

Public Abstract

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Graduation Term:SS 2013

Department:Veterinary Pathobiology

Degree:PhD

Title:Ecomorphological Implications of Primate Dietary Variability: An Experimental Model

The form and function of mammalian skulls is strongly influenced by the diet an individual consumes over the course of its lifetime. The mechanical properties of foods (the hardness or toughness of a food) are known to influence chewing motions, the strength of the bite force, and the size and shape of the skull and jaws.

Many wild mammals live in seasonal habitats and have diets that change seasonally, and the foods eaten during different seasons may have very different mechanical properties. Certain foods, known as “fallback foods,” can be very difficult to eat but provide a reliable source of nutrition when no other foods are available. Fallback foods may have been consumed by early human ancestors and other closely related primate species.

This study examined how a seasonally changing diet influences the growth and function of the mammalian skull. Results showed that jaw shape in adult mammals can be used to assess whether an individual ate a seasonal diet. The jaws of juveniles provided less information about diet, since the growth of bone and teeth were still in progress. An individual’s diet also affected bone physiology and growth rates in the skull.

The diet an individual consumes during its lifetime affects the shape, function, and health of the skull. Additionally, the skeleton actively responds to changes in an individual’s activity levels. When diet and chewing behaviors change, the portion of the skeleton associated with feeding (the skull and the jaws) will change to accommodate these new behaviors. Finally, this study identified those parts of the skull which best reflect an individual’s diet. These results can be used to better assess the diet and habitat of living and extinct mammals, such as early human ancestors.