Cephalorhynchus heavisidii – Heaviside's Dolphin

Regional Red List status (2016)	**Least Concern*†**
National Red List status (2004)	Data Deficient
Reasons for change	Non-genuine change: New information
Global Red List status (2013)	Data Deficient
TOPS listing (NEMBA) (2007)	None
CITES listing (2003)	Appendix II
Endemic	Near endemic

*Watch-list Data †Watch-list Threat

Heaviside's Dolphin is South Africa's only near endemic cetacean species and is a flagship species for the West Coast.

Taxonomy

Cephalorhynchus heavisidii (Gray 1828)

ANIMALIA - CHORDATA - MAMMALIA - CETARTIODACTYLA - DELPHINIDAE - *Cephalorhynchus* - *heavisidii*

Synonyms: *Grampus heavisidii* (Gray 1828)

Common names: Heaviside's Dolphin, Benguela Dolphin (English), Heaviside se dolfyn (Afrikaans)

Taxonomic status: Species

Taxonomic notes: No subspecies have been described (Skinner & Chimimba 2005). Recent genetic research using mitochondrial DNA (mtDNA) control region and thirteen microsatellite loci to determine population genetic structure and gene flow revealed contrasting patterns of geographical variation among seven sampling sites (N = 395 specimens) across South Africa and Namibia (Gopal 2014). Mitochondrial DNA suggested fine-scale division, with six populations identified, whilst microsatellite markers indicated two widespread populations. These results are in contrast to earlier genetic work that found no evidence of population structure between South Africa and Namibia (van Vuuren et al. 2002), due to poor sampling. Gopal's (2014) results highlight the importance of evaluating multiple markers to have a comprehensive understanding of population structure in order to implement the correct conservation measures and for continual monitoring to take place to ensure the survivorship of this species.

Assessment Rationale

This is the only near endemic cetacean species within the assessment region, ranging northwards along the west coast of southern Africa from Cape Point to southern Angola. Recent research indicates a large population within the assessment region: estimated population size is 6,345 individuals (95% CI 3,573–11,267) along ~ 390 km of coastline from Table Bay to Lambert's Bay. Thus, we infer that there are certainly > 1,000 mature individuals within the assessment region and possibly > 10,000 mature individuals along the entire west coast of the assessment region. Although we suspect that competition with hake (*Merluccius* spp.) fisheries could represent a threat to this species, this is indirect, as Heaviside's Dolphins target smaller-sized prey and remain largely inshore of the fishery. A potential emerging threat is the experimental mid-water trawl fishery for horse mackerel operating of the West Coast. Heaviside's Dolphin bycatch must be monitored and the potential effects of the full-scale operation should be mitigated if it potentially increases mortality of the species in the future. As this species is limited by water temperature, climate change represents an additional emerging threat. A recent population viability analysis indicated that the population may decline if 63 animals per year are removed (assuming population size is 10,000 individuals), which emphasises the need to quantify mortality rates.

At present, there is no evidence for population decline and thus we list the species as Least Concern. Long-term monitoring of population size and trends is recommended to detect any significant effects of identified threats to this flagship cetacean species. This species should be re-assessed when mortality rates from bycatch and/or subpopulation trends have been quantified.

Regional population effects: The lack of definite population structure between South African and Namibian Heaviside's Dolphin populations suggests dispersal between the two regions. Furthermore, subpopulation estimates from two high-use areas in Namibia (Walvis Bay: 508 individuals, 95% CI 461–833, and Lüderitz: 494 individuals, 95% CI 403–607) suggest a stable extra-regional population.

Distribution

Heaviside's Dolphins are near endemic to South African waters and non-migratory. They are restricted to the cold continental shelf waters of the Benguela ecosystem off southwestern Africa, where they are found in waters between the surf zone and 200 m depth, although most records occur in less than 100 m of water (Findlay et al. 1992; Best 2007). The northernmost record occurs at

Recommended citation: Gopal K, Elwen S, Plön S. 2016. A conservation assessment of *Cephalorhynchus heavisidii*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

