The anogenital swelling of female Barbary macaques is a confusing signal to males

Christopher Young[1], Bonaventura Majolo[2], Michael Heistermann[3], Oliver Schülke[1] & Julia Ostner[1]

Courant Research Centre Evolution of Social Behaviour, Georg-August-University Göttingen[1]
School of Psychology, University of Lincoln, UK[2]
The Reproductive Biology Unit, German Primate Center, Göttingen[3]

Aim: Examine what males know about female swellings

Background

- Anogenital swellings may indicate timing of ovulation, so males should concentrate mating behaviour around this period
- If males cannot distinguish post-conception swellings it could be a female strategy to increase paternity confusion/reduce male monopolization
- Previous research has shown contradictory results in Barbary macaques: one study showing males concentrate mating behaviour on conception swellings while another did not; both in free-ranging popluations (Küster & Paul 1984, Small 1990, Brauch et al. 2007)

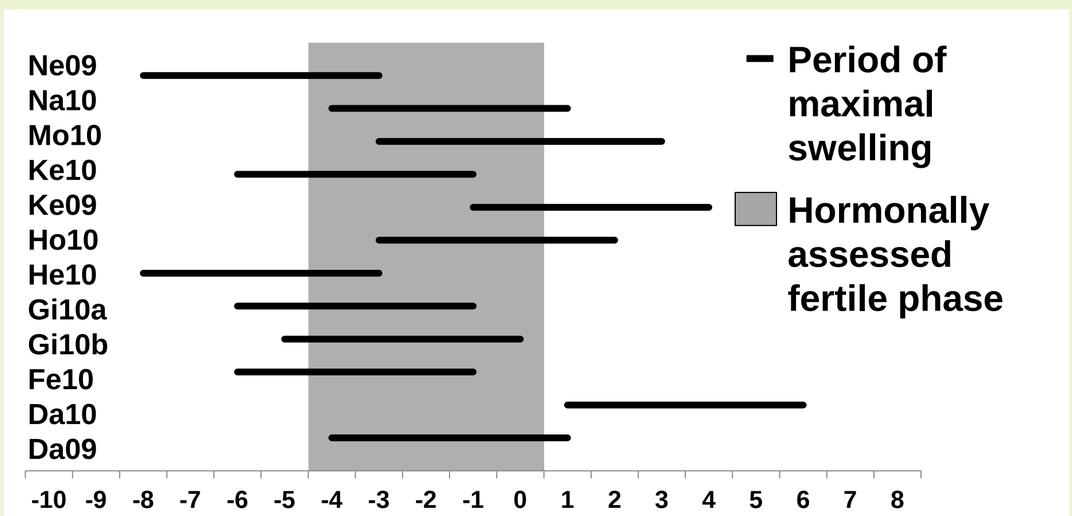
Conclusions

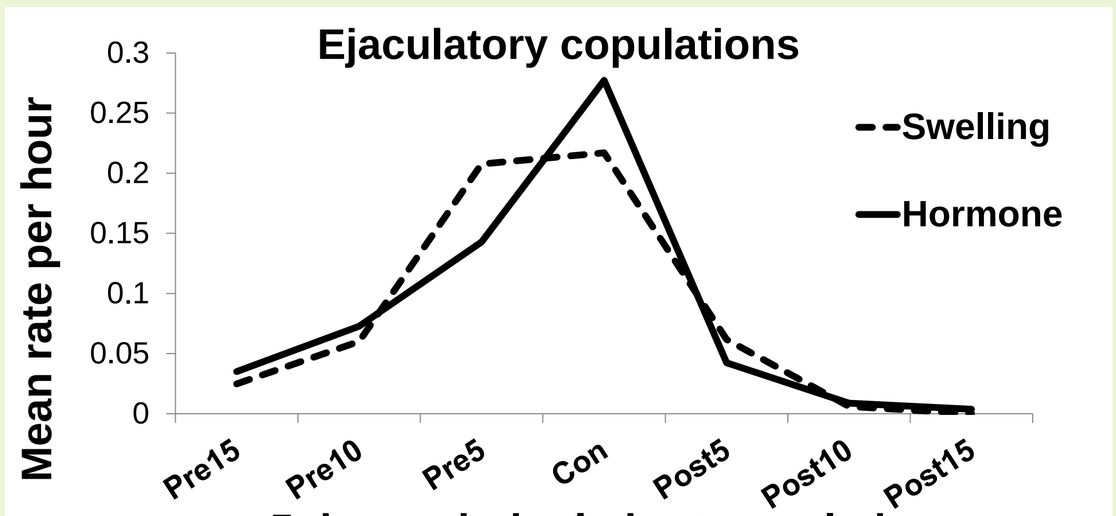
- Males seem to understand swellings indicate ovulation timing

But:

- Male cannot differentiate conception and post-conception swellings
- Suggests swellings evolved for confusion not concentration

