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Coastal Hydrocarbon Pollution: A Case Study From Deception Island, Antarctica

Coastal Hydrocarbon Pollution: A Case Study

From Deception Island, Antarctica¹

Summary

This paper updates on monitoring activities conducted by ASOC at Deception Island in 2001-2002 jointly with the Institute of Chemical Physics of Materials, Environment and Energy (INQUIMAE, in Spanish), University of Buenos Aires, Argentina, as reported to the SCAR/IASC Open Science Conference, St. Petersburg, Russia, July 8-11 2008. Monitoring identified detectable hydrocarbon concentrations at a number of Deception Island coastal sites. The results suggest that regular and effective monitoring should take place to allow assessment of the impacts of ongoing activities at Deception Island, in accordance with Art. 3(2)(d) of the Protocol of Environmental Protection to the Antarctic Treaty, as well as at other Antarctic sites where high levels of shipping are frequent. Monitoring is not about assigning (or avoiding) blame from causing pollution but about increasing our scientific and practical knowledge about human impacts on the Antarctic environment with a view to better manage activities in the area and reduce environmental impacts.

1. Introduction

Marine pollution has concerned Antarctic Treaty Consultative Parties since early on and has resulted in several Recommendations² as well as the adoption of Annex IV of the Protocol of Environmental Protection to the Antarctic Treaty. At ATCM XXXII (2003) ASOC introduced IP117 “Coastal sediment pollution at sites frequently visited by tourism operations”. This reported on monitoring activities conducted by ASOC at Deception Island³ in 2001-2002 in the context of the international expedition organised to establish an ASMA at Deception Island.⁴ Analytical work on coastal sediment samples was carried out at the Institute of Chemical Physics of Materials, Environment and Energy (INQUIMAE, in Spanish), University of Buenos Aires, Argentina. IP117 noted detectable hydrocarbon concentrations at a number of Deception Island coastal sites. ASOC expressed its intention to undertake further analysis and to report back to the CEP on these matters.

This paper briefly expands on the information contained in IP117 on the basis of a poster submitted to the SCAR/IASC Open Science Conference, St. Petersburg, Russia, July 8-11 2008,⁵ which summarises the methods and results and contains a map summarizing the findings at Deception Island (Appendix 1). The poster was prepared jointly by researchers from ASOC and INQUIMAE. The authors intend to submit this information for publication in a peer reviewed scientific journal.

2. Overview of Deception Island

Deception Island in the South Shetland Islands (62°57'S, 60°38'W) is a ring shaped island about 12 km in diameter, with a narrow entrance into Port Foster, a central landlocked harbour (a flooded volcanic caldera). Activities in the island have included sealing (1820s), industrial whale processing (1912–1931), scientific base operations (from 1944), and organised tourism (from 1958). A 1969 volcanic eruption forced the evacuation of the island and caused a significant destruction of some active and abandoned facilities.

There are two sites of past whaling and research activities, now designated as Historic Sites and Monuments 71 (Whalers Bay) and 76 (Pendulum Cove). In addition, there are two summer-only stations in Fumarole

¹ Lead author: R. Roura.

² See for instance Recommendation ATCM IX-6 (London, 1977); Recommendation ATCM X-7 (Washington, 1979); and Recommendation ATCM XV-4 (Paris, 1989).

³ Roura R and Pérez-Muñoz C (2002): *Evaluation of sites with human activities at Deception Island. Recommendations for a management plan*. A field report of the Antarctic and Southern Ocean Coalition. Submitted to the Deception Island Management Group coordinated by the British Antarctic Survey. Washington DC: The Antarctica Project. 36pp.

⁴ Argentina, Chile, Norway, Spain, UK, USA, ASOC and IAATO (2002): *An International Expedition to Deception Island*. XXV ATCM/CEP V, IP028.

⁵ Roura RM, dos Santos Afonso M, Pérez Muñoz C, and Tin T (2008): “Tourism and the human footprint at Deception Island, South Shetland Islands, Antarctica.” *Abstract Volume*, SCAR/IASC Open Science Conference, St. Petersburg, Russia, July 8-11 2008, p.452.