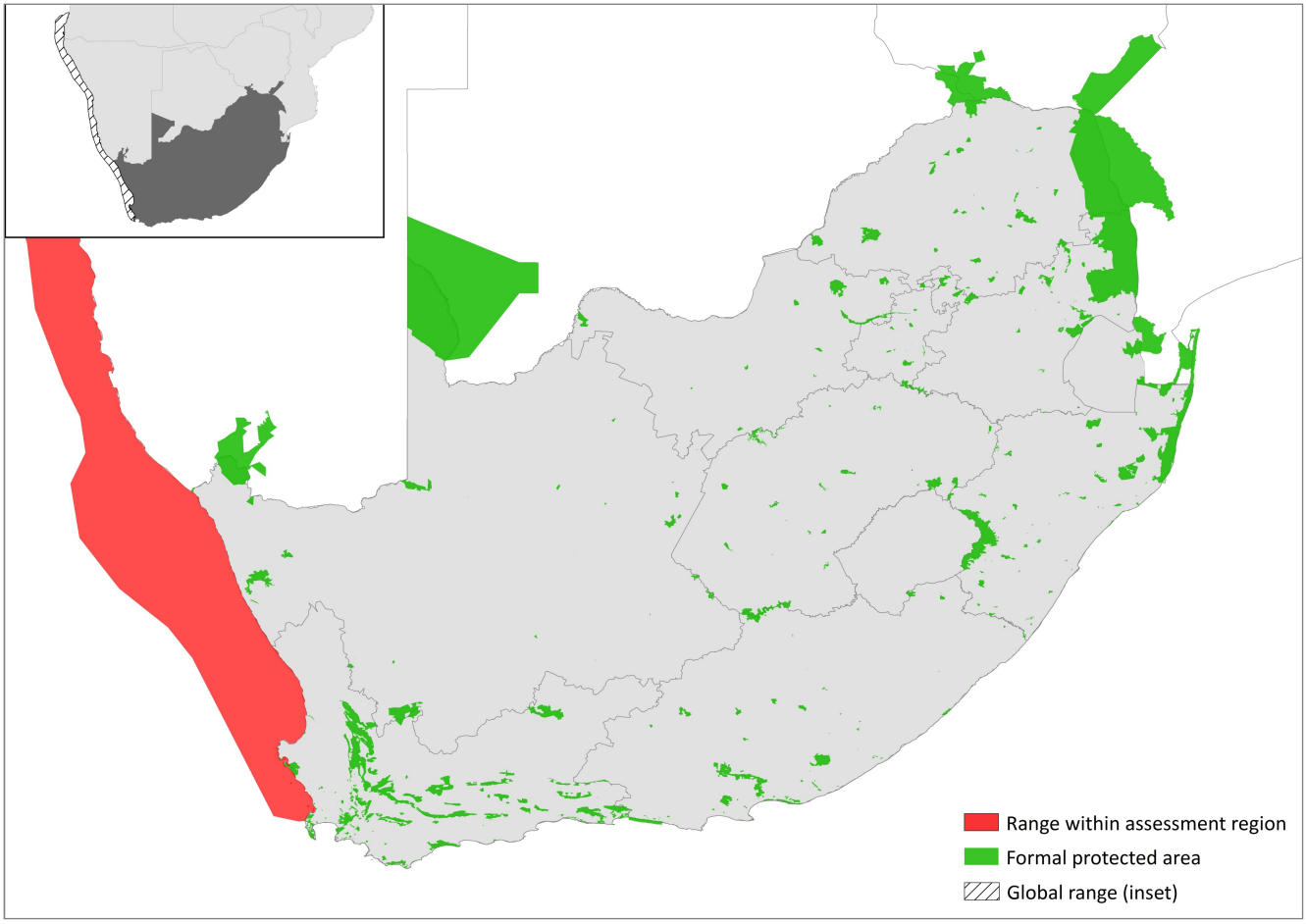

Figure 1. Distribution range for Heaviside's Dolphin (*Cephalorhynchus heavisidii*) within the assessment region (S. Elwen unpubl. data)

Table 1. Countries of occurrence within southern Africa

Country	Presence	Origin
Mozambique	Absent	-
Namibia	Extant	Native
South Africa	Extant	Native

16° 30'S (Baia dos Tigros, southern Angola) and the southernmost record at the southwestern tip of the continent (34° 20'S) at Cape Point (Best 2007). The cetacean fauna of Angola is poorly known and it is uncertain how far north the species' distribution extends, but it is likely that the distribution is closely linked to the cool waters of the Benguela ecosystem. Records available from both summer and winter surveys in the in the coastal waters of the Namibe Province, Angola (15° 33'S), do not include sightings of the species (Weir 2010). Although sightings have occurred in the warmer waters to the east of Cape Point, these are considered vagrants (Best 2007; Vinding et al. 2015). Within the assessment region specifically, the species' range extends from the continental shelf waters off Cape Point to the Orange River (Figure 1). They appear to occur continuously along the coast within this geographic range, with areas of higher density associated with higher levels of prey availability in both South Africa (Elwen et al. 2010) and Namibia (Golaski 2015).

