

# Tar on Your Swimming Cozzie?

Lewis C.A.<sup>1</sup>, Harman, C.P.<sup>1,2</sup>, Pinfold, K.L.<sup>1</sup>, Reeves, C.E.<sup>1,3</sup>,  
Wilkes, P.T.V.<sup>1,4</sup> and Wilson, H.K.<sup>1</sup>



<sup>1</sup> Petroleum and Environmental Geochemistry Group, SEOES, University of Plymouth, Plymouth, Devon PL4 8AA, U.K.

<sup>2</sup> Present Address: Norwegian Institute for Water Research (NIVA), Gaustadalleen 21, 0349 Oslo, Norway

<sup>3</sup> Present Address: URS Qatar LLC, Bin Jaham Al Kuwari Building, Al Sadd Street, P.O. Box 22108, Doha, Qatar

<sup>4</sup> Present Address: Air Quality Unit, Faculty of Business, Enterprise and IT, Cornwall College Camborne, Cornwall TR15 3RD, U.K.

<http://www.pegg.org.uk/>

## Summary

We have undertaken a decadal study (1998-2008) of the tar balls found on beaches around the South-West peninsula of the UK. Beaches on the north and south coasts of Cornwall and Devon have been surveyed a number of times, often during both the summer (July-September) and the winter (December-February). Although the amount of tar may be classed as “negligible” (<1.0 g m<sup>-1</sup>) it can originate from sources that are geographically remote from the UK. This is demonstrated by tar balls showing a biological marker signature similar to that of oil from the *Prestige*, which sank off Spain (42°15'N, 12°08'W) in November 2002.

## Introduction

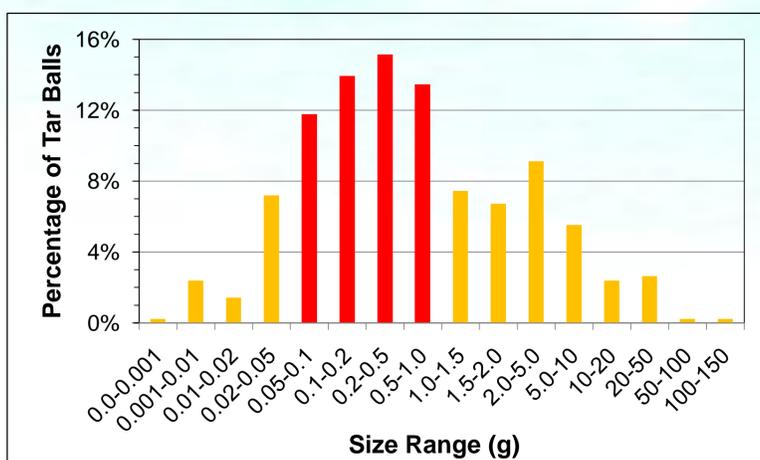
The English Channel is one of the busiest waterways in the world and a significant proportion of the UK and Europe's shipping must pass close by the South-West peninsula. For example, in 2006 Milford Haven and Southampton accounted for over 25% of the UK's oil and gas traffic (Department for Transport, 2006). Additionally, between 1971 and 2003 the number of visitors to Cornwall has increased from 2.9 to over 5 million (Cornwall County Council, 2006) and the “beach holiday” is an important component of this phenomenon; there is the expectation that the beaches will be clean and also free of anthropogenic pollutants, including tar. Although legislation has significantly reduced the anthropogenic input of petroleum products into the marine environment, tar ball pollution remains a serious issue in many parts of the world. A study of the tar balls found on beaches of the South-West peninsula, would provide baseline data for the region and may provide information on their source as well as spatial and temporal distributions.

## Methods

Precise methods have varied slightly over the period of study. Typically, collection of tar balls from beaches (**Figure 1**) followed UNESCO (1984) guidelines. In the laboratory, soluble material was isolated from individual tar balls by dissolution in dichloromethane, and this was then separated by micro-column chromatography on silica into aliphatic and aromatic fractions. The fractions were subjected to GC and GC-MS using conditions commonly encountered when analysing hydrocarbon mixtures.

