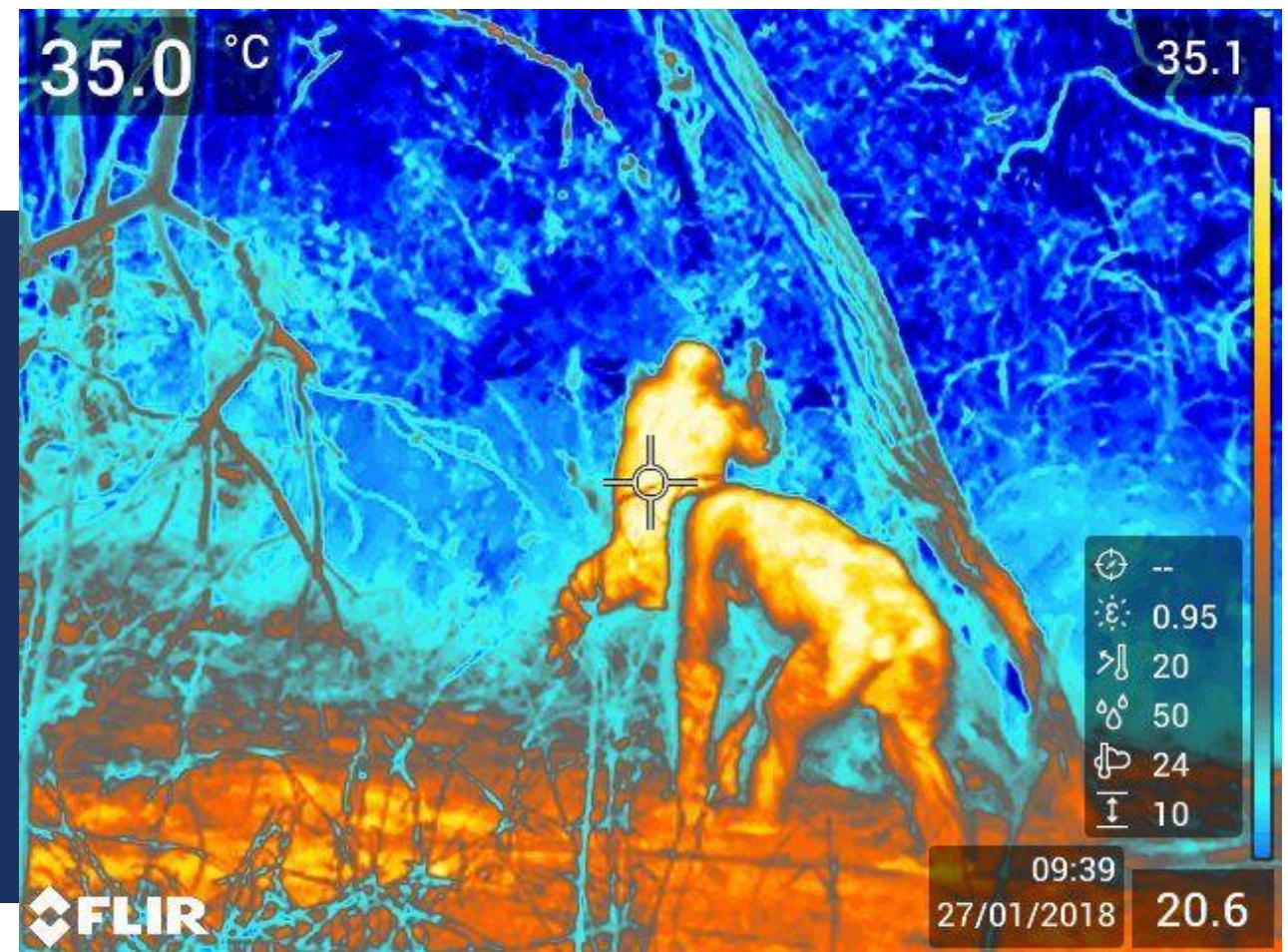


THERMO-IMAGING BIPEDALISM ON THE SAVANNA: CHIMPANZEE LOCOMOTION AT FONGOLI, SENEGAL AND IMPLICATIONS FOR THE EVOLUTION OF HOMININ BIPEDALISM

NICOLE WACKERLY



WHY ARE HUMANS BIPEDAL?