Population

No range-wide survey has been conducted for this species. However, population estimates are available at several spatial scales from photographic mark-recapture studies over three years (1999–2001) between Cape Town and Lambert's Bay, South Africa: 527 animals (95% CI 272–1,020) using 20 km of coastline in western St Helena Bay estimated over 6 weeks of survey effort; using 150 km of coastline around St Helena Bay, estimated over three summer seasons: 3,429 animals (95% CI 1,721–6,828); and using ~ 390 km of coastline from Table Bay to Lambert's Bay, estimated between two summer field seasons: 6,345 animals (95% CI 3,573–11,267) (Elwen et al. 2009b). Considering the fact that Table Bay to Lambert's Bay represents roughly half the length of the west South African coastline, doubling this estimate would yield a total of 12,690 individuals within the assessment region. This estimate may be likely given the small home ranges, apparently continuous distribution within the overall range, and the size of estimates available for the widely spaced areas mentioned above. Corroborating this are population estimates from two high-use areas in Namibia (Walvis Bay: 508 animals, 95% CI 461–833, over eight weeks; and Lüderitz: 494 animals, 95% CI 403–607, 14 survey days over one year). Similar densities exist in the northern Benguela (S. Elwen et al. unpubl. data). Although no data are currently available to estimate a population trend, we suspect the population is stable due to its large size and relatively minor threats. However, a recent population viability analysis indicated that the population may decline if 63 animals per year are

removed (assuming the population size is 10,000 individuals), which emphasises the need to quantify mortality rates (Gopal 2014).

The population genetic structure and gene flow investigated for this species using both mitochondrial control region sequences and thirteen microsatellite loci along the South African (Table Bay, St. Helena Bay, Lambert's Bay, Hondeklipbaai, and Port Nolloth) and Namibian (Luderitz and Walvis Bay) coastline rejected the hypothesis of one homogenous population, but were somewhat contrasting. Mitochondrial DNA suggested six subpopulations of the seven sites sampled from Cape Town, South Africa, to Walvis Bay, Namibia, with Hondeklipbaai and Port Nolloth sampling sites grouping as one subpopulation, whilst microsatellite data identified two metapopulations, namely a southern group consisting of Table Bay and St. Helena Bay and a northern group consisting of Lambert's Bay, Hondeklipbaai, Port Nolloth, Luderitz and Walvis Bay (Gopal 2014). These results suggest that there are two larger subpopulations, but that, even within these, gene flow is somewhat limited between major bays (Gopal 2014). Further genetic research including information on relatedness, kin associations and mating patterns will enhance the population-level status by identifying important management units for conservation.

Current population trend: Unknown, but likely to be stable.

Continuing decline in mature individuals: Not suspected.

Number of mature individuals in population: *c.* 12,690

Number of mature individuals in largest subpopulation: Unknown

Number of subpopulations: Six

Severely fragmented: No

Habitats and Ecology

The Heaviside's Dolphin is strongly associated with the cold, northward-flowing Benguela ecosystem off the west coast of southern Africa. This is a shelf-dwelling dolphin, seen mainly in waters less than 100 m deep, where more than 85% of sightings occur in waters with surface temperatures of 9–15 °C (Best & Abernethy 1994). Evidence from photographic mark-recapture (Elwen 2008) and satellite telemetry (Elwen et al. 2006; Davis et al. 2014) suggest individuals maintain small home ranges, extending approximately 50–80 km along the shore, resulting in total home range sizes of between 300 and 2,300 km^2, depending on the measure used.

