THE CRANIAL MORPHOLOGY OF DWARF PRIMATE SPECIES

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Abstract

In 2004 a team of researchers announced the discovery of curious hominin skeletal material from Liang Bua cave on the small island of Flores, Indonesia. Several individuals assigned to a new taxon, *Homo floresiensis*, have been recovered, the most complete dating to only 18,000 years ago. This remarkable individual—the type specimen, LB1—is represented by the skull and skeleton of an adult hominin which stood just over a meter high, with a cranial capacity of ~400 cc. One hypothesis about the origin of this controversial material is that this creature evolved from a larger, known hominin that dwarfed over thousands of generations while in isolation on Flores. In this thesis, I seek to illuminate the debate over *Homo floresiensis* by informing our understanding of the cranial size and shape changes that accompany species-level dwarfing in non-human primates. To do this, I quantitatively compare the cranial morphology of three primate species that have evolved smaller bodies than their closest living relatives. Crania from a total of six species—three dwarfs and three relatives—were measured from museum skeletal collections. Cranial form, shape, and allometry were analyzed using an array of morphometric techniques, including traditional approaches as well as more recent innovations in quantitative morphology. I tested the null hypothesis that the dwarf primate species exhibit paedomorphic cranial features, as has been shown in some dwarf mammals (e.g., elephants and sloths), but not others (e.g., goats and hippos). My results reveal a unique pattern of cranial size and shape evolution in each of the three species. The dwarf guenon (*Miopithecus ogouensis*) exhibits stereotypical ontogenetic scaling of the cranium. The simakobu monkey (*Simias concolor*) of the Mentawai archipelago in Indonesia is paedomorphic in its large orbits, but its cranium has otherwise typically "adult" proportions. Finally, shape and cranial proportions in the small-bodied Natuna Island leaf monkey (*Presbytis natunae*) are essentially isometric relative to larger *Presbytis*. This research demonstrates the variety of possible outcomes of evolutionary dwarfing events. Based on these three case studies, I hypothesize two global models for dwarfing in primates which represent extremes along a spectrum of possible outcomes. The position of any given species along this spectrum is determined by its own unique natural history. In considering human and non-human primates alike, these results encourage thoughtful skepticism of some common assumptions about evolutionary processes, particularly with regard to encephalization. As our knowledge of the Flores hominin grows, we must continually update our theoretical interpretations with information about its distinctive ecological and evolutionary context.