

Orangutans: ecology and social organization



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The orangutan is a particularly interesting big ape with numerous characteristics that make it distinctive from all other big apes. It is the only big ape to live a commonly unsocial and solitary way of life and it uses vocalization as spacing instrument rather than physical quarrels to guard territories and females (Rijksen and Meijaard, 1999). The orangutan is in addition the only big ape other than human to exist outside of Africa, and actually has the longest afterbirth interval of any primate species.

Consequently, the orangutan has become a well-liked scientific study matter and one of the most identifiable big ape and primate species in modern culture. Orangutans are in grave danger of extermination due to an impressive decrease in numbers, which was first noted in the 1980's (Rijksen and Meijaard, 1999). Orangutans once ranged over a enormous area including much of SouthEast Asia from southern China through Laos, Thailand, Vietnam, and into the Sunda Islands (Delgado and van Schaik, 2000).

Orangutans have earlier gone vanished over much of this area and nowadays only exist on the islands of Borneo and Sumatra. Two probable reasons for the collapse of the orangutan range have been proposed. The first is the ecological reason, which suggests that orangutan distributions shifted southward as a consequence of the shifting subtropical and tropical zones of SouthEast Asia (Delgado and van Schaik, 2000).

The increase in temperature since the most recent glaciations has elevated sea levels and possibly restricted the amount of territory accessible for great mammals such as orangutans (Delgado and van Schaik, 2000). The second theory is that humans are to blame for the decline in orangutan allocation for

the reason that orangutans are quite slow, arboreal animals making them simple to utilize while their sluggish reproduction makes them vulnerable to extinction (Delgado and van Schaik, 2000). It seems possible that these two suggestions should not be thought of as mutually exclusive.

Both human and ecological factors have almost certainly contributed to the exclusion of orangutans from its previous territory. (Rijksen and Meijaard, 1999) Habitat and Local Population Density Orangutans range within the mosaic habitats of tropical rainforests in Borneo and northern Sumatra that include lowland dipterocarp forest, heath forest, peat swamp forest, alluvial flats, and mountain slopes up to 2000m (Rijksen & Meijaard, 1999). Orangutans are most frequently found close to streams and rivers, and in swamps.

In the absence of human hunting pressures, the highest densities are in non-masting habitats such as alluvial forest patches in lowland river valleys, and in the freshwater and peat swamp forests in floodplains (Rijksen & Meijaard, 1999). Orangutan densities decline steeply with increasing altitude and tend to be higher in Sumatra than in Borneo across similar habitats (Rijksen & Meijaard, 1999). What are the major determinants of orangutan density? Findings from northern Sumatra indicate that orangutan densities vary closely with the amount of soft pulp of fruit available (van Schaik et al. 1995).

Because the production of soft, fleshy fruits declines with altitude, this explains the strong negative relationship between orangutan density and altitude. The result also helps explain the variability in orangutan densities at a given altitude. Forests on relatively more fertile soil tend to have a higher

proportion of plant species that produce the soft-pulp fruits and this probably explains why riverine alluvium and some swamp forests have high densities of orangutans (Noordwijk and van Schaik, 2005).

In non-swampy forests, strangling figs are very important food sources because they produce large crops of easily harvested and easily digested soft-pulp fruits (Rijksen et al. , 1995). The density of large stranglers increases with soil pH (van Schaik, 1995) which, in turn, is a good predictor of forest productivity, another reason for the relatively higher orangutan densities in alluvial forests. Finally, alluvial and swamp forests, on average, contain a lower proportion of mast-fruited species (Delgado and van Schaik, 2000).

Accordingly, there is a higher abundance of fruiting trees in any given year and, thus, higher orangutan density. Masting habitats support lower orangutan densities because masting means lower productivity during non-mast years and thus, the absence of a reliable supply of soft-pulp fruits (van Schaik, 1999). Feeding Ecology of the Orangutan The orangutan is frugivorous. This means that the orangutan must have some nutritional elasticity since fruit lacks some of the vital essential amino acids (Chivers, 1998).

Orangutans are supposed to have 3 types of foodstuff preference. Esteemed foods attract impermanent associations of 2 or more orangutans, at the same time, as favored foodstuff sources are those visited by more than 3 orangutans throughout a fruiting period. The last foodstuff preference category consists of those entire foodstuff that do not fit into the above 2 groups (Rijksen, 1978). The most widespread technique used to estimate

diet is to study the time spent feeding on different foodstuff types (Knot, 1998).

