

A note on the spike in recorded mortality of humpback whales (*Megaptera novaeangliae*) in Western Australia

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ABSTRACT

An unprecedented number of humpback whales ($n = 46$) from Breeding Stock D (BSD) were found dead or dying on Western Australian beaches in 2009. This compares to an average of less than four stranded humpback whales in each year in the period between 1989 and 2008. The recorded number of humpback whales on beaches in the year preceding this peak (2008, $n = 13$) and the two years following the peak (2010, $n = 16$; 2011, $n = 17$) were also above the long term average. In 2012 ($n = 7$), the numbers of stranded whales was closer to the longer term average. The majority of stranded individuals were either calves (44%) or juveniles/sub-adults (49%), with only 7% classified as adults. Most whales appeared emaciated. There were insufficient data to determine cause of death. Three possible hypotheses to explain this spike in mortality are proposed: (1) the increase in mortality of BSD was an artefact of increased detection and reporting; (2) the increase was temporary and transitory; and (3) the spike in mortality represents the start of an increasing trend in mortality as the population approaches carrying capacity. We suggest that hypothesis two is the most plausible but on-going monitoring will be required to test this.

KEYWORDS: HUMPBACK WHALE; MONITORING; SOUTHERN HEMISPHERE; STRANDING; TRENDS

INTRODUCTION

Like many other populations of great whales, humpback whales (*Megaptera novaeangliae*) that aggregate to breed along the coast of Western Australia (Breeding Stock D: BSD) were severely depleted through unsustainable whaling practices (Gibbs, 2012). A combination of historic catches from Western Australian coastal whaling stations and pelagic whalers, high seas whaling in the Southern Ocean and illegal, unreported whaling by the then Soviet Union (Yablokov *et al.*, 1998) had depleted the population to fewer than 800 animals by 1962 (Chittleborough, 1965). Although there is uncertainty around estimates of pre-whaling population abundance, BSD was likely to have numbered at least 20,000 animals in the early 20th century, and so had been depleted to just a few percent of its original size by the early 1960s.

The almost complete cessation of whaling on BSD post-1962 resulted in evidence of population increase by the mid-1970s and by the end of the 20th century the population was estimated at 10,000 animals (Bannister and Hedley, 2001). This remarkably rapid recovery rate (>10% per annum) was also reported for humpback whales that breed off the east coast of Australia (Noad *et al.*, 2011). Recent population estimates of BSD at 21,750 (95% CI = 17,550–43,000; Hedley *et al.*, 2009) and 17,810 (95% CI = 14,210–27,720; Hedley *et al.*, 2011) suggest that the population is likely to be at, or approaching, pre-exploitation size. Similar increases in population size for this species have been observed in Brazil (Andriolo *et al.*, 2010). An increase in the occurrence of stranded humpback whales is also reported for the humpback whale population in Brazil (Siciliano *et al.*, 2011).

This paper presents data of humpback whale strandings between 1989–2012, with an unusual spike in recorded

mortality of humpback whales along the west Australian coast in 2009 and discusses the plausibility of the following three hypotheses:

- (1) the increase in mortality of BSD was an artefact of increased detection and reporting;
- (2) the increase was temporary and transitory; and
- (3) the spike in mortality represents the start of an increasing trend in mortality as the population approaches carrying capacity.

METHODS

Study area

The coast of Western Australia (WA) extends over 12,000km (excluding islands) and covers a wide latitudinal range from tropical to temperate. In WA, State waters extend 3 n.miles from the coast and Commonwealth waters extend from the State water boundary to the Exclusive Economic Zone (EEZ), some 200 n.miles from the coast. WA is most heavily populated along the coast of its southwestern region (Fig. 1).

