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Review

From a millennium base line to 2012: Beach litter changes in Wales

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ABSTRACT

Forty-five beaches at 41 bathing area locations in Wales were analysed for litter in 2000 and 2012, via a standard seven category checklist. Fourteen resorts, 2 urban, 11 village, 15 rural 3 remote, were graded, A to D. A grade beach numbers changed from 5 to 19; B, 27 to 24; C, 9 to 2; D, 4 to 0, many beaches maintaining their current status. Assuming trend continuance within the next 12 years, the A:B grade ratio would approach equilibrium of 44:56, with no grade C or D beaches. Recreational litter was ubiquitous; fishing materials prevalent along Cardigan Bay. New water treatment plant investment reduced sewage related debris. Despite apparent increased awareness of beach litter, improving visitor behaviour through information/education should be a future priority. Removing a few gross items could improve beach grades at little cost to local authorities and benefits to the Welsh economy.

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1. Introduction

Litter is a massive global issue that is of concern to governments, and the general public, as it despoils beaches, is non-aesthetic and frequently a health hazard. Litter that accumulates on beaches is derived from three main sources: *marine*, e.g. commercial fishing vessels, cruise ships, recreational vessels, together with sea disposed industrial and domestic wastes; *riverine*; and *beach user* recreational discards, e.g. water bottles, crisp packets. Litter may be found floating on the sea surface or

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hanging in the sea column, on beaches, and in the deep sea (Pichel et al., 2007; Santos et al., 2009; Lee et al., 2006) and many surveys have recorded that it mars holiday enjoyment (Williams et al., 2013).

Larger landfill materials and illegal 'fly tipping', e.g. tyres in particular, are 'land borne litter', although the latter could have a riverine origin prior to beach deposition. Marine litter may be defined as the solid materials of human origin that are discarded at sea or reaches the sea through waterways or domestic or industrial out-falls (Williams and Micallef, 2009). Marine litter adversely affects coastal development sectors, especially the tourism industry, as it curtails beach enjoyment and eliminating litter at source should be the aim. This is difficult, but crucial. However, before it can be achieved robust assessments are needed, requiring close links between field surveys and management activities (Tudor and Williams, 2001).

One of the largest problems of the 21st Century is plastic litter (Goldberg, 1995), which may comprise some 40–60% of litter found on a beach (Derraik, 2002). Until recently, most litter research involved tabulating counts of various litter types (bottles, tyres, etc.), usually in conjunction with 'beach clean-ups', but with scant regard to either sourcing or site comparisons (Williams et al., 2000). The litter found is usually eclectic in character. Largely as a result of public awareness, litter has recently become an important issue, especially with the growth in outdoor activities and tourism. In response to this, an EC initiative – The Marine Strategy

Framework Directive (MSFD) – was issued and applied to all European seas, aiming to ensure, 'Good Environmental Status', through the use of 11 descriptors, with Descriptor 10 specifically relating to marine litter (EC, 2008). It is interesting to note that, at the International Berlin litter meeting of 13.03.2013 (www.seas-at-risk.org/n2_more.php?page=583 (accessed 10.05.13)), it was revealed that no EU country had set quantitative reduction targets for marine litter, for reasons of lack of knowledge and baseline data.

Many studies have attempted to assess the amounts of land-sourced debris and sources of litter but global knowledge is mainly 'educated guestimates'. For example, Myers (2007) pointed out that globally some 6 million items enter the sea daily. The Ocean Conservancy (2009) gave a figure of 11,439,086 for the worldwide total of marine debris items although this total is obtained from small areas (Santos et al., 2005; Sol and Coast, 2007). Hall (1998) showed that litter exerts a powerful influence on the economics of bathing areas, as tourists will avoid such areas due to aesthetics and health reasons. Other researchers, e.g. Williams, 2011, McKenna et al. (2011), argue that clean beaches are fundamental for attracting the tourist trade, especially at resort and urban beaches. *Toxicaria canis* (resulting from dog fouling), is now becoming a large issue in beach litter clean-ups and a maximum of £1000 can be imposed on dog owners for not picking up the waste. Additionally, potential dangers to tourists are broken glass, syringes and nails, etc. which can cause foot lacerations (Phillip et al., 1995) and sharps containers have been issued to lifeguards who are

