Explaining the findings at an individual level

Are immigrant males stronger competitors than natals?

Does competition from increased density of immigrant males affect breeding success?

Do the effects of competition depend on female temporal availability?

Individual models of breeding success

Annual breeding success, Failure to breed

Duration of rut (days)

Age, Age^2

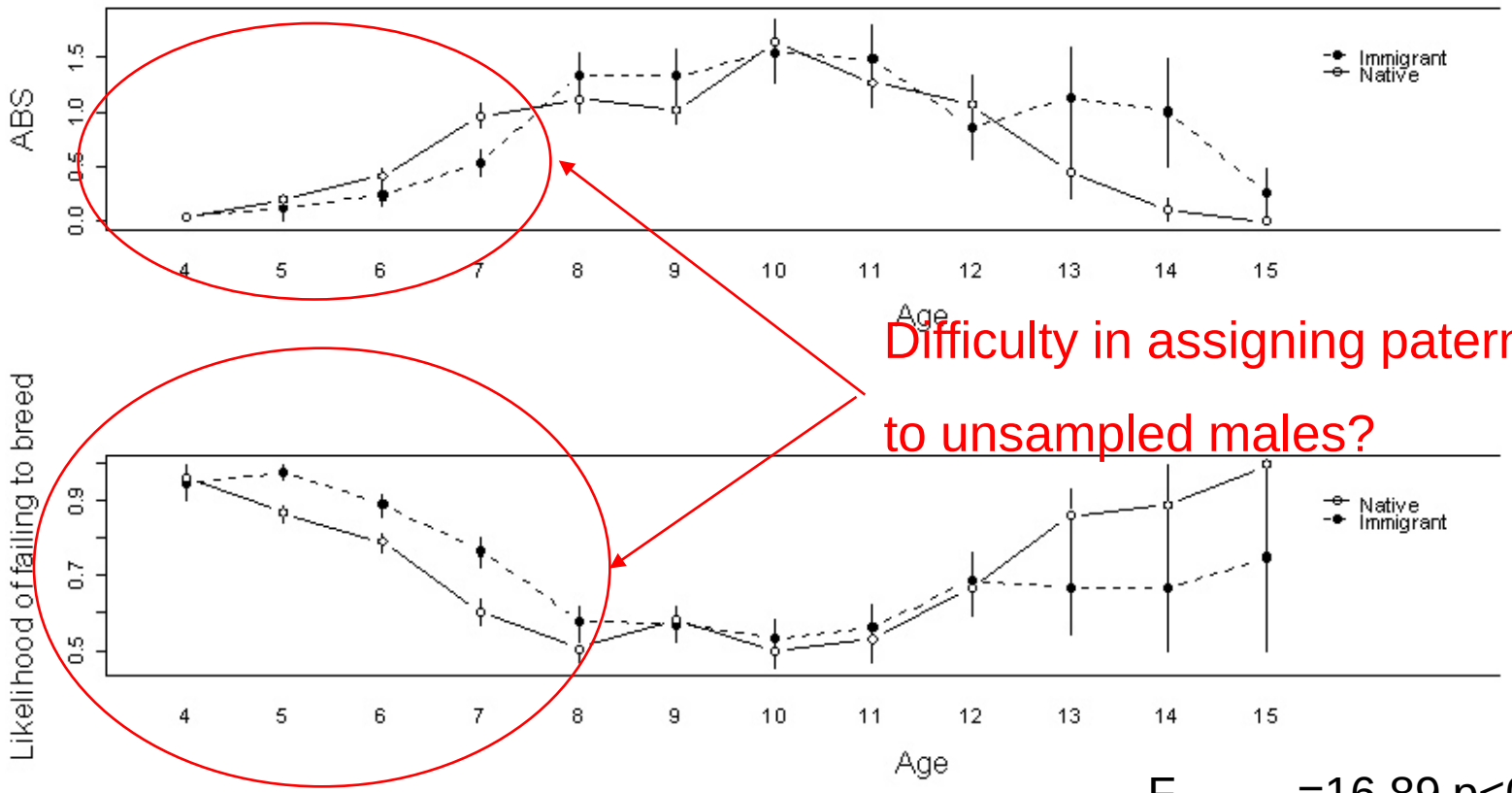
Immigrant status

Number of immigrant males rutting

Variance in female oestrus date

Are immigrant males stronger competitors than natals?