Current Biology: Mathias Osvath



BIPEDAL EVOLUTION AND THERMOREGULATION

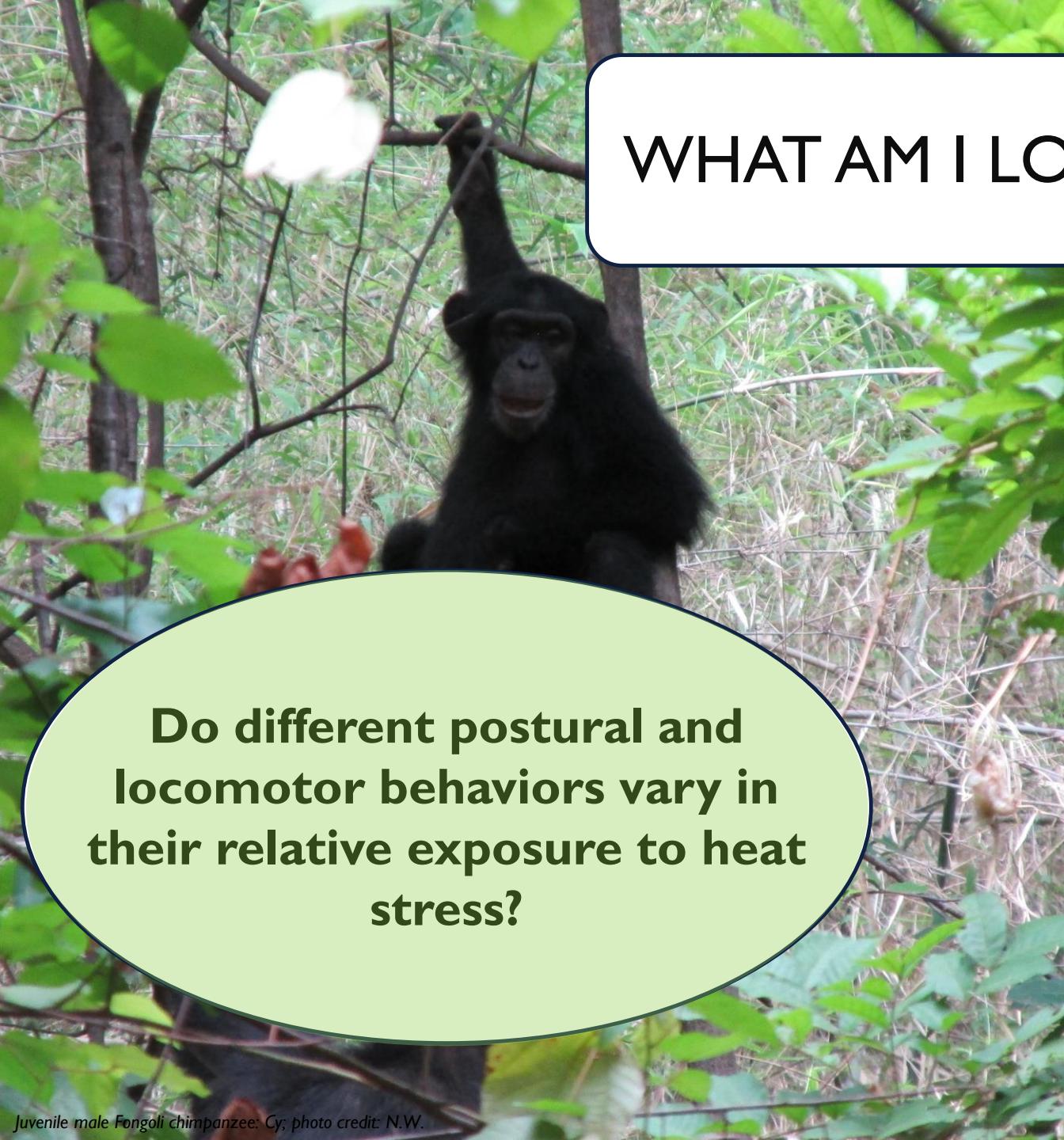
- Shift in habitat from closed canopy to a more open, woody-savanna environment
 - Introduced new hardships
- Bipedalism:
 - Reduces surface area exposed to direct sunlight,
 - Increases exposure to airflow by raising body surfaces above the ground
 - Favored to overcome the challenges of a hot, dry and open environment



WHAT DOES THIS HAVE TO DO WITH CHIMPS??

