Individuality in the alarm calls of an endangered population of the Spotted ground squirrel (Spermophilus suslicus)

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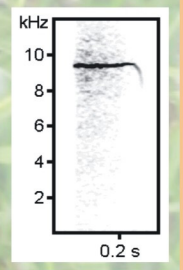
PURPOSE Acoustic monitoring of populations has proved useful for many animal groups, especially for birds, whales and bats, but has rarely been applied to rodents. We tested whether the very simple structure in the alarm calls of the spotted ground squirrel reliably coded for the callers' identity and sex. Also we tested. if the call structures are stabile over years.

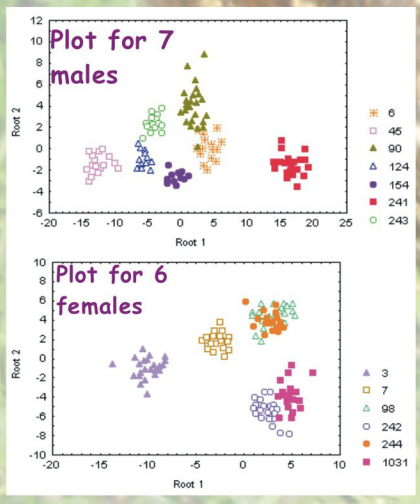
METHODS Call were recorded during the summer in 2001 - 2003 from endangered isolated small population spotted ground squirrels in Moscow province (Russia). We recorded 892 calls from 19 individually marked, live-trapped ground squirrels (12 males and 7 females) of known age, during capture-recapture procedures. Using Avisoft – SASLab Pro we measured 15 parameters for each call.



RESULTS

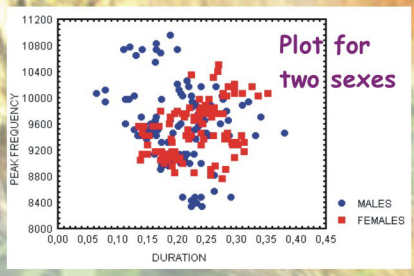
assignment to individuality

Animals: 7 males, 6 females (29-30 calls per squirrel)
Totally 389 calls were analysed spectrographically by 15 parameters.
Discriminant analysis showed 95.3% correct assignment to individual (with the expected random value for 14 animals 7.1%).
Crossvalidation (classification of test call set using discriminant functions counted for training call set) showed 96% correct assignment.
Separately for 7 males and for 6 females the values of correct assignment to individual were 99% and 99% respectively.



assignment to sex

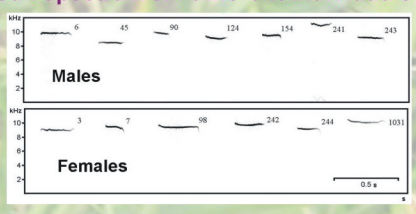
However, the value of correct assignment to sex - 71.5% (n=221 calls, 105 from 7 females and 116 from 12 males) were close to random (about 50%).



stability of individual features in calls over years

In summer 2003 we repeatedly captured and recorded 4 individuals that were already captured in 2001 or 2002. Discriminant analysis of 104 calls (30 calls per animal for three and 14 from the forth) from sample of 2001+2002 showed 100% correct assignment. Similar analysis of 120 calls (30 per animal) recorded in 2003 showed 95%. However, estimation of stability of individual features using a cross-validation procedure (classification of recordings obtained in 2003 using functions from those obtained in 2001+2002) showed as small as 40%, varying from 23 to 90 % for different animals.

Call spectra from different individuals



Discrimination of calls within and between years

Animal	Discriminant analysis 2002		Discriminant analysis 2003		Cross-validation of 2003 using functions 2002	
	n calls	% of correct assignment	n calls	% of correct assignment	n calls	% of correct assignment
m 130	14	100	30	96,7	30	23,3
m 154	30	100	30	96,7	30	0
f 242	30	100	30	86,7	30	90
f 244	30	100	30	100	30	46,7
Total:	**104**	**100**	**120**	**95**	**120**	**40**

CONCLUSIONS : The alarm calls of spotted ground squirrels:

- surely identify individuals within a season, but not between them
- do not identify sex
- change their structure after hibernation

This research will be prolonged in order to study call stability for more individuals within and between seasons, and to test a hypothesis that the spotted ground squirrels may forget their calls because of known fact - perfect reconstruction of brain structures during hibernation.

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