



Whale carcass strandings on beaches: Management challenges, research needs, and examples from Australia

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ABSTRACT

The management of stranded whale carcasses is a logistical, environmental and economic challenge concerning a number of different stakeholders. In this paper, we review the current carcass disposal methods, stakeholders involved, and identify research needs and gaps. Examples of carcass disposals from all over the world are presented with Australia used as an example of current governance procedures and related challenges. Current management options include (1) leaving a carcass to decompose *in situ*, (2) beach burial, (3) oceanic tow, and (4) transport to waste management facility or rendering plant. Leaving a carcass to decompose *in situ* is the most cost effective and natural method, but raises issues of sight, smell, changes in sediment and groundwater chemistry, and shark attraction. Beach burials remove the sight and smell of a carcass and are relatively cost effective, but the extent to which carcass burial alters beach groundwater and attracts sharks to the surf due to leachate transported via submarine groundwater discharge is unknown. Oceanic tows are a simple disposal method, but carcasses can become boating hazards and may return ashore. Transporting carcasses to a waste management or rendering plant is costly, but effectively removes most social and environmental issues associated with a carcass stranding. The management of stranded carcasses involves a number of stakeholders with differing missions and priorities, from government agencies to conservation groups. Differences in priorities often cause tensions between groups increasing the complexity of carcass disposals. This review identifies key challenges and potential issues to guide decisions that are often made at a local scale. We recommend that clear legislation and organisational responsibilities are needed to prevent ambiguity when managing carcass disposal.

1. Introduction

Since the commercial whaling moratorium in 1986, global whale populations have been rising (International Whaling Commission, 2017). For example, the Western Australian population of Humpback Whales (*Megaptera novaeangliae*) is estimated to have increased from ~7,000 in 2000 to ~26,000 in 2008 (Salgado Kent et al., 2012). As populations increase so does the frequency of natural whale mortalities and beach strandings of live animals (Coughran et al., 2012), usually caused by nutritional or disease stress sustained during migrations (Smith, 2006). While most carcasses are likely to sink or are predated at sea after death, some are transported to the coast and strand on beaches. For example, out of ~1,600 Gray Whales (*Eschrichtius robustus*) that died annually in the Northeast Pacific, ~50 per year typically become stranded along the shoreline (Smith, 2006). Some individuals or pods of live animals also die after stranding themselves on beaches.

Here we focus on the management of stranded carcasses; either those washed ashore after death or those that have died during stranding.

Species of great whales have long migration routes that follow the coastlines of many countries, therefore, the effective management of carcass strandings is of international importance. Due to the large size of carcasses, varied locations of potential strandings, and difficult access to some beaches; management of stranded carcasses is complex and presents technical, social, economic and environmental challenges. Consistent and robust management requires an understanding of factors including frequency of strandings, logistics, costs and general environmental impacts of potential management strategies. In many stranding cases, animals are already deceased and decomposition has begun. There is often community pressure for the removal of carcasses due to smell, unpleasant sight, and more recently a perceived threat of shark attraction to the surf (Fig. 1) (Rubbo and Lyons, 2017).

This paper will review the benefits and issues associated with each

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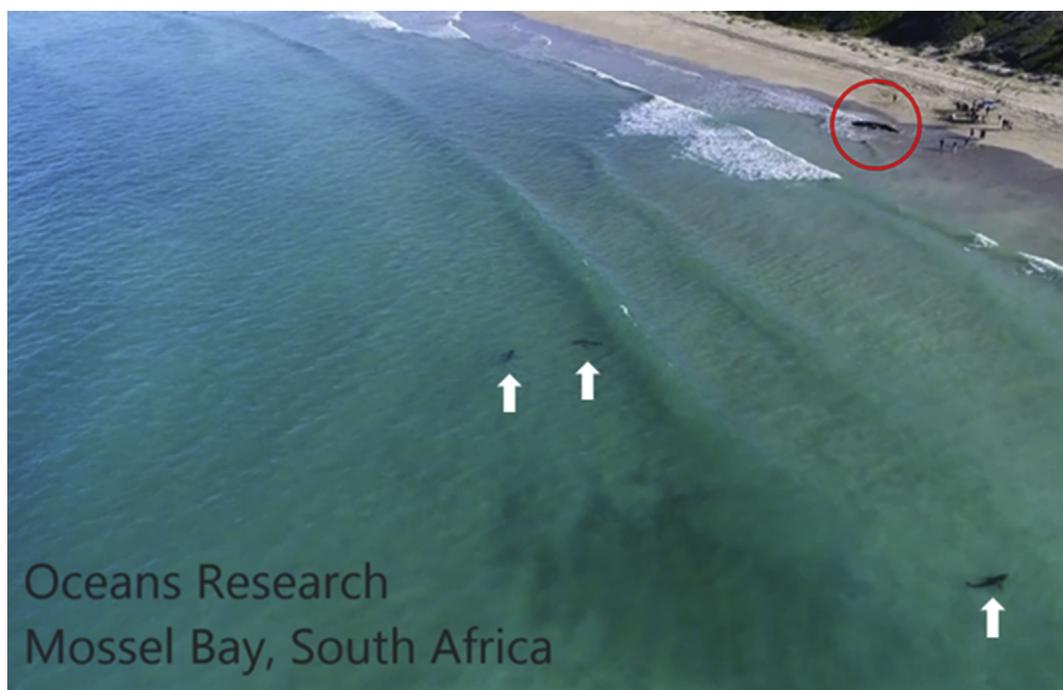


