

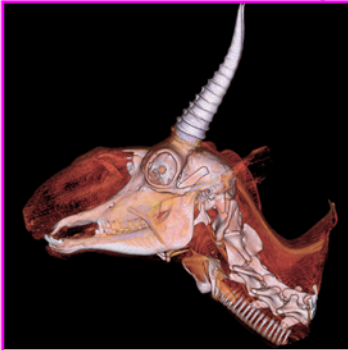
NASAL ROARING IN RUTTING MALE SAIGA

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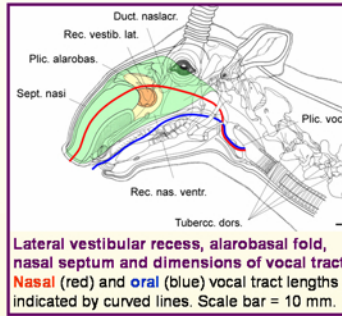
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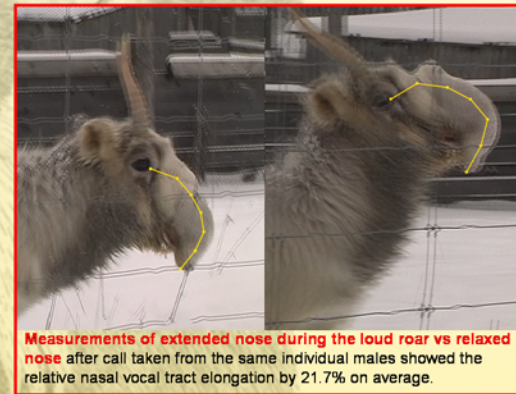
CT-image showing the enlarged flexible nasal vestibulum and the shortened nasal cavity proper in a male saiga



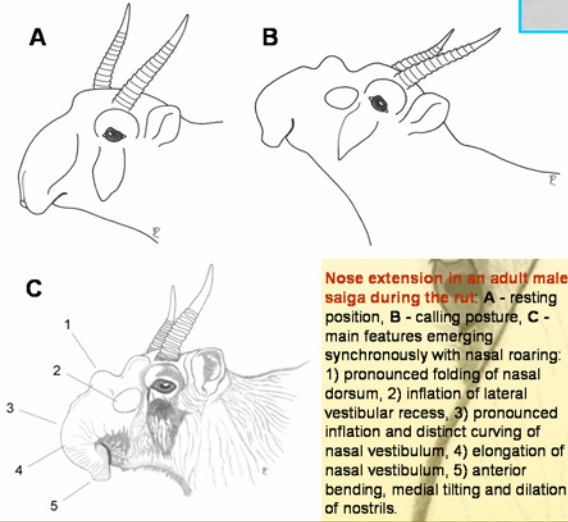
Saiga antelopes (*Saiga tatarica*) lives in large herds in open steppes and cover tremendous distances during their migration. The preferential allure is the amble with low head position. However, large dust clouds are produced by the moving herd. Saiga heads are always immersed in dust clouds and enlarged nasal vestibula act as dust filters in both males and females. Probable, that the increasing demand for getting rid of filtered and mucus-covered dust particles from the nasal vestibulum provoked regular forced expirations through the nose. This specific behaviour favored preferential calling through the nose rather than through the mouth in both sexes. Anatomical measurements showed that the male nasal vocal tract length exceed the oral one by 20% (380 vs 320 mm).

We analysed 258 calls from 5 rutting males and 47 calls from a non-rutting male with FFT-analysis (Avisoft SASLab Pro) and LPC-analysis (Praat).

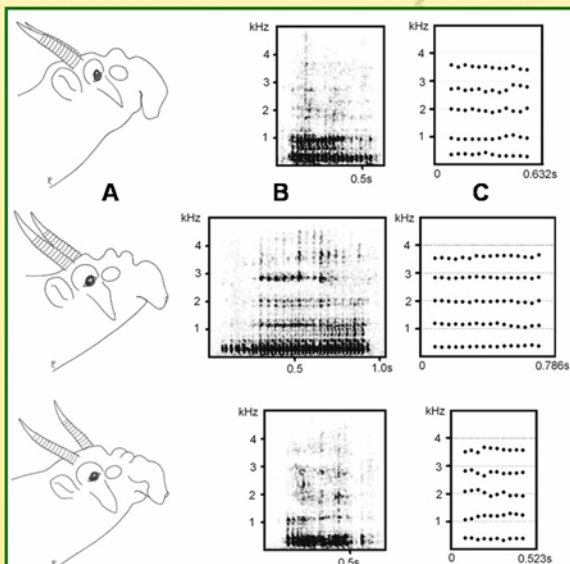
Video frame-by-frame analysis has shown, that a male starts calling when the nose is configured perfectly, that results in a stable formant track throughout a call. The configuration of a nose elongates the nasal vocal tract length by $21.7 \pm 11.4\%$ ($n=26$ frame pairs). The comparable difference of 21.1% has been received with comparison between the loud roars' formant dispersions in rutting males vs a non-rutting male, who called with non-configured nose (407 and 493 kHz correspondingly), as well as between the estimated apparent vocal tract lengths (431 and 356 mm correspondingly). Behavioural results suggest that this formant dispersion lowering in the loud roars is effected by the specific change of nose configuration exclusively observed in rutting males.



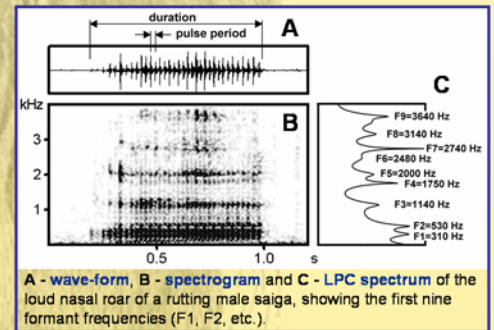
Measurements of extended nose during the loud roar vs relaxed nose after call taken from the same individual males showed the relative nasal vocal tract elongation by 21.7% on average.



During the winter rut, males hold harems and their loud roars through the tensed nose represent a part of their rut displays.



Individual differences of nose extension (1 fold, 2 folds, 3 folds) and concomitant acoustic features between three adult males during the rut. A - nose extension, B - spectrograms of loud nasal roars and C - tracks of the most clearly visible formants F1, F3, F5, F7 and F9 throughout these roars. The run of formants is given from 0.1 to 0.55 s of the roar in the 1-fold male (above), from 0.3 to 0.9 s in the 2-folds male (middle) and from 0.1 to 0.5 in the 3-folds male (bottom). Head contours according to video clip single frames.



A - wave-form, B - spectrogram and C - LPC spectrum of the loud nasal roar of a rutting male saiga, showing the first nine formant frequencies (F1, F2, etc.).

CONCLUSION

As the roaring cervids, red and fallow deer, harem saiga males has evolved a mechanism of vocal size exaggeration, but based on distinctive anatomical structures: the dynamic nose extending instead of the dynamic larynx descending.

	Formant dispersion (Hz)	Vocal tract length (mm)
Rutting males	407±17 (n=5)	431±17 (n=5)
Non-rutting male	493 (n=1)	356 (n=1)