

REPORTS

The *Urquiola* Oil Spill, La Coruña, Spain: Case History and Discussion of Methods of Control and Clean-up

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A massive oil spill affected approximately 215 km of coastline as a result of the grounding and subsequent explosion of the supertanker *Urquiola* at the entrance to the harbour at La Coruña, Spain, on 12 May 1976. A total of 99-100 000 tons of Persian Gulf crude oil was lost, most of which burned, but an estimated 25-30 000 tons washed ashore. Over 2000 tons of dispersants were applied to the oil at sea. Land-based clean-up and control methods were largely inadequate to combat the spread of oil, and were ineffective at preventing large scale environmental damage.

The Rias Altas section of Galicia Province, Spain, depends on tourism and marine resource industries for a substantial portion of its economy. Both were heavily affected by a massive oil spill resulting from the grounding of the supertanker *Urquiola* on 12 May 1976 (Anon., 1976; Gundlach *et al.*, 1977). A total of 99-100 000 tons of Persian Gulf crude oil was lost, most of which burned when the ship exploded. However, large quantities of oil washed ashore over the next 4 weeks covering popular tourist beaches and killing significant numbers of the benthic and intertidal life along the coastline. On 21 May 1976, nine days after the spill, the affected region was declared a national disaster area by the Spanish government, and thereby subject to special financial compensation.

Members of the Oil Spill Assessment Team (OSAT) from the Geology Department, University of South Carolina studied the effects of the oil on the beaches, rocky coasts, marshes and tidal flats of the area from 17 May to 10 June 1976. This report presents our observations concerning the cause of the spill, the subsequent pattern of oil dispersal, and the methods of oil spill clean-

up and control used to combat it. Other papers covering the environmental effects of the *Urquiola* spill are in preparation.

History of the Spill

This history of the *Urquiola* oil spill was compiled from reports carried in local newspapers (often including personal interviews), our own observations, and information supplied by Sr. José M. Turnay y Turnay, director of the Spanish oceanographic institute (Instituto Español de Oceanografía) in Madrid.

On 12 May 1976, the supertanker *Urquiola*, carrying 107 000 tons of crude oil and 3000 tons of Bunker C fuel oil, struck bottom while passing through Seijo Blanco Channel into La Coruña harbour (Fig. 1). Though the ship maintained speed and passed over the rocks, some forward plates were ruptured, causing oil leakage and an increase in the draft of the bow from its original 15.6-18 m, too deep to enter the oil facility at La Coruña. The spilling oil also posed an ever increasing threat of explosion within the harbour. As a result, a joint decision was reached between Captain Francisco Rodriguez, Harbour Pilot Begnigno Sanchez, and the port authorities to leave the harbour and either attempt repair of the *Urquiola* at sea, or wait until mid-tide to enable off-loading in La Coruña.

The ship was turned about with the assistance of two tugs and headed out of the harbour. At 10:00 am, in the same passage (Fig. 1), the *Urquiola* ran hard aground again, further rupturing the bow tanks. It is unknown why the ship grounded. Spain's hydrographic office charts (Nos. 929 and 9290) indicate a minimum channel depth of 21 m. The draft of the *Urquiola* was 15.6 m upon