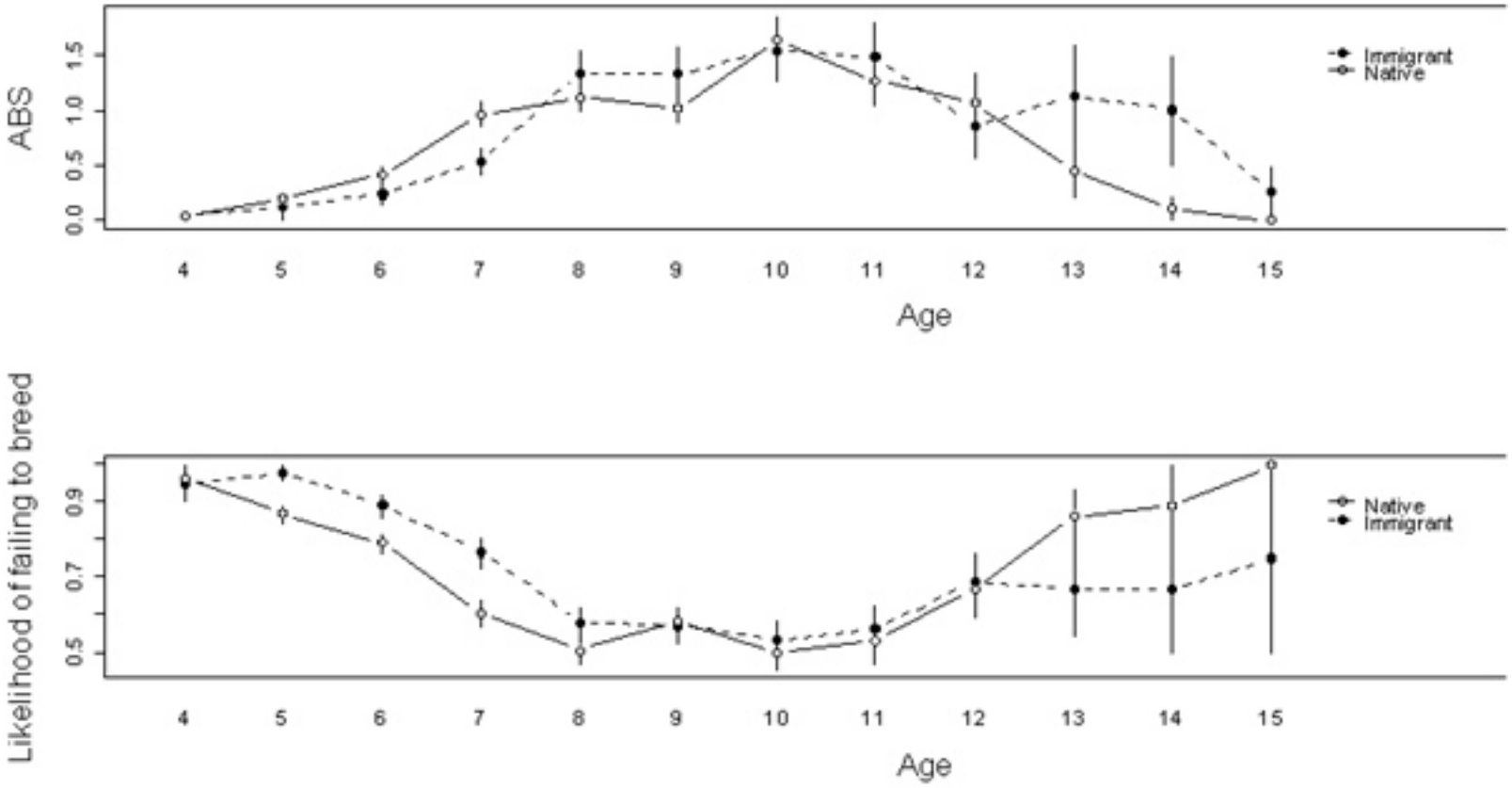
$F_{1,1379.4}=11.63$ $p<0.01$



Difficulty in assigning paternities to unsampled males?