Fig. 1. Whale stranding (circled) with sharks (arrows) in close proximity indicating the attraction of sharks to the near shore area when carcasses are left on the beach (provided by Dr Enrico Gennari, Oceans Research Institute, 2017).

management method. It will illustrate some of the governance challenges of managing stranded carcasses using examples from Australia to guide the development of site-specific whale carcass management plans. We focus on great whales ranging from 5 to > 160 tonnes as defined by Smith (2006) which create the most complex management challenges.

2. Management options

2.1. Do nothing

The option to leave a carcass to decompose unburied *in situ* (hereinafter referred to as “do nothing”) often occurs in remote locations (Fig. 2A). In areas that are not frequented by beach users, do nothing disposals have obvious logistical, economic and environmental benefits. Commonly a representative from the appropriate agency simply assesses the site as one that a do nothing disposal will not have a significant influence on the public or the environment. At most, a manager may post warning signage if the site has any public traffic. This prevents any costs and complex logistics of moving and/or burying carcasses.

Issues associated with this method include (1) changes in groundwater chemistry from carcass leachate, (2) unpleasant sight and smell, (3) shark attraction to the surf, and (4) contamination from euthanasia and sedation drugs. There may be a risk of biological contamination (pathogens), however, more research is needed on the presence of potential pathogens, including zoonoses (Moura et al., 2013), and the fate of these pathogens in the sand and groundwater (Hassard et al., 2016) surrounding carcasses. Factors including sediment characteristics, tidal cycling and beach microorganisms may have an influence. Despite the risk of contamination, allowing access of the carcass to insects and scavengers will increase decomposition rate and spread the material (Carter et al., 2007) meaning potential chemical and biological changes will not last as long as in a burial (Carter, 2005). This method of disposal may be beneficial for beach organisms. Carcasses provide a significant food source for scavengers (Huijbers et al., 2013; Schlacher et al., 2013) and enrichment of nutrients in the surrounding environment (Freedman and Fleming, 2003). Stranded cetacean carcasses have

been observed to attract large scavengers including lizards and birds (Huijbers et al., 2013), which effectively provide ‘free’ and natural disposal of a carcass.

The do nothing approach is not a viable option for sites that are in close proximity to residential areas or beaches of high public traffic due to the smell and the unpleasant sight of decomposition. There is evidence that stranded whales are preyed by sharks in the near-shore area as observed by recent drone images in South Africa (Fig. 1) (Gennari, 2017), however it is unknown if the sharks were already in the area, passing through, or attracted to the area because of the whale carcass. Sharks feeding on whale carcasses are often considered enough evidence for local authorities to avoid the do nothing approach in areas frequented by beach users.

The do nothing approach also leaves open the potential for a carcass to re-enter the ocean. This could cause the movement of a carcass to a more populated area, the floating carcass becoming a boating hazard, and/or the re-attraction of sharks to the near shore area; effectively starting the management process over again. Past instances that attempted to lower the impact of a whale carcass include a case wherein explosives were used on a carcass to break it into smaller sections with the hypothesis that these would be manageable for small beach scavengers such as birds. The explosion did not have the intended effect making the clean up a long process and frightening away any scavenging birds (Geraci and Lounsbury, 2005).

Using a stranded whale carcass for human consumption has occurred in the past and also has the potential to reduce the impacts of a carcass stranding. Although this has happened in the past in Iceland (International Whaling Commission, 2013), Indonesia (The Telegraph, 2012), and South Africa (Barcroft et al., 2014), whales are internationally protected by the Convention on International Trade in Endangered Species of Wild Fauna and Flora even after death. It is therefore illegal to take any parts from a carcass. There are special cases wherein indigenous peoples are allowed to remove whale parts for consumption, for example in USA (Alaska), Canada, Russia (Chukotka), Iceland, and Greenland (International Whaling Commission, 2018), however these are heavily regulated and not common place. There is a fine line between utilising carcasses that have died naturally and

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