

Behavioural ecology of Irrawaddy, *Orcaella brevirostris* (Owen
in Gray, 1866), and Indo-Pacific humpback dolphins, *Sousa
chinensis* (Osbeck, 1765), in northeast Queensland, Australia: a
comparative study

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in February 2005

for the degree of
Doctor of Philosophy
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Project support	Natural Heritage Trust	\$90,000
	CRC Reef Research Center	\$10, 000
	The PADI Foundation	\$7,000
	Sea World Research and Rescue Foundation	\$26,400
	School of Tropical Environment Studies and Geography	\$1,000
	CRC Postgraduate Travel Award	\$1,000
	Stipend	International Postgraduate Research Scholarship
	James Cook University Postgraduate Research Award	\$30,740
Supervision	Professor Helene Marsh Dr. Peter Arnold Dr. Peter Corkeron	
Statistical support	Professor Helene Marsh Dr. Peter Corkeron Rohan Arthur Robert Schick	
Editorial assistance	Whole thesis: Isabel Beasley References: Kiri Peat	

ACKNOWLEDGEMENTS

First I would like to thank the most important people in my life, my family, as none of this work would have happen in the first place if it wasn't for them. Dad, mom, I will never find the words to say how grateful and lucky I am to have you as parents. Thank you for all your guidance, support, and encouragement. I know it was not easy to support the crazy idea of studying biology after high school, and then followed it with a PhD studying marine mammals, but thanks for listening and believing in my dreams and for giving me the courage to go and pursue them. I am equally grateful to my three brothers Juancho, Enrique, and Alejandro who have always been there for me and have served as a source of inspiration for everything I do. As the older brother I have no idea if I served you as a role model, but you all have certainly done so for me. Thank you for teaching me that in life there is no limitations just new beginnings.

I had the best supervision a PhD student could ask for. I am deeply thankful to my supervisors: Helene Marsh, Peter Arnold and Peter Corkeron. I have the greatest respect for all of you and I am grateful and honoured that I had the chance to learn and work beside you. Peter Corkeron, thank you for offering me the amazing opportunity to come to Australia and work with coastal dolphins back in 1998. I never thought after our first meeting here at James Cook University, where I did not understand most of what we talked about (still have trouble with the Australian accent), that the project I started as a masters would turn into a PhD adventure. Thank you for all your guidance and support throughout the project. I know this thesis means as much to you as to me, and I hope the work done fulfilled your initiative to get to know more about Australia's coastal dolphins. I would also like to thank you for giving me the independence I needed to learn how a research project is carried out from beginning to end, and trusting and constructively criticising my decisions along the way.

To my supervisor Helene Marsh, I cannot thank you enough for all your support throughout this PhD, as a supervisor and as Dean of Postgraduate Studies. I am deeply grateful to you for convincing me to upgrade my master's science project to a PhD, and encouragement to apply for a research scholarship. Your guidance, patience, continuous enthusiasm, and confidence in my work certainly made a great difference during the ups and downs of this project. I also like to thank you for

facilitating my attendance to conferences and workshops, for always pushing me to do my best, and for reminding me to see the big-picture.

A big thank you to Peter Arnold, for his willingness and enthusiasm to join in as a supervisor of my PhD in 2001 when Peter C. left Australia. Thank you for your time, feedback, discussions, and for always picking up in my writing and analysis what I seem to miss. Finally I would like to thank you all for your tremendous patience with my writing, and for the numerous corrections to words I refused to write properly over and over again (if there is asses instead of assess in any part of this thesis is totally my fault).

This project was supported by a different number of funding agencies and I am deeply thankful for their interest in my studies. A scholarship from Colfuturo allowed me to travel and start my M.Sc. studies in James Cook University in 1999. In 2001 I received an International Postgraduate Research Scholarship from the Commonwealth Government and top-up scholarships from James Cook University and the School of Tropical and Environmental Studies and Geography (TESAG) to conduct this PhD. My research was funded by Australia's Natural Heritage Trust, Sea World Research and Rescue Foundation, CRC Reef Research Centre, and the PADI Foundation.

I could not have carried out this project with the help of many volunteers. Special thanks (in no specific order) to: Tamara Ryan, Isabelle Thiebaud, Silvana Urtiaga, Federico Riet, Jennifer Selgrath, Alexandra Morel, Nicky Spencer, Reggie Hunziker, Emily Weeks, Ann Fergusson, Alice Hurlbatt, Jenny Broberg, Kim Loeun, Kara Dew, Hitomi Kaneko, and Marie Fosse. Thank you all for the many hours you dedicated to help me with the fieldwork and photo-id labwork. Most of all, thank you for your interest in my project, for your patience during long hours at sea looking at mostly water, your friendship, and for all the laughter you brought into the project.

