Marine Biodiversity Records, page 1 of 3. ©2009 Marine Biological Association of the United Kingdom
doi:10.1017/S1755267208000158; Vol. 2; e15; 2009 Published online

Recent whale shark (*Rhincodon typus*) beach strandings in Australia

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We document two recent beach strandings of whale sharks on both the east and west coasts of Australia and compare them to strandings of other species of shark and cetaceans. Historically, whale shark stranding is an unusual phenomenon in Australia. Although the reasons for whale shark strandings are speculative, their low frequency suggests they are unlikely to pose any considerable threat to the population viability of this species in Australia.

Keywords: whale shark, *Rhincodon typus*, beach stranding, Australia

Submitted 19 November 2007; accepted 25 January 2008

Beach strandings of marine megafauna have been recorded since antiquity, although the reasons for this behaviour remain largely a mystery (but see Bradshaw *et al.*, 2005; Evans *et al.*, 2005). Most recorded strandings are of cetaceans, with large events sometimes including hundreds of individuals (e.g. pilot whales *Globicephala melaena* (Traill, Geraci & Staubin, 1977); sperm whales *Megaptera novaeangliae* (Borowski, Evans *et al.*, 2002); pygmy killer whales *Feresa attenuata* (Gray, Mignucci-Giannoni *et al.*, 2000); and several species of beaked whales—(Santos *et al.*, 2007)). In contrast, strandings of sharks occur infrequently, and usually comprise single individuals. Worldwide reports of shark strandings include white sharks (*Carcharodon carcharias* Linnaeus) (Martin, 2004), salmon sharks (*Lamna ditropis* Hubbs & Follett) (Compagno, 2001), basking sharks (*Cetorhinus maximus* Gunnerus) (Whitley, 1940), megamouth sharks (*Megachasma pelagios* Taylor, Compagno & Struhsaker) (Berra & Hutchins, 1990) and whale sharks (*Rhincodon typus* Smith) (Beckley *et al.*, 1997).

Beach strandings of both basking and megamouth sharks have been recorded in Australia. In 1930, a 7.6 m basking shark died after stranding at Mungo Beach, New South Wales (NSW) (32°32′28″S 152°27′17″E) apparently after chasing a school of salmon (*Arripis* sp.) into shallow water, where it was washed ashore by heavy surf (Whitley, 1940). This explanation seems unlikely because basking sharks are not known to pursue fish actively, although they may become stranded when feeding on the surface in rough sea conditions (D. Sims, Marine Biological Association of the UK, personal communication). A stranded 5.2 m male megamouth shark was found at Mandurah, Western Australia (32°30′S 115°43′E) in 1988 (Berra & Hutchins, 1990). This animal provides the only record of this species in Australia.

Like strandings of basking and megamouth sharks, there have been relatively few confirmed strandings of whale sharks in Australia. Only two specimens of whale sharks from Australia exist in museum collections: the remains (skin and teeth parts) of two beach-stranded specimens (AMS IB.7100; AMS IB.7314) from NSW, in the Australian Museum, Sydney.

Whitley (1965) reported three whale shark strandings in NSW during the 1960s: the first was at Brooms Head in 1963; the second near Cemetery Point, Anna Bay in 1964; and the third at Bare Island, Botany Bay occurred in 1965 (Table 1; Figure 1). One other whale shark stranding (beaching) also occurred at Point Hicks in Victoria in 1979 (Wolfson, 1986), and there is an unconfirmed whale shark stranding of a 2 m juvenile at Sandy Bay, North West Cape, Western Australia in 1982 (Colman, 1997) (Table 1; Figure 1).

Here we report the most recent confirmed strandings of whale sharks in Australia, both of which have occurred within the past two years. On 11 March 2006, an approximately 4 m juvenile whale shark stranded near Shark Bay, Western Australia. To our knowledge, this is the first confirmed reported stranding of a whale shark on the west coast of Australia. This individual was found alive and was returned to sea by local fishers. The carcass of the same individual was found the following day washed up on a beach at Cape Inscription on Dirk Hartog Island (Table 1; Figure 1) in an area exposed to high wave action. The second and most recent whale shark stranding occurred on 25 April 2007, when a 3 m juvenile stranded inside a sandbar at a beach in South Ballina, northern New South Wales on a rising tide (Table 1; Figure 1). Four attempts were made to assist the animal in returning to sea over three hours, before it swam off to deep water. The animal was not seen again

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https://doi.org/10.1017/S1755267208000158 Published online by Cambridge University Press

Table 1. Whale shark strandings in Australia. See also Figure 1.