Prior to 1981, cetacean strandings were not recorded in a systematic manner, with the exception of some specimens archived by the Western Australian Museum on an *ad hoc* basis. The Western Australian Department of Parks and Wildlife (DPaW) established the Western Australian Cetacean Stranding Database in 1982. DPaW maintains this database of cetacean stranding events that includes both live-stranded and dead, beach-cast cetaceans. Reports of stranded cetaceans are investigated and validated by DPaW before being entered into the database by the custodian (DKC) who has maintained the database since 1982. There is an inevitable spatial bias in reports of stranded cetaceans due to

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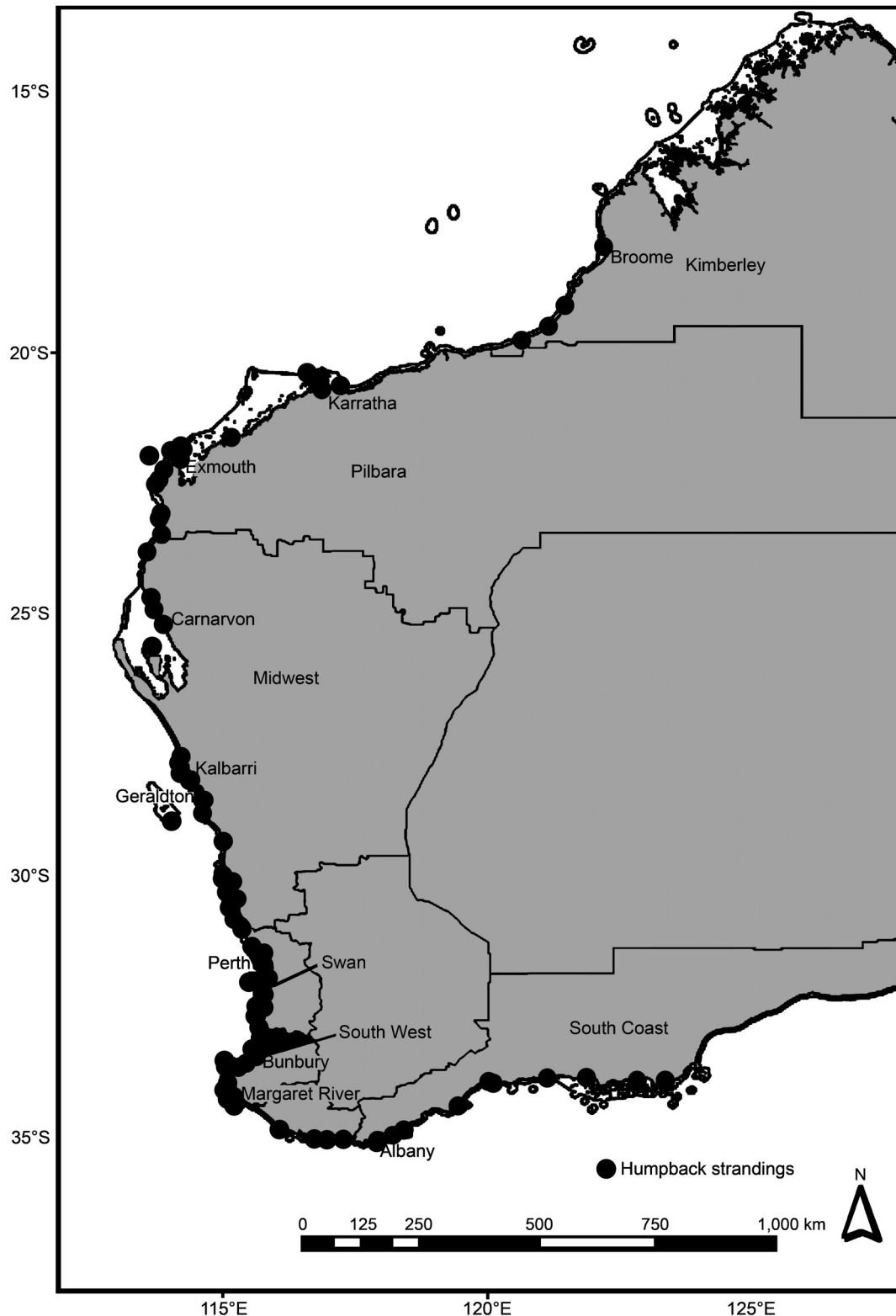


Fig. 1. Distribution of recorded humpback whale stranding events along the Western Australian coastline between 1989 and 2012.

the variable human population density along the coastline (Groom and Coughran, 2012).

Species identification is only included in the database when verified by a suitably qualified person. Data of beach-cast humpback whales were extracted from 1989–2012 for the purpose of this paper. Where available, data on stranding location, sex, body length and condition were recorded. Age class was assigned based on body length with adults greater

than 12m, juveniles/sub-adults 7–12m and calves of the year less than 7m.

