Fifty years after the wreck of the Torrey Canyon

The work of the Marine Biological Association of the UK on acute impacts and subsequent recovery

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The Torrey Canyon disaster in 1967 was the first involving a new generation of super-tankers and the first major oil spill in British and European waters. In addition to the enormous damage to marine life and the livelihoods of local people, it turned parts of the Cornish coast into a laboratory for a long-term study which revealed how rocky shores treated with toxic dispersants took 13-15 years to recover: around 5 times longer than those where the oil was dispersed naturally by wind and waves.

The *Torrey Canyon* was wrecked on 18th March 1967 on the Pollard Rock of the Seven Stones reef, 15 miles (25 km) from Land's End, Cornwall, UK (Figure 1). The 970 foot (300 m) tanker was bound for oil refineries at Milford Haven with 117,000 tons of Kuwait crude oil. She struck the rocks at 17 knots, tearing open six of her 18 storage tanks and less severely damaging the others. Salvage attempts failed. The ship progressively broke up over the next six weeks due to storm damage and bombing on the 28th, 29th and 30th March in an attempt to burn up the oil. She finished a submerged, broken wreck, being officially declared to contain no more oil towards the end of April 1967.

At the time, the *Torrey Canyon* oil spill attracted much media attention and political intervention. The Prime Minister at the time, Harold Wilson, took a personal interest. He had a holiday home on the Isles of Scilly, seven miles to the southwest of the wreck. It was also the first spill involving the first generation of super-tankers. Furthermore, it was treated – excessively in many instances – by the first generation of dispersants. These were in effect industrial cleaning agents – euphemistically called detergents at the time (e.g. Smith 1968). More damage was done by the dispersant applied (10,000 tons) than by the oil itself (14,000 tons) that came ashore in west Cornwall.

All the staff of the Marine Biological Association of the UK (MBA) were mobilised to deal with the environmental impacts of the spill for six weeks (Smith 1968). The MBA's research vessel *Sarsia* was on the scene within a week or so after the wreck.

Chief Scientist Gerald Boalch, present on board the vessel at the time recalled: "When we steamed west on *Sarsia* the first thing we noticed before we saw the oil was the dreadful sickening smell. When we did reach the oil it was like a thick rust-red layer on the surface. Local boats were out spraying the oil with detergent and the oil was obviously being broken up and dispersing. We realised that the detergent was breaking up the oil but was probably making it more accessible to the marine life. At that time we had no information on the toxicity of the detergent. We sampled the plankton in the area where the oil was being treated and under the microscope could see that some species of the plankton were being killed."

MBA staff members Alan and Eve Southward were subsequently involved in long-term studies of recovery of rocky shores for the next ten years or so, (Southward 1979, Southward and Southward 1978), continued in concert with Steve Hawkins since 1980 at one of the worst affected shores – Porthleven (Hawkins et al. 1983, Hawkins et al. 2002, Hawkins and Southward 1992, Hawkins et al. 2017, in press.) and more recently (since 2002) with Nova Mieszkowska.

A network of shores had been studied in the southwest of England for over a decade before the spill (Southward 1967), primarily to understand the influence of climatic fluctuations on intertidal species, particularly barnacles (Southward and Crisp 1954, 1956). These observations were subsequently maintained by the Southwards (e.g. Southward 1991, Southward et al. 1995) and continued by Steve Hawkins, Nova Mieszkowska and co-workers (e.g., Hawkins et al. 2003, 2008, 2009, Mieszkowska et al. 2006, 2014a,b, Mieszkowska and Sugden 2016) (Fig. 1). The trajectory of recovery following the *Torrey Canyon* oil spill was determined by interaction with climate fluctuations and other sources of chronic pollution such as Tributyltin from anti-fouling paints (Bryan et al. 1986, Spence et al. 1990, Hawkins et al. 2017).