Savanna chimpanzees make good referential models:

- Close evolutionary relationship to humans (homology)
- Similarities in habitat to early hominins (analogy)



WHAT AM I LOOKING FOR?

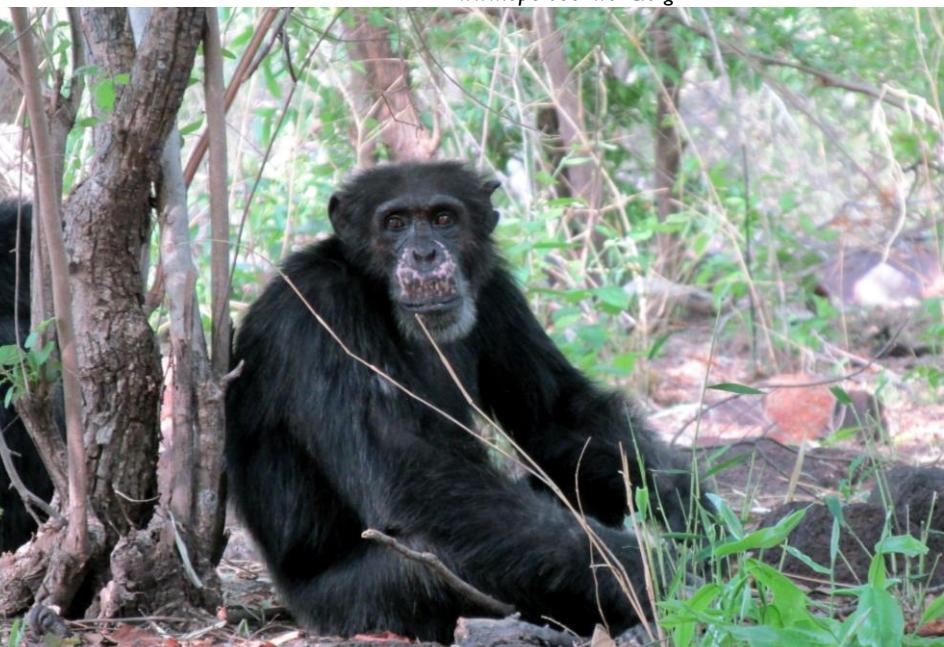
Do different postural and locomotor behaviors vary in their relative exposure to heat stress?



Do open habitats exert significant thermal stresses on apes at Fongoli?

METHODS – STUDY SITE & SUBJECTS

- Fongoli field site in southeastern Senegal
 - Mosaic of grassland, woodland, gallery forest, bamboo woodland and ecotone forest habitats
- Focal subjects: adult male chimpanzees (*Pan troglodytes verus*)
 - n=12
 - Well-habituated (since 2005)
- Followed from night nest to night nest, with behavioral data collected at rough 5-minute intervals using a thermo-imaging camera



Adult male Fongoli chimpanzee: Bandit; photo credit: N.W.

