

# Orangutan male success not due to dominance alone, study finds

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A flanged Bornean orangutan. Credit: Suwi / Tuanan Orangutan Project

In primates, the biggest, bossiest males usually get to father the most offspring; and for a long time it was thought that this rule applied to orangutans too. Male orangutans openly compete; and it's the older males

with hefty cheek pads, known as "flanges," who usually get their way when they want to mate. But for wild orangutans, nobody knew for sure which males actually won the ultimate prize of fathering offspring.

Now, the largest paternity study on a natural population has finally provided some answers. The study on Bornean orangutans reveals that simply beating males in competitions, per se, did not lead to siring success. Rather, success was determined by where males chose to spend their time.

The work by an international team led by scientists now at the Max Planck Institute of Animal Behavior (MPI-AB) has produced the clearest picture yet on how orangutans become fathers in the wild, and the space they need to do so.

"Male orangutans are so problematic to study in the wild that the window into their reproductive lives has stayed closed," says MPI-AB scientist Maria van Noordwijk, the first author on the paper [published](#) in *Behavioral Ecology and Sociobiology*. "Now, with 15 years of combined data on behavior and DNA, we finally have a small opening."

## **Finding the 'lost boys of orangutan science'**

Since 2003, the team has been continuously collecting data on Bornean orangutans in the Tuanan area in Central Kalimantan, Indonesia. The Tuanan Orangutan Research Project has amassed some of the most detailed data anywhere on a wild [orangutan](#) population, but even here, adult males have languished out of the scientific spotlight.

"They are the lost boys of orangutan science," says van Noordwijk. "Adult males range over areas far larger than any study site so that no human observer can gain data on them continuously." This practical issue has meant that a basic question—which males father offspring

where and when—has remained unanswered.

Much more is known about the reproductive careers of females, who stay in the neighborhoods in which they were born. Females mate with multiple males, sometimes in a single day. After birth, offspring stay with their mother for up to nine years.

"For every orangutan born you always know who the mother is," says van Noordwijk. "But figuring out who the father is requires DNA."

The team collected [fecal samples](#) from as many individuals in Tuanan as possible—mothers, offspring, and adult males. For adult males, the scientists collected samples from both morphs: the younger [adult males](#) who had not yet developed cheek flanges, and males who were flanged.

After extracting [genetic information](#) from the samples, they could successfully identify fathers of 21 offspring. The next step was to find out more about what these fathers were like at the time of mating—whether they were flanged, and how they behaved.

To do that, the researchers drew on over 100,000 hours of observations at Tuanan. This data allowed them to calculate when eight of these babies were conceived, and to cross check that with observations of which males were around in the area at the time. "We could turn back the clock to the period when a successful mating occurred and see which male got the winning lottery ticket, and why," says van Noordwijk.



An unflanged male Bornean orangutan. Credit: Anna Marzec / Tuanan Project

Their results showed that males with flanges succeeded in siring most offspring: over 90% of babies had fathers who were flanged at the time of conception, implying that older males, over 30 years old, were disproportionately successful.

"Flanged males can consistently displace unflanged males, so we were not surprised by this result," van Noordwijk says. But while virtually all fathers were flanged, not all flanged males became fathers. So what was it about the successful males?

The team drilled down into the data, looking for patterns among flanged males that could explain the skew. Surprisingly, they did not find any evidence that successful fathers had outcompeted other males by emitting the most 'long calls,' which can be heard far away. "In other words, having the confidence to advertise your presence might be enough to intimidate other males, but it doesn't lead to securing offspring," explains van Noordwijk.

Instead, the answer was found in an unlikely place: movement behavior. Co-author Laura LaBarge, a spatial analysis expert, looked at movement patterns of four fathers with enough data.

"The data were chaotic," says LaBarge, a postdoctoral researcher at MPI-AB. "Males move in and out of the site so much that we have only partial tracks of where they were." Still, LaBarge detected a signal in the data. Fathers all spent more time near the females with whom they sired offspring than they did with other females.

"Nobody expected this," says Carel van Schaik, senior author and scientist at MPI-AB. "This shows that dominance works for flanged males, but only up to a point. After that, it seems like concentrating on one neighborhood, rather than roaming too widely, is the best strategy to fatherhood."

The authors acknowledge that the question of why this strategy works is still open. "It could be that local males have more information about when females are ready to breed," says van Schaik. "But we should not ignore the role of the females. By keeping local males as likely fathers of their [offspring](#), mothers are protecting their young from potential aggression by males who are definitely unrelated."

## **Room to reproduce**

LaBarge's movement analyses also provided tantalizing clues on the enduring mystery of where, and how far, male orangutans roam. "Many appear to be nomadic, but they do tend to return to the study area, probably to assess their chances with females," she says.

To find out more, LaBarge and van Noordwijk are currently analyzing acoustic data from male calls as indicators of their movement. By doing so, they hope to widen the frame of understanding of male orangutan behavior.

"I hope this strengthens our commitment to preserving large areas of remaining habitat to give orangutans a decent chance to maintain their natural patterns of ranging and reproduction," says van Noordwijk.

Many details are still missing, and van Noordwijk says that collaboration is urgently needed to fill in the blank pages of orangutan fatherhood before it's too late. "I hope this inspires other orangutan field sites to assess paternities and male movement to see how consistent this pattern is. With [forest fires](#), climate change, and deforestation, we can't afford to wait any longer."

**More information:** Maria A. van Noordwijk et al, Reproductive success of Bornean orangutan males: scattered in time but clustered in space, *Behavioral Ecology and Sociobiology* (2023). [DOI: 10.1007/s00265-023-03407-6](#)

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