I thank the Queensland Parks and Wildlife Service for providing assistance and access to their boats to carry out surveys in Princess Charlotte Bay and Hinchinbrook Channel. Special thanks go to the conservation officers and rangers Michael Short, Chris Briggs, Sebastian Selwood, Mick, Karen Vidler, and Patrick Centurino for their time and interest in the project and the good times spent during boat surveys. I thank the Great Barrier Reef Marine Park Authority for facilitating permits to carry out my fieldwork and for their interest in the outcomes of this project.

Special thanks to the administration staff in TESAG and CRC Reef Research Centre for dealing with all the paperwork related to my scholarships and research accounts, and for providing letters and documents needed for the numerous times I had to extend my student visa. I am thankful to Clive Grant and Rob Scott for solving all the computer glitches I had, Adella Edwards, Jim Monaghan, and Marji Puotinen for all their help and advice in obtaining, sorting and analysing spatial data, and Jodie Kreuger for organising fieldwork equipment, boats, and many volleyball games, barbecues, and parties that made all of this PhD work the more enjoyable.

I would also like to thank the many colleagues that took the time to provide unpublished data, answer questions, review chapters, or provide analysis advice: George Heinsohn, Anthony Preen, Ivan Lawler, Donna Kwan, Louise Chilvers, Sam Dufresne, Robert Schick, Thomas J. Jefferson, Samuel Hung, Danielle Krebs, Tim Gerrodette, David Lusseau, Carl Schwarz, Hal Whitehead, Alana Grech, Jenny Haynes, Dave Savage, Norah Cooper, Peter Horner, Steven Van Dyck, Sandra Ingleby, and Ray Chatto.

I was also fortunate enough to meet some incredible people here in Townsville that welcomed me as a friend and have offered immense moral support throughout my studies: Oliver Floerl, Ameer Abdulah, Mikaela Bergenius, Karin Buchler, Tim Pryor, Laurance Lahilaire, Rohan Arthur, and Anna Lashko. Thank you, to my office buddies Damon Newling and James Sheppard for your friendship, help, advice, discussions, laughs, beers, and for being my private English dictionaries and grammatical consultants. Thank you to Luis Toro and Federico Riet for the amazing time spent together in the “Latin Brother’s House”, you are the best housemates I have ever had. To my best mate Amanda Hodgson, thank you for being there in the good and bad times, for all the lunches, crazy dances, shared chocolates, chats about everything and nothing, and for all the laughs. It all meant a lot to me and your friendship is one of the most precious treasures I take with me from this experience. To my dear friend Isabel Beasley, a mega thank you for all your advices during this project and for sharing all your dolphin knowledge with me, for helping me many times with fieldwork, for taking the time to read my whole thesis, and most important for teaching me to laugh about myself. To my Indian sister, Dipani Sutaria, thank you very much for receiving me in your flat for the last 6 months and making me feel at home when I thought I had none. Finally, I would like to thank Sula Blake for all her love, affection and support over the last two and a half years, and for the wonderful

person she is. Also for coping with the moody and annoying bastard I can be sometimes, especially during the analysis-writing stage of this PhD. Thanks for making me a better person and for teaching me so much about love and life.

PUBLICATIONS ASSOCIATED WITH THIS THESIS

Information from this thesis has been published or is currently in preparation to be submitted to peer reviewed journals. From information in chapters 2 and 6 the following articles have been published:

- Parra, G. J.**, and P. J. Corkeron. 2001. Feasibility of using photo-identification techniques to study the Irrawaddy dolphin, *Orcaella brevirostris* (Owen in Gray 1866). *Aquatic Mammals* **27**:45-49.
- Parra, G. J.**, C. Azuma, A. R. Preen, P. J. Corkeron, and H. Marsh. 2002. Distribution of Irrawaddy dolphins, *Orcaella brevirostris*, in Australian waters. *Raffles Bulletin of Zoology Supplement* **10**:141-154.
- Parra, G. J.**, P. J. Corkeron, and H. Marsh. 2004. The Indo-Pacific humpback dolphin, *Sousa chinensis* (Osbeck, 1765), in Australian waters: a summary of current knowledge. *Aquatic Mammals* **30**:195.

Manuscripts based on Chapters 4, 5, 6, 7, 8, 9, and 10 are currently in preparation for submission.

