MARINE MAMMAL SCIENCE, 9(2):195–197 (April 1993)

ROSTRAL FUSION AS A CRITERION OF CRANIAL MATURITY IN THE COMMON DOLPHIN, *DELPHINUS DELPHIS*

When examining sexual dimorphism, individual variation, or geographical variation in cranial characters in a mammal, it is necessary to decide which skulls in a series to include in the analysis as adults. For dolphins of the genus *Stenella,* distal fusion of the premaxillae with the maxillae was proposed as a criterion of cranial adulthood by Dailey and Perrin (1973); this was based on the observation by Perrin (1972, 1975) that such fusion occurred at about the age (based on *growth layer groups* in the dentine, *sensu* Perrin and Myrick, 1981) at which elongation of the rostrum ceased in series of pantropical spotted dolphins, *S. attenuata,* and spinner dolphins, *S. longirostris.*

We recently examined a large series of skulls of short-beaked common dolphins, *Delphinus delphis,* thought to have come from a single interbreeding population (Heyning and Perrin, in press), and found that distal fusion is not an accurate marker of cranial maturity in this species. The rostrum on average continues to elongate, at least in males, until slightly after distal fusion begins. This is apparent in comparison of length-frequency distributions of rostrum length (measured from a line across the bases of the antorbital notches) for specimens known to be physically mature (all vertebral epiphyses fused to centra; A in Fig. 1) and for specimens physically immature but with rostral fusion (B in Fig. 1); the difference between means for males is statistically significant at $0.10 > P > 0.05$ (95% confidence intervals 235.3–250.9 cm and 249.4–258.8 cm for B and A, respectively, in Fig. 1).

We found that combined criteria of distal rostral fusion and sexual maturity (presence of lactation, fetus, or at least one ovarian corpus in female; testis weight $\geq$100 g in male; hatched portions of B in Fig. 1) yielded rostrum-length frequencies in physically immature specimens more in line with those in physically mature specimens, although the sample sizes were relatively small.

These results suggest that male adult series of common dolphins used for analyses of non-developmental variation should include only skulls of specimens known to be physically mature and perhaps those known to both exhibit distal fusion and be sexually mature. In view of the small sample sizes in the present analysis, it would seem prudent to do the same for females. If ages have been determined for a large series of specimens, other specimens known to be of an age at which physical maturity is universal can also be included.

These cautions imply that series for analyses of adult variation in this species, and possibly others, should not include "beach pick-up" skulls for which information on postcranial skeleton or on sexual maturity is not available and for which age cannot be estimated relatively precisely.

The results accord with those of Mead and Potter (1990) for *Tursiops truncatus*; they found that distal fusion ("skull maturity" in their paper) occurs in

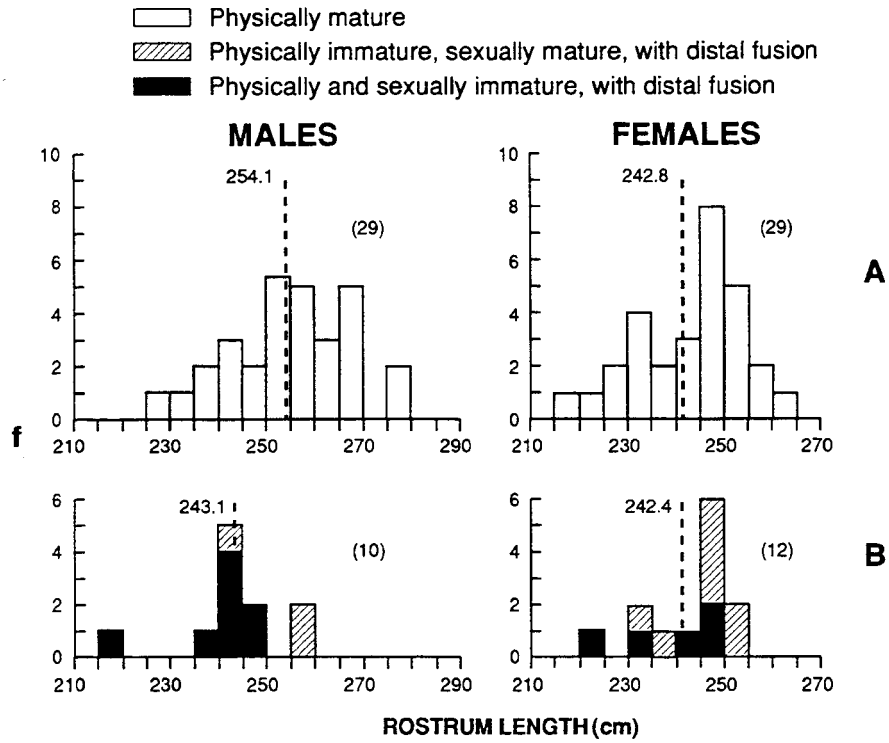

Figure 1. Frequency distributions of rostrum length and average rostrum length (dashed lines) in physically mature (upper) and physically immature (lower) male (left) and female (right) specimens of *Delphinus delphis*.

that species on average at least several years (approximately 7 growth layer groups) before attainment of sexual maturity. However, they did not state whether the skull continues to grow after the onset of distal fusion.

Perrin's original (1972, 1975) conclusions about the apparent correlation of cranial maturity and distal fusion in both males and females in *Stenella* spp. were based on relatively small series of adult specimens for which age had been estimated from tooth sections. The results reported here for *Delphinus delphis* indicate that the question should be re-examined based on larger series.

We thank J. G. Mead and I. Barrett for reviewing the manuscript.

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