

Aerial photographs reveal unique breeding characteristics for *Delphinus capensis* and *D. delphis* off southern California, USA and Baja California, Mexico

Chivers, Susan J ¹; Peryman, Wayne L ¹; Lynn, Morgan S ¹; Danil, Kerri ¹; Berman, Michelle ²; Dines, James P ³

(1) NOAA Fisheries - NMFS, Southwest Fisheries Science Center, 3333 N Torrey Pines Ct, La Jolla, California, 92037, USA

(2) Santa Barbara Museum of Natural History, Department of Vertebrate Zoology, 2559 Puesta del Sol Road, Santa Barbara, CA, 93105, USA

(3) Natural History Museum of Los Angeles County, Section of Mammals, 900 Exposition Blvd., Los Angeles, CA, 90007, USA

Corresponding author: susan.chivers@noaa.gov

We estimated reproductive parameters for *Delphinus capensis* and *D. delphis* using data from vertical aerial photographs. Only limited information is available for these species that are impacted by numerous anthropogenic activities off southern California, USA and Baja, Mexico. Data from 76 *D. capensis* and 34 *D. delphis* schools photographed during a 2009 field study revealed differences in timing-of-reproduction, calf production and calf length-at-independence. Birth dates back-calculated from calf length measured in photographs (n=411 *D. capensis*; 348 *D. delphis*) revealed different breeding seasons suggesting a potential reproductive isolating mechanism for these closely related species that have unique genetic and morphological characters. A predominantly late-winter to spring peak was evident for *D. capensis* throughout their range, while the peak for *D. delphis* occurred later in the year and differed regionally. Average calf production estimated from dolphins counted in photographs (calf/total counts) was 4.52% and 5.69% for *D. capensis* and *D. delphis*, respectively. Assuming a 1:1 sex ratio in these populations, these estimates are equivalent to birth rates (calf/female counts) of 9% and 11%, respectively. This is approximately 50-60% lower than the birth rates estimated for these populations from skin biopsy samples collected during the same field project. Photo-based estimates inherently incorporate neonatal mortality through to the ages of calves sampled, and thus, the observed differences between birth rates and calf production suggests high neonatal mortality; at least in 2009. Length-at-independence was estimated as the average length of dolphins swimming independently. The estimates were 145 cm and 140 cm, or approximately 1 year and 1.5 years, for *D. capensis* and *D. delphis*, respectively. These results demonstrate the value of this non-invasive sampling technique for estimating multiple reproductive parameters and providing the means to monitor population responses to changing habitats.