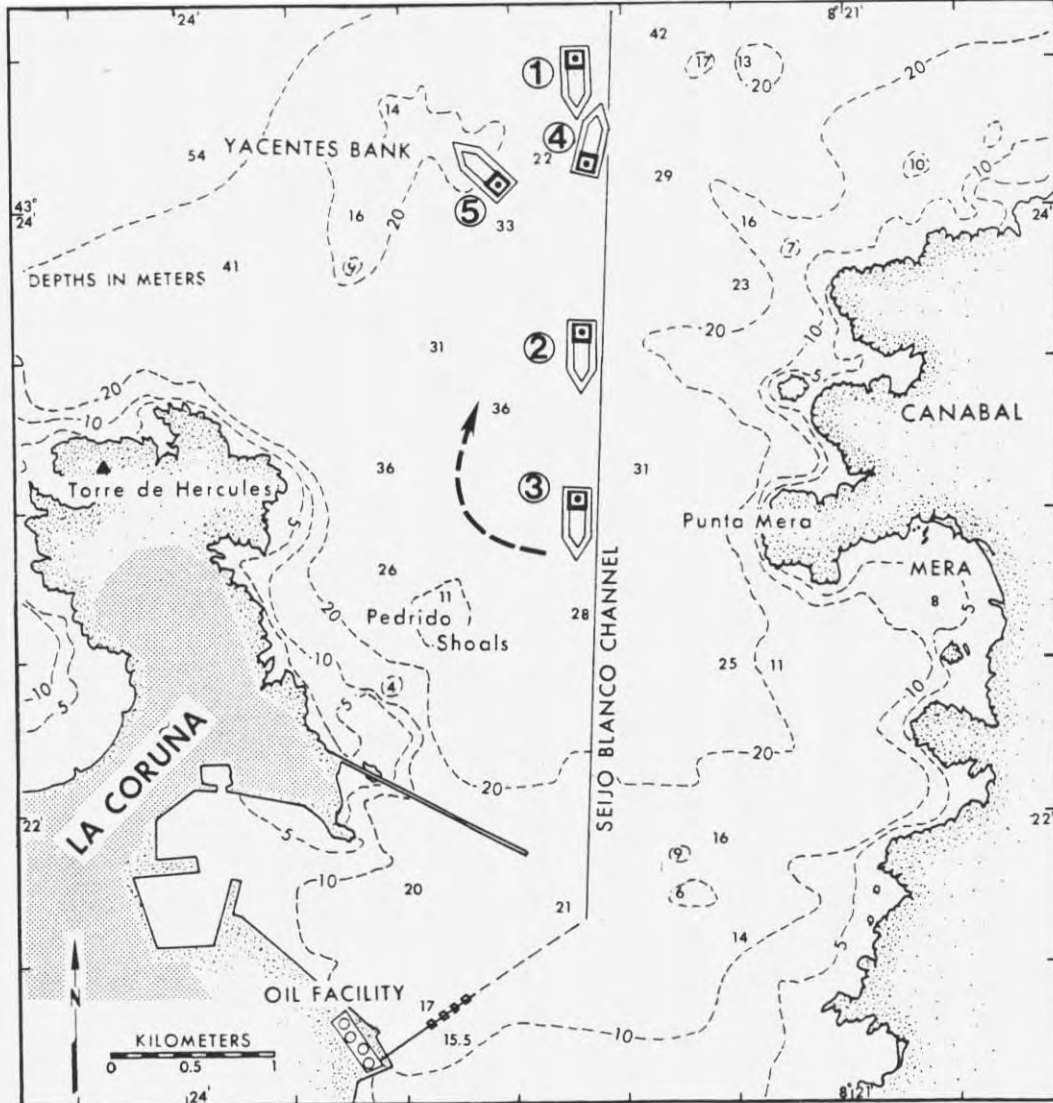


Fig. 1 Position of the supertanker *Urquiola* subsequent to its grounding on Yacentes Bank at the entrance to La Coruña, Spain on 12 May 1976. (1) The *Urquiola* scraped bottom while passing through Seijo Blanco Channel, rupturing some forward compartments and releasing oil. (2) Harbour Pilot Benigno Sanchez boarded the ship. (3) The ship was turned about and headed out to sea, rather than risk a possible explosion within the harbour. (4) The *Urquiola* firmly struck bottom, causing further damage to the ship. (5) On the rising tide, tidal currents and a prevailing northeast wind pushed the *Urquiola* onto Yacentes Bank. Early in the afternoon of 12 May 1976, the ship exploded and burned. Much of the cargo went up in flames, but an estimated 25–30 000 tons washed ashore over the next 4 weeks.

entry and 18 m after striking the bottom the first time. Furthermore, the ship was apparently on course. However, passage through the channel occurred during spring low tide, at which time there was probably less depth than that indicated on the charts.

The ship soon listed 10° to starboard, and the crew was ordered to abandon ship. Only the captain and harbour pilot remained on board. Over the next few hours on a rising tide, tidal currents and a prevailing wind pushed the ship firmly onto Yacentes Bank (Fig. 1). The tug *Priorino* attempted to tow it off the rocks without success. Early that afternoon, the ship abruptly exploded and began to burn. Captain Rodriguez was killed, becoming the first and only casualty of the disaster. The harbour pilot safely made it to shore.

The *Urquiola* burned for nearly a day, and oil immediately began to wash ashore in large quantities. A command centre for the direction of salvage and clean-up operations was set up at the offices of Port Commander Felix Bastarreche. After the fire, an unknown quantity of

oil still remained on board. On 21 May, off-loading to the small CAMPSA tanker *Camporraso* began. The *Camporraso* was assisted by the tug *Smit Lloyd 106*. By 26 May, transfer was complete; 7059 tons of crude oil were removed. However, most of the 3000 tons of Bunker C fuel oil still remained on board. On 28 May, the tanker *Campolara* was substituted for the *Camporraso*, but transferral of the Bunker C was inhibited by rough seas. Less than 600 tons were off-loaded before the operation was halted.

The *Urquiola* broke in two on 31 May, and attempts at removal of the remaining Bunker C were discontinued. On 7 June, the stern section (160–170 m in length) was refloated and towed to a semi-protected area off Punta Cruz in the Ria de Ares. Refloating of the bow was not accomplished before our departure on 10 June. However, Turnay y Turnay (pers. comm., 1976) reported that the operation was successfully completed, and the remains of the *Urquiola* were eventually towed to the supertanker construction yards in El Ferrol.