Comparing hormonal and visual swelling data



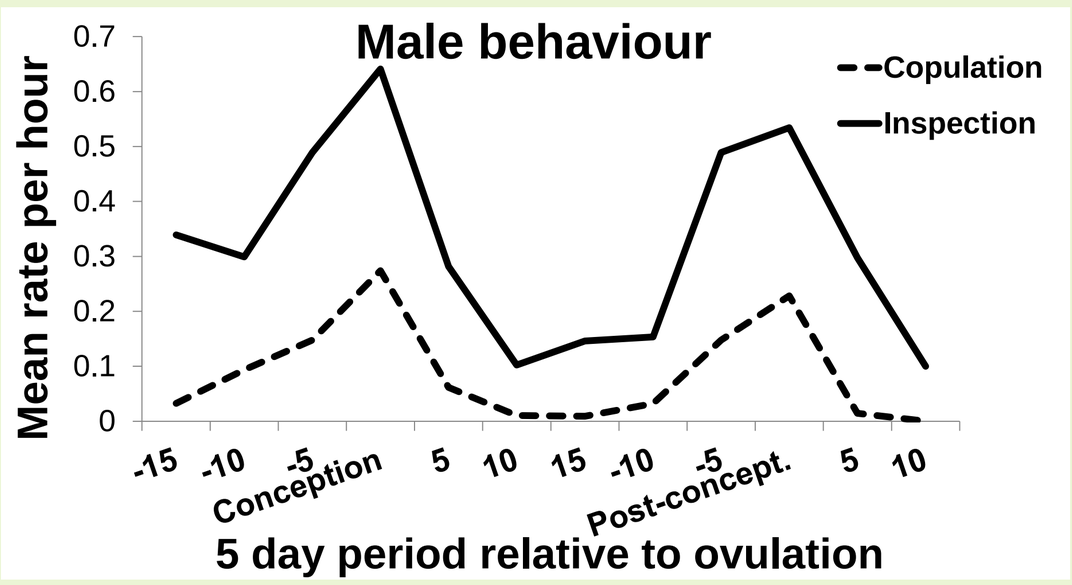


- Majority of swelling days are within the fertile phase (Binomial $x = 53$, $N = 72$, $P = 0.001$)
- Swellings confuse males

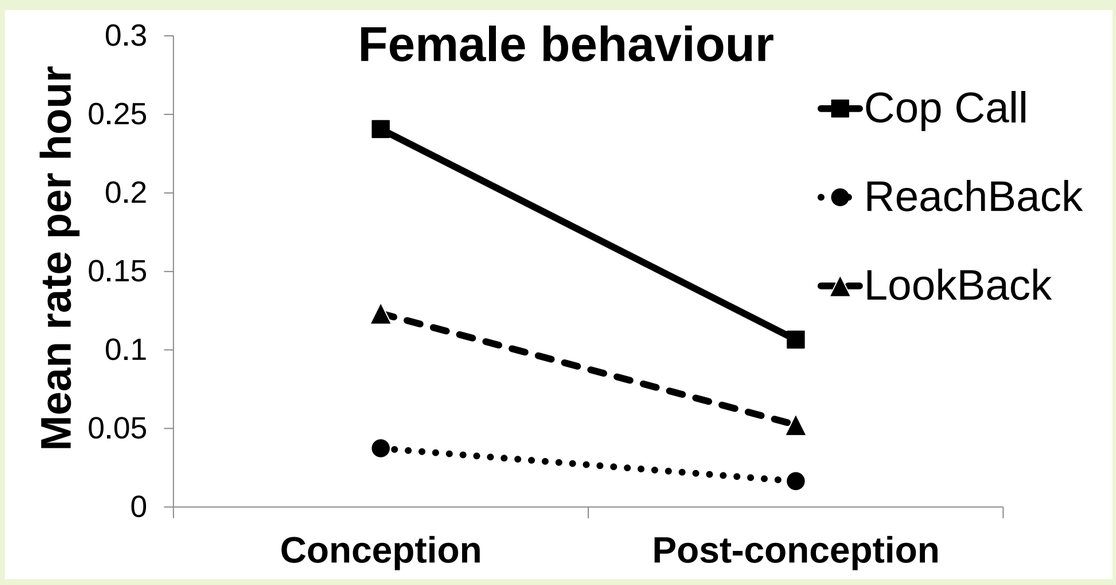
- No sig. difference in male behaviour between swelling & hormone data (Wilcoxon: for all tests $P > 0.19$)
- Males may know something about fertile phase

Comparing swelling periods

- No difference in male behaviour between conception & post-conception swellings (Wilcoxon: Copulations $P = 0.24$; Inspections $P = 0.63$)
- Males cannot differentiate swellings



- No sig. difference in female sexual behaviour (Wilcoxon: for all behaviours $P > 0.48$)
- Confusion not female driven



Methods

- Data collected from two wild groups of Le Parc National D'Ifrane, Azrou, Morocco
- Behavioural data collected on 14 adult males using continuous focals (2,188hrs) from Oct. 2009 through Apr. 2011 and 1,033 faecal samples collected from 15 females
- Female samples analysed hormonally to determine fertile phase (most likely ovulation) via enzyme-immunoassays examining progestogen metabolite concentrations (Ziegler et al. 2000, Heistermann et al. 2008)
- Swellings also determined visually using "peri-ovulatory" period; -2 to -7 days before detumescence
- 5 day periods determined before and after fertile period and post-conception swelling
- Male behaviour (ejaculatory copulations and inspections) and female behaviour compared using Wilxocon signed rank tests between conception and post-conception periods and peri-ovulatory and hormonal periods

References

Brauch et al. 2007, Horm. Behav., 52, 375-383. Heistermann et al. 2008, Am. J. Primatol., 70, 44-53. Küster & Paul 1984, Fol. Primatol, 43, 69-83. Small 1990, Am. J. Primatol., 20, 267-282. Ziegler et al. 2000, Am. J. Primatol., 51, 119- 134.

Acknowledgments

We are grateful to our collaborator Professor Mohamed Qarro (Ecole Nationale Forestière d'Ingénieurs, Salé, Morocco) and the Haut Commissariat des Eaux et Forêts of Morocco for granting us permission to work in Morocco. We also thank our field assistants Michael Madole, Dave Thomas, Sofia Santos, Maria Thunström, Tom Smith and Josephine Msindai for their invaluable assistance in the project. Andrea Heistermann and Petra Kiesel for expertise during hormone analysis. Further Information: The Barbary Macaque Project - http://barbarymacaque.blogs.lincoln.ac.uk/ Research funded by Max Planck Society, Christian Vogel Fonds and the German Initiative for Excellence.