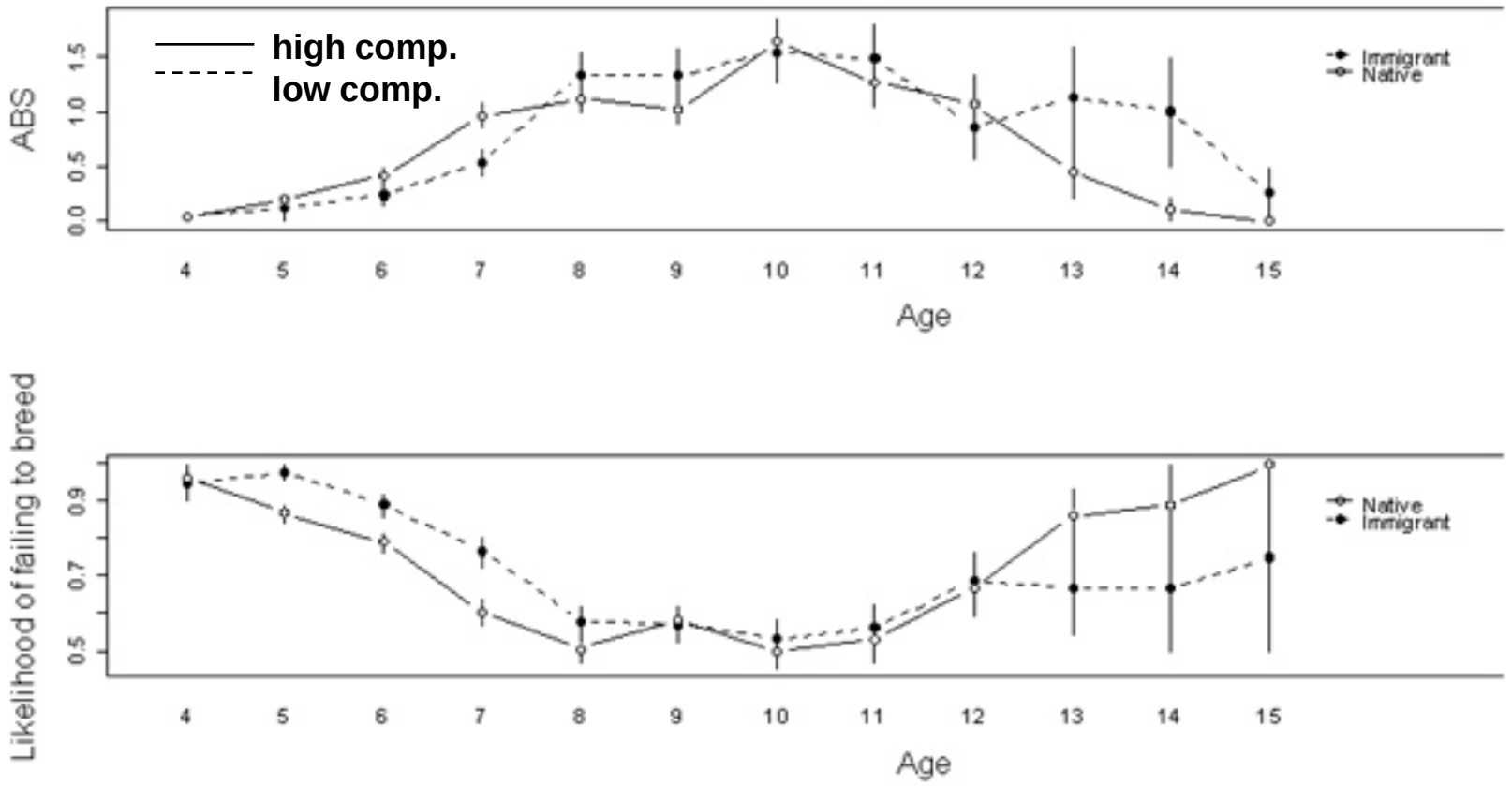
$F_{1,1761.4}=16.89$ $p<0.01$

Immigrants and Natals



$F_{1,1554.3}$=6.00, p=0.014

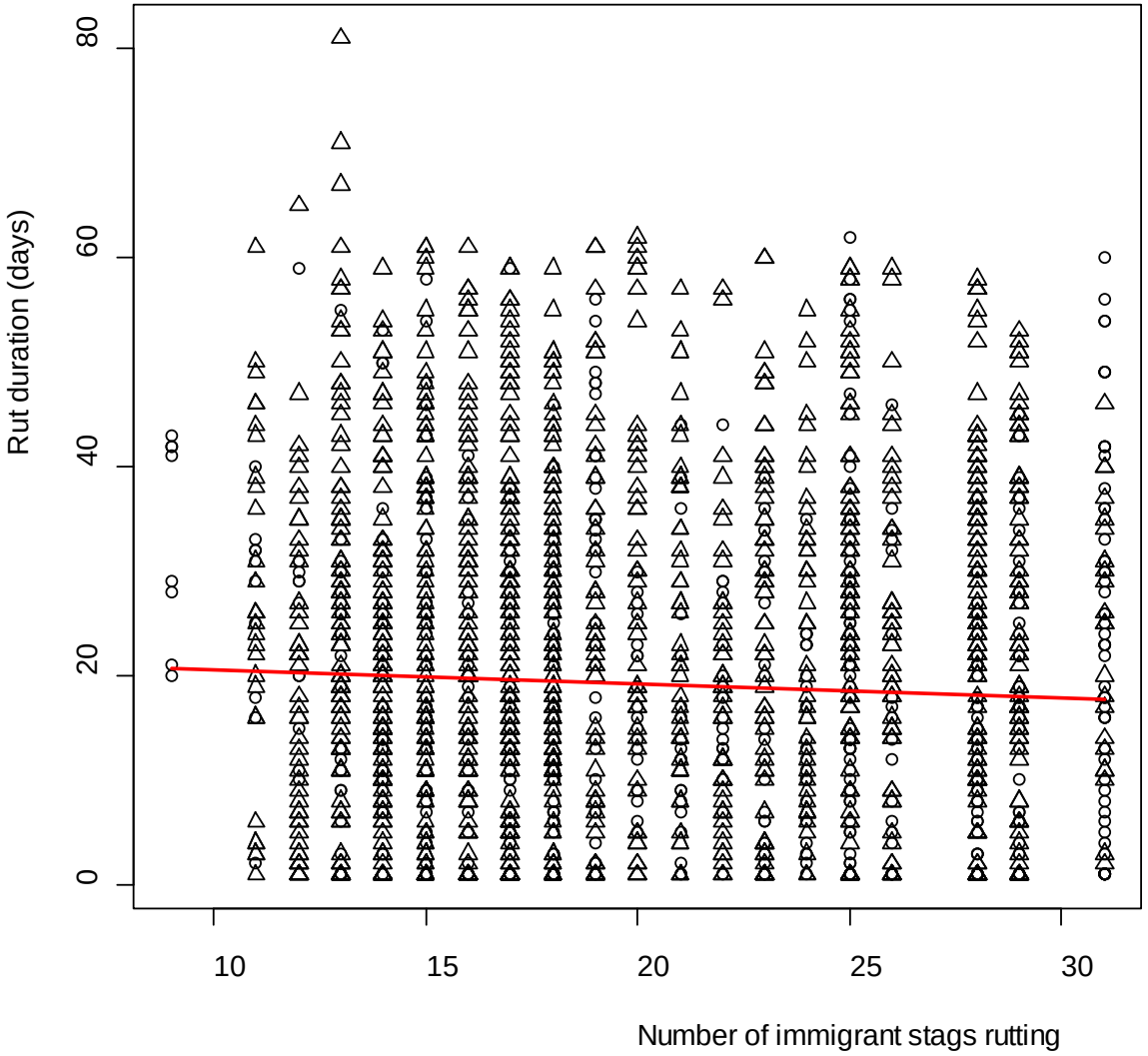
Does competition from increased density of immigrant males affect breeding success?