The diet of Heaviside's Dolphins, as ascertained from caught, stranded and bycaught animals, consists mainly of juvenile hake *Merluccius* spp. (49% by modified volume) as well as juvenile goby, *Sufflogobius bibarbatus* (13.6%), kingklip *Ophiphidae* spp. (8.5%) and a range of other predominantly demersal fish and cephalopods, including Cape Gurnard (*Chelidonichthys capensis*), octopus, and Chokka Squid (Best 2007). Most fish caught by Heaviside's Dolphins are well below the modal length of commercially caught fish (Sekiguchi et al. 1992), and there is little spatial overlap in fishing effort and dolphin habitat (Fairweather et al. 2006). In South African waters, Heaviside's Dolphins mainly feed nocturnally on prey associated with the deep scattering layer, which migrates closer to the surface at night (Sekiguchi et al. 1992; Elwen et al. 2006, 2009a). By day the majority of dolphins rest and socialise close to shore (Elwen et al. 2006, 2009a). This feeding habit results in a strong diurnal movement pattern, with animals being closest to shore between 06h00 and noon and farthest offshore between 15h00 and 05h00 (Elwen et al. 2006). Although the species similarly exhibits a strong diurnal movement pattern in Namibia, the pattern appears to be reversed with acoustic detections in coastal habitat higher during the night than day (Leeney et al. 2011). This is likely driven by differences in prey habitat use and behaviour.

They reach a maximum age of 26, and become sexually mature at 7.5 years. Calving is thought to occur seasonally in summer, and females are able to be simultaneously pregnant and lactating (Skinner & Chimimba 2005).

Ecosystem and cultural services: This is South Africa's only near endemic cetacean species and a flagship species for the West Coast.

Use and Trade

Some illegal hunting has been reported, but it is probably not at a significant level (Best & Abernethy 1994; Best 2007). There is presently no known trade in the region, although some localised, illegal hunting or opportunistic use of by-caught animals may still take place on the South African west coast.

Threats

Heaviside's Dolphins are suspected to face fewer threats than many other cetacean species due to limited human population density on the West Coast and the lack of direct competition with the hake industry. The following minor threats are described and should be quantitatively evaluated for their effect on the species:

Table 2. Use and trade summary for the Heaviside's Dolphin (*Cephalorhynchus heavisidii*)

Category	Applicable?	Rationale	Proportion of total harvest	Trend
Subsistence use	Yes	Opportunistic use.	All	Stable
Commercial use	Yes	Non-consumptive, only for ecotourism.	-	-
Harvest from wild population	Yes	Illegal hunting on small scale.	All	Stable
Harvest from ranched population	No	-	-	-
Harvest from captive population	No	-	-	-

Table 3. Threats to the Heaviside's Dolphin (*Cephalorhynchus heavisidii*) ranked in order of severity with corresponding evidence (based on IUCN threat categories, with regional context)

Rank	Threat description	Evidence in the scientific literature	Data quality	Scale of study	Current trend
1	*5.4.3 Fishing & Harvesting Aquatic Resources*: accidental bycatch from fisheries, especially purse seine and set nets.	Best & Abernethy 1994	Indirect	Regional	Possibly < 100 killed annually because of short soak times of nets.
		Gopal 2014	Simulation	Regional	PVA results suggest population decline if 63 animals removed / year.
2	*11.1 Habitat Shifting & Alteration*: climate change may exacerbate shifts in prey base.	Mead et al. 2013	Simulation	National	West Coast becoming cooler.
		Moloney et al. 2013	Simulation	National	West Coast oxygen levels decreasing.
3	*5.4.4 Fishing & Harvesting Aquatic Resources*: loss of prey base from fisheries. Current stress *2.3.8 Indirect Species Effects*: threatened food source.	Sekiguchi et al. 1992	Indirect	Regional	Fisheries target higher hake size class than dolphins.
		Fairweather et al. 2006	Indirect	Regional	Fisheries trawl deeper than dolphin foraging depths.
4	*5.4.1 Fishing & Harvesting Aquatic Resources*: direct subsistence hunting.	-	Anecdotal	-	No current records reported.
5	*9.1.2 Domestic & Urban Waste Water*: pollution from run-off; inland effluents and pesticides (for example, DDT) may affect reproductive success.	Serot 2013	Empirical	Regional	Low risk of lethal poisoning detected.
6	*4.3 Shipping Lanes*: increased boat traffic reduces habitat area and quality, especially around ports and harbours, and may increase ship strikes.	Elwen et al. *in review*	Empirical	Regional	Adverse behavioural changes correlated with boat traffic.

