was not successful, although since 1993, using the Oahu-Kauai channel has been a voluntary practice adopted by the shipping industry (Hoffman 1999).

In 2008 Marpol declared the Papahanaumokuakea Marine National Monument a "Particularly Sensitive Sea Area" (PSSA), and outlined four voluntary "Areas To Be Avoided" (ATBA) as well as a reporting system for all vessels transiting the Monument. Within the Monument, there are three routes through which ships can pass: 1. between Pearl and Hermes' Atoll and Lisianski Island; 2. between Maro Reef and Gardner Pinnacles; and 3. between Necker and Nihoa islands (Federal Register 2008).

**Spill Response**

According to federal law, when a spill occurs in Hawaiian waters, the Responsible Party (the polluter), the Coast Guard and the State of Hawai'i Department of Health are jointly responsible for the response. Two local industry cooperatives, the Clean Islands Council and Marine Spill Response Corporation, provide oil containment and cleanup equipment in the Main Islands thereby reducing liability through a rapid and organized response (http://www.msrrc.org/). Response to large spills, however, is effectively a governmental responsibility because the Oil Pollution Act sets limits on liability at $75 million (Helm et al. 2006). Thus all but the largest corporations will not be able or willing to cover what could be billion dollar liabilities. The U.S. Fish and Wildlife Service, National Marine Fisheries Service, and State of Hawai'i Department of Land and Natural Resources are NOT lead agencies during a spill, so it is inevitable that protection of natural resources will take a back seat to the physical oil cleanup.

While the federal government does have some equipment pre-positioned on Midway (E. Flint pers. comm.), Shallenberger (2006) considered the Northwestern Hawaiian Islands "not well prepared to mitigate wildlife impacts at a large spill event, particularly . . . at any of the uninhabited islands and atolls". Pfund (1992) suggested that the government has little incentive to maintain the standing infrastructure to respond rapidly to rare but massive oil spills, unless strongly supported by the public.

The Tesoro spill in 1998 demonstrated the need for a facility in the islands dedicated to the cleaning of oiled birds (Elliott 2006). The Hawai'i Wildlife Center on Hawai'i Island will provide such a base (Morgan 2006); however, it is still being built and is not yet fully funded. Further, there is no group of trained first responders that are critical in the first hours and days of a spill. In the event of a spill, trained personnel will have to be flown in or local volunteers trained. The Clean Islands Council has a "containerized mobile stabilization unit" stationed in Oahu that could be moved to the site of a spill to treat as many as 10 brown boobies (Hawai'i Area Contingency Plan), a response capacity that would be overwhelmed in the event of a major spill.

The Trustees, the State and Federal agencies responsible for the natural resources damaged by the spill, can file for the costs to rehabilitate the resources, and these would be paid by the insurance of the polluting 'responsible party' or by the federal government if the party is underinsured or unknown. Documenting damage is thus key. Dead, oiled birds on beaches are the 'gold standard' of damage; but if much of the damage to Hawai'i's birds occurs at sea, agencies have to send ships and aircraft to look for oiled birds. They also have to rely on sophisticated models of carcass survival and drift based on current, weather and biology (e.g. Ford 1999); otherwise, resource damage will be grossly under-estimated.

continued from page 41
The Future

Even though shipping in the islands is light compared to many other seaways, it is not insignificant. Seven hundred tankers carry over 6 million barrels of petroleum into Hawai‘i annually (Morgan 2006). More than 18,000 marine vessels are annually active in Hawaiian waters, including 900 foreign vessels; at any one time 180 vessels can be found in Hawaiian waters carrying 50-70,000 barrels of fuel oil (U.S. Coast Guard, Honolulu). All these could generate spills from groundings or collisions at sea. Other potential sources of spills are pipeline breaks, runoff from onshore dumping, and aircraft accidents.

Response planning and response around harbors appears excellent in Hawai‘i, but remain questionable at a larger scale. Steiner and Townsend (1997) and G. Ford (pers. comm.) both noted that past oil spill responses in Hawai‘i tended to suffer from a lack of coordination and communication. It is unclear whether the future will be different for bigger spills or those away from harbors. The Papahanaumokuakaa Marine National Monument is managed jointly by one state and two federal agencies, none of which are lead agencies for oil response. Thus, a rapid and coordinated response during a major spill would probably be difficult to achieve. Concentrations of nesting birds on distant, isolated islands, multiple jurisdictions, and inadequately pre-positioned resources are indicative of the preconditions for a disaster.

In a worst case scenario, a foreign-flagged tanker heading from Latin America to China, or a tramp steamer carrying petroleum products would come to grief in one of the transit gaps through the Northwestern Hawaiian Islands, generating a spill. By spring, the only evidence of damage might be a few carcasses washed up on beaches and depressed population counts of nesting birds and turtles in the coming years.

To improve response, we need to preposition a significant amount of response equipment, as Alaska now does in Prince William Sound, in the Northwestern Islands. This would require a substantial investment that might not pay off for years, then one day the investment would become priceless. We also need to initiate practice drills in the same islands, to understand the issues of logistics and communication that would follow from an oil spill. We need The Hawai‘i Wildlife Center up and running both for its response capabilities and so it can train responders. Finally, we need to learn from past oilings of reefs and develop response protocols based on this experience. We might also even think about small experimental oil spills and clean ups, so we don’t have to learn in the middle of actual spills. All this will involve foresight and planning, whereas too often we have preferred to wait until a disaster is upon us.

LITERATURE CITED


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1Pacific Cooperative Studies Unit, Department of Botany, University of Hawai‘i Manoa, Honolulu, Hawai‘i 96822, USA. dduffy@hawaii.edu.

2Hawai‘i Wildlife Center, P.O. Box 351752, Kapaa‘u, Hawai‘i 96755 USA. info@hawaiiwildlifecenter.org.