

# Subspecies-specific rutting calls and male vocal activity in an Asian subspecies of red deer, *Cervus elaphus xanthopygus*

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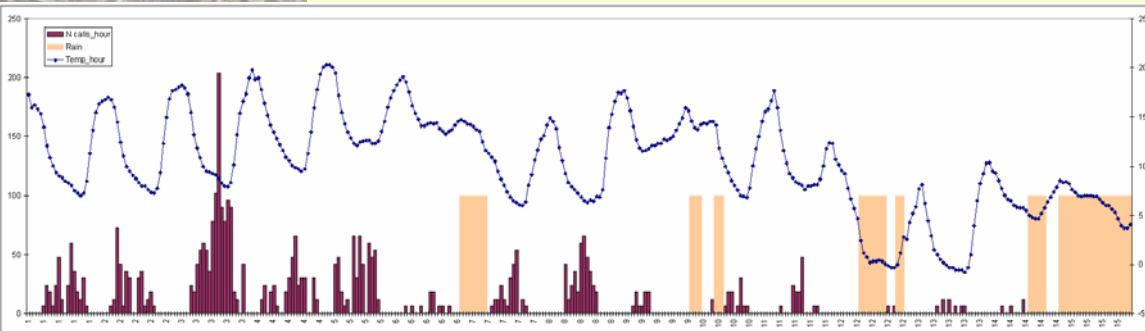
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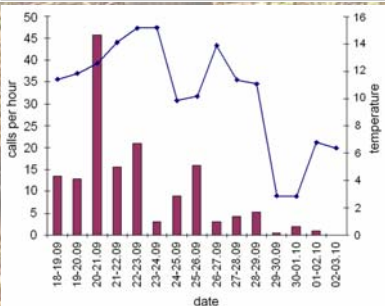


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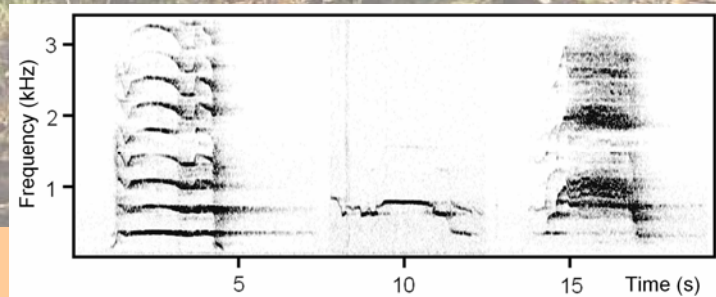
**IDEA:** Deer censuses by voice are often used as abundance indices, however to obtain reliable results knowledge about the vocal activity patterns in the given locality is required. This study provides the first data on the acoustic structure of stag rutting calls in *C. e. xanthopygus* and the relationship of vocal activity and ambient temperature, obtained using automated recording systems SongMeter SM2+. Data were collected in the Komarov Ussuriiskii State Nature Reserve from September 18 to October 16, 2014



The maximum number of calls per hour was recorded during nighttime (3 a.m. to 6 a.m.), whereas from 2 p.m. to 5 p.m. no rutting calls were recorded. For the duration of the total 360-hour registration rutting vocal activity, 58 hours was with rain. No one single roar was registered during the rain.

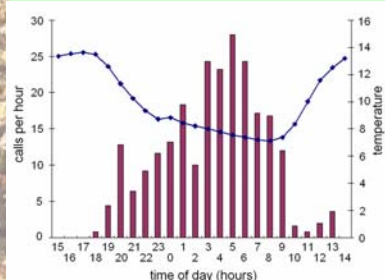


From 20:00 to 01:00 stags emitted 11.9 calls/hour; from 02:00 to 07:00 stags emitted 21.2 calls/hour. The number of calls per hour decreased with increasing ambient temperature ( $r = -0.79$ ,  $p < 0.001$ ,  $n = 24$ ).



Most rutting calls were single calls with duration  $3.41 \pm 0.65$  s and mean maximum fundamental frequency  $0.66 \pm 0.15$  kHz.

From 18 to 25 September stags emitted 17.35 calls/hour, from 25 September to 2 October 4.57 calls/hour. The number of calls per hour positively correlated with ambient temperature ( $r = 0.44$ ,  $p = 0.10$ ,  $n = 15$ ).



**CONCLUSION:** The rutting calls of *C. e. xanthopygus* are considerably lower than in Asian and American subspecies and higher than in all European subspecies. Acoustic differences may be used for subspecies diagnostic in combination with morphological and genetic indices.