1. Direct mortality from bycatch is probably the largest threat. They are susceptible to entanglement in inshore fishing gear, such as beach seines, purse seines, trawls and gillnets (Best & Abernethy 1994; Peddemors 1999; Elwen et al. 2010). Numbers killed are unknown, but are believed to be <100 annually, because of short soak times of nets. However, this could be an underestimate, because fishermen may hide the carcasses (Best & Abernethy 1994). A potential emerging threat is the experimental mid-water trawl fishery for horse mackerel operating off the West Coast. Heaviside's Dolphin bycatch must be monitored and the potential effects of the full-scale operation should be considered if it might significantly increase mortality of the species in the future.
2. A potential threat is competition with hake (*Merluccius* spp.) fisheries, which may reduce the prey base or kill animals as bycatch. There is no direct competition for hake as these dolphins target a smaller size class than the commercial fisheries (Sekiguchi et al. 1992). Furthermore, since Heaviside's Dolphins occur mainly in waters less than 100 m deep, there is little overlap with the commercial hake bottom trawl, which occurs in waters between 100–1,000 m (Fairweather et al. 2006). Since the fishery is well managed and the stocks in South Africa and Namibia are considered sustainable (by the Marine Stewardship Council), although well below pristine levels (van der Westhuizen 2001; Rademeyer et al. 2008), there is no reason to expect a current or increasing threat to Heaviside's Dolphins from the fishery.
3. Although there is no evidence for an overall population decline at present, small home range size may facilitate local declines and climate change may exacerbate existing threats. Significant changes in marine ecosystems have already been recorded in terms of air and sea temperatures, wind patterns, ocean current speed and upwelling regimes (Mead et al. 2013; Moloney et al. 2013). Heaviside's Dolphins are limited by water temperatures that are either too cold or too warm (so-called CWWL species) and are listed amongst the species most vulnerable to climate change (MacLeod 2009).
4. Although fully legally protected, some direct illegal harvesting has been reported in the past (Rice & Saayman 1984; Best & Abernethy 1994), but there are no known records of this recently.
5. Concern has been expressed about the potential effects of boat traffic and pollution (Culik 2005; MacLeod 2009). Although behavioural changes in response to boat traffic have been identified in some areas in Namibia (Elwen et al. *in review*; MacLeod 2009), low human population densities and the scarcity of large ports along most of the species' range probably help reduce the possibility of adverse effects from boat traffic at a population level (P. Best pers. comm. 2013).
6. Organochlorine levels in a small sample of Heaviside's Dolphins failed to indicate significant exposure to DDT in the coastal waters of South Africa's west coast, where the scarcity of arable land and low rainfall may help minimise pesticide residue inputs to the marine environment (de Kock et al.

1994). A more recent analysis of heavy metals in the skin of Heaviside's Dolphins from South Africa and Namibia revealed that, while levels were higher than expected for some metals, sampled individuals were deemed to be at relatively minimal risk of lethal poisoning (Serot 2013). Additionally, clear differences between sampling sites were detected, thereby corroborating the existence of population structure and small home range.

Population viability analysis (PVA) is a commonly used tool to forecast extinction risk as well as assessing a species' threat category, whereas sensitivity analyses consider the effects that changes in demographic parameters (population size, age, birth and death rate and migration) or environmental variations can have on the resilience of wildlife populations, and the effect of different management approaches that can be tested. Sensitivity analysis was examined with various hypothetical scenarios whereby demographic parameter values were varied to examine potential population responses to threats. The modelled PVA exercise was inconclusive, because parameter values used were based on a threatened sister species, *Cephalorhynchus hectori*, and did not produce models that showed stable populations, suggesting these values do not apply to Heaviside's Dolphin. However, when the model parameters were modified to produce a stable population, simulated rates of removal (for example, from bycatch and/or illegal harvesting) suggested that the population might decline under removal rates of 63 animals per year if population size is 10,000 individuals. Because of the seriousness of this modelling result, there is an urgent need for long-term life history data, inclusive of the direct and indirect threats faced by this species, to completely understand the biology and behaviour of the population (Gopal 2014).

