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TITLE: Estimation of body temperature of Bornean orangutans (*Pongo pygmaeus wurmbii*) from internal fecal temperature measurements

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ABSTRACT:

Monitoring health status is a critical aspect of primate conservation, yet can be difficult to noninvasively investigate in the wild. Because mammals are endothermic, body temperature can be used as a health marker for primates. Using a method previously tested on chimpanzees and humans, we estimated body temperature of wild Bornean orangutans by measuring the internal temperature of fecal samples. Upon quickly collecting a fecal sample after defecation, we recorded internal temperature of the sample at 20-sec intervals for six minutes. Data included a series of temperatures for each sample that we fitted to a sigmoid curve, which was used to estimate body temperature. Estimated body temperature was not affected by sex ($F(2,92) = 0.431$, $P = 0.651$), weather ($F(2,92) = 1.175$, $P = 0.313$), or collection time ($r = -0.074$, $N = 95$, $P = 0.468$). Estimated body temperature was higher for fecal samples that fell from lower estimated heights ($r = -0.23$, $N = 95$, $P = 0.0004$) and were heavier ($r = 0.23$, $N = 75$, $P = 0.0475$). We compare these results from the field to captive fecal samples, taking place on the ground, to determine the accuracy of this field method. From our field samples ($N = 95$), orangutans appear to have a lower internal body temperature (33.44 ± 1.74 °C) on average than either chimpanzees or humans. Previous studies have demonstrated that orangutans have a lower metabolic rate than other great apes. Lower body temperature may serve as a metabolic adaptation of orangutans to survive extended periods of low food availability when energy needs to be conserved.

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