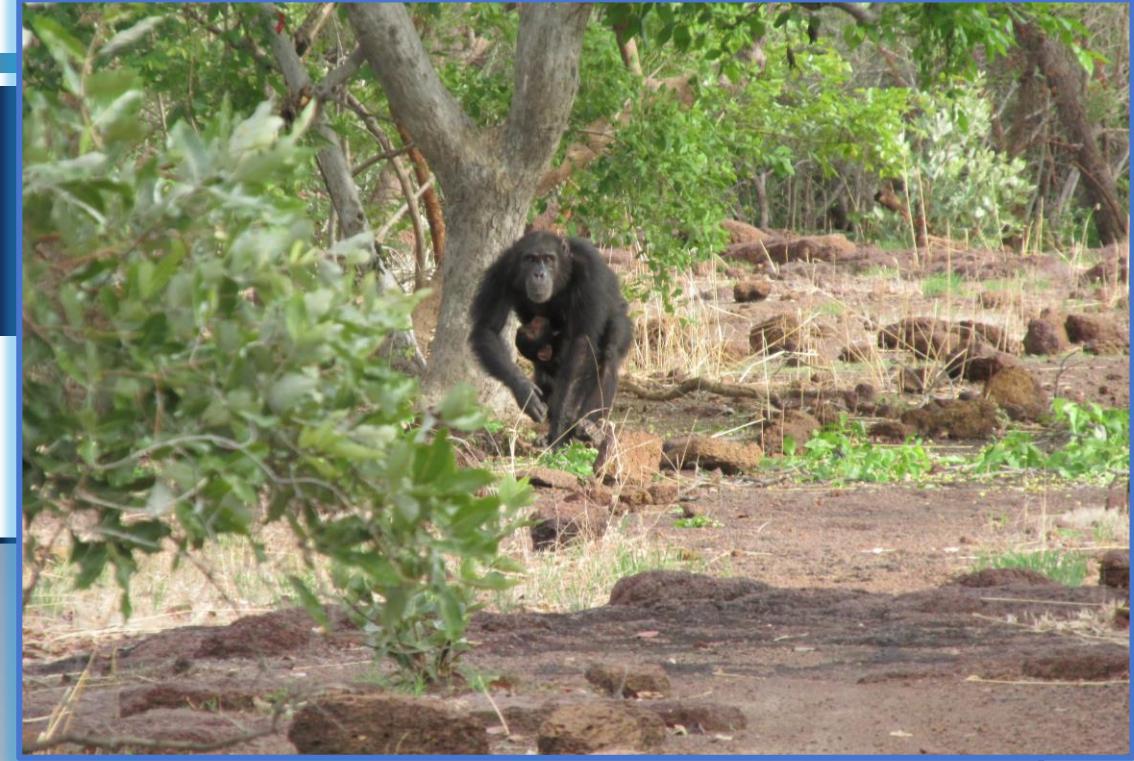
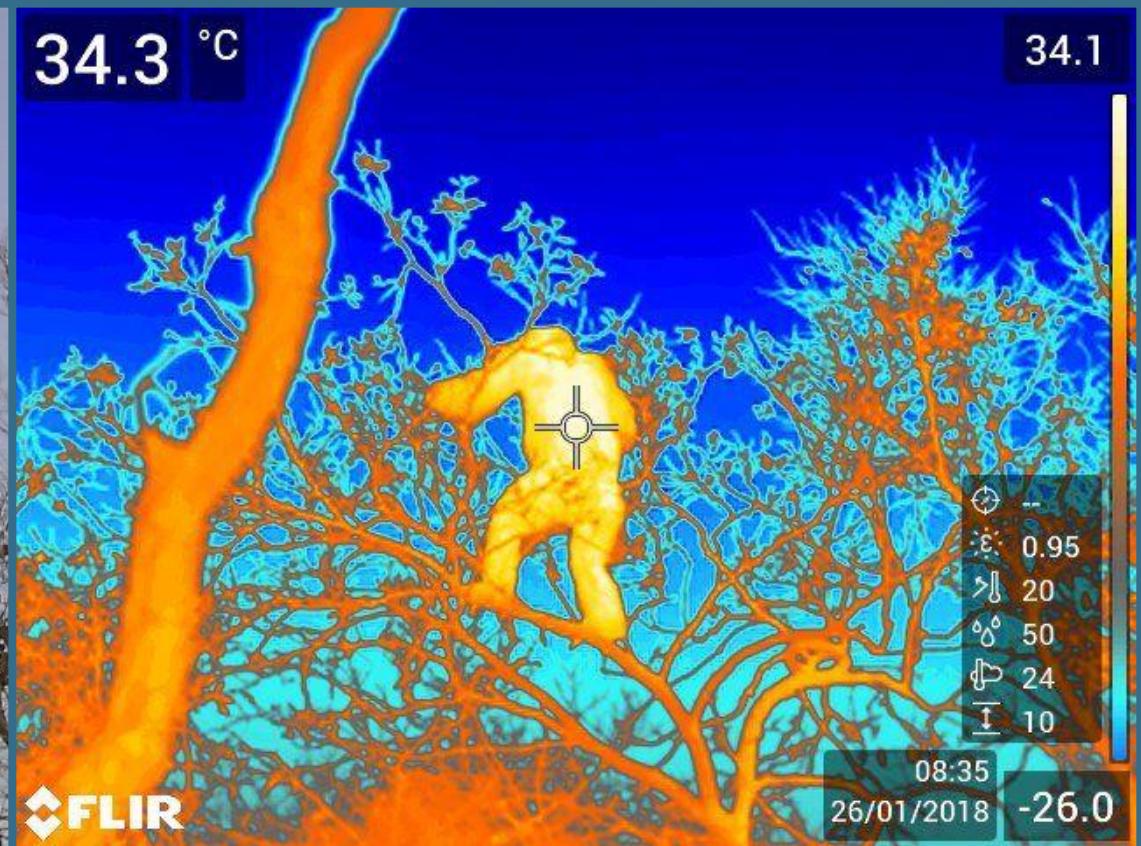