Related publications:

- Van Parijs, S. M., **G. J. Parra**, and P. J. Corkeron. 2000. Sounds produced by Australian Irrawaddy dolphins, *Orcaella brevirostris*. *Journal of the Acoustical Society of America* **108**:1938-1940.

ABSTRACT

Irrawaddy dolphins, *Orcaella brevirostris*, and Indo-Pacific humpback dolphins (hereafter humpback dolphins), *Sousa chinensis*, are two of the least known species of coastal dolphins found in the Indian and West Pacific Ocean region. Both species occur in sympatry throughout most of their range in Australian waters, where they have been little studied. As a result, the conservation status of Australian populations of Irrawaddy and humpback dolphins is unknown and conservation and management actions have been hampered by this lack of knowledge.

To overcome this lack of knowledge and improve the capacity to effectively conserve and manage Australian populations of Irrawaddy and humpback dolphins, this study aimed to contribute information on different aspects of their behavioural ecology. As both species co-occur throughout most of their range in Australian waters, an additional aim of this study was to analyse the degree of ecological separation between them. This comparative approach served two purposes: 1) to provide species-specific information on different aspects of the behavioural ecology (e.g., habitat use, social structure) of these species, and 2) to provide insights into the mechanisms promoting their coexistence.

Boat-based surveys were carried out in different areas along the east coast of Queensland between 1999-2002, focusing mainly in one area, Cleveland Bay Dugong Protected Area (hereafter referred as Cleveland Bay), where populations of both species are known to co-occur and where weather and logistical considerations allowed for almost year-round boat-based observations.

Analysis of data on the spatial distribution of Irrawaddy and humpback dolphin schools along different areas along the east coast of Queensland indicated that the distribution of Irrawaddy and humpback dolphins was strongly influenced by proximity to the coast, with both species occurring closer to land than would be expected under a random scenario. When comparing between species, Irrawaddy dolphins occurred closer to river mouths than humpback dolphins, but this interspecific difference was not constant across study areas. Based on the spatial distribution of both species in the areas surveyed, I found that the existing protected areas may not include the most critical habitats for Irrawaddy and humpback dolphins.

In Cleveland Bay, I found that Irrawaddy and humpback dolphins were present year round between 1999 and 2002. There was no evidence of variation in their occurrence with year or season. Irrawaddy and humpback dolphins used coastal

waters of Cleveland Bay mainly for foraging activities indicating this area represents an important feeding area within their home range.

I also found that Irrawaddy and humpback dolphins exhibit significantly different school dynamics, with Irrawaddy dolphins forming larger schools (mean \pm SE = 5.3 ± 0.35) than humpback dolphins (mean \pm SE = 3.5 ± 0.19). School of both species were mainly composed of adult individuals and, in proportion to the total number of animals within a school, Irrawaddy dolphins had a greater number of adults than humpback dolphin schools. Differences in school size and composition may be attributed to socioecological and phylogenetic factors. There is evidence from my studies that social as well as behavioural constraints may be responsible for these differences in school sizes.

Analysis of the relative use of space by both species using kernel methods showed that Irrawaddy and humpback dolphins do not use Cleveland Bay uniformly. The representative ranges (95% kernel range) of Irrawaddy and humpback dolphins were similar in size and location covering mainly the area between the Port of Townsville and the mouth of the Black River. The area around the Port of Townsville was used heavily by both species and represented a core area of use (50% kernel range) for both Irrawaddy and humpback dolphins. Irrawaddy dolphins had another core area between the mouths of the Bohle and Black Rivers. The behaviour of Irrawaddy and humpback dolphins within and outside their core areas was dominated by foraging and travelling activities. The 95% representative ranges of Irrawaddy and humpback dolphins showed considerable spatial overlap (81%). Additionally, the Utilization Distributions (UDs) of both species showed strong correlation ($r_s = 0.55$, $P < 0.05$), indicating strong concordance in the utilization patterns of shared areas by both species.

Despite considerable overlap and concordance in space use patterns, Irrawaddy and humpback dolphins showed different habitat preferences. Within their representative range Irrawaddy dolphins preferred shallow (0-2 m) waters with seagrass meadows, and occurred closer to river mouths than humpback dolphins. Humpback dolphins showed preference for deeper waters (2-5 m deep), followed by waters close to the coast, shallow waters (1-2 m deep) with no seagrass, and dredge channels (5-15 m deep). I propose that these differences in habitat preference are important factors promoting the coexistence of Irrawaddy and humpback dolphins.