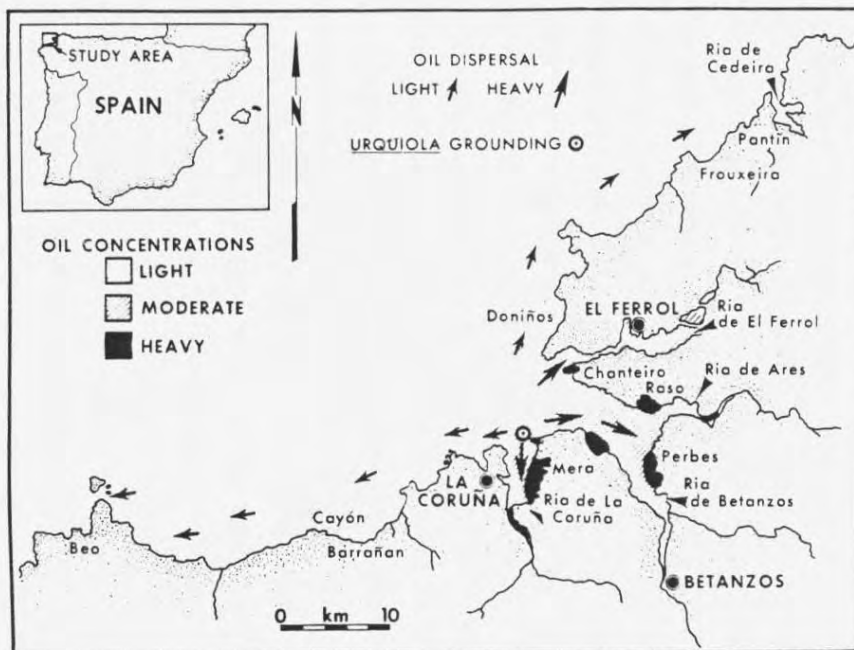


Fig. 2 Areas affected by varying quantities of oil spilled by the supertanker *Urquiola* as of 1 June 1976. Concentrations are divided into 'light' (<25% surface coverage of the upper intertidal zone), 'moderate' (25–65% coverage) and 'heavy' (> 65% coverage).

Oil Dispersal and Distribution

On-scene estimates of the total amount of oil that washed ashore ranged from 10–30 000 tons. In comparing the extent of oil coverage of the coastal area in Spain to our own observations at the *Metula* oil spill site in the Strait of Magellan (Hayes & Gundlach, 1975; Hayes *et al.*, in prep.), we believe that the total amount was on the order of 25–30 000 tons. Most of the oil spilled from the *Urquiola* during the first few days after the grounding; however, oil continued to seep from the ship at a slower rate until it was removed on 7 June.

Dispersal of the oil was influenced by tidal currents within the embayments or *rias*, a weak northerly coastal current, and generally onshore northwesterly winds. Figure 2 indicates oil distribution along the coast as of 1 June 1976. Concentrations are divided into 'light' (< 25% surface coverage of the upper intertidal zone), 'moderate' (25–65% coverage) and 'heavy' (> 65% coverage).

The heaviest oil contamination occurred in the three closest *rias* to the *Urquiola* grounding site: Rias de La Coruña, Ares, and Betanzos. Two embayments along the



Fig. 3 Playa de Raso, one week after the grounding and explosion of the *Urquiola*. The entire intertidal zone was covered by a 1–3 cm thickness of oil. The upper edge of oil accumulation is indicated by a black arrow.

eastern side of Ria de La Coruña, Canabal and Mera (Fig. 1) were inundated by oil due to onshore winds and their proximity to the ship. Northwesterly winds quickly spread the oil into Ria de Ares and Ria de Betanzos to the east, severely contaminating beaches at Raso (Fig. 3) and Perbes. Although the oil spread quickly into these *rias*, it was not until 19 May, a week after the spill, that oil reached the head of the embayments and entered the marshes and tidal flats. These previously unspoiled estuaries, very rich in commercial shellfish, might have been saved had booms been deployed across their narrow entrances during the preceding week. To the north, oil entered the Ria de El Ferrol on 16 May, moderately contaminating its shoreline.

Further to the north, along the outer coast beyond these four *rias*, moderate oil concentrations were found as far as Playa de Doniños (Fig. 2). By 19 May, oil was coming ashore as far north as Playa de Frouxeira and Playa de Pantín. Large oil slicks were observed off the coast at Ria de Cedeira, but no shoreline contamination was found.