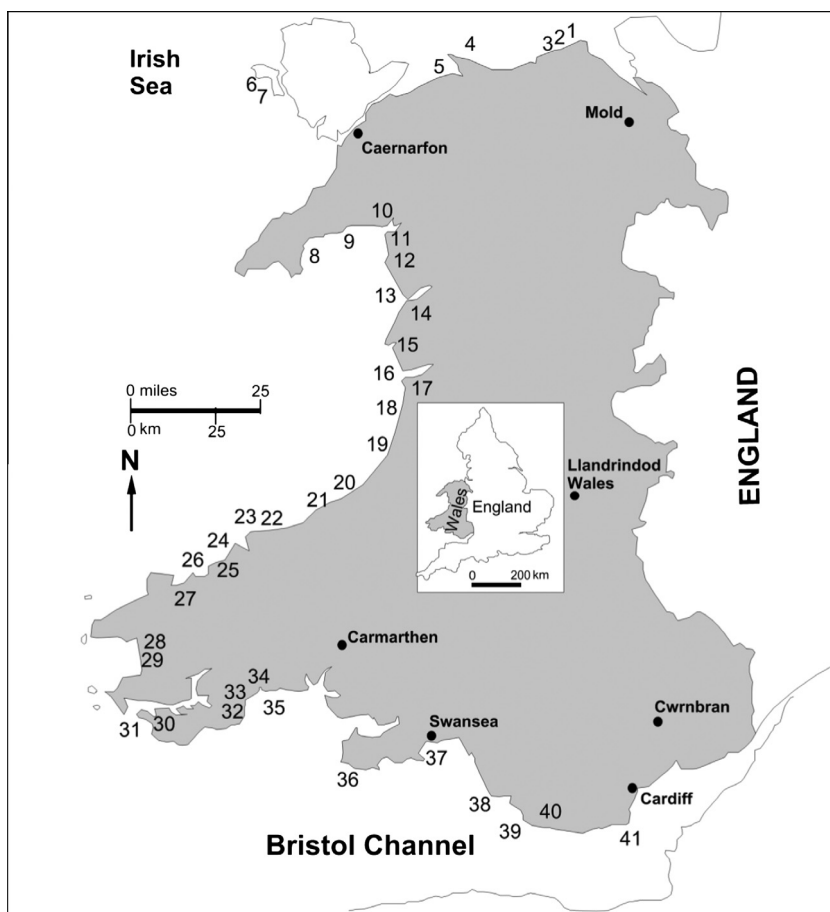


Fig. 1. Location of investigated beaches. **KEY:** 1 Rhyl, 2 Kimmel Bay, 3 Abergele, 4 Llandudno, 5 Penmaenmawr, 6 Porthdafach, 7 Llanfynach, 8 Pwllheli, 9 Crickieth, 10 Morfa Bychan, 11 Harlech, 12 Talybont, 13 Barmouth, 14 Fairbourne, 15 Towyn, 16 Aberdovey, 17 Borth, 18 Aberystwyth, 19 Newquay, 20 Llangrannog, 21 Tresaith, 22 Aberporth, 23 Mwnth, 24 Poppit, 25 Newport, 26 Dinas, 27 Goodwick, 28 Nolton, 29 Broadhaven, 30 Freshwater West, 31 Angle, 32a Tenby North, 32b South, 33 Wisemans Bridge, 34a Amroth, 34b Amroth Castle, 35 Pendine, 36 Port Einion, 37 Swansea Bay, 38a Porthcawl Rest Bay, 38b Sandy Bay, 38c Trecco Bay, 39 Southerndown, 40 Llantwit Major, 41 Lavernock.

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