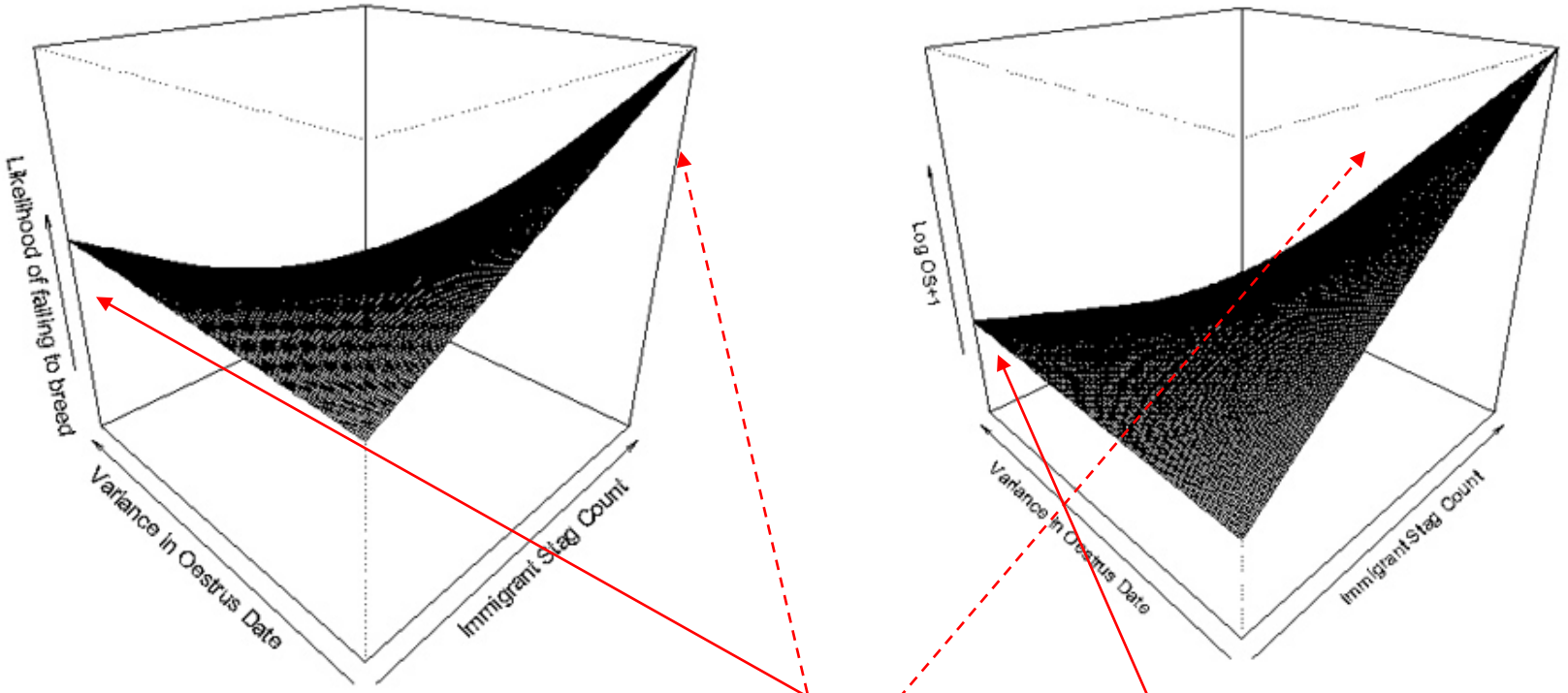
$F_{1,1785.6}=13.6$, $p<0.01$

$F_{1,1901}=8.29$, $p<0.01$

And shorter rut durations for immigrants…



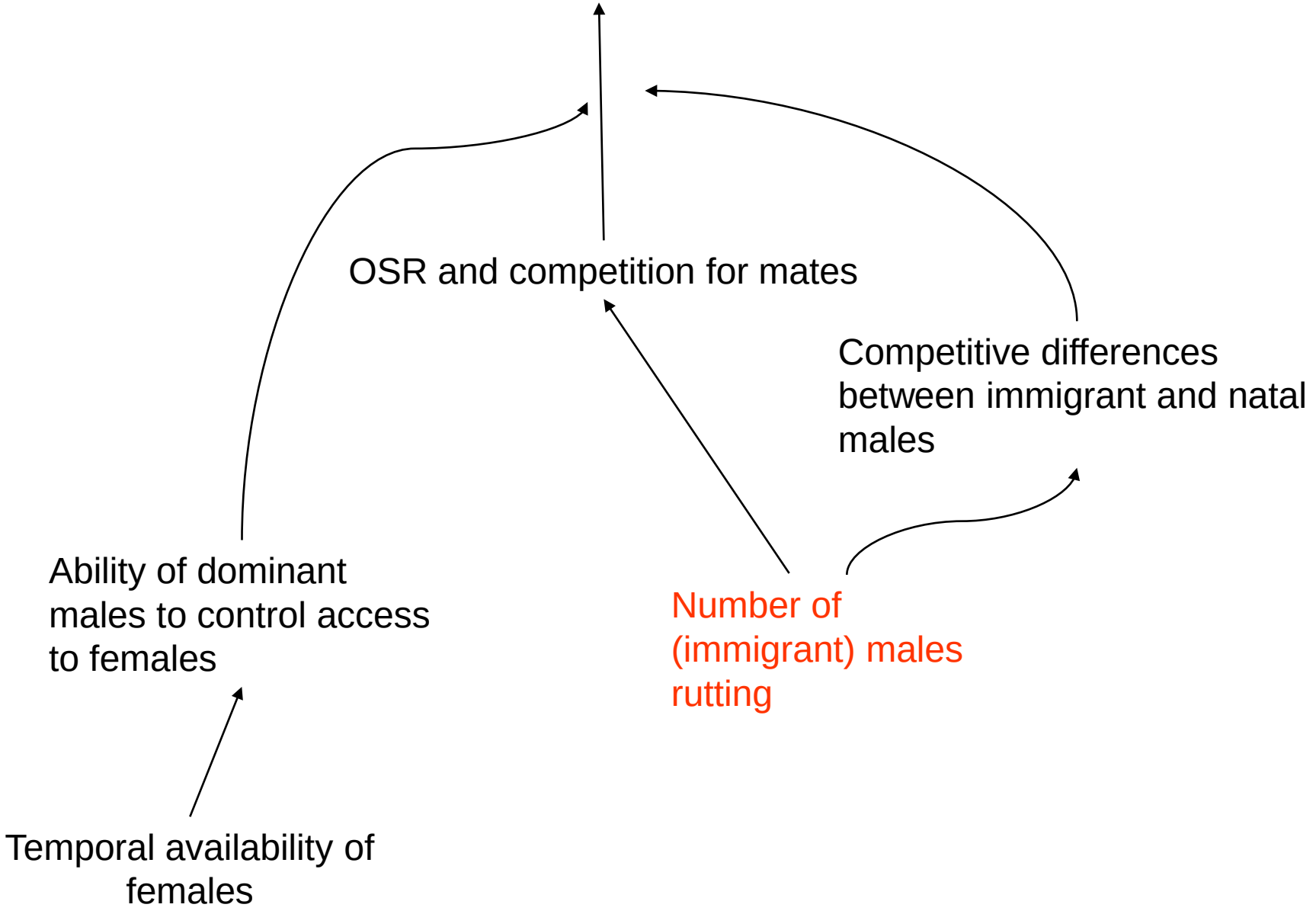
Do the effects of competition depend on female temporal availability?