Post-mortem examination and scientific sampling was not within the stranding response protocol until 2009. Body condition measurements were not taken, but general appearance of condition was noted in some cases. The DPaW stranding protocol was amended in 2009 to include scientific sampling, including measurements of blubber thickness and

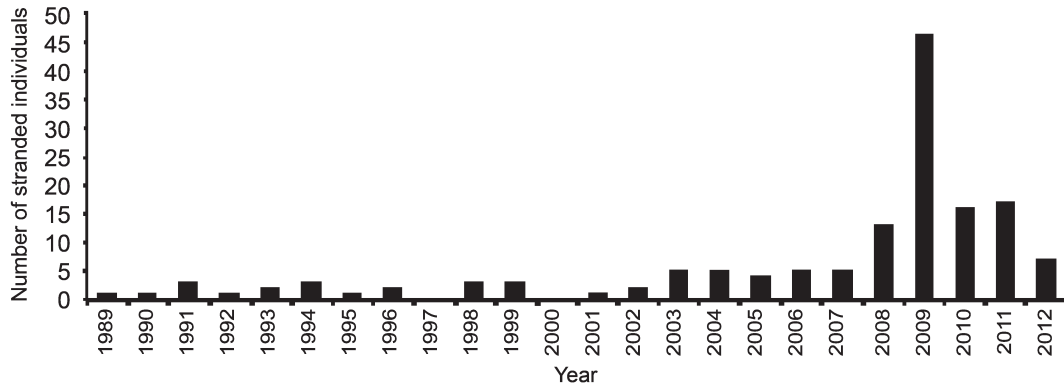


Fig. 2. Number of live and dead humpback whales recorded on west Australian beaches between 1989 and 2012.

post mortem analysis of carcasses based on necropsy protocols by Geraci and Lounsbury (2005), Higgins and Noad (2006) and Pugliares *et al.* (2007).

RESULTS

Since 1989, 146 humpback whales have been recorded stranded on the west Australian coast. On 50 occasions humpback whales were found on the beach alive, 26 died soon after being found, 16 were euthanased, three were refloated but died later, and five were refloated and not seen again. For the purpose of this paper, these last five whales were assumed to have died. Of the 96 whales found dead, approximately 30% were in a state of advanced decomposition.

The mean number of whales ashore between 1989 and 2007 was 2 humpbacks per annum (range 0–5). Thirty one percent of the total humpback whale strandings occurred ($n = 46$) in 2009 (Fig. 2). The majority (84%) of the strandings occurred between July and November; the austral winter/spring breeding season (Fig. 3).

Stranded humpback whale length ranged from 3.2–15m (Fig. 4). Mean length was 7.7 unit of metres (m) (mean \pm SD). Determining age cohort by length is difficult as there is substantial overlap between calves of the year, juveniles/sub-adults and adults and therefore these results should be

interpreted as indicative only. The majority of stranded individuals were immature – either calves (44%) or juveniles/sub-adults (49%); only 7% were classified as adults (Fig. 4)

Body condition was frequently scored ‘poor’ for individuals where the flanks were sunken, a depression was apparent posterior to the blowhole or scapular and/or ribs and vertebrae were prominent indicating thin blubber layer and emaciation. However, there were insufficient data to provide any quantification of nutritional status.

The strandings occurred throughout the expected range of humpback whale migratory and breeding grounds along the coast of Western Australia (Fig. 1). Highest densities in recorded stranding events were in the lower mid-west coast of Western Australia (Fig. 1).

DISCUSSION

The strandings recorded in 2009 may represent an UME (unusual mortality event) for BSD humpback whales. There was a slight increase in stranding events in 2008 and in the two years following 2009. Few humpback whales stranded in 2012, possibly signalling a return to the historic lower rates.

The winter migratory and breeding season of humpback whales is associated with a period of physiological and