Along with other primates, orangutan should be careful about their diet in terms of the ingestion of necessary nutrients, the reduced utilization of indigestible plant compounds and in the eating of plant minor components such as tannins and alkaloids (Knot, 1998). Chivers (1998) argues that this preceding point is particularly significant as orangutans lack the enzyme uricase which means that they have more complexity in dealing with tannins than some other primates. Rijksen (1978) initially divided orangutan foodstuff types into 5 broad categories: 1) fruit; 2) leaf material; 3) bark; 4) insects and 5) miscellaneous.

These categories can be supplemented with the 6th category of flowers and their ingredients (Knot, 1998). Inter-Island Differences Densities of orangutans on Sumatra are approximately twice as high as in similar habitats on Borneo and the biomass of primates and other mammals is also higher on Sumatra (van Schaik et al. , 1995). The orangutan's altitudinal range also appears to be higher in Sumatra. Sumatran orangutans tend to spend more of their feeding time eating fruit and insects and less on the cambium growth layer of some trees (van Schaik, 1999).

Together with the higher gregariousness of Sumatran orangutans, these differences suggest that Sumatran forests are more productive than Bornean forests (van Schaik, 1999). Although a thorough inter-island comparison of soil types and productivity is needed, the ecological factors underlying the differences may well be tied to divergent geologic histories that included

extensive uplift and volcanism in Sumatra (Muir et al. , 2000), producing much higher soil fertility (van Schaik et al. , 1995).

Higher soil fertility generally results in higher productivity and, consequently, a higher density of orangutans (van Schaik, 1999). Both habitat productivity and orangutan density, then, are likely to influence behavioral traits such as long call rates, rates of encounter, costs of association and therefore the reproductive tactics of both sexes. The Nature of Orangutan Social Organization Adult females tend to have highly overlapping home ranges of up to 900 hectares with the most overlap occurring in areas of high density (Singleton & van Schaik, 2001).

Flanged males do not actively defend territories, but appear to use long calls in part as a site-independent spacing mechanism. In Sumatra, male home ranges are larger than those of females and may exceed 2000-3000 hectares—though perhaps are lower for dominant individuals—and also have extremely high overlap (Singleton & van Schaik, 2001). Variation in male ranging patterns are probably tied to fluctuations in fruit availability, the availability of receptive females, and the presence of other, more dominant males (Delgado & van Schaik, 2000).

Unlike all other diurnal anthropoids, orangutans do not have easily recognizable social units. Individuals are often solitary but associate in parties on a regular basis for social benefits although mean party size tends to remain small because of the high costs of feeding competition (van Schaik, 1999). Behavioral observations such as preferential party associations further suggest individualized relationships between different adult animals (Singleton & van Schaik, 2002).

At some sites in northern Sumatra, clusters of presumably related females associate preferentially with one another (Singleton & van Schaik, 2002). Taken together, these studies suggest the most probable scenario for orangutan social organization is one in which animals form a network of socially distinct associations characteristic of individual-based fission-fusion societies (Delgado & van Schaik, 2000). The network most likely organized around the locally dominant flanged male, who is the preferred mating partner of the area's females (Fox, 2002).

The other flanged males and probably all unflanged males visiting an area may form a separate class, covering several such loose communities (Singleton & van Schaik, 2002). In orangutans, the absence of cohesive group structures does not preclude the presence of social networks. If social units can be described as a group of animals that associate frequently and more so with each other than with individuals of other such groups, then close and permanent spatial proximity is not a necessary requirement for social units.

Distance communication by vocalizations, as well as regular interactions, can lead to individual assessment, mating preferences, spatial coordination and thereby to a loose network of socially distinct relationships. Minimum requirements for such a social system include a high degree of spatial overlap between individual home ranges and the temporal stability of associations. In addition, it should be demonstrated that affiliative social encounters and partner preferences occur on a regular basis.

Singleton and van Schaik (2002) have observed preferential associations among the adult females within their respective study populations. Higher

social units might be more readily identified during masting periods of high fruit availability when both local population density and rates of association between adult individuals increase (van Schaik & van Hooff, 1996). Thus, rather than being a species-specific attribute, orangutan social structure might, in fact, be flexible and highly dependent on local habitat productivity including the distribution and abundance of food resources in time and space.

Because of the high density of large, strangling figs that consistently fruit throughout the year, fluctuations in food availability are less drastic and social organization is expected to be more stable, especially among females. Males, in turn, most likely appear periodically in order to seek reproductive opportunities. The presence and ranging patterns of the dominant resident male (and that of unflanged males) tend to reflect the local abundance of sexually attractive females (Singleton & van Schaik, 2002). Association Patterns

Fruit is not regularly available in large enough concentrations, spatially and temporally, to permit orangutans to be permanently gregarious (van Schaik & van Hooff, 1996). Nonetheless, orangutans regularly will form parties, or temporary non-mating associations. Orangutans encounter each other more frequently than expected by chance and often coordinate travel during times of uneven food distribution (van Schaik & van Hooff, 1996). Nonetheless, mean party size remains small. Orangutans regularly form two types of parties.