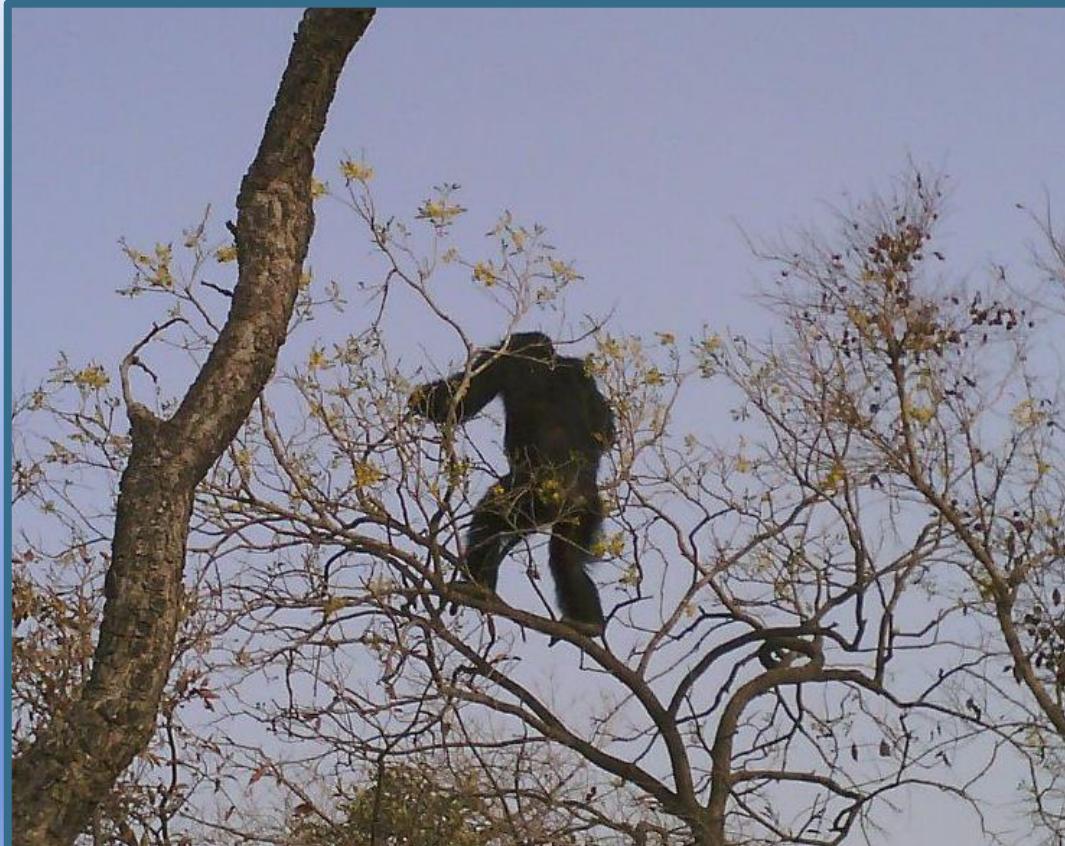