Current habitat trend: Declining in quality. The West Coast has become cooler over the past 20–30 years (Mead et al. 2013), where simultaneously oxygen concentrations have decreased (Moloney et al. 2013). The specific effects of these patterns on Heaviside's Dolphin distribution, either directly or indirectly through resource shifts, have not been documented and should be monitored.

Conservation

This species occurs in the West Coast National Park Marine Protected Area (MPA) and is listed on Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Marine Living Resources Act (No. 18 of 1998). Suggested interventions are further establishments of MPAs along the west coast, stricter regulation of the hake and horse mackerel fisheries, and zoning of boat traffic in high-density use areas, such as Granger Bay, Cape Town:

1. MPAs would be best established at Table Bay, Yzerfontein or Lambert's Bay where Heaviside's Dolphin abundance is highest, due to the use of predictable breeding and foraging sites.
2. Inshore net management of fisheries can be achieved by assessment of risk to dolphin populations and education of artisanal fishers.
3. Zoning boat traffic could be achieved by relating traffic patterns to dolphin high-use areas and activity patterns, where boat traffic is restricted between 06h00 and noon when dolphins are most likely to be closest to the shore (Elwen et al. 2009a).

More research emphasis should be placed on possible detrimental interactions due to tour vessels and the overfishing of prey stocks, especially hake, and resilience of the species to adapt to alternate prey. Increased knowledge of how Heaviside's Dolphins respond to boat traffic and the impact of this at a subpopulation level would be informative to potentially modify vessel behaviour/area use and reduce impacts.

Recommendations for managers and practitioners:

- The systematic monitoring of identified subpopulations to determine subpopulation size and trends is recommended. Both line-transect (Slooten et al. 2006) or mark-recapture (Gormley et al. 2005) methodologies are suitable for this species and have been used on the closely related Hector's Dolphin (*C. hectorii*).
- Use of set nets in inshore waters of the Western Cape and Northern Cape requires careful monitoring and management to determine levels of bycatch and, if necessary, the initiation of mitigation measures.

Research priorities: Most research on the species is, or has been, conducted or coordinated by members of the Mammal Research Institute of the University of Pretoria with research focussed on a number of topics, including distribution (Elwen et al. 2010), abundance and trends

Table 4. Conservation interventions for the Heaviside's Dolphin (*Cephalorhynchus heavisidii*) ranked in order of effectiveness with corresponding evidence (based on IUCN action categories, with regional context)

Rank	Intervention description	Evidence in the scientific literature	Data quality	Scale of evidence	Demonstrated impact	Current conservation projects
1	*2.1 Site/Area Management*: inshore net management of hake and horse mackerel fisheries.	Elwen et al. 2010 describes fisheries interactions.	Anecdotal	Local	-	None
2	*1.1 Site/Area Protection*: establish MPAs on the West Coast.	Elwen et al. 2010 describes high and low density areas between Table Bay and Lamberts Bay.	Anecdotal	Local	-	None
3	*2.1 Site/Area Management*: zoning boat traffic to reduce disturbance.	Elwen et al. 2009a	Indirect	Local	Highest risk from boat traffic is between 06h00 and noon.	None

(Elwen et al. 2009b), foraging strategies (Elwen et al. 2009a, 2010; Leeney et al. 2011), ecological niche (stable isotope analysis), genetic population structure (Gopal 2014) and heavy metal analysis (Serot 2013). Research has also been conducted on vocalisation characteristics (Morisaka et al. 2011) and response to tagging attempts (Sakai et al. 2011). Specific research priorities include:

- Density and abundance estimates along the entire range are needed to estimate total population size.
- For a comprehensive picture of the population genetic structure, additional samples (biopsy/ stranded) should be obtained from areas not sampled previously.
- Estimates of dispersal rates and bycatch (including mapping geographical overlap with fisheries) are needed to evaluate their impacts on the population.
- Studies of ecological niche and adaptability to different foraging environments are necessary to understand likely impacts of environmental change.

Encouraged citizen actions:

- Use information dispensed by the South African Sustainable Seafood Initiative (SASSI) to make good choices when buying fish in shops and restaurants, for example wwfsa.mobi, FishMS 0794998795.
- Save electricity and fuel to mitigate CO_2 emissions and hence rate of climate change.
- Buy local products that have not been internationally shipped.
- Reduce boat speed in high-density Heaviside's Dolphin areas.
- Report sightings on virtual museum platforms (for example, iSpot and MammalMAP) to help with mapping geographical distribution.