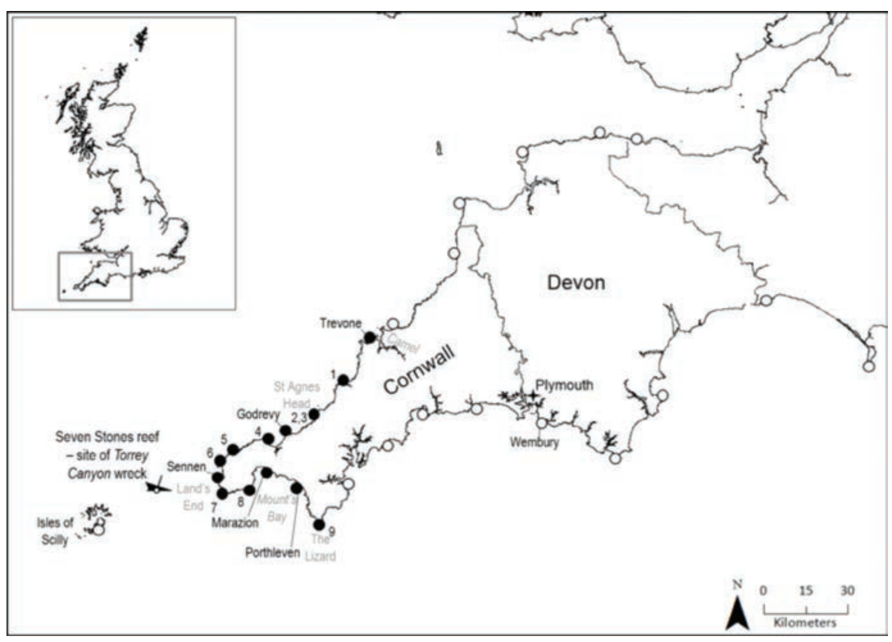

Figure 1: Long-term study sites in southwest England monitored since the 1950s by A. J. Southward and E. C. Southward, and more recently by S. J. Hawkins and colleagues from the MBA. Closed circles represent sites affected by the Torrey Canyon oil spill and clean-up operation. Open circles represent sites not affected by the incident (From Hawkins et al. in press).

Highly toxic dispersants, mainly BP1002 (Smith 1968), with several other proprietary products were also used. All contained between 66-85% organic solvent with a high proportion of aromatics (up to 85%), a surfactant (often an ethylene oxide condensate) and a stabilizer such as coconut oil diethanolamide (Smith 1968). The armed forces had been mobilised to deal with the oil coming ashore. The priority was to preserve the amenity value of the seashores around Cornwall, one of the UK's premier tourist destinations. There was much less concern about the consequences for marine life.

The dispersants killed the dominant grazer, limpets of the genus *Patella*, leading to massive subsequent colonisation by algae. The resulting canopy of fucoid algae ('rockweed' or 'wrack') facilitated dense recruitment of limpets. These subsequently grazed the seaweeds down, before the starving limpets largely died off after migrating across the shore in search of food. This reduction in limpet numbers and grazing pressure then prompted a further bloom of algae. There was then a return to normal levels of fluctuations charted from the mid 1980s to date. At Porthleven sustained observations over five decades (1967-2016) revealed when return to the typically observed range of natural patchiness and fluctuations on rocky shores occurred after 13-15 years. In stark contrast, the shore at Godrevy that received no treatment by dispersants, recovered within two to three years. There was no major flush of ephemeral algae followed by massive fucoid recruitment. The shore swiftly returned to normal

1961

1968

appearance (Southward and Southward 1978, see also Hawkins et al. 2017 and Hawkins et al. in press).

Steve Hawkins said "Recovery was rapid at Godrevy where the oil was not treated by dispersant because of concerns for the seals. The shore got back to normal appearance in 2-3 years. In contrast shores such as Porthleven and Trevone which were heavily treated by dispersants took much longer to recover. On dispersant treated shores nearly all the limpets were killed by dispersants leading to a massive bloom of brown seaweeds (fucoids); this then encouraged a huge over-recruitment of limpets that ate the algae and then subsequently died off triggering further bloom. Return to normal levels of seaweeds, barnacles and limpets probably took 13-15 years.

"Although there was huge mortality of seabirds caused by the oil, more damage to life on rocky shores was caused by excessive application of first generation highly toxic dispersants than the oil itself. Fortunately much was learnt from the Torrey Canyon oil spill. Oil spill contingency plans are in place all around the world to deal with spills. Dispersants are now mainly used at sea and are much less toxic. Large tanker accidents are also much rarer."

In subsequent spills, dispersants have been used largely at sea and much more sparingly on shores and in a more targeted and proportional manner. Dispersants in use have increasingly been improved to become much less toxic than those used in 1967. What certainly emerged during the *Torrey Canyon* oil spill itself and subsequently, is that on most wave-exposed rocky shores letting nature take its course and relying on natural dispersal by waves and microbial degradation ('doing nothing') is usually the best option.

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The Marine Biological Association (MBA) is a professional body for marine scientists with some 1,400 members world-wide. Since 1884 the MBA has established itself as a leading marine biological research organization contributing to the work of several Nobel Laureates and over 170 Fellows of the Royal Society.

In 2013, the MBA was awarded a Royal Charter in recognition of its long and eminent history and its status within the field of marine biology. The award strengthens the Association's role in promoting marine biology as a discipline and in representing the interests of the marine biological community.

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1971

1972

Figure 2: Photographs of the shore taken before (1961) and after the Torrey Canyon oil spill: in 1968 showing a flush of green algae resulting from grazing limpets being killed; in 1971 these were replaced by large brown algae which began to thin out in 1972. P icture credits and copyright: A.J and E.C Southward.

For references see overleaf

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