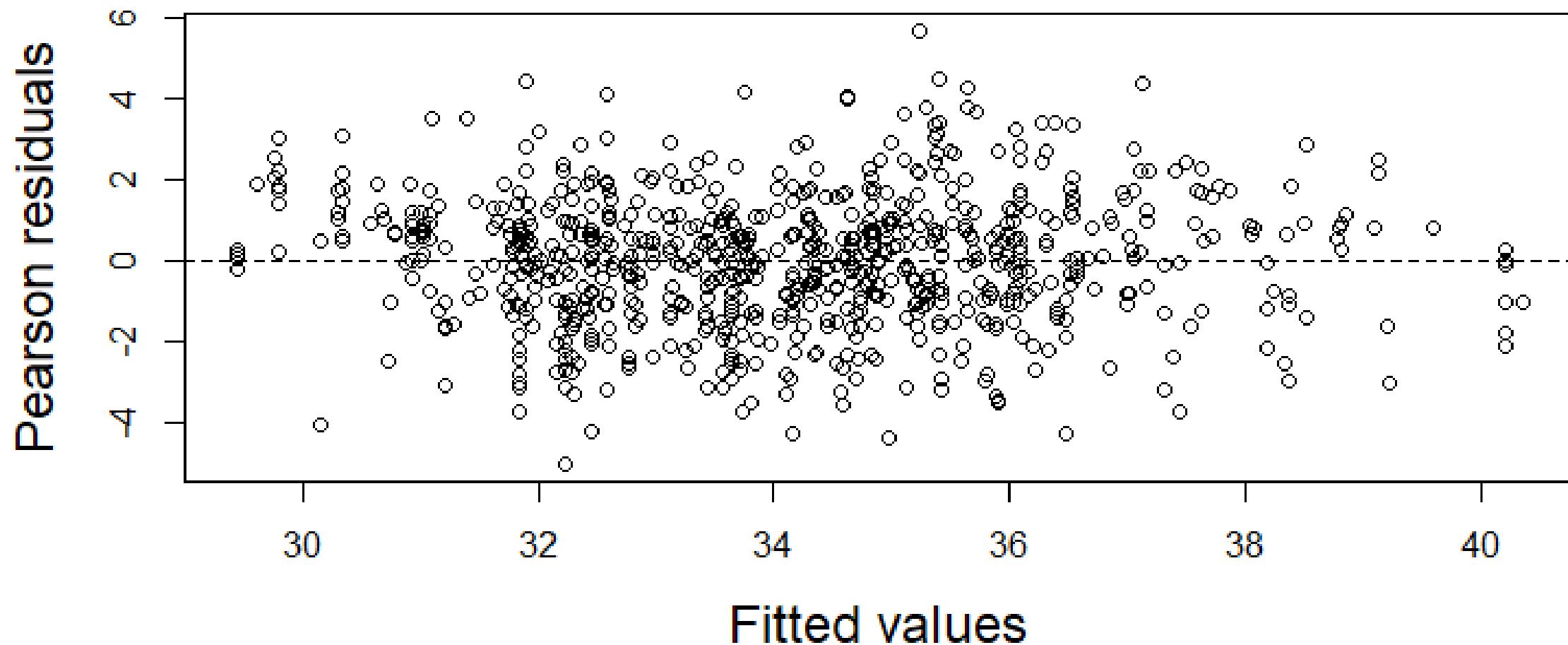
Photo credit: N.W.