Data Sources and Quality

Table 5. Information and interpretation qualifiers for the Heaviside's Dolphin (*Cephalorhynchus heavisidii*) assessment

Data sources	Field study (published), indirect information (unpublished, expert knowledge)
Data quality (max)	Estimated
Data quality (min)	Suspected
Uncertainty resolution	Confidence intervals
Risk tolerance	Evidentiary

References

Best PB. 2007. Whales and Dolphins of the Southern African Subregion. Cambridge University Press, Cape Town, South Africa.

Best PB, Abernethy RB. 1994. Heaviside's dolphin *Cephalorhynchus heavisidii* (Gray, 1828). Pages 289–310 in Ridgway SH, Harrison R, editors. Handbook of Marine Mammals. Volume 5: The First Book of Dolphins. Academic Press, New York, New York, USA.

Culik BM. 2005. Review of Small Cetaceans: Distribution, Behaviour, Migration and Threats. Marine Mammal Action Plan/ Regional Seas Reports and Studies, No. 177. UNEP/CMS, Bonn, Germany.

Davis RW, David JHM, Meÿer MA, Sekiguchi K, Best PB, Dassis M, Rodríguez DH. 2014. Home range and diving behaviour of Heaviside's dolphins monitored by satellite off the west coast of South Africa. African Journal of Marine Science **36**:455–466.

de Kock AC, Best PB, Cockcroft V, Bosma C. 1994. Persistent organochlorine residues in small cetaceans from the east and west coasts of southern Africa. Science of the total environment **154**:153–162.

Elwen S, Meÿer MA, Best PB, Kotze PGH, Thornton M, Swanson S. 2006. Range and movements of female Heaviside's dolphins (*Cephalorhynchus heavisidii*), as determined by satellite-linked telemetry. Journal of Mammalogy **87**:866–877.

Elwen SH. 2008. The distribution, movements and abundance of Heaviside's dolphins in the nearshore waters of the Western Cape, South Africa. Ph.D. Thesis. University of Pretoria, Pretoria, South Africa.

Elwen SH, Best PB, Reeb D, Thornton M. 2009a. Diurnal movements and behaviour of Heaviside's dolphins, *Cephalorhynchus heavisidii*, with some comparative data for dusky dolphins, *Lagenorhynchus obscurus*. South African Journal of Wildlife Research **39**:143–154.

Elwen SH, Golaski SB, Leeney RH, Shaanika T, Roux J-P, Gridley T. *in review*. Boat avoidance as a source of capture heterogeneity in Heaviside's dolphins (*Cephalorhynchus heavidii*) in Namibia. PLoS One.

Elwen SH, Reeb D, Thornton M, Best PB. 2009b. A population estimate of Heaviside's dolphins, *Cephalorhynchus heavisidii*, at the southern end of their range. Marine Mammal Science **25**:107–124.

Elwen SH, Thornton M, Reeb D, Best PB. 2010. Near-shore distribution of Heaviside's (*Cephalorhynchus heavisidii*) and dusky dolphins (*Lagenorhynchus obscurus*) at the southern limit of their range in South Africa. African Zoology **45**:78–91.

Fairweather TP, Booth AJ, Sauer WHH, Leslie RW. 2006. Spatial description of hake-directed fishing activity off the west coast of South Africa. African Journal of Marine Science **28**:13–24.

Findlay KP, Best PB, Ross GJB, Cockcroft VG. 1992. The distribution of small odontocete cetaceans off the coasts of South Africa and Namibia. South African Journal of Marine Science **12**:237–270.

Golaski S. 2015. Spatial and temporal patterns of habitat use of Heaviside's dolphins in Namibia. M.Sc. Thesis. University of Pretoria, Pretoria, South Africa.

Gopal K. 2014. A genetic study of two inshore dolphin species (*Cephalorhynchus heavisidii* and *Tursiops aduncus*) found along the coast of South Africa. Ph.D. Thesis. University of Pretoria, Pretoria, South Africa.

