

ORANGUTANS: THE LARGEST CANOPY DWELLERS*Cheryl D. Knott*

As I walk through the rainforest of Borneo at dusk, I am startled by a loud “snap” as a tree limb is broken off and inserted into a nest stretching over 2 m wide. Although I can barely make out a glimpse of orange fur, this is unmistakably an adult orangutan bedding down for the night. With adult males weighing 86.3 kg on average and females 38.5 kg (Markham and Groves 1990), orangutans are the largest habitually arboreal animal (Rodman and Mitani 1987; Knott 1999a). My data from Gunung Palung in Borneo show that orangutans spend, on average, 99.6 percent of their waking hours in the canopy. This is in stark contrast to the African apes—chimpanzees and gorillas—that are much more terrestrial. Chimpanzees, smaller than orangutans, climb into trees to eat fruit, but normally travel and rest on the ground. At the Tai forest in the Ivory Coast, Doran (1993) found that they spent close to 50 percent of their time on the ground. The larger mountain gorillas are almost exclusively terrestrial, relying on abundant low-lying vegetation. Recent studies of western lowland gorillas indicate that they often climb trees to obtain fruit, but they rest and travel on the ground like the other African apes. Orangutans are thus unique among the large-bodied hominoids in their essentially exclusive use of the canopy.

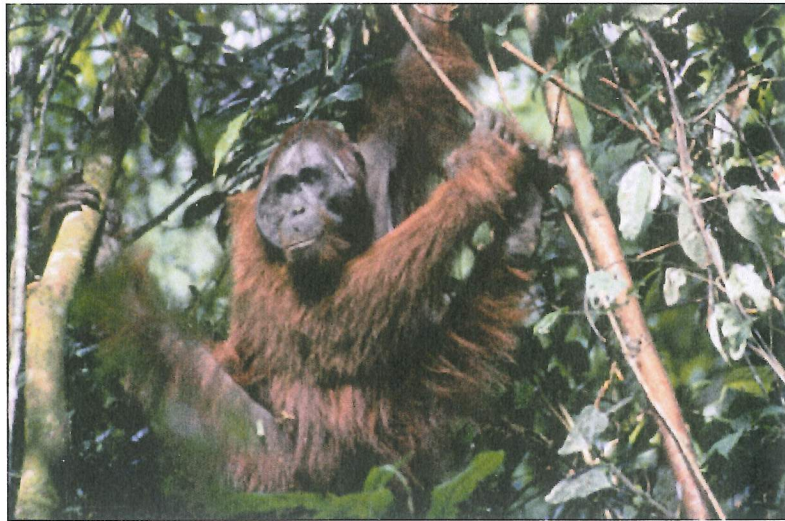


Figure 1 Adult male orangutan traveling through the canopy in Gunung Palung National Park, Indonesia. Photograph by Tim Laman.

Their niche as large-bodied canopy dwellers raises intriguing questions about how they can use the canopy efficiently. These large animals are cautious climbers, moving through the forest by quadrumanual clambering—using all four hands and feet to grasp and pull themselves along (Rodman and Mitani 1987). This spreads their bodyweight over several different arboreal supports, lessening the risk that one will give way. Essentially, this is the same method humans use for climbing, although without as much strength or flexibility! Orangutans have extremely shallow hip joints, allowing them almost 360 degrees of

rotation and giving them the ability to reach tree limbs in any direction. Smaller individuals exhibit brachiation on occasion.

Size does place constraints on canopy usage, but heavy bodyweight also allows orangutans, particularly the big males, to use unique forms of locomotion. One of their common techniques is to sway a slender tree from side to side, utilizing their bodyweight to bend it. They then grab a branch of an adjacent tree and pull it toward them before scrambling onward. As the new tree swings toward vertical, they quickly move to the other side and use their weight to bend the tree toward the next objective. They are thus effectively using a tree as a spring to propel themselves across a gap until they can reach the next tree. This mode of locomotion is particularly common among the males (Rijksen 1978). They normally come down to lower canopy levels to use this travel method, and males tend to travel lower in the canopy than do females (Setiawan et al. 1996). Pole trees in the mid-canopy are smaller in diameter, easier to bend over, and spaced more frequently. Using the substrate itself to help them locomote is one of the unique possibilities in the canopy that distinguishes the movement of orangutans from terrestrial locomotion.

The preferred food of orangutans is fleshy fruit; however, they also eat bark, leaves, piths, and insects when times are tough (Knott 1998). These foods are primarily located in the canopy and often, such as the case with some ripe fruit and young leaves, are situated at the terminal ends of branches. Comparing orangutan males to females that are half their size provides an excellent test of the way size may constrain the evolution of large-bodied canopy animals. Adult males spend more time on the ground than females do, especially while traveling long distances (Galdikas 1988). Females may be able to travel and feed higher in the canopy than the males because their lighter weight enables them to travel to smaller branches while feeding and to access higher canopy pathways that may be difficult for adult males to use (Cant 1987a, 1987b; Rodman and Mitani 1987). However, males (as well as females) may also just break off a large fruit-bearing branch and take it to a more comfortable perch for consumption, such as a tree crotch. Whether males really suffer a foraging cost because of their greater heft has not been demonstrated. Other sex differences also exist: males travel significantly slower in the canopy than do females, are more likely to build their nests close to their last food tree, and tend to build their nests in trees that are lower in the canopy and smaller in diameter than do females (Setiawan et al. 1996).

An arboreal lifestyle may also place constraints on orangutan reproduction. Orangutans give birth on average only once every 8 years (Galdikas and Wood 1990; Knott 2001)—the longest inter-birth interval of any mammal. This is compared to a mean of only 4 years between births in gorillas and approximately 5 years in chimpanzees (Knott 2001). Juvenile orangutans at least occasionally ride on their mothers until they are as old as 7 years. Mothers spend significant amounts of time helping juveniles negotiate the canopy, and often have to wait for slower juveniles to catch up. This may place significant energetic costs on orangutan females. We now know that being in poor energetic status lowers ovarian function in female orangutans and is a main contributor to long inter-birth intervals (Knott 1999b, 2001). Thus, the added energetic cost of arboreality on orangutan females may be one of the factors that have had a significant effect on orangutan inter-birth intervals and thus their evolution.

Why then are orangutans habitual arboreal travelers when the African apes are not? Avoiding terrestrial predators seems unlikely to be the reason as there are records of leopard predation on chimpanzees (Boesch and Boesch-Achermann 2000), but no records of

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predation on wild orangutans. Borneo, in fact, has no cats large enough to be a threat to orangutans, although Sumatra has tigers that have occasionally killed ex-captive orangutans. The answer may lie in differences in canopy structure and food availability and distribution between the Southeast Asian rainforests and those of Africa. Forests inhabited by orangutans potentially provide a more continuous canopy for travel. These forests also tend to harbor taller trees. It may simply be more energetically efficient for orangutans to travel arboreally rather than descend to the ground between feeding bouts. Additionally, orangutans, which are predominantly solitary, may feed in trees that are smaller and closer together whereas more group-living chimpanzees feed on large fruit trees that are relatively far apart, favoring the use of faster terrestrial travel. Cross-continent comparisons will, undoubtedly, shed more light on the evolution and ecology of the great apes. Seeing orangutans so effectively negotiate the canopy surely challenges our notion of what a canopy dweller can be.

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