Year	Location	Total length (m)	Sex	Literature cited
1963	Brooms Head, New South Wales (29°36′S 153°19′E)	7.6	unknown	Whitley, 1965
1964	Cemetery Point, Anna Bay, New South Wales (32°46′S 152°04′E)	9.2	male	Whitley, 1965
1965	Bare Island, Botany Bay, New South Wales (33°59′S 151°13′E)	7.7	unknown	Whitley, 1965
1979	Point Hicks, Victoria (37°48′S 149°16′E)	unknown	unknown	Wolfson, 1986
1982*	Sandy Bay, North West Cape, Western Australia (21°52′S 113°59′E)	2.0	unknown	Colman, 1997
2006	Cape Inscription, Dirk Hartog Island, Western Australia (25°29′S 112°58′E)	4.0	unknown	–
2007	South Ballina, New South Wales (28°50′S 153°37′E)	3.0	unknown	–

*, unconfirmed stranding.

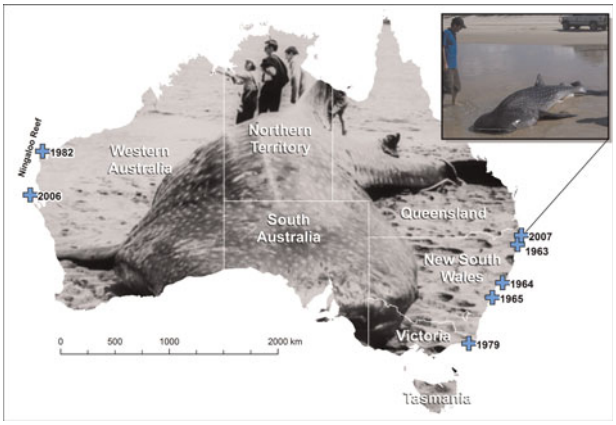


Fig. 1. Locations of whale shark strandings in Australia 1963–2007 (see also Table 1). Background photograph: whale shark stranded at Bare Island, Botany Bay, New South Wales in 1965 (photograph© Australian Museum). Inset upper right: juvenile whale shark stranded at Ballina, New South Wales in 2007 (photograph© L. Ferris).

and its fate is unknown; however, it appeared stressed and weakened at the time of release. A remora remained attached to its host throughout the stranding.

There was no obvious reason for these strandings of whale sharks. No recent scarring was evident on either animal suggesting that the strandings were not caused by predator attack, collision with a vessel or fishing gear entanglement (Gudger, 1940; Fitzpatrick *et al.*, 2006; Speed *et al.*, 2008).

In contrast to Australia, strandings of whale sharks occur relatively frequently on the coast of South Africa, where 36 (mostly immature) shark strandings were reported between 1984 and 1995 (Beckley *et al.*, 1997). That study posed two hypotheses to explain beach strandings in South Africa: (1) sudden changes in water temperature that reduce metabolic rate; and/or (2) the combination of heavy wave action and a steeply sloping continental shelf that push sharks ashore (Beckley *et al.*, 1997).

Whale sharks generally occur in warm temperate and tropical seas that range between 21 and 25°C (Last & Stevens, 1994). Despite their selection of warmer water, they have been found as far as 44°N in the Bay of Fundy on the eastern coast of North America in waters as cold as 10°C (Turnbull & Randell, 2006). Similarly, satellite tracking studies confirm that whale sharks are capable of tolerating temperatures <10°C (Rowat & Gore, 2006; Wilson *et al.*, 2006; Hsu *et al.*, 2007), at least during deep dives.

Given this apparently large thermal tolerance, it seems unlikely that the strandings on the Australian coast were caused by an abrupt change in water temperature because mean sea surface temperatures (SST) for Point Inscription in March and Ballina in April are approximately 25°C (Australian Government Department of Defence, 2007). Furthermore, no anomalies in SST were observed around either of the stranding sites during, or leading up to the events. There are no sharp declines in bathymetry close to shore of the stranding sites (Australian Government Department of Defence, 2007), indicating that these sharks would not have been able to make deep dives to cooler water immediately prior to stranding. No autopsy information was available from the dead individual, so other causes such as disease or the ingestion of flotsam cannot be excluded. The rare occurrence of whale shark strandings on Australian coasts suggests that these events require an unusual combination of factors that are thus not likely to be a major threat to this species.

ACKNOWLEDGEMENTS

We acknowledge the support of the Western Australian Department of Environment and Conservation (WA-DEC), the Australian Commonwealth Department of Environment and Water Resources (DEW) and SeaWorld. We especially thank T. Berra (Ohio State University), L. Ferris (Australian Seabird Rescue), A. Graham (CSIRO Marine Research), M. McGrouther (Australian Museum), D. Sims (Marine Biological Association of the United Kingdom), and E. Wilson (WA-DEC), for providing photographs or other information.

