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The distribution, movements and abundance of Heaviside's dolphins in the nearshore waters of the Western Cape, South Africa

By

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Abstract

Heaviside's dolphin (*Cephalorhynchus heavisidii*) is a poorly studied coastal delphinid with a limited inshore distribution off the west coast of southern Africa where it is sympatric with the similar sized dusky dolphin (*Lagenorhynchus obscurus*). It is exposed to an unknown level of bycatch particularly in near-shore set-net fisheries and is also potentially impacted by the growing boat-based whale watching industry in South Africa. In this thesis I describe the results of a study investigating the distribution, movements, behaviour and abundance of Heaviside's dolphins in the near-shore environment of the Western Cape of South Africa as a precursor to assessing its potential vulnerability to anthropogenic threats. Data were gathered using three different approaches in the field; diurnal shore based observations, boat based photo-ID surveys along ~390 km of coastline and satellite telemetry. Data were collected for dusky dolphins where feasible.

Heaviside's dolphins exhibited a strong pattern of resting inshore during daytime and foraging offshore at night that was presumed to be related to the movement of juvenile hake

(*Merluccius capensis*) closer to the surface at night. In addition, despite near-shore observations failing to indicate feeding, dolphins were consistently found to be more abundant along regions of the coast which over the long term had higher levels of small hake available offshore. In contrast the near-shore distribution of dusky dolphins varied considerably between years possibly due to the very near-shore environment being at the edge of their habitat. A tendency for dusky dolphins to move offshore during upwelling conditions was observed from shore in St Helena Bay, the site of a strong predictable upwelling cell. However this was the only location in which very large groups of animals (50-500) were seen during coastal boat surveys suggesting this pattern may have been area specific and feeding strategies may vary throughout their range. Sympatry appears to be mediated by differences in overall range and prey type and size differentiation.

Heaviside's dolphins were found to have small home ranges and show a high degree of site fidelity over several years, at least during summer months. Dolphins fitted with satellite-linked transmitters used only limited home ranges (~876 to 1990 km^2) which scaled positively with body size within the ~50 day tracking period, while photographically identified animals did not disperse significantly further than this over 3 years. The maximum coastwise displacement observed for an individual (88.4 km after 1 year) was considerably less than the 390 km length of the overall study area, and equivalent to the maximum coastwise movement seen during satellite-tagging (83.1 km). This suggests that measured home ranges may be stable over several years, although the number of resighted individuals (n = 76) was small and (as data collection was restricted to summer months) seasonal differences in movements or migrations cannot be ruled out. Associations among photographically identified animals did not differ from a random mixing of individuals, suggesting that this species has a fission-fusion type social structure at least over the short term.

The abundance of Heaviside's dolphins was calculated from photo-ID mark-recapture data at three spatial scales using Chapman's modified Petersen estimators. The proportion of

distinctively marked individuals in this species is low (14 - 17%) reducing sample sizes and introducing a large extrapolation factor, both of which contribute to an increase in the variance of any resultant population estimate. Using resightings after one year, the total number of animals over the whole 390km study area was calculated to be 6345 (CV = 0.26, CI = 3573 – 11 267) while using same-season re-sightings the total number of animals using a 20km long section of coastline in the centre of the study area was calculated as 527 (CV = 0.35, CI = 272 – 1020). These estimates may be significantly biased downwards by the effects of heterogeneity in the capture probability of individuals which it was not possible to account for analytically due to small sample sizes.

Sympatry of Heaviside's and dusky dolphins appears to be mediated by differences in the overall range and in the type and size of prey consumed. From a conservation point of view, our findings for Heaviside's dolphins are encouraging in that they indicate a relatively large population size, although their strong site fidelity does make them more vulnerable to localised impacts than a more widely ranging species like dusky dolphins and this needs to be considered during management of the population.

Acknowledgements

It's taken me a while to get this dissertation together and it's been a long haul since 2000 when I was the green (literally) trainee marine biologist donating my lunch to the dolphins over the side of Balaena while the rest of the Whale Unit shook their heads and wondered what they'd taken on – Desray Reeb and Meredith Thornton, thanks so much for all the help and support through the years and for putting so much time into helping collect the data, without which there would have been nothing here at all! I hope I've proved myself sufficiently over the last few years and can justifiably call myself a 'real marine biologist' now. Peter Best – thank you for giving me, a total unknown at the time, this chance in the first place and for all your guidance over the years, it's been a real experience and I've certainly learned a lot from working with you that I would never have learnt anywhere else.

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Disclaimer

This dissertation was written as a collection of five manuscripts to simplify the process of publication of these results as recommended by the Department of Zoology and Entomology. This has naturally led to some duplication between chapters, particularly in the methods and background. Literature is thus cited for each chapter independently. Chapter 5 was published in the Journal of Mammalogy in 2006, I have included a reprint from published manuscript in the Journal of Mammalogy as well as the thesis-edited version – these two versions are identical except for some minor textual corrections that have taken place subsequent to publication and a US spelling in the reprint. Chapter 1 has been subjected to peer review when it was submitted to The African Journal of Marine Science, where it was rejected but invited to be resubmitted pending extensive recommended changes which have been included in this final draft.

Declaration

I declare that the thesis that I hereby submit for the degree in PhD at the University of Pretoria has not previously been submitted by me for degree purposes at any other university.

Simon Elwen:_____ Date:_____

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Two Heaviside's dolphins in St Helena Bay, 2004. Simon Elwen