Gormley AM, Dawson SM, Slooten E, Bräger S. 2005. Capture-recapture estimates of Hector's dolphin abundance at Banks Peninsula, New Zealand. Marine Mammal Science **21**:204–216.

Leeney RH, Carslake D, Elwen SH. 2011. Using static acoustic monitoring to describe echolocation behaviour of Heaviside's dolphins (*Cephalorhynchus heavisidii*) in Namibia. Aquatic Mammals **37**:151–160.

MacLeod CD. 2009. Global climate change, range changes and potential implications for the conservation of marine cetaceans: a review and synthesis. Endangered Species Research **7**:125–136.

Mead A et al. 2013. Human-mediated drivers of change—impacts on coastal ecosystems and marine biota of South Africa. African Journal of Marine Science **35**:403–425.

Moloney CL, Fennessy ST, Gibbons MJ, Roychoudhury A, Shillington FA, Von der Heyden BP, Watermeyer K. 2013. Reviewing evidence of marine ecosystem change off South Africa. African Journal of Marine Science **35**:427–448.

Morisaka T, Karczmarski L, Akamatsu T, Sakai M, Dawson S, Thornton M. 2011. Echolocation signals of Heaviside's dolphins (*Cephalorhynchus heavisidii*). The Journal of the Acoustical Society of America **129**:449–457.

Peddemors VM. 1999. Delphinids of southern Africa: a review of their distribution, status and life history. Journal of Cetacean Research and Management **1**:157–165.

Rademeyer RA, Butterworth DS, Plagányi É. 2008. Assessment of the South African hake resource taking its two-species nature into account. African Journal of Marine Science **30**:263–290.

Rice FH, Saayman GS. 1984. Movements and behaviour of Heaviside's dolphins (*Cephalorhynchus heavisidii*) off the western coasts of southern Africa. Investigations in Cetacea **16**:49–63.

Sakai M, Karczmarski L, Morisaka T, Thornton M. 2011. Reactions of Heaviside's dolphins to tagging attempts using remotely-deployed suction-cup tags. South African Journal of Wildlife Research **41**:134–138.

Sekiguchi K, Klages NTW, Best PB. 1992. Comparative analysis of the diets of smaller odontocete cetaceans along the coast of southern Africa. South African Journal of Marine Science **12**:843–861.

Serot JL. 2013. Heavy metal analysis in Heaviside's dolphins (*Cephalorhynchus heavisidii*). M.Sc. Thesis. University of Hong Kong, Hong Kong, China.

Skinner JD, Chimimba CT. 2005. The Mammals of the Southern African Subregion. Third edition. Cambridge University Press, Cambridge, UK.

Slooten E, Rayment W, Dawson S. 2006. Offshore distribution of Hector's dolphins at Banks Peninsula, New Zealand: is the Banks Peninsula Marine Mammal sanctuary large enough? New Zealand Journal of Marine and Freshwater Research **40**:333–343.

van der Westhuizen A. 2001. A decade of exploitation and management of the Namibian hake stocks. South African Journal of Marine Science **23**:307–315.

van Vuuren BJ, Best PB, Roux J-P, Robinson TJ. 2002. Phylogeographic population structure in the Heaviside's dolphin (*Cephalorhynchus heavisidii*): conservation implications. Animal Conservation **5**:303–307.

Vinding K, Bester M, Kirkman SP, Chivell W, Elwen SH. 2015. The use of data from a platform of opportunity (whale watching) to study coastal cetaceans on the southwest coast of South Africa. Tourism in Marine Environments **11**:33–54.

Weir CR. 2010. Cetaceans observed in the coastal waters of Namibe Province, Angola, during summer and winter 2008. Marine Biodiversity Records **3**:e27.

Assessors and Reviewers

Keshni Gopal[1], Simon Elwen[2], Stephanie Plön[3]

[1]South African National Biodiversity Institute, [2]University of Pretoria, [3]Nelson Mandela Metropolitan University

Contributors

Matthew Child[1], Shanan Atkins[2], Ken Findlay[3], Mike Meÿer[4], Herman Oosthuizen[4], Claire Relton[1]

[1]Endangered Wildlife Trust, [2]Private, [3]University of Pretoria, [4]Department of Environmental Affairs

Details of the methods used to make this assessment can be found in *Mammal Red List 2016: Introduction and Methodology.*