Southwest of the wreck, shoreline investigation on 21 May revealed that oil slicks continued as far as Playa de Barranan. Weather records show that on 25 and 26 May, winds up to 56 km/h blew from the northeast, contrary to the usually prevailing gentle northwesterly winds. This change in wind direction resulted in further movement of the oil to the west. On 31 May, the furthest westward contamination extended to Playa de Beo, 45 km from the wreck. The beaches between La Coruña and Playa de Beo all exhibited relatively light oil concentration, usually present as oil swashlines.

By 1 June 1976, approximately 215 km of the coastline of northwestern Spain had been contaminated with *Urquiola* oil. An estimated 60 km was moderately to heavily oiled. Beaches at Bastiagueiro, Porto Cobo, Mera, Canabal, Perbes, Raso, and Doninos received the heaviest concentrations. Light oil coverage extended from Doniños to Pantín in the north and from La Coruña to Beo in the west.

Control and Clean-up Methods

Oil control and clean-up operations implemented during the spill were generally ineffective. The lack of an oil spill contingency plan, the large amount of oil spilled, and the lack of accessible equipment, all contributed to the failure of these operations.

The use of dispersants received high priority as a technique for combatting the spreading oil. In total, over 2000 tons of chemicals were applied to the oil around the wreck site (Turnay y Turnay, pers. comm., 1976). Among the types used were BP 1100X, BP 1100WD, Finasol OSR2, Shell Dispersant LT, Solufax 85, Seaklin 1100NT, Kraken MC563, and CEPESA 3 Marine Dispersant. Their use within the *ria* system was restricted for fear of further damaging the biological communities. However, we did observe use of dispersants as part of the beach clean-up programme at Bastiagueiro, near the head of Ria de La Coruña.

Oil booms flown in from Great Britain proved to be partially effective for oil containment at a few embayments (Mera and Canabal in particular). Buckets were

used manually to reduce the large standing pool of oil at Canabal before high pressure pumps arrived. Suction pumps replaced an oil-mop apparatus to remove the oil at Mera. Pumping operations continued over a four-week period following the spill.

Clean-up of the oiled beaches was very slow or ineffective when the beach was extremely contaminated, or when the cleaning techniques were improperly applied. At Playa de Beo (near Perbes, Fig. 2), sawdust was applied to soak up the oil, but proved inadequate to handle the large volume present. A front-end loader was later used in conjunction with a motorized grader in an unsuccessful attempt to clean the beach. On 21 May, similar machinery was used to clean up Bastiagueiro, one of La Coruña's popular tourist beaches. Much oiled sand was removed from the lower beach face, possibly reducing the long-term stability of the beach. In this case, mechanical removal proved inadequate since the oil still in the water recoated the beach during each succeeding high tide. Furthermore, repeated runs by the heavy machinery over the oiled beach only embedded the oil deeper into the sediment. After two weeks, up to a metre of sand had been removed from the lower half of the beach, and it was still contaminated with oil. It should be noted, that these same techniques can be applied successfully under proper supervision (Sartor & Foget, 1971).

The most successful and least damaging clean-up method used by the Spanish authorities was a combination of machinery and manual labour. However, this method only worked on beaches of light to moderate oil concentrations. At Playa de Banobre (near Perbes, Fig. 2), townspeople raked the oiled sand into rows along the swashline, which were later removed by a front-end loader. At Playa de Orzán in La Coruña, raking of the beach was also effective in removing oiled swashlines.

To put the Spanish clean-up effort in perspective, we observed less than 15 pieces of heavy machinery, not including trucks, operating on the beaches, and an organized clean-up force of 100 persons at maximum. As reported by Henry (1971), beach clean-up of oil spilled by the *Torrey Canyon* (117 000 tons lost; Smith, 1968) was carried out by local authorities assisted by over 1400 men from the armed services. During the Santa Barbara blow-out (12 320–124 190 tons; Foster *et al.*, 1974), over 1000 men, 54 boats, and 125 pieces of machinery were used in the clean-up operation. Thus, although the *Urquiola* accident was nearly as large as the others, the clean-up effort employed only a small fraction of the equipment and manpower that were used to clean up the other spills.

Conclusions

The *Urquiola* is another case in which an oil spill could have been avoided. Port regulations should have prohibited entry of supertankers into La Coruña during low tide, especially spring low tide. Once oil began leaking from the vessel, it became clear that La Coruña and the Spanish authorities were unprepared to effectively combat it. Delays in equipment arrival and placement of booms to protect sensitive environments, and the lack of available high pressure suction pumps, all increased the extent of dispersal of the oil. The circumstances surrounding the *Urquiola* oil spill disaster point out the necessity for oil spill contingency planning, which

should especially include the prior determination of the local coastal environments most sensitive to oil contamination, and the training of an adequate number of personnel competent to react swiftly and properly should a spill occur.

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