DETERMINING MY BEST MODEL...

- Followed a Normal Distribution
- Both Fixed and Random Effects present
 - **LINEAR MIXED MODEL!**
- Made a full model → reduced models → compared AIC values
- Compared best model with & without outliers
 - Residual plots

Model





THE MODEL!

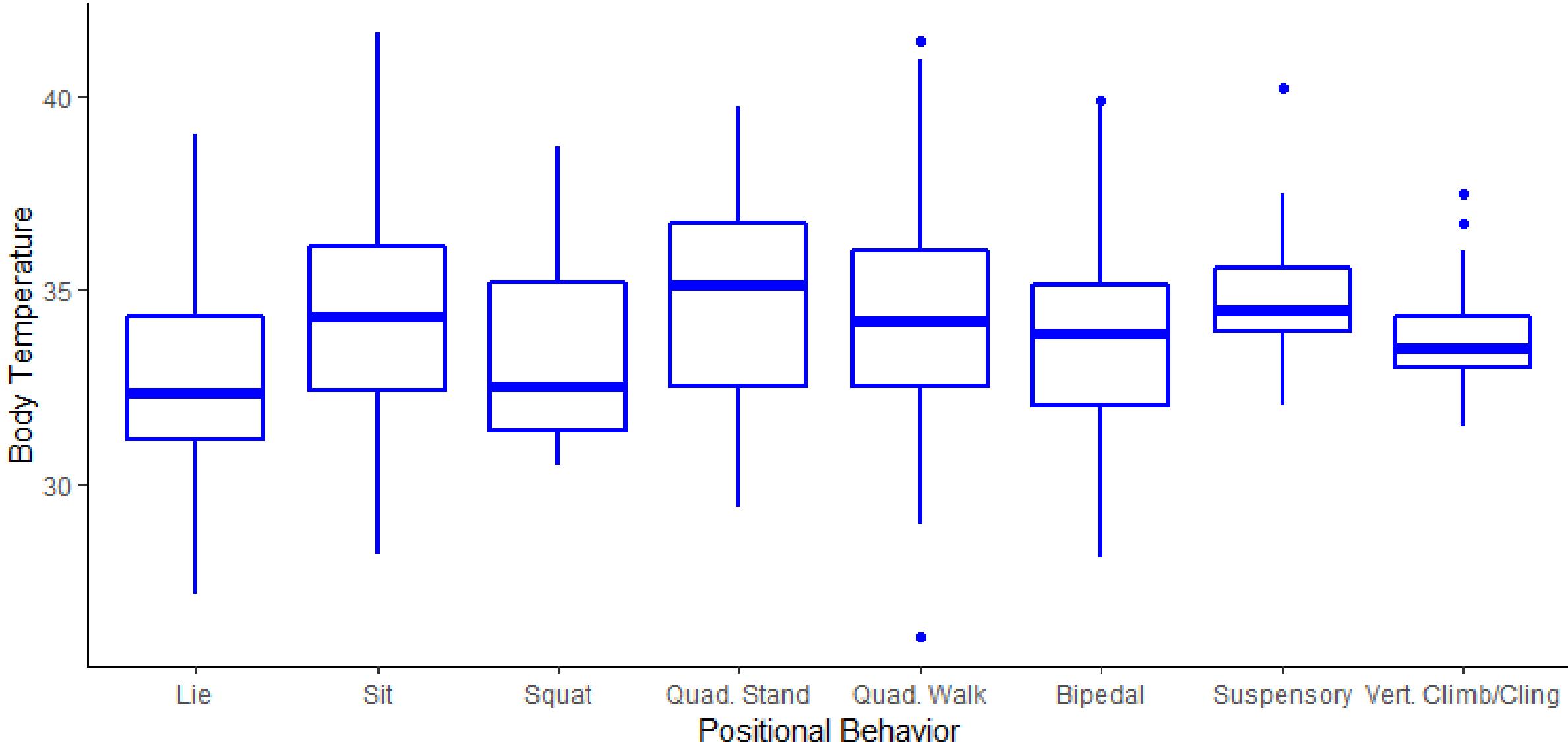
- Linear Mixed Model
- Thermo-temp ~ positional behavior + time of day + sun + date + habitat type + (I|individual)

	Estimate	Std. Error	t-value	Confidence Interval	p-value
Intercept	988.83	117.51	8.415	759.12, 1215.38 *	--
Lie	-1.418	0.317	-4.466	-2.03, -0.79*	0.0002
Squat	-0.310	0.679	-0.456	-1.63, 1.01	0.9998
Sit	0.143	0.256	0.559	-0.64, 0.35	0.9993
Quadrupedal					
Walk	-0.292	0.269	-1.084	-0.81, 0.23	0.9602
Bipedal	-0.689	0.276	-2.495	-1.22, -0.15*	0.2001
Suspensory	0.084	0.571	0.148	-1.19, 1.03	1.0000
Vertical					
Climb/Cling	-0.641	0.407	-1.576	-1.43, 0.15	0.7657

Post hoc pairwise analysis with Tukey adjustment

- “results are averaged over the levels of: time_od & hab_type”

Effect of Positional Behavior on Body Temperature (Raw)



