POPULATION DYNAMICS AND HABITAT USE OF BOTTLENOSE DOLPHINS (*TURSIOPS ADUNCUS*), BUNBURY, WESTERN AUSTRALIA

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This thesis is presented for the degree of
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I declare that this thesis is my own account of my research and contains as its main content work which has not previously been submitted for a degree at any tertiary education institution.

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Holly Crystal Smith Date

STATEMENT ON THE CONTRIBUTION OF OTHERS

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Abstract

Coastal dolphins are increasingly exposed to a variety of human activities through the proliferation of coastal development. Threats to dolphins in near-shore environments include the loss of suitable habitat, increasing vessel traffic and tourism, entanglement in fishing gear or other marine debris, noise pollution, environmental contaminants and disease. Baseline data and long-term monitoring are needed to inform effective management initiatives to conserve dolphin populations. This study focused on the bottlenose dolphin (*Tursiops aduncus*) population that inhabits the waters around the rapidly developing city of Bunbury, Western Australia. This study investigated the spatial and temporal variability in population abundance, social dynamics, calving seasonality, home range size and habitat use of dolphins in Bunbury waters over a three-year study period. From 2007-2010, year-round boat-based, photo-identification surveys followed pre-determined transect lines within a 120 km^2 study area (212 transect lines total; N=578 dolphin group encounters) to achieve intensive and consistent sampling effort. Abundance and demographic parameters were estimated using the capture-recapture Robust Design model. The model with Markovian temporary emigration was favoured over other varying parameters (survival, capture probability and emigration time). Abundance estimates varied from 65 individuals (± SE 8.53; 95% CI: 54- 90) in winter 2007 to 139 individuals (±SE 3.41; 95% CI: 134-148) in autumn 2009. The apparent adult survival estimate was 0.985 (±SE 0.006; 95% CI: 0.964- 0.994). Calving peaked in late February to early March. Associations between adult females showed an annual seasonal cyclic pattern that peaked during the breeding and calving season. Home range estimates were important in identifying critical habitat areas. Home range areas for individual dolphins were estimated using the Minimum Convex Polygon method and adult females occupied statistically different sized areas (ANOVA: $P \leq 0.0001$). Females in sheltered inner waters (Leschenault Estuary and Koombana Bay) had smaller home ranges (7.4-24.6km2; N=9) than those in exposed coastal areas (home ranges: 32.1-125.2km2; N=9). Seasonal differences in ranging patterns were analysed using the kernel density *hotspot method*. During the summer and autumn calving season, there was a hotspot for adult females on the lee-side of an artificial groyne, adjacent to the Estuary and Bay. Habitat use was explored further through maximum entropy modelling. Reef habitat had the strongest influence over dolphin presence whilst distance from coast was a weak predictor. Managers can now focus on protecting this critical habitat. This project has demonstrated the benefits of intensive multi-year

research on a population by detecting the seasonal differences in abundance, behaviour and habitat use – information critical to managing human impacts on this species. Future research should combine our spatial understanding of this dolphin population and human use of the area to conduct a risk assessment and rank the threats to these dolphins.

Table of Contents

List of Figures

List of Tables

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The journey is the reward…