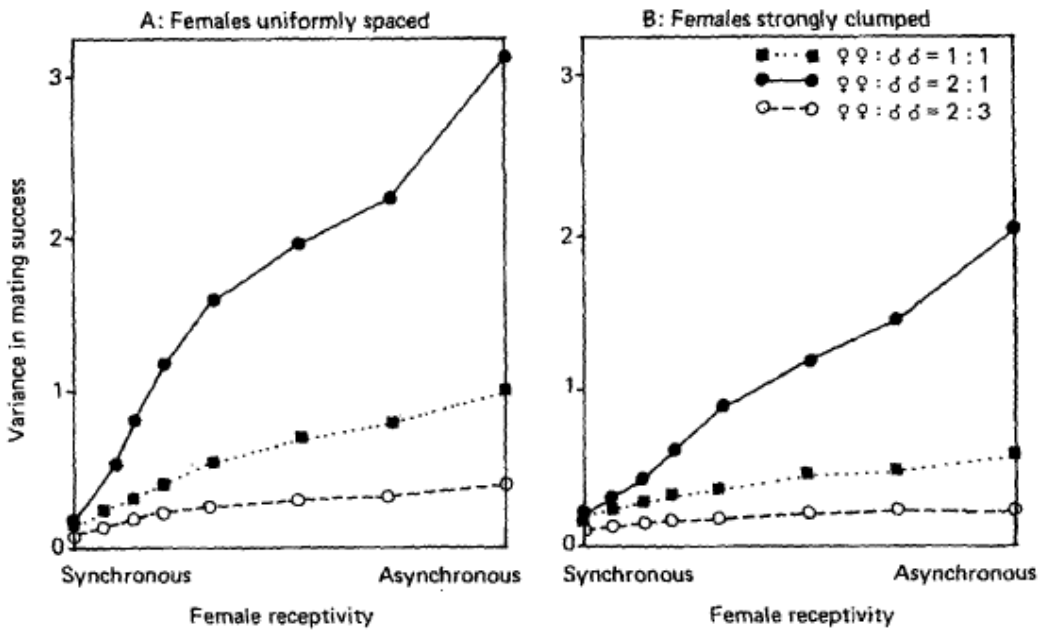
High competition: instability in harem holding coupled with increased variance in oestrus dates widens the group of males with access to females

Low competition: variance in female availability allows dominant males to monopolize oestrous females

Opportunity for sexual selection



Conclusions: competition and temporal female availability



Ims (1988): variance in mating success decreases with a male-biased sex ratio when females are asynchronous

Future Questions

Why did we find no significant effects of climate?

Acknowledgements

- Josephine Pemberton and Dan Nussey for supervision
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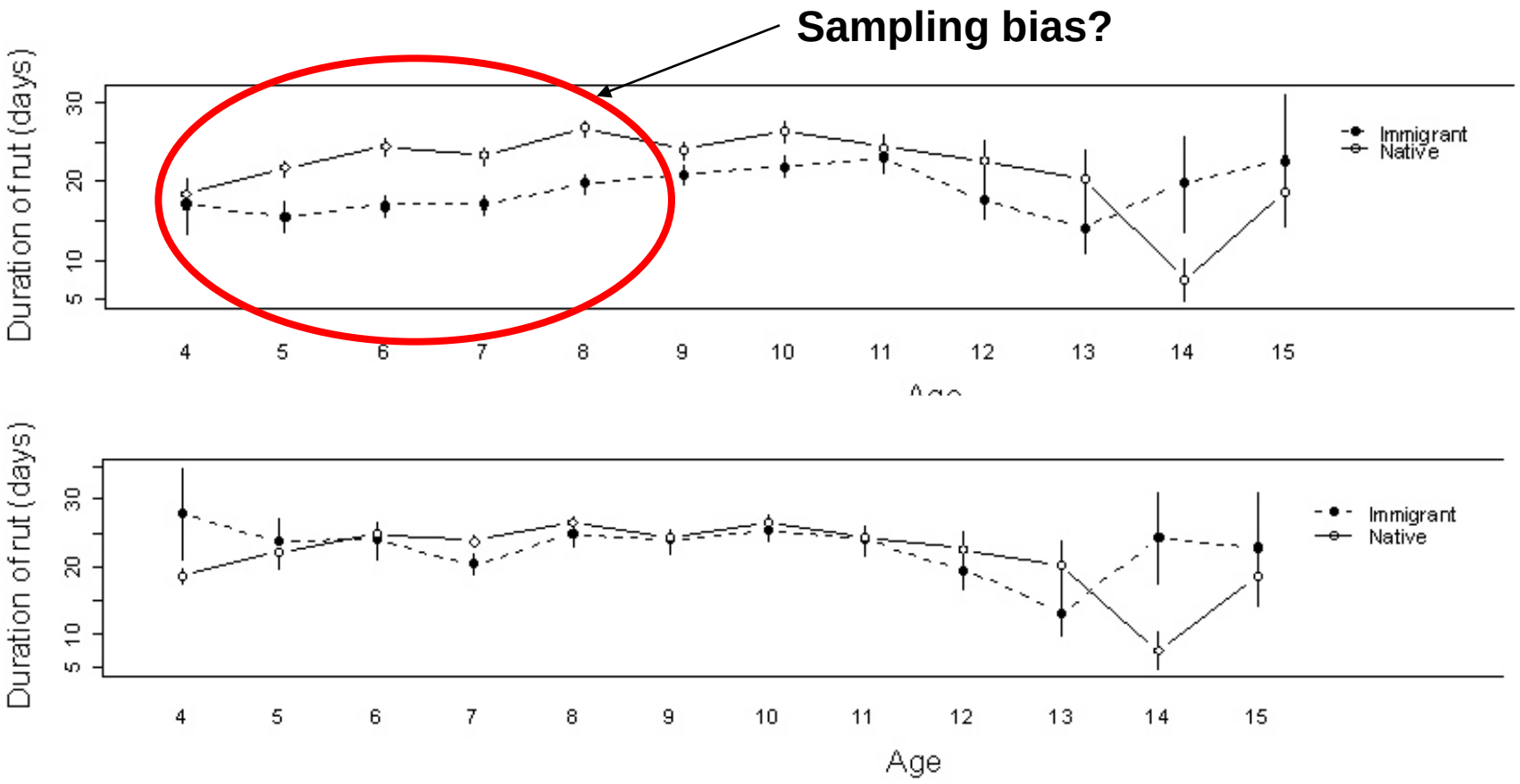
- Martyn Baker and Arpat Ozgul for photos!

