678

THE SELECTIVE VALUE OF BIG SIZE AND SEXUAL DIMORPHISM IN PRIMATES

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For fully understanding size differences among primates, the pros and cons of big size must be recognized clearly. As a first step, biomechanical *advantages* and *disadvantages* of increased body size are defined precisely. Proximate consequences of several size parameters are shown across taxonomic units and formulated mathematically as functions of length, or mass, to evaluate their potential influence on chances of survival: Great length of the arms allows harvesting a big volume without changing the animal´s position in a tree, but is limited by the muscle and skeletal mass necessary to maneuver a very long extremity. Length of limbs increases locomotor speed, or width of a leap, and may reduce energy consumption, but is limited by lower cycle frequency. In agonistic intraspecific or interspecific encounters, growth of body mass increases the impact exerted, but entails slowness of movements. Thickness of skin, muscular and skeletal cover of the most vulnerable organs grow linearly with volume. This protection can be overcome by more projecting teeth, which in turn lead inevitably to increased weight of the head, and to slowness of its movements. – In summary, increasing body dimensions and body mass offer indeed quantitative biomechanical advantages. These, however, follow linear, root, or asymptotic functions, so they do not longer grow once bigger sizes are reached. The numerical advantages and limitations, quantified on the basis of physical laws and not confined to particular taxa, can be understood as selective pressures which have lead to size increase and to sexual dimorphism along various evolutionary lines.

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