REFERENCES

Australian Government Department of Defence (2007) *Directorate of Oceanography and Meteorology, Sea Surface Temperature Tool*: available online at http://www.metoc.gov.au

Beckley L.E., Cliff G., Smale M.J. and Compagno L.J.V. (1997) Recent strandings and sightings of whale sharks in South Africa. *Environmental Biology of Fishes* 50, 343–348.

Berra T.M. and Hutchins J.B. (1990) A specimen of megamouth shark, *Megachasma pelagios* (Megachasmidae) from Western Australia. *Records of the Western Australian Museum* 14, 651–656.

Bradshaw C.J.A., Evans K. and Hindell M. (2005) Mass cetacean strandings—a plea for empiricism. *Conservation Biology* 20, 584–586.

https://doi.org/10.1017/S1755267208000158 Published online by Cambridge University Press

Colman J.G. (1997) A review of the biology and ecology of the whale shark. *Journal of Fish Biology* 51, 1219–1234.

Compagno L.J.V. (2001) *Sharks of the world. FAO Species Catalogue for Fishery Purposes no. 1*, vol. 2, 201–209.

Evans K., Morrice M. and Hindell M. (2002) Three mass strandings of sperm whales (*Physeter macrocephalus*) in southern Australian waters. *Marine Mammal Science* 18, 622–643.

Evans K., Thresher R., Warneke R.M., Bradshaw C.J.A., Pook M., Thiele D. and Hindell M. (2005) Periodic variability in cetacean strandings—links to large-scale climate events. *Biology Letters* 1, 147–150.

Fitzpatrick B., Meekan M. and Richards A. (2006) Shark attacks on a whale shark (*Rhincodon typus*) at Ningaloo Reef, western Australia. *Bulletin of Marine Science* 78, 397–402.

Geraci J.R. and Staubin D.J. (1977) Mass stranding of long-finned pilot whale, *Globicephala melaena*, on Sable Island, Nova Scotia. *Journal of the Fisheries Research Board of Canada* 34, 2196–2199.

Gudger E.W. (1940) Whale sharks rammed by ocean vessels. How these sluggish leviathans aid in their own destruction. *New England Naturalist* 7, 1–10.

Hsu H.H., Joung S.J., Liao Y.Y. and Liu K.M. (2007) Satellite tracking of juvenile whale sharks, *Rhincodon typus*, in the Northwestern Pacific. *Fisheries Research* 84, 25–31.

Last P.R. and Stevens J.D. (1994) *Sharks and rays of Australia*. CSIRO.

Martin R.A. (2004) Northerly distribution of white sharks, *Carcharodon carcharias*, in the Eastern Pacific and relation to ENSO events. *Marine Fisheries Review* 66, 16–19.

Mignucci-Giannoni A.A., Toyos-Gonzalez G.M., Perez-Padilla J., Rodriguez-Lopez M.A. and Overing J. (2000) Mass stranding of pygmy killer whales (*Feresa attenuata*) in the British Virgin Islands. *Journal of the Marine Biological Association of the United Kingdom* 80, 759–760.

Rowat D. and Gore M. (2006) Regional scale horizontal and local scale veritcal movements of whale sharks in the Indian Ocean off Seychelles. *Fisheries Research* 84, 32–40.

Santos M.B., Martin V., Arbelo M., Fernandez A. and Pierce G.J. (2007) Insights into the diet of beaked whales from the atypical mass stranding in the Canary Islands in September 2002. *Journal of the Marine Biological Association of the United Kingdom* 87, 243–251.

Speed C.W., Meekan M.G., Rowat D., Pierce S.J., Marshall A.D. and Bradshaw C.J.A. (2008) Scarring patterns and relative mortality rates of Indian Ocean whale sharks. *Journal of Fish Biology*, in press.

Turnbull S.D. and Randell J.E. (2006) Rare occurrence of a *Rhincodon typus* (Whale shark) in the Bay of Fundy, Canada. *Northeast Naturalist* 13, 57–58.

Whitley G.P. (1940) *The sharks, rays, devil-fish, and other primitive fishes of Australia and New Zealand*. Sydney: Sydney and Melbourne Publishing Co. Pty. Ltd.

Whitley G.P. (1965) The Whale Shark in New South Wales. *Australian Natural History* 15, 44–46.

Wilson S.G., Polovina J.J., Stewart B.S. and Meekan M.G. (2006) Movement of whale sharks (*Rhincodon typus*) tagged at Ningaloo Reef, Western Australia. *Marine Biology* 148, 1157–1166.

and

Wolfson F.H. (1986) Occurrences of the whale sharks, *Rhincodon typus* Smith. In Uyeno T. *et al.* (eds) *Proceedings of the Second International Conference on Indo-Pacific Fishes. Indo-Pacific Fish Biology*. Tokyo: Ichthyological Society of Japan, pp. 208–226.

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https://doi.org/10.1017/S1755267208000158 Published online by Cambridge University Press