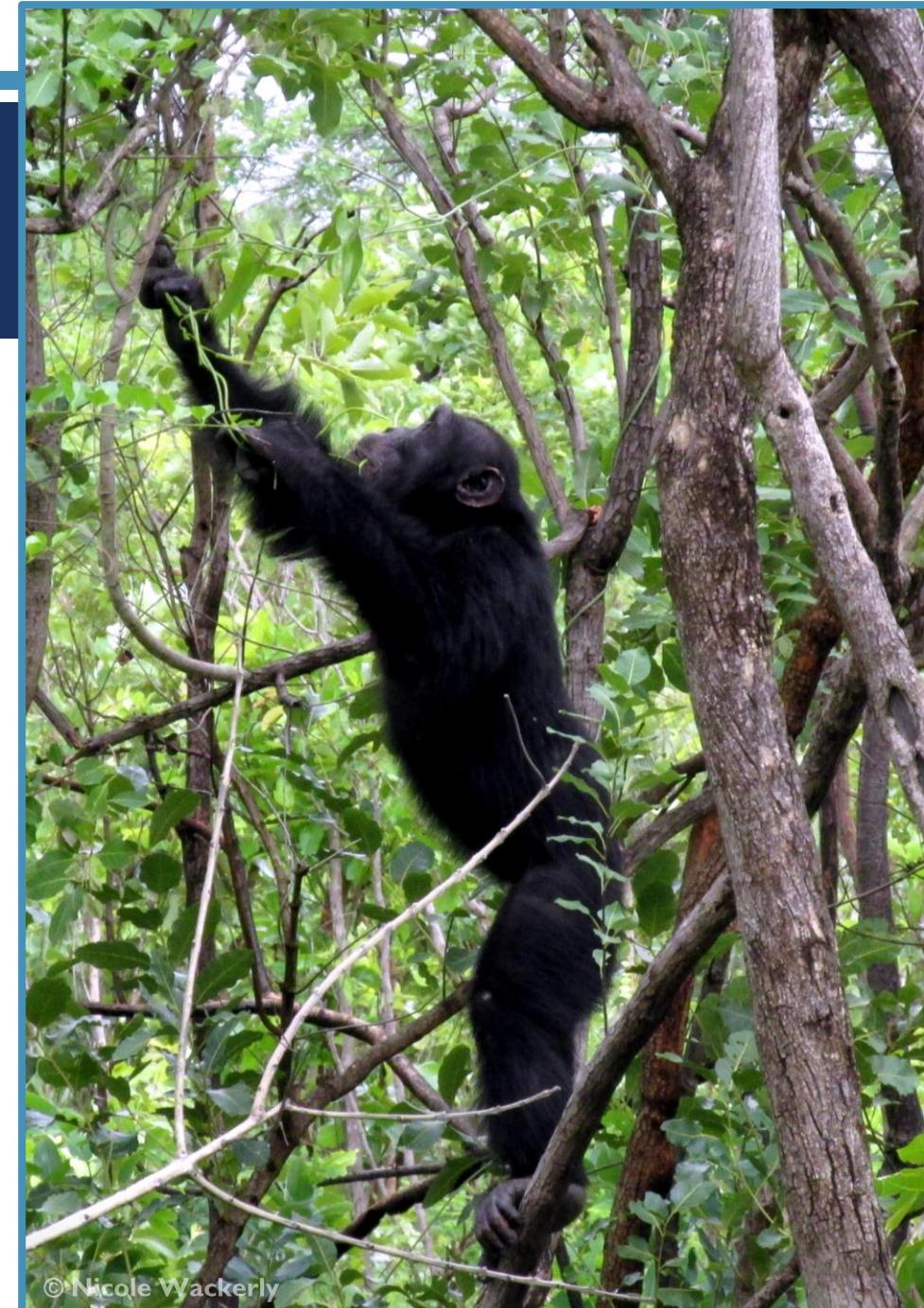
DO DIFFERENT POSITIONAL BEHAVIORS VARY IN RELATIVE EXPOSURE TO HEAT STRESS?

- Postural and locomotor modes expected to differ in exposure to UV radiation, thereby altering the experienced thermal load
- Bipedal posture and locomotion:
 - predicted to be associated with a lower body temperature



CONCLUSION

- Only some positional behaviors differed significantly in their effect on body temperature when compared to other positions
 - Lie
 - Bipedalism...
- Bipedalism as a means of thermoregulation?
 - Possibly...



© Nicole Wackerly

