

Development of independence and behavior of wild immature East Bornean orangutans (*Pongo pygmaeus morio*), Danum Valley Conservation Area

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Orangutans have a prolonged period of immaturity and the longest inter-birth interval (IBI) of all mammals, which can be explained by their solitary lifestyle, preventing the mother from rearing two offspring simultaneously (solitary life hypothesis). In the Chapter 2, I collected data on mother offspring dyads living in a primary lowland forest in Danum Valley, East Borneo in an effort to examine the developmental and behavioral patterns of the subspecies *Pongo pygmaeus morio*. Comparisons with previously published data on the Sumatran species *Pongo abelli* revealed no fundamental differences in these behavioral measures. However, a shorter association time with the mother after behavioral independence is documented for this East Bornean population in comparison to Sumatran populations. These results are best explained by the solitary life hypothesis. I suggest that environmental constraints in Bornean forests, as well as a lower population density, should be considered when interpreting the differences between Sumatran and Bornean orangutans in both the period of association with mother and the IBI.

In the Chapter 3, I explored the ontogeny of feeding behavior in dependent immature orangutans. Predictions of both nutritional and informational hypothesis, which explain the functions of food-sharing, were also tested. Results showed that mother-offspring diet is very similar and infants rarely eat items that are not consumed by their mothers and with the increase in offspring age, patterns start to resemble adult ones. Offspring spent most of their time foraging with the mother rather than independently. These results are consistent with previous studies on different populations of Bornean and Sumatran orangutans, suggesting a similar age of acquiring feeding competence,

despite the prolonged association with the mother in Sumatran populations. However, unlike previous studies on great apes, infant orangutans do not seem to solicit items that are more difficult-to-process items or more nutritionally-valuable.

In the Chapter 4, I examined the adolescent behavior, association preferences, as well as, interactions with other conspecifics. The study findings suggested no sex differences in the activity budget and no differences between adolescent and adult females' activity budget. Sex biased differences in the activity budget may be more noticeable during adult life, as a result of sexual dimorphism and female's reproductive status. Associations with mother-offspring pairs also allowed the dependent immatures to engage in social interactions with older and more experienced conspecifics. These results corroborate previous studies stating that adolescence may be the right phase in which individuals balance the necessity for energy requirements and social life. The reasons could be to cope with predation pressures, increase foraging efficiency and develop social skills.

In the Chapter 5, I reported rescue/release case of a juvenile orangutan that suffered from an earlier separation from the mother and remained isolated in a tree for one month. I recorded the juvenile's activity, collected samples for fecal glucocorticoids (fGC) determination and combined with biochemical to assess the health status the juvenile. The pre-rescue diagnosis revealed dehydration, malnourishment and slight anemia. The juvenile showed abnormal activity budgets before rescue and after release. fGC levels were higher comparing to DVCA juveniles, showing a marked increase after release. The results suggest that rescue programs help reestablish health parameters, but release processes are stressful for wild orangutans. Early separation from the mother in orangutans may occur more often than reported, particularly in fragmented habitats, and result in poor health that could hasten death.