

What would happen if one of the world's most environmentally sensitive regions was hit by a major marine oil spill? The result could be catastrophic; entire species could even face extinction.

This is what may be facing the Galapagos Archipelago, the Ecuadorian volcanic islands in the eastern Pacific Ocean where Charles Darwin gathered evidence for his *Origin of Species*. Many species in the Galapagos are endemic, or only found on these islands. Although this endemism is an inherent part of many small island systems, around 40% of the species on the Galapagos are unique to the islands. Such species include the marine iguana (*Amblyrhynchus cristatus*), Galapagos penguin (*Spheniscus mendiculus*), flightless cormorant (*Nannopterum harrisi*) and the lava gull (*Larus fuliginosus*). It is this concentration of rare species that makes the islands so vulnerable to the demands of an increasing human population, which has risen ten-fold over the past four decades from about 2,000 in the early 1960s to over 20,000 today.

Along with this expanding population there are other stresses that put the fragile Galapagos environment at risk. For example, increasing levels of tourism, with over 100,000 people a year now visiting the islands; over-fishing of lobsters, groupers and sea cucumbers, coupled with an illegal shark-fin industry; the impact of introduced species including goats, rats, blackberry, guava and *Aedes aegypti* mosquitoes (vectors of dengue fever); and sources of pollution ranging from vehicle emissions to the problems of waste disposal.

I decided to focus my NERC-funded Masters degree on the threat of oil pollution to the islands. My field work

involved a four-week visit to the Galapagos. I was based at the Charles Darwin Research Station on the main island of Santa Cruz, which has a population of more than 10,000 people. From here I visited a number of sites and collected relevant information by liaising with appropriate people from the research station, the Galapagos National Park Service, international oil pollution experts and locals. I also benefited from access to the research station library.

The islanders need oil as fuel and this is imported in tankers. They jostle with cargo ships, fishing boats and tourist vessels in the ports, where consequently there is a high risk of groundings and collisions. In spite of this, the greatest oil

spill risk lies in the way oil is transferred from tankers to shore. There are no deepwater docks in the Galapagos, so tankers have to remain moored offshore where oil is pumped into barges, which are then towed to shore. However, these

barges are not designed for this role, but are in fact just a flat-top barge with a tank sitting on it. These are not suitable for such operations and, as a result, small

quantities of oil are often spilled into the sea. There is also a strong risk of a whole barge being lost, as they are not designed to operate in the rough seas that are relatively common in many of the less sheltered coastal areas. Once at a dock side, oil is then pumped from the barge into an awaiting truck which will then

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The author David White.

The Galapagos: unique and at risk

Netting oiled pelicans for cleaning following the Jessica oil spill.

deliver the cargo.

Small spills and leakages commonly occur in all shipping areas of the world, whether it be from tankers, commercial or pleasure craft. This is true of the Galapagos. What is reassuring is that this chronic pollution has so far had little obvious impact on the islands and its animals.

Beyond small operational spills, a major oil spill could have a catastrophic impact on the islands. In January 2001 a supply tanker, the Jessica, ran aground as it entered one of the ports, creating a shallow furrow of 50m x 30m on the sea floor. Around 700 tonnes of oil cargo (diesel and intermediate fuel oil) was spilled from its ruptured hull. Fortunately, favourable weather conditions kept most of the oil offshore where it naturally dispersed. Some oil did beach on a number of islands, but particularly vulnerable areas, for example mangroves or seal haul-outs, were not heavily affected. A few animals were oiled, with 370 coastal vertebrates being reported to the Research Station as having been contaminated. Most of these were marine iguanas (*Amblyrhynchus cristatus*), brown pelicans (*Pelecanus occidentalis urinator*) and Galapagos sea lions (*Zalophus wollebacki*). Fortunately only six deaths were reported, although there were suggestions that some sea lion populations were affected in the short-term and a marine iguana population suffered more long-term effects.

Had conditions been different, and had oil migrated to more vulnerable areas, the impact could have been greatly magnified. A number of animals, for example marine iguanas, sea lions and sea birds, rely on the shoreline and sea to feed, breed or simply rest, and these animals would be at greatest risk of oiling,



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Some of the most vulnerable animals are found only in the Galapagos. The flightless cormorant, which feeds within 100m of the shore, is more or less confined to two islands, which, if hit by an oil spill, would put the entire population of about 1,000 individuals at great risk. Similarly, there are only 400 breeding pairs of lava gulls in the Galapagos and so this seabird could also face extinction if significant numbers were killed. Even a small oil spill in the wrong place at the wrong time could extinguish these species forever. In addition to the endemic species, the Galapagos is home to large sea lion colonies and globally-significant populations of other seabirds, for example the blue-footed (*Sula nebouxii excisa*), red-footed (*Sula sula websteri*) and Nazca boobies (*Sula dactylatra granti*).

It is not just animals that are at risk from oil pollution. The Galapagos has large areas of mangrove swamps that are home to turtles, fish, birds and numerous species of invertebrates. They also act as nursery areas for juvenile fish and other species. The swamps are highly vulnerable to oil and can take over 20 years to recover fully from a major oil spill. Such a major spill in the Galapagos would also severely

affect the livelihood of many of its human inhabitants who rely on fishing and tourism for their income.

The Jessica spill should have served as a warning to the islanders by demonstrating just how vulnerable the Galapagos Islands are and how long it takes to mount an international response, as it took five days for the US Coast Guard to arrive with specialised response equipment. This delay originated from the lack of formalised emergency planning and no defined system of securing emergency financial support from the Ecuadorian Government. Despite this wake-up call, I concluded that there still are not enough islanders trained to deal with spills and no small stockpiles of basic oil spill response equipment to mount a first response. In addition, the planning for dealing with major spills remains inadequate and there are still no agreements on international assistance.

The safest way to make sure this World Heritage site is not irreparably damaged by oil pollution is through investment in both reducing chronic pollution and the risk of major spills, and by increasing the level of preparedness.

For more information:

The Charles Darwin Foundation
www.darwinfoundation.org

The Galapagos Conservation Trust www.gct.org

International Fund for Animal Welfare www.ifaw.org

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