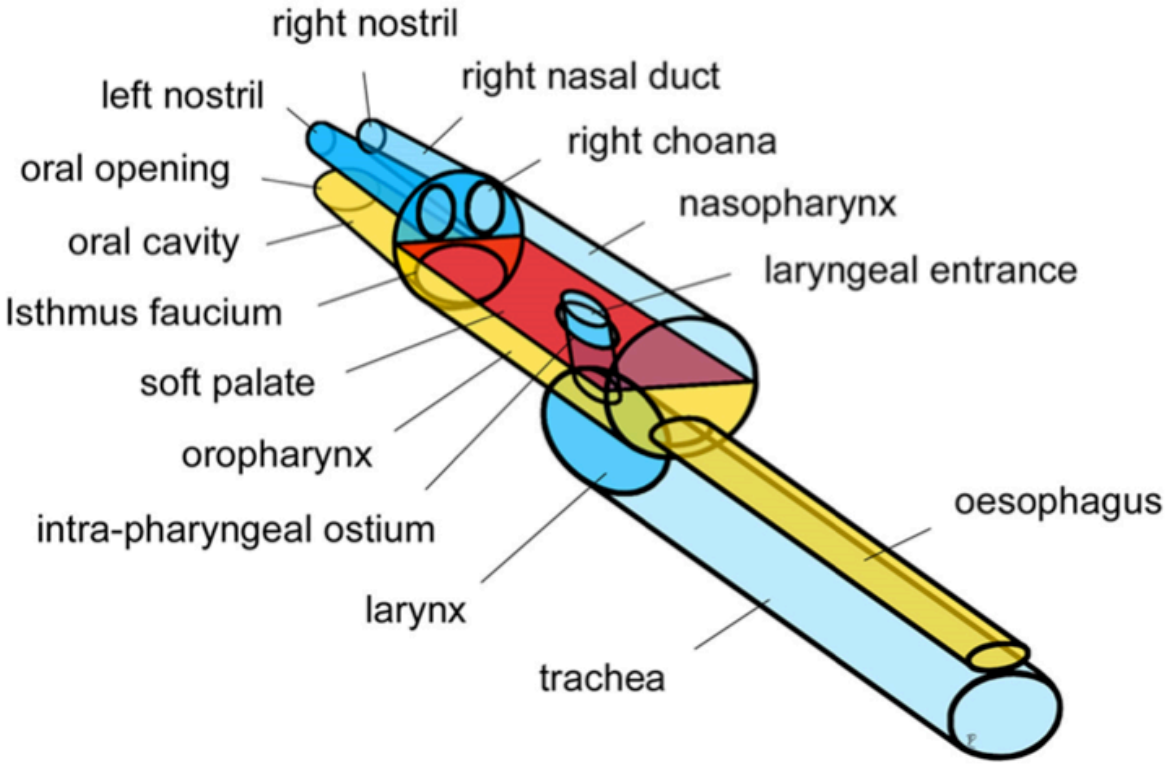

Fig. S1. Model of a mammalian vocal tract.
The model demonstrates that the most rostral portions of the nasal vocal tract are paired (left and right nostril, left and right nasal duct) up to the choanae. Then, from the choanae along the nasopharynx, the nasal vocal tract becomes unpaired, enters the larynx and ends at the vocal folds inside the larynx. Caudally subsequent to the larynx, the trachea connects the upper airways to the lungs.

Typically, the intra-pharyngeal ostium in mammals is a simple oval opening in the soft palate that connects the nasal vocal tract to the oral vocal tract. It is the single opening by which the naso- and oropharynx communicate. Through this opening, the entrance of the larynx protrudes into the nasopharynx during quiet breathing.

The oral vocal tract is unpaired throughout. The most rostral portion comprises the lips and the oral opening followed by the oral cavity and the isthmus of the fauces at the transition to the oropharynx. After having passed the oropharynx, the oral vocal tract also enters the larynx. This can only occur when the larynx is withdrawn from the intra-pharyngeal ostium and the laryngeal entrance then lies inside the oropharynx, e.g. for producing an open-mouth call. As the intra-laryngeal portion of the nasal vocal tract the oral vocal tract ends at the vocal folds inside the larynx.

The soft palate produces a complete subdivision of the pharynx in a two-storey tube (cf.: Wood Jones 1940: The nature of the soft palate. J Anat Physiol 74, 147-170.). The dorsal nasopharynx continues through the intra-pharyngeal ostium and the larynx into the ventrally located trachea. The ventral oropharynx continues around the epiglottis and the laryngeal entrance into the dorsally located oesophagus (crossing of airway and foodway). Caudally subsequent to the oropharynx, the oesophagus courses dorsal to the larynx and trachea.