NATURAL ENVIRONMENT RESEARCH COUNCIL

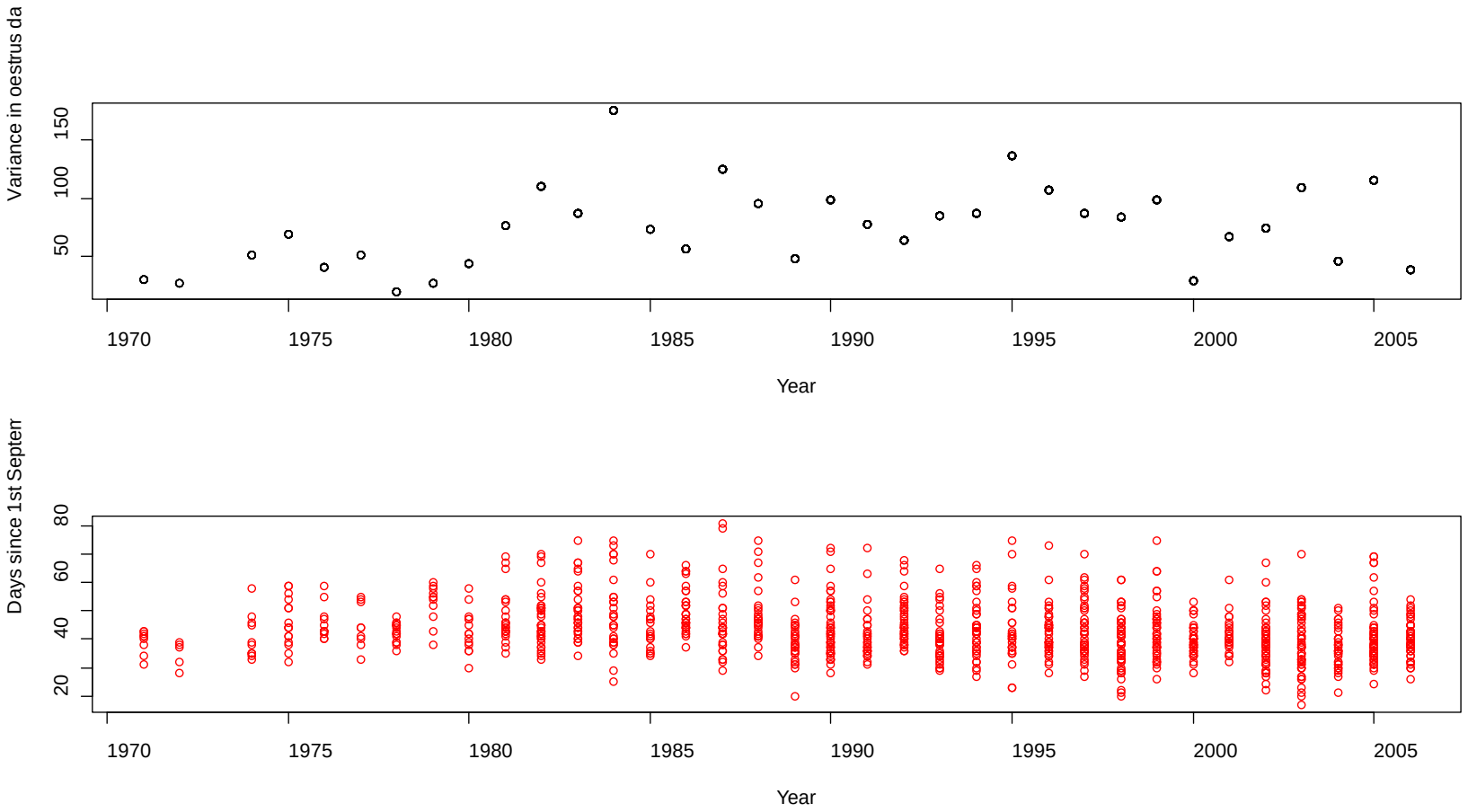
Correlation matrix

Rut sex ratio (RSR)	-0.55								
Population Size (P)	0.71	-0.31							
No.rutting males (RM)	0.78	-0.81	0.68						
No.rutting immigrant males (IM)	-0.01	-0.61	-0.17	0.32					
No.oestrous females (OF)	0.19	-0.24	0.28	0.29	-0.25				
Variance in oestrus date (VO)	0.29	-0.29	0.30	0.28	-0.21	0.58			
Average age rutting males (AM)	-0.08	0.24	0.02	-0.18	-0.38	0.14	0.29		
Maximum temperature (MT)	0.49	-0.30	0.41	0.29	0.20	0.05	0.14	-0.31	
Rainfall (R)	-0.07	0.28	0.14	-0.04	-0.01	-0.19	-0.13	-0.11	-0.01
	Year	RSR	P	RM	IM	OF	VO	AM	MT

