



Murdoch  
UNIVERSITY

# 2016 RESEARCH FINDINGS

in the School of  
**VETERINARY & LIFE  
SCIENCES**

BULLETIN

6.11

Wildlife Biology  
& Conservation



KATE SPROGIS, KENNETH POLLOCK, HOLLY RAUDINO, SIMON ALLEN, ANNA KOPPS, OLIVER MANLIK,  
JULIAN TYNE & LARS BEJDER

## Sex-specific patterns in demography of bottlenose dolphins in coastal and estuarine waters

Inherent difficulties in determining the sex of free-ranging, sexually monomorphic species (where both sexes look the same) often prevents a sex-specific approach to their study. However, accounting for sex-differences in population parameters can have important conservation and management implications, as one sex may be more susceptible to threats than the other.

In this recently published study (Sprogis et al. 2016a), seven years of data were used to examine sex-specific abundance, movement patterns and survival rates of Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) occurring in the coastal and estuarine waters off Bunbury, Western Australia. Such an analysis was made possible by the long-term field efforts of the South West Marine Research Program, which, through an accumulation of genetic samples and behavioural observations, have revealed the sex of a large proportion of this population.

### Methods

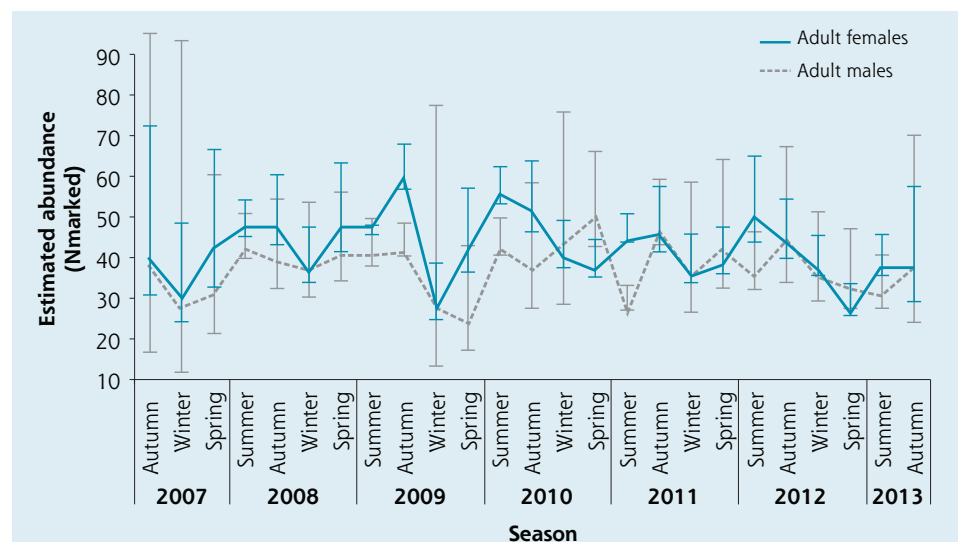
Systematic, boat-based surveys ( $n = 417$ ) were conducted across all seasons from 2007 to 2013 in the coastal and estuarine waters off Bunbury, Western Australia. Using photo-identification as a method of 'capturing' individual dolphins (based on unique marks along the trailing edge of their dorsal fin), capture histories of recognisable individuals were developed for the study period. Capture-recapture modelling, using Pollock's Robust Design,

was then used to estimate seasonal abundance, movement patterns and survival rates. Sex-specific analyses were restricted to adult dolphins, and included 81 female and 59 male individuals. Sex was determined by: molecular analyses; consistent presence of a calf (for females); and/or, strong associations with a known adult male (for males).

### Results and discussion

Results on the sex-specific abundance, movements and survival of bottlenose dolphins off Bunbury, WA, indicate that:

- the abundance for both adult males and females fluctuates seasonally.
- during summer and autumn, the abundance of males and females was the highest, coinciding with the peak breeding and calving season (see Smith et al., 2016).
- during the winter, the abundance of males and females decreased compared to summer. There were half as many males in the study area compared to females (Table 1), suggesting that males range much further than the 540km<sup>2</sup> study area (see Sprogis et al. 2016). Males may be required to range even further than females in winter to



**FIGURE 1** Seasonal abundance estimates for recognisable adult female and adult male bottlenose dolphins. Lines between data points have been used for illustrative purposes and continuity of values is not implied. Vertical lines represent the 95% confidence intervals.