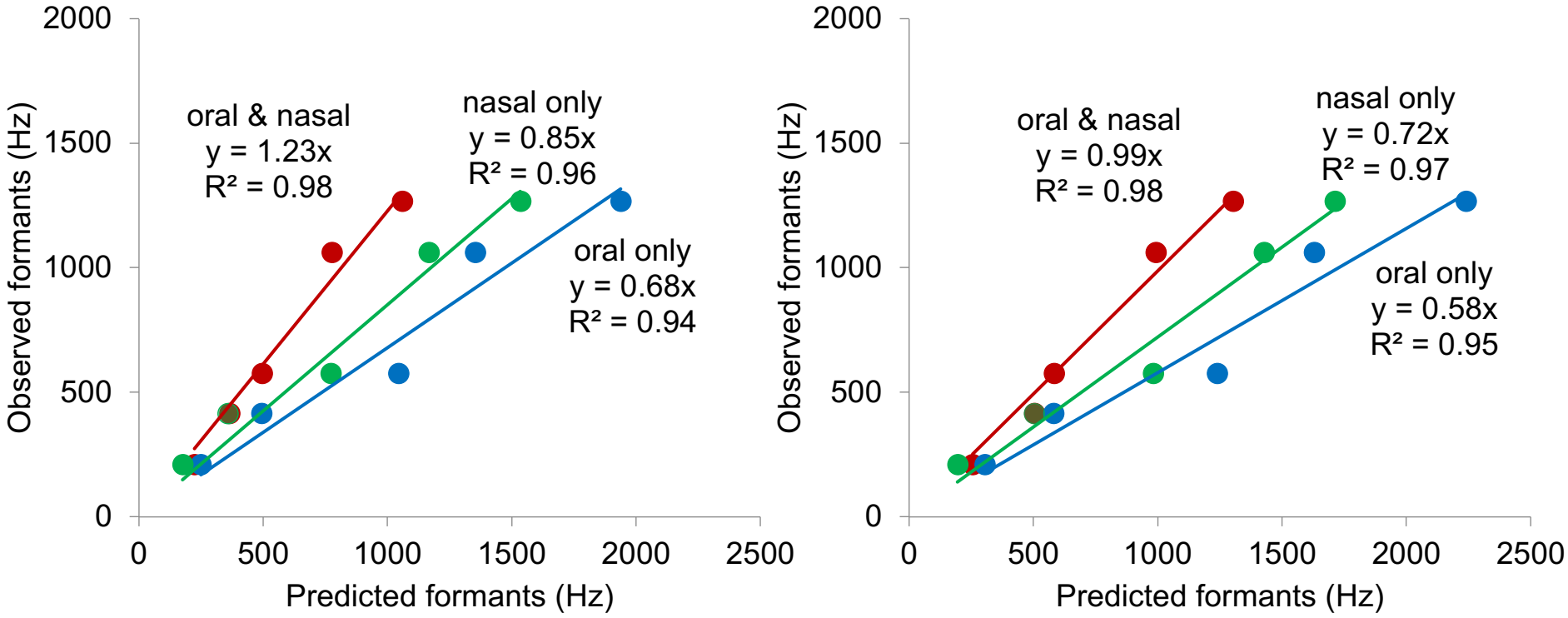

Fig. S2. Correlations between resonances observed in male fallow deer groans (y axis) as reported in the literature and resonances predicted from vocal tract geometries (x axis) for two scanned specimens, male 1 (left) and male 2 (right). Predicted resonances are the average centre frequencies of the first 5 peaks predicted by the cross-sectional areas of the vocal tract of male 1 and 2 including the oral vocal tract only (blue line), the nasal vocal tract only (green line), or both the oral and nasal vocal tracts (red line). Observed resonances are the average centre frequencies calculated from 16 males (Vannoni & McElligott 2007). The regression slopes inform the fit of the scaling (formant spacing) of the observed resonances to the predicted resonances. The values of R^2 provide the fit of the pattern of the observed resonances to the predicted resonances.

While the formant frequencies predicted by combined oral and vocal tract geometries are an excellent match to formant frequencies reported in the literature in male 2, those predicted for male 1 underestimate those observed by 23%, suggesting that the vocal tract may have been excessively artificially extended before CT-scanning.