In large fruiting trees, they form feeding aggregations that are often a result of an attraction to large food sources. The second type of party is a travel

band, where individuals show coordinated travel between food sources (Fox, 2002). There is variation across sites in the proportion of time that orangutans spend in feeding aggregations and travel bands. At sites, where there are many large strangling figs, estimated party sizes involve many aggregations and relatively few travel bands (van Schaik, 1999). Benefits to party formation are likely to be largely social rather than ecological.

Potential benefits of grouping include access to mates (van Schaik, 1999); for females, protection from male sexual coercion (Fox, 2002); and the socialization of youngsters, including the transmission of cultural information such as the ability to manufacture and use food-extraction tools (van Schaik & Knott, 2001). Ecological benefits are less likely to arise from orangutan associations. (van Schaik & van Hooff, 1996) Independent individuals have a low predation risk because of their large body size and coalitions over food have never been observed (van Schaik, 1999). Furthermore, gregariousness is energetically costly.

Due to their large body size, orangutans require much food and if multiple individuals use the same food source, reduced per capita intake of fruit by subordinates could ensue (Utami et al. , 1997). Animals can respond to high costs of grouping in two different ways. First, they can form parties when the costs are reduced, such as when fruit is abundant or, second, they can form parties when they can pursue the benefits (e. g. consorting with a female) whenever the opportunity to do so arises, sometimes at a considerable cost (van Schaik, 1999). Reproductive Strategies: Male-Male Competition, Sexual Coercion & Female Mate Choice

Flanged adult males express secondary sexual characteristics such as large body size, a well-developed throat sack, wide cheek pads, long, dense cape-like hair, and emit long calls periodically (van Schaik & van Hooff, 1996). Unflanged adult males lack the large body size and secondary sexual characteristics and are known for their higher incidence, relative to flanged males, of forced copulations with females. In the wild, males are unable to defend exclusive territories and instead compete for access to females and typically compete by establishing local dominance relations (van Schaik & van Hooff, 1996).

The locally dominant flanged male and females normally mate within temporary sexual consortships. Females often initiate these consortships by seeking out the locally dominant flanged male with which to copulate (van Schaik & van Hooff, 1996). Thus, it appears females express mating preferences for and against certain males, either by initiating consortships or resisting mating attempts, again suggesting individualized relationships including non-exclusive pair bonds (van Schaik & van Hooff, 1996).

In the wild, females are more inconspicuous than flanged males due to their smaller size and lack of loud long-distance vocalizations. Hence, it is relatively easier for females to locate males than for males to locate females and it seems likely that females often have the opportunity to express active mate choice (van Schaik & van Hooff, 1996). Females will arrive in places where they know males to be or from where they have seen or heard them call (Fox 2002). Why do females have strong preferences for, and aversions to, certain (classes of) males?

The lack of allies and the disparity between adult males and females in terms of size and strength, even when compared to unflanged males, suggest that female orangutans are vulnerable to sexual coercion in the form of harassment (Fox 2002) or the threat of infanticide (Delgado & van Schaik, 2000). Females do not have conspicuous sexual swellings or other visual markers indicating a short and clearly advertised receptive period that might minimize the threat of sexual harassment during non-cycling phases (van Schaik & Van Hooff, 1996).

However, females could easily avoid flanged males by keeping track of their long calls and there is some evidence that they do. Females actively avoid some flanged males (van Schaik & van Hooff, 1996) and willingly engage in temporary non-mating associations or sexual consortships with others (van Schaik & van Hooff, 1996). Unflanged males, in turn, are not as easily avoided and often harass lone females by associating persistently with them in order to force copulations (Fox, 2002).

Consequently, mate choice by orangutan females might best be explained by protection against sexual coercion; specifically, protection against harassment by unflanged males (Fox, 2002) or against the threat of infanticide (Delgado & van Schaik, 2000). Harassment indeed is prevalent in the form of forced copulations, but infanticide has not yet been reported in orangutans. Although the absence of published reports of infanticide by male orangutans makes this hypothesis speculative, the threat of infanticide might still act as a strong selective pressure for male-female associations (Delgado & van Schaik, 2000), even loose ones.

Females have been observed to change their association preferences to the new dominant male after a takeover, suggesting an allegiance to males with high resource-holding potential or fighting ability (Delgado & van Schaik, 2000), presumably for protection against infanticide. Since close, permanent associations in orangutans are normally constrained by ecological factors, females might still do well by maintaining some degree of spatial proximity to flanged males and coordinating ranging patterns.