**TABLE 1** The mean number of sightings ( $\pm$  SE) for adult female ( $n = 81$ ) and adult male ( $n = 59$ ) dolphins pooled by season.

| Sex     | Summer          | Autumn          | Winter          | Spring          |
|---------|-----------------|-----------------|-----------------|-----------------|
| Females | 8.80 $\pm$ 0.91 | 6.04 $\pm$ 0.60 | 4.23 $\pm$ 0.57 | 4.35 $\pm$ 0.55 |
| Males   | 7.17 $\pm$ 0.86 | 5.10 $\pm$ 0.49 | 2.27 $\pm$ 0.27 | 3.76 $\pm$ 0.41 |

search for necessary prey resources (see McCluskey et al., 2016).

- during spring, both males and females had high return rates into the study area, likely moving close to the coast for the peak breeding season (summer/autumn).
- the survival rate for both males and females were high, constant and similar between sexes.

*Long-term data sets are required in order to determine the sex of a sufficient number of males and females in the population. The sex of mature females is determined by the presence of a calf that is in 'baby position', just behind the mother's dorsal fin. (Photo: Kate Sprogis)*

This study offers a comprehensive interpretation of the population dynamics of a top predator in a coastal and estuarine environment, and acts as a model for future sex-specific population studies on sexually monomorphic species. ■

#### More information

See [MUCRU.org](http://MUCRU.org) or contact Kate Sprogis  
E: [k.sprogis@murdoch.edu.au](mailto:k.sprogis@murdoch.edu.au)

#### Acknowledgements

We thank numerous volunteers and research assistants who helped with fieldwork and data processing. Thank you to our research associates for collecting field data and/or data management, and our colleagues who obtained biopsy samples and performed molecular analyses.

#### References

- 1 Manlik, O., McDonald, J.A., Mann, J., Smith, H.C., Bejder, L., Krützen, M., Connor, R.C., Heithaus, R.M., Lacy, R.C., and Sherwin, W.B. (2016). The relative importance of reproduction and survival for the viability of two dolphin populations: implications for the management of slow-growing vertebrate taxa. *Ecology and Evolution*. doi: 10.1002/ece3.2130
- 2 McCluskey, S.M., Bejder, L., and Loneragan, N.R. (2016). Dolphin prey availability and calorific value in an estuarine and coastal environment. *Frontiers in Marine Science* 3:30. doi: 10.3389/fmars.2016.00030.
- 3 Sprogis, K.R., Pollock, K.H., Raudino, H.C., Allen, S.J., Kopps, A.M., Manlik, O., Tyne, J.A., and Bejder, L. (2016a). Sex-specific patterns in abundance, temporary emigration and survival of Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) in coastal and estuarine waters. *Frontiers in Marine Science* 3:12. doi: 10.3389/fmars.2016.00012.
- 4 Sprogis, K.R., Raudino, H.C., Rankin R., MacLeod, C. and Bejder, L. (2016b). Home range size of adult Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) in a coastal and estuarine system is habitat and sex-specific. *Marine Mammal Science* 32: 287–308.
- 5 Smith, H.C, Frère, C., Kobryn, H., and Bejder, L. (2016). Dolphin sociality, distribution and calving as important behavioural patterns informing management. *Animal Conservation*. doi: 10.1111/acv.12263.

#### Sponsors

We thank the partners for financial support from the South West Marine Research Program: Bemax Cable Sands, BHP Billiton Worsley Alumina Ltd, the Bunbury Dolphin Discovery Centre, Bunbury Port Authority, City of Bunbury, Cristal Global, the Western Australian Department of Parks and Wildlife, Iluka, Millard Marine, Naturaliste Charters, Newmont Boddington Gold, South West Development Commission and WA Plantation Resources.

Kate Sprogis was supported throughout her PhD by an Australian Postgraduate Award, Murdoch University Research Excellence Scholarship and a SWMRP Scholarship.



If you are interested in our research and would like to know more, then please contact us on [vlsresearch@murdoch.edu.au](mailto:vlsresearch@murdoch.edu.au)  
Our research bulletins can be downloaded from [www.murdoch.edu.au/School-of-Veterinary-and-Life-Sciences/Our-research/Our-Bulletins/](http://www.murdoch.edu.au/School-of-Veterinary-and-Life-Sciences/Our-research/Our-Bulletins/)  
Undergraduate or postgraduate degrees, please see [www.murdoch.edu.au/School-of-Veterinary-and-Life-Sciences/Our-courses/](http://www.murdoch.edu.au/School-of-Veterinary-and-Life-Sciences/Our-courses/)

