The undistinguishable alarm whistle frequences in adult and juvenile ground squirrels: the way to avoid an age-dependent risk?

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INTRODUCTION

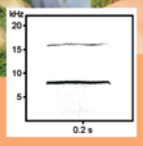
In most mammals, the larger body sizes of adult animals correlate with lower fundamental frequency and more closely spaced formants in their calls. Alarm whistles of the speckled and yellow ground squirrels lack formant cues to body size, so we should look for these cues in the fundamental frequency.

In this study, we compare the alarm whistle frequency between age classes for two species of ground squirrels and describe the phenomenon of similarity of the fundamental frequencies between adults and juveniles. Also, we study relationships between body weight, morphological parameters of the larynx and the alarm whistle fundamental frequencies.

ANIMALS AND METHODS

Speckled ground squirrel *(Spermophilus suslicus)*

Moscow province, Zarajsk district (54°47'68"N, 38 42'23"E)

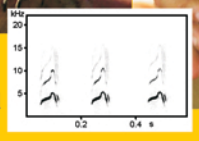


659 alarm calls,
up to 10 calls per animal

We recorded the alarm whistles in summer 2003-2005 in natural colonies of the ground squirrels. The animals called toward a human from wire-mesh live-traps.
The spectrographic analysis of calls was made with *Avisoft SASLab Pro v.4.3©*.

Yellow ground squirrel *(Spermophilus fulvus)*

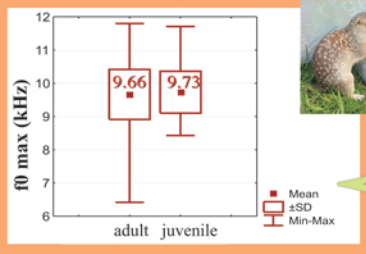
Saratov province, Village Djakovka (50°43'88"N, 46 46'04"E)



500 alarm calls,
10 call notes per animal

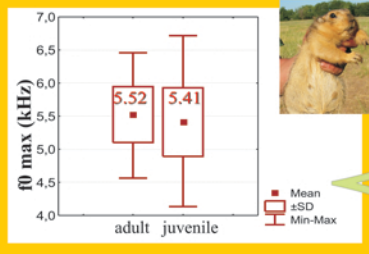
RESULTS

1. *Maximum fundamental frequency* (*f0 max*): comparison between **adult** and **juvenile** calls



N=463 alarm call notes from adults
N=196 alarm call notes from juveniles
U=43006, p=0.29, Mann-Whitney U-test

The same frequency in both



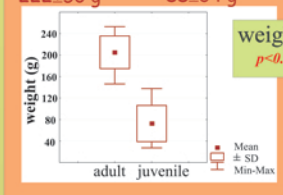
N=250 alarm call notes from adults
N=250 alarm call notes from juveniles
U=26317, p=0.002, Mann-Whitney U-test

Juvenile frequency is lower

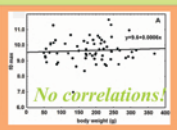
2. Size differences between **adults** and **juveniles**

A) Body weight

Mean weight 222±50 g *vs.* Mean weight 88±34 g



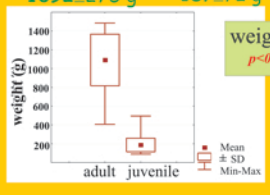
weight **2.5** times smaller
p<0.001, Mann-Whitney U-test



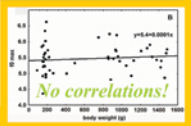
In the two species examined, the **body weight**, skull length values and all morphological measurements were significantly smaller in juveniles than in adults.

We **did not find correlations** between the individual *f0 max* and body weight, either within age classes or for pooled samples of all animals within species. All correlation coefficients were very low.

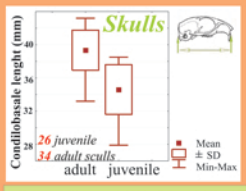
Mean weight 1092±275 g *vs.* Mean weight 187±72 g



weight **5.8** times smaller
p<0.001, Mann-Whitney U-test

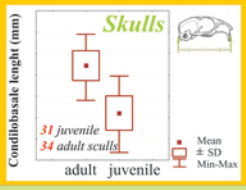


B) Skull lenght and larynx size



To approximate linear sizes of animals, we measured **skulls** of **60 speckled** squirrels and **65 yellow** squirrels from the collection of the Zoological Museum of Moscow State University.

We excised **larynges** of **one** adult and **one** juvenile of each species that died of diseases or a car accident.



Juvenile skull = **88%** of adult skull Juvenile larynx = **82%** of adult

Juvenile skull = **80%** of adult skull Juvenile larynx = **74%** of adult

3. **Kids** calling **bass? Why?**

Some **predators** are **DANGEROUS** only for **youngs**, not for adults: e.g. **small mustelids** and **infanticidal adult conspecifics.**

Vocal mimicry hypothesis:

It may be **advantageous** for juveniles to call at low pitch pretending they are adults to avoid **age-dependent risk**!

CONCLUSION

- **No differences in the mean maximum fundamental frequency between the ages in the speckled ground squirrel and even lower juvenile fundamental frequency in the yellow ground squirrel.**
- **No correlations between the maximum fundamental frequency and body weight both within the ages and for pooled samples of animals within species.**

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