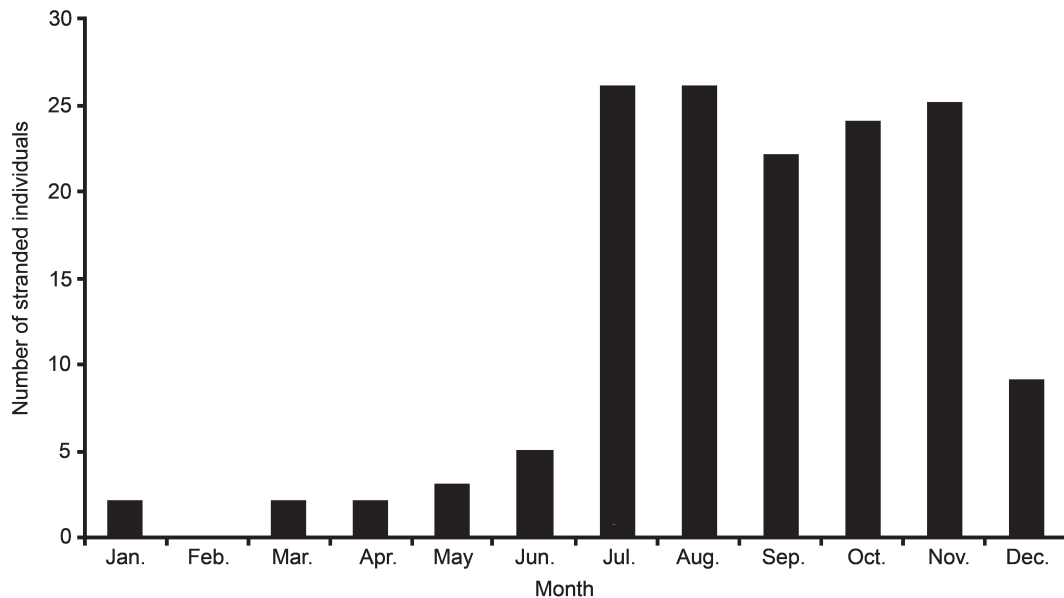


Fig. 3. Number of live and dead humpback whales recorded on west Australian beaches during each month for the years 1989 and 2012.

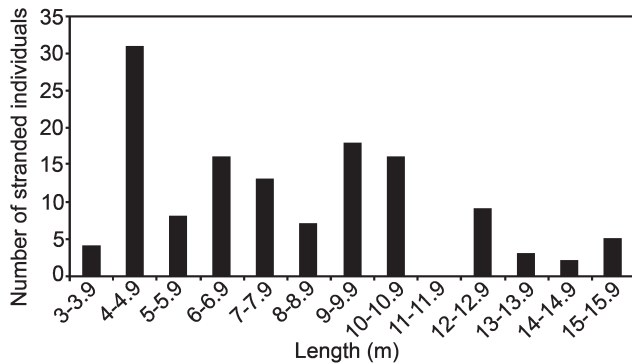


Fig. 4. Length frequency distribution of live and dead humpback whales which stranded on west Australian beaches between 1989 and 2012.

energetic stress associated with extended fasting and the demands of travel and, in the case of adult whales, reproduction (Clapham, 2000; Jenner *et al.*, 2001). This almost certainly leads to seasonal spikes in mortality which will be disproportionately recorded at coastal locations near human populations (Groom and Coughran, 2012). The record presented here, which runs for more than two decades, includes biases associated with reporting effort, as well as variability in coastal geography and oceanography that affects the likelihood of sick or dead whales becoming beach-cast. The majority of Western Australians reside along or utilise the coastline for recreation or industry. Therefore, a stranding of a humpback whale represents a conspicuous incident that is likely to attract attention and be reported to management authorities.

We argue that Hypothesis 1 (that the increase in mortality of BSD is an artefact of increased detection and reporting), is of low plausibility given the consistency of the number of stranding events reported for this species over the preceding two decades (Groom and Coughran, 2012) and the decreasing trend since 2009.

The trend data shown in Fig. 1 are most supportive of the conclusion that the trend in mortality is temporary and transitory (Hypothesis 2). If Hypothesis 3 is correct and this mortality signifies a threshold change in carrying capacity for humpback whales in the Southern Ocean, an increase in stranding events would be expected to continue. The downward trend in numbers since 2009 suggests this may not be the case, but future monitoring will be required to determine if this is the case.

Although separate populations, a similar spike in humpback whale mortality is reported for Brazil in 2010 (Siciliano *et al.*, 2011). Additionally, high mortality of southern right whale (*Eubalaena australis*) calves from Península Valdés, Argentina (Sironi *et al.*, 2012) has been observed. This level of mortality of southern right whales has not been observed elsewhere in the Southern Hemisphere, i.e. Australia or South Africa. The implications of such mortality events are greater for species with a contemporary small population size, such as the southern right whale.

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