

# Effects of social density during the rut and arousal at mother-offspring separation on male and female vocalisation traits in Siberian wapiti



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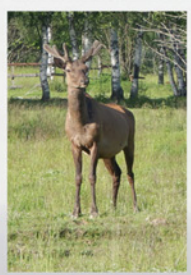
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**Idea:** Acoustics of red deer *Cervus elaphus* enable estimating discomfort and represent potential indicators of animal welfare. Local density of animals during the rut may affect vocal activity and the acoustics of rutting vocalizations in males. At the same time, separation of offspring from their mothers may affect the acoustic characteristics of females.

## Stags

Rutting period

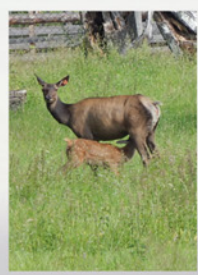
**Recording calls**  
Automated recording systems  
**SongMeter2+**



## Hinds

Mother-offspring separation

**Recording calls**  
•Solidstate recorder Marantz PMD-660 + Sennheiser K6-ME66 cardioid electret condenser microphone



2 populations:

Farmed, 0.08 deer/ha  
103 calls

Farmed, 2.0 deer/ha  
123 calls

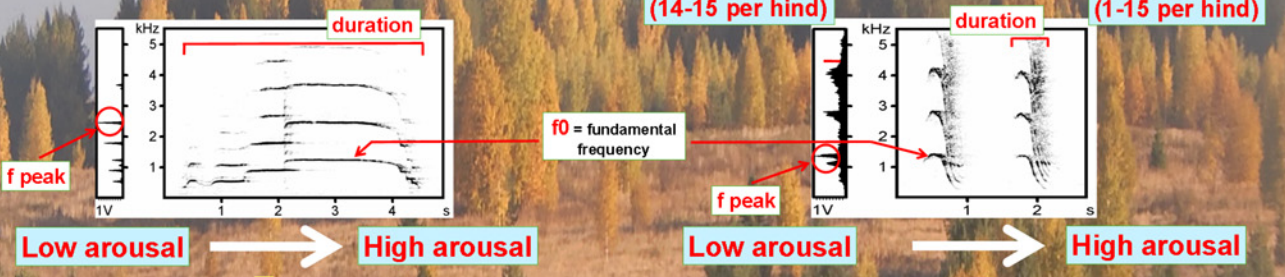
1 population 2.0 deer/ha  
2 sessions:

December  
Milk-independent calves

June  
Milk-dependent calves

9 hinds  
134 calls  
(14-15 per hind)

21 hinds  
133 calls  
(1-15 per hind)



High social density in males during the rut leads to the increase of arousal

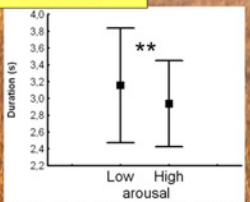
Hinds with younger calves demonstrate higher level of arousal

## Results

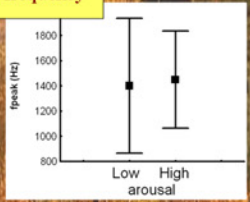
Statistical analysis  
•STATISTICA, v. 6.0 •ANOVA

### Stags

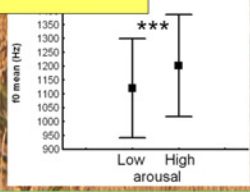
Duration



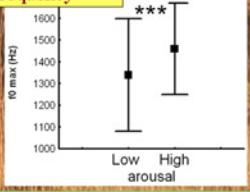
Peak frequency



Mean f0 frequency

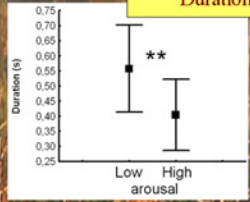


Max f0 frequency

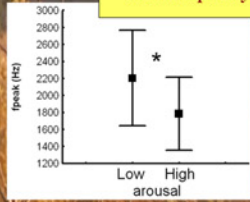


### Hinds

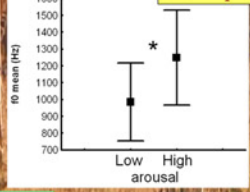
Duration



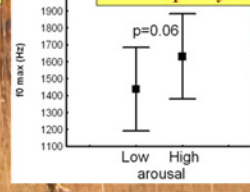
Peak frequency



Mean f0 frequency



Max f0 frequency



## Conclusion

In Siberian wapiti elevation of emotional arousal:  
 > in males from low to high social density during the rut  
 > in females from milk-independent to milk-dependent offspring  
 results in call shortening and increase of fundamental frequencies (f0).  
 This will be useful to estimate discomfort and improve animal welfare on deer farms.

Central points indicate mean values; whiskers show ±SD. Tukey post-hoc significant differences: \*-p<0.05; \*\*-p<0.01; \*\*\*-p<0.001