I photo-identified 63 Irrawaddy dolphins and 54 humpback dolphins in Cleveland Bay. Analysis of monthly and annual sighting rates of identified animals indicated most individuals were not permanent residents in the bay, but most used the area from year to year. Irrawaddy and humpback dolphins identified in more than one year were mainly identified and re-identified during the dry season between May and September when greater survey effort was carried out. The low standard distance deviations of Irrawaddy and humpback dolphins sighted on eight or more occasions indicated that individuals of both species tended to come back to specific areas within Cleveland Bay. The observed sighting patterns of individual Irrawaddy and humpback dolphins fitted exponential models of emigration + reimmigration, indicating that some animals are permanent residents while others reimmigrate into the study area after certain periods of time. I suggest site fidelity patterns may reflect fluctuations in prey resource availability and levels of predation risk within Cleveland Bay.

The ranges of individual animals of both species sighted on eight or more occasions were similar in size; length and location. Individual ranges of both species extended over similar areas, covering mainly the stretch of coastline southeast and northwest of the Port of Townsville. This pattern of interspecific overlap in range patterns indicated a lack of species-specific territories.

Analysis of association patterns among identified individuals indicated that Irrawaddy and humpback dolphins were more frequently seen with a particular companion than would be expected by chance. Cluster analysis showed that individual Irrawaddy dolphins may form strong associations with more than one individual. Strong associations between humpback dolphins appeared to be limited to pairs of animals. The social model that best described this relationship suggested that at any one time an individual Irrawaddy dolphin had two types of associates: “constant companions” and “casual acquaintances”. The mean number of associates (constant companions + casual acquaintances) suggested by the model was approximately eight, of which four were constant companions. The fit of all social models to the data from humpback dolphins suggested a complex pattern of associations between individual humpback dolphins that may involve various associates with different levels of temporal stability. Differences in the social systems of both species could be explained by their different phylogenetic relationships among the Delphinidae and/or exposure to different levels of predation risk.

Photo-identification data collected between 1999-2002 and open mark-recapture models provided abundance estimates of Irrawaddy and humpback dolphins inhabiting the coastal waters of Cleveland Bay. Based on the open population model that best fitted the data, I estimated that less than a hundred individuals of each dolphin species used Cleveland Bay between 1999 and 2002. Based on historical data, it is certain that both species have been subject to anthropogenic mortality in the past due to entanglement in shark nets set for bather protection, and in commercial gillnets. A power analysis of the abundance estimates of both species and their associated variation indicated that, even with relatively unbiased and precise abundance estimates ($CV = 0.08$), population trends will be extremely difficult to detect within the space of a few years unless decreases in population size are worryingly high ($> 20\%$ p.a.). Because of their small population sizes, Irrawaddy and humpback dolphins are particularly vulnerable to local extinction. Detection of population trends should not be a necessary criterion for enacting conservation measures of both species.

My observations on the interspecific interactions among individuals of both species showed that encounters between Irrawaddy and humpback dolphins are common and predominantly of an aggressive/sexual nature in Cleveland Bay. The individuals involved in aggressive/sexual interactions appear to be mainly adult-male humpback dolphins and adult-female Irrawaddy dolphins with calves. During these encounters, humpback dolphins were dominant in initiating chasing, and seeking physical contact with Irrawaddy dolphins, while the latter tried to swim away or showed resistance to the interaction. I suggest the predominant aggressive/sexual interactions observed may reflect: 1) a physical training or skill development function that would have beneficial effects for future interactions between male humpback dolphins and their female conspecifics; 2) a mechanistic basis for some competitive interactions and patterns of resource partitioning between these two species of coastal dolphins; and 3) a relative scarcity of female humpback dolphins.

This study is the first comprehensive investigation of Irrawaddy and humpback dolphins in the Australian/Papua New Guinean region. The information collected provides a preliminary scientific basis for their future conservation and management. Given the certainty that the continuing loss of global biodiversity will be particularly severe in coastal ecosystems, the conservation and management of Irrawaddy and humpback dolphins will need to be intensive and adaptive. The potential for the conservation and management of Irrawaddy and humpback dolphin

populations along the Queensland coast is relatively good. However, in view of the concerns raised in this study about the long-term survival of these two species, and evidence that Australian populations of Irrawaddy and humpback dolphins represent different species/subspecies from populations elsewhere, future research directed at enhancing our ecological knowledge throughout Queensland and other areas of their range in Australia will be essential to inform their conservation.

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