

BALES

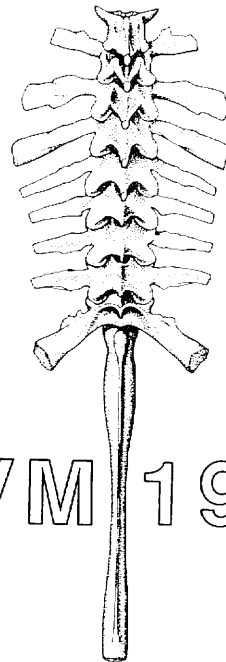
JOURNAL OF

# MORPHOLOGY

ESTABLISHED 1887

JUNE 1994

VOLUME 220  
NUMBER 3



ICVM 1994



WILEY-LISS

ISSN 0362-2525

COMPARATIVE ARCHITECTURE OF HINDLIMB MUSCLES IN GALAGOS: AN ANALYSIS OF SCALE. Babcock, S.K. James Madison Univ., Harrisonburg, VA, USA.

Galagos are a group of closely related primates that range in body size from 60 to 2000 and share a specialized mode of arboreal leaping. Similarly shaped leapers of differing size face different functional constraints: smaller leapers are limited in time for acceleration while larger leapers are limited in muscle force per unit body mass. I used the model of geometric similarity as the null hypothesis to detect relations between body mass, hindlimb musculoskeletal morphology, and locomotor behavior. Architectural data were collected from hindlimb muscles in galagos (*Galagoideus demidovii*, *Galago moholi*, *Otolemur crassicaudatus*), lorises (*Nycticebus coucang*, *N. pygmaeus*), and the mouse lemur (*Microcebus murinus*). Only the gasteocnemius differed significantly from the model of geometric similarity; fiber lengths increased at a rate greater than the 0.33 power of body mass, and cross-sectional areas increased at a rate less than the 0.67 power of body mass. Since muscle force is proportional to cross-sectional area, none of the results of this study suggest that relative hindlimb muscle forces are enhanced in larger galagos. Furthermore, the moment arm for ankle plantarflexors does not differ significantly from the model of geometric similarity. The output lever arm, however, decreases with increasing size. These results suggest that rather than compensating for decreasing muscle forces with increasing size, galagos maintain functional similarity by compensating for decreasing size.

SKULL EVOLUTION IN LIVING AND FOSSIL RHINOCEROSES: MORPHOMETRIC ANALYSES OF WITHIN AND BETWEEN GROUP VARIATION. Bales, G.S. Univ. of Southern California, Los Angeles, USA.

Rhinoceroses comprise a long-lived and once diverse group with a relatively large fossil record and a few surviving taxa. Skull evolution was studied using living analogues as gauges of intraspecific variation. Analyses were done on 15 extinct and 4 extant genera using 19 measurements of adult crania (83 living, 103 fossil), and 11 measurements of adult mandibles (80 living, 84 fossil). Within-group variation was observed by principal components. Sources of variation within extant genera included geography, sex dimorphism, and taxonomic differentiation. *Diceros* (black rhino, n = 48) showed the greatest intraspecific variation and was the most homogeneous sample (monospecific, geographically circumscribed, no significant dimorphism). Variation within fossil genera was partitioned into subgroups based on morphological, geographical, and temporal criteria. Variation within subgeneric groups was often

more consistent with living analogues. Canonical variates were used to observe morphological variation and relationships among groups defined by principal components analysis. Affinities were observed with respect to familial and subfamilial taxa, horn arrangements, hypothesized phylogenies, and temporal trajectories of small to large size. Affinities were less clear with respect to browsing versus grazing adaptations, and skull characters used in recent cladistic analyses. Rhinoceros skull evolution appears to have been a mosaic of shape changes accompanying significant size changes both within and between genera.

FREQUENCY OF OCCURRENCE OF GERM CELL TYPES IN THE SEMINIFEROUS TUBULES OF FOUR VERTEBRATE SPECIES. Banerjee, T.K. S.B.College of Burdwan Univ., Magra, Hooghly, India.

Quantitative germ cell analysis is an important device for evaluation of spermatogenic activity. Testicular tissues of the catfish, *Heteropneustes fossilis*, the toad, *Bufo melanostictus*, the lizard, *Calotes versicolor* and the bull, *Bos indicus* were prepared following routine histological methods. Stages of spermatogonia, spermatocytes and spermatids were identified and their numbers were counted from at least one hundred tubular cross sections selected at random. The average frequencies of germ cell types per cross section of the seminiferous tubules of these four vertebrates were determined and necessary corrections were made applying Abercrombie's formula. The frequency of occurrence of spermatogonia is 48.6, 46.0, 60.1 and 30.0; of pachytene spermatocytes is 19.4, 27.9, 42.1 and 14.4; of early spermatid is 337.2, 58.0, 174.3 and 30.6 and of late spermatid is 45.0, 41.8, 84.2 and 19.2 in catfish, toad, lizard and bull respectively. Higher frequency of early spermatids in catfish and lizard and mid and late spermatids in bull indicate relatively longer duration of those spermatids. Similarly, pachytene is of longer duration in all four species in comparison to other meiotic stages. Lower frequency of mid spermatids in *C. versicolor* suggests their rapid transformation into late spermatids. Higher spermatogonial frequencies in catfish, toad and lizard indicate several mitotic divisions of the spermatogonia. The present study also reveals that the degeneration of germ cells is less frequent in submammalian species.

THE EVOLUTION OF HINDLIMB MUSCULATURE AND LOCOMOTOR PERFORMANCE IN WADERS (AVES: CHARADRII). Barbosa, A., Moreno, E. Museo Nacional Ciencias Naturales, Madrid, Spain.

Locomotor mode is an important factor determining access to food in birds. Relative to other locomotor modes such as flying or swimming, running is very