Immigrants and Natals

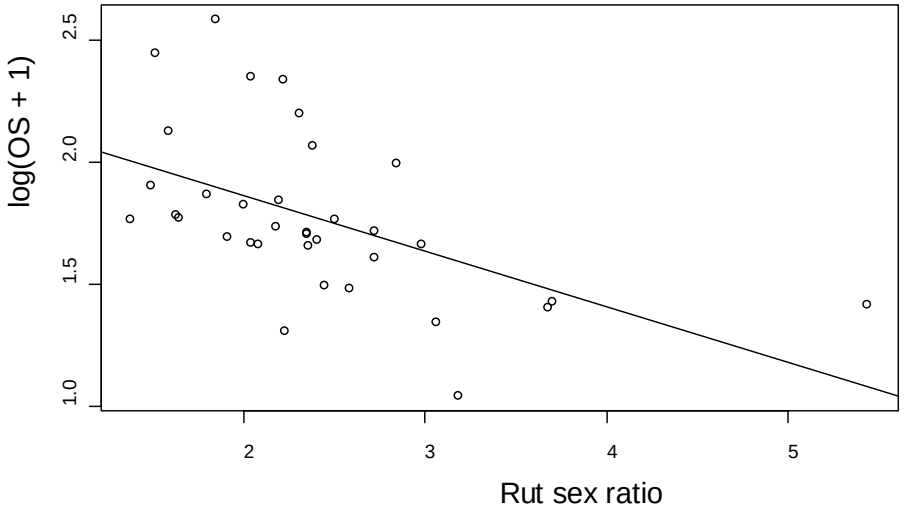


No interaction, no effect of immigrant

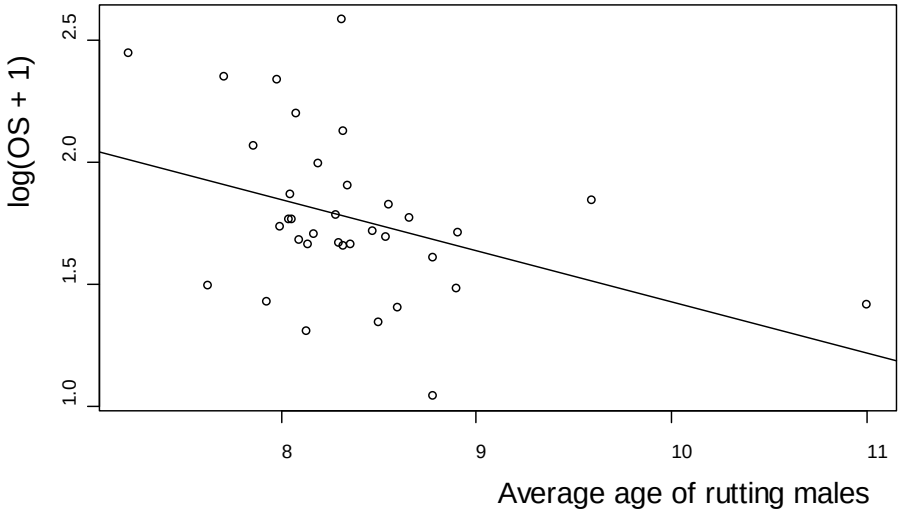

Variance in oestrus da
50
100
150
1970
1975
1980
1985
1990
1995
2000
2005
Year
Days since 1st Septem
20
40
60
80
1970
1975
1980
1985
1990
1995
2000
2005
Year