Bay operated by Argentina and Spain. Research is conducted around much of the island, particularly around the perimeter of Port Foster, and involves both boating and overland transport. Government and cruise ships, and private and commercial yachts regularly operate inside Port Foster.⁶ For the past decade Deception Island has been one of the most visited tourism destinations in Antarctica. The four sites where tourism landings take place at Deception Island – Whalers Bay, Pendulum Cove, Telefon Bay, and Baily Head – are fairly frequently visited by Antarctic standards. Whalers Bay has been for some years one of the most visited sites in the entire region, with more than 18,000 tourists reported to have landed in 2008-2009, up from more than 6,000 tourists in 2001-2002 when the fieldwork reported here was carried out.⁷ Visitor numbers at Whalers Bay are much higher than at the other tourism landing sites. Visitation patterns are dynamic – for instance, visits to Pendulum Cove have declined in recent years, and those to Telefon Bay have increased. Baily Head, where hazardous conditions make landings difficult if not impossible, is nevertheless visited on a regular basis. Some tourist groups are taken for walks between Whalers Head and Baily Head.

3. Overview of findings

In February 2002 ASOC examined the footprint of tourism and other contemporary and past activities on the island through a range of methods, including monitoring of hydrocarbons on beach sediments. Thirty-four beach sediment samples were collected around Port Foster as well as in control locations. Detectable hydrocarbon concentrations were obtained at a number of sites, with highest values at the sites of past or present activity (i.e. whale processing, research, and tourism). The highest hydrocarbon concentrations, in excess of five times higher than background levels, were found in the eastern and northern part of Port Foster. Marine diesel was identified in samples collected at Pendulum Cove (one samples), Telefon Bay (two samples), and Baily Head (one sample).

Hydrocarbons sources at Deception Island could be manifold. These may include natural sources (including fauna and perhaps volcanic activity), as well as historic and recent human activity, resulting in both land-based and maritime sources of pollution. The location of higher hydrocarbon concentration values within Port Foster may be related to the location of pollution sources and also to the transport and re-deposition of hydrocarbons due to environmental conditions.

4. Relevancy of findings to ATME

For the purposes of this ATME, the results obtained at Deception Island suggest:

1. In view of the multiple possible sources of hydrocarbons at Deception Island, both natural and anthropogenic, and the longevity of some hydrocarbons, it is not suggested here that tourism-related shipping is the main or sole cause of hydrocarbon concentrations as found in beach sediments at the island. However, given the distribution and nature of hydrocarbons and the importance of tourism in this area, a contribution from tourism-related shipping to the hydrocarbon load is likely;
2. ASOC finds it surprising that, to its knowledge, relatively little monitoring efforts appear to have taken place at Deception Island, particularly after the 2007 accident of the *M/S Nord Kapp*, which resulted in oil discharges in Port Foster.⁸ Given this event and the high-level shipping activity in the area, regular and effective monitoring should take place to allow assessment of the impacts of ongoing activities at Deception Island, in accordance with Art. 3(2)(d) of the Protocol of Environmental Protection to the Antarctic Treaty;
3. The information collected by ASOC some seasons ago can be used as a benchmark to monitor changes in nature and distribution of hydrocarbons in beach sediments since then;
4. Monitoring results should inform decisions about the management of Deception Island; and
5. It would be advisable to monitor hydrocarbon marine pollution at other Antarctic sites where high levels of shipping are frequent, particularly in coastal locations where waters are relatively enclosed and tourism landings take place regularly.

⁶ During the observation period (January-February 2002) cruise ships were the most frequently visitors to the island, although government ships appeared then to have the longest residence time inside Port Foster.

⁷ IAATO (International Association of Antarctica Tour Operators). undated. *Tourism statistics*. URL: <http://www.iaato.org/stats/> (accessed 8 July 2009).

⁸ From informal communications with Spanish officials ASOC is aware of some monitoring conducted by Spanish scientists during the *MS Nord Kapp* incident and subsequently, although it has not yet had access to monitoring reports.

When IP 117 was introduced at CEP VI, some meeting participants noted the need to consider historic sources of pollution.⁹ Conceptually this is correct; however, ASOC contends that the issue is not assigning (or avoiding) blame from causing pollution but increasing our scientific and practical knowledge about human impacts on the Antarctic environment.¹⁰ This knowledge can then be used to better manage activities in the area with a view to reducing human impacts, using a pragmatic precautionary approach where needed.

⁹ Report of CEP VI (2003), paragraphs 118-119.

¹⁰ For instance, ASOC-member Greenpeace has reported extensively on the environmental impact of its Antarctic base, which operated between 1988-1991 before being entirely removed and the site subject to remediation and monitoring, even though the environmental impact of the base was negligible. See for instance Roura R (2004): "Monitoring and remediation of hydrocarbon contamination at the former site of Greenpeace's World Park Base, Cape Evans, Ross Island, Antarctica." *Polar Record* 40 (212) 51-67.