



## Morphological measurements of manta rays (*Manta birostris*) with a description of a foetus from the east coast of Southern Africa

ANDREA D. MARSHALL<sup>1,2,3</sup>, SIMON J. PIERCE<sup>1,2</sup> & MICHAEL B. BENNETT<sup>1</sup>

<sup>1</sup> School of Biomedical Sciences, Department of Anatomy and Developmental Biology, University of Queensland, St. Lucia, Queensland 4072, Australia

<sup>2</sup> Manta Ray & Whale Shark Research Centre, Tofo Beach, Inhambane, Mozambique

<sup>3</sup> Corresponding author. E-mail: andrea.marshall@uq.edu.au

### Abstract

Descriptions and morphological measurements from manta rays (*Manta birostris*) caught in bather-protection nets in eastern South Africa are presented and compared to a *M. birostris* foetus from southern Mozambique. Specimens examined from South Africa had disc widths ranging between 2230–2370 mm and were immature. The foetus was 1328 mm in disc width. External examination of the foetus revealed the presence of teeth on the lower jaw and spot patterning on the ventral surface. The ventral spot patterning, which is commonly used in photo-identification studies, was similar in style and colour to the patterning recorded in both the examined juveniles and free-swimming manta rays. The presence of a distinctive ventral spot arrangement in this foetus establishes that spot patterns develop before birth. Morphological differences between the foetus and the juvenile specimens are attributed to the folded position of the foetus's pectoral fins *in utero* and its developmental state. The presence of 1300–1700 mm DW free-swimming individuals from the southern Mozambican area suggests that the foetus was near-term. This study on western Indian Ocean specimens provides the first diagnostic description, morphometric measurements and photographs of *M. birostris* from this region.

**Key Words:** Elasmobranch, Reproduction, Development, Ventral Spot Patterning, Photo-identification

### Introduction

The manta ray (*Manta birostris* Walbaum 1792) is the largest batoid species and one of the largest of all living fish. Data on the life history and ecology of *M. birostris* remain scarce. Few comprehensive morphological descriptions exist for juvenile or adult *M. birostris* (Whitley 1936; Beebe and Tee-Van 1941; Bigelow & Schroeder 1953) and previous descriptions of foetuses have either relied on estimated body sizes and dimensions or have been based on incomplete or non-standard morphometric measurements (Lamont 1824; Lesueur 1824; Müller & Henle 1841; Coles 1916). The most detailed morphological description of a manta ray foetus to date comes from a specimen caught at the Galapagos Islands in 1928 (Beebe and Tee-Van 1941). This study provides the first detailed descriptions of *M. birostris* from the western Indian Ocean, including a near-term foetus, and updates the literature with detailed morphometric measurements appropriate for this species.

### Methods

Three juvenile *M. birostris* specimens were obtained from the Natal Sharks Board (NSB) bather-protection netting network off Durban, South Africa, from Richards Bay (28°48'S, 32°6'E) in the north to Port Edward