Univariate results

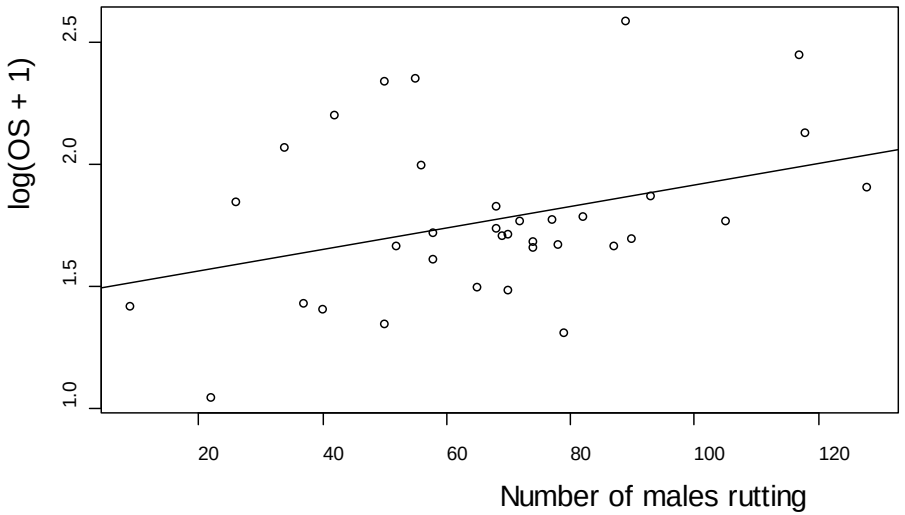
$F_{1,33}$=12.64, p<0.01



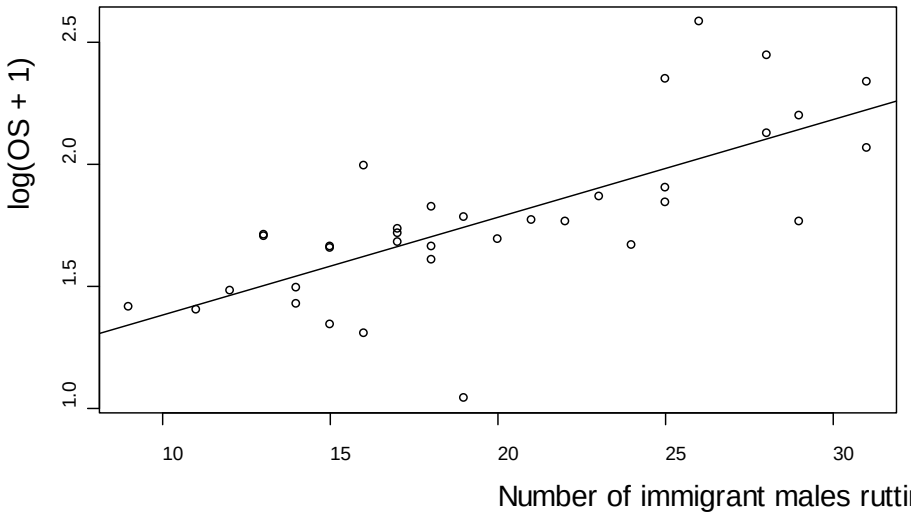
$F_{1,33}$=5.97, p=0.02

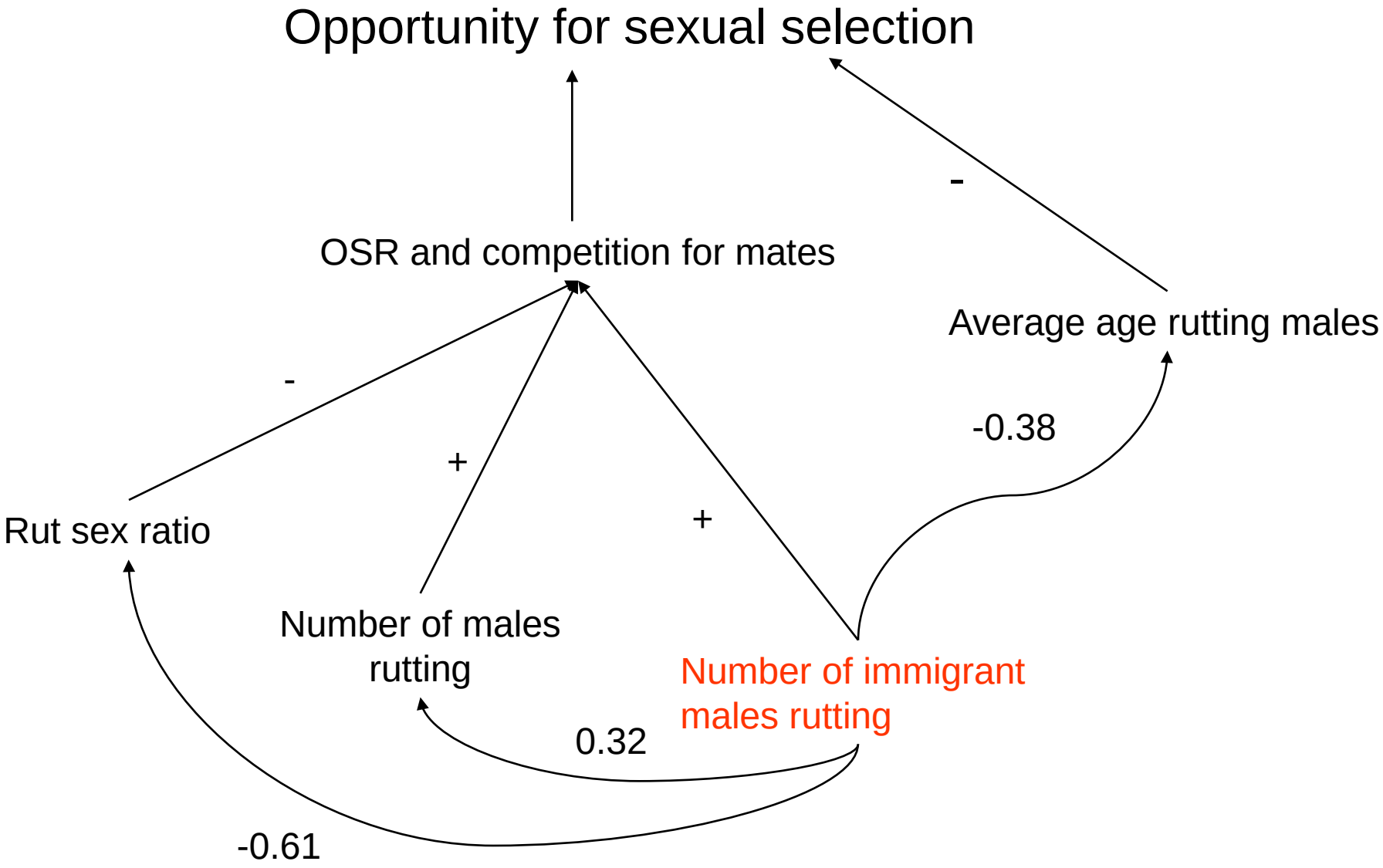


$F_{1,33}$=4.81, p=0.04



$F_{1,33}$=36.66, p<0.01




Opportunity for sexual selection
OSR and competition for mates
-
Average age rutting males
-
-0.38
+
+
Rut sex ratio
Number of males rutting
Number of immigrant males rutting
0.32
-0.61