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## Acoustic monitoring of vocal rutting behaviour in ungulates using automated recording systems

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**Abstract**

In many ungulates the rut period is strictly seasonal. During the rut, males compete to each other, using vocal rutting displays. Vocal rutting activity demonstrates clear dynamics: onset, peak and completion of the rut. This dynamic is affected however by environmental factors (ambient temperature, wind, humidity, precipitations), as well as social factor (animal density, group composition, management conditions). Rutting activity and its dynamics characterize a population on the current time period, whereas the changes of these characteristics allows to monitor the state of populations and compare them with other populations. Vocal rutting activity of male ungulates is often used for animal censuses. Using automated systems for recording vocalizations enables to collect acoustic data during a prolonged period and by the same method simultaneously in many places, and to avoid the influence of researcher presence on vocal activity of study animals. Since 2015 we collected material on dynamics of rutting vocal activity in male red deer (Cervus elaphus) in Russia using automated systems of sound recording (SongMeter 2+). The recordings were scheduled for 5 min/hour, 24 hours/day, 120 min for each 24 hours, 60-70 days per each device. Recordings of rutting vocal activity have been conducted in three populations of European red deer C.e. hippelaphus (Bryansk, Lipetsk, Belgorod), in three populations of Siberian wapiti C.e. sibiricus (Kostroma, Tver, Khakasia) and in two populations of Far-East wapiti C.e. xanthopygus (Ussury, Khabarovsk). In each of the locality we used from one to three devices. To date we collected data on 19 rutting periods in total. We present data on five rutting periods in three populations with analysis of effects of rut phase, time of day and ambient temperature on vocal rutting activity of red deer. Supported by the RSF grant 14-14-00237.