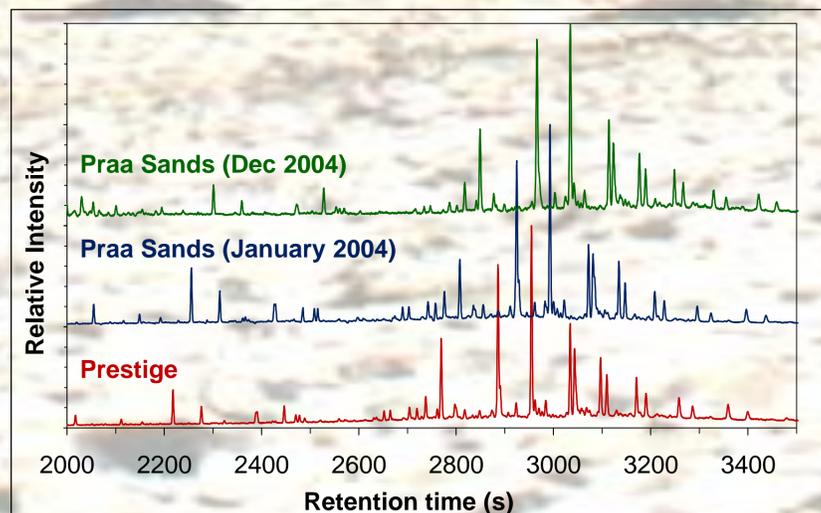
## Results

- The number and size of tar balls on the beaches studied are both spatially and temporally inhomogeneous; however, the mean loading of tar is considerably less than 1.0 g m<sup>-1</sup> and therefore “negligible” (Corbin *et al.*, 1993).
- The detection limit for finding tar balls may be as low as 0.001 g and, although the largest tar ball found was over 110 g, the majority fall in the range 0.05-1.0 g (**Figure 2**).



**Figure 2:** Size distribution of tar balls found on beaches of the South-West peninsula of the UK

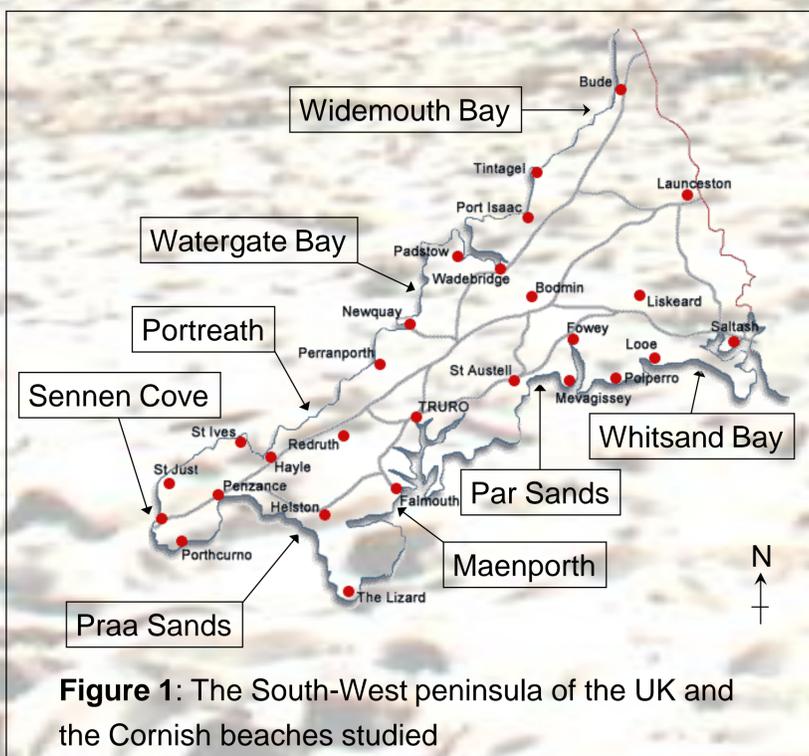
- Some tar balls show a full suite of *n*-alkanes and isoprenoids, reminiscent of relatively fresh oil, others have a distribution clearly indicating biodegradation has occurred.
- The distribution of *n*-alkanes and isoprenoids in the outer and inner portions of tar balls appears to be different, which presumably reflects protection of the latter from biodegradation.
- Alkyl naphthalenes and phenanthrenes are absent from the outer layer of tar balls but present inside, presumably reflecting their dissolution from the outer surface.
- In August 2003, January 2004 and December 2004 tar balls collected from two beaches in Cornwall (Portreath and Praa Sands) showed distinct similarities to the oil carried by the *Prestige*, which sank 130 nautical miles off the Spanish coast on 19<sup>th</sup> November 2002 (Figure 3).



**Figure 3:** Mass chromatograms (*m/z* 191) illustrating similar distributions for tar balls and the *Prestige* oil

## References

- Corbin, C.J., Singh, J.G. and Ibiebele, D.D. (1993) Tar ball survey of six eastern Caribbean Countries. *Marine Pollution Bulletin* **26**, 482-486.
- Cornwall County Council (2006) *Management of Beaches and Coastal Areas in Cornwall – A Guide to Current Best Practice*. Available at <http://www.cornwall.gov.uk>.
- Department for Transport (2006) *Transport Statistics Report: Maritime Statistics 2006*.
- UNESCO (1984) *Manual for Monitoring Oil and Dissolved/Dispersed Petroleum Hydrocarbons in Marine Waters and on Beaches*. Manuals and Guides No. 13.



**Figure 1:** The South-West peninsula of the UK and the Cornish beaches studied

## Acknowledgements

We thank Roger Srodzinski, Paul Sutton and Charles West for help with analysis and the University of Plymouth and PEGG for providing facilities.