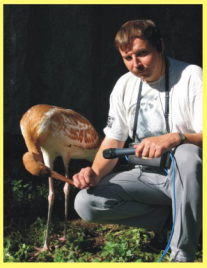
Stability of calls in the Red-breasted goose (*Branta ruficollis*): pilot tests in captivity for future vocal monitoring in the field



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INTRODUCTION

Monitoring of endangered populations using identification of individuals by voices is relevant for the red-breasted goose, because for this species capture for ringing is limited in application. However, recognition of individual geese on nesting grounds in the next breeding season is only possible, if individuals do not change their calls from year to year.

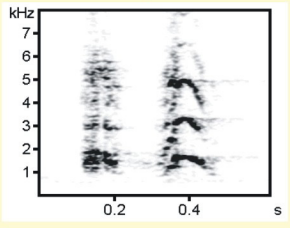
PURPOSE

The purpose of this research was to estimate reliability of identification of individual red-breasted geese by their loud two-syllable calls from year to year, imitating natural population monitoring on their nesting grounds.

ANIMALS AND METHODS

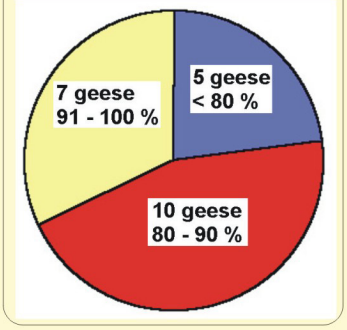
In total, we analysed 1329 two-syllable calls from 37 geese (23 males and 14 females). These calls were recorded throughout 5 breeding seasons (springs) in geese colonies of Moscow Zoo. Using Avisoft SASLab Pro v.4.2 we measured 55 parameters for each call (duration of each syllable and interval between them as well as 26 spectral parameters for each syllable).

The two-syllable call



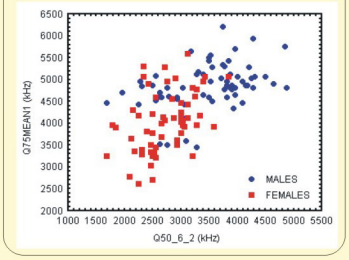
ASSIGNMENT TO INDIVIDUAL

In total for five seasons discriminant analysis showed 86% of correct assignment to individual (n=430 calls from 22 birds; 16-20 calls per bird)



ASSIGNMENT TO SEX

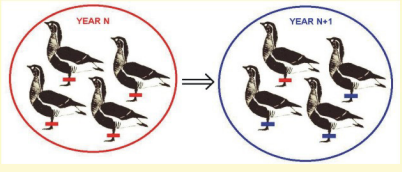
In total for five seasons discriminant analysis showed 87% of correct assignment to sex (n=125 calls; 22 males, 3 calls per male; 12 females, 4-5 calls per female).



INDIVIDUAL RECOGNITION OF GEESE BY THEIR CALLS IN THE NEXT SPRING

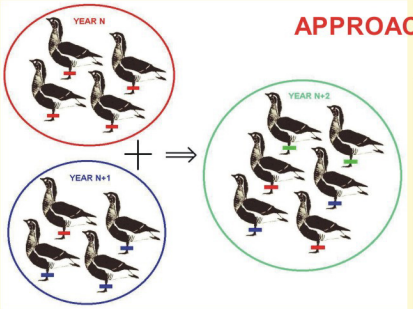
Within each spring the discriminant analysis showed high values of correct assignment to individual (from 100% (3 birds) to 88% (25 birds) for different springs). To analyse stability in calls, we applied two approaches of preparing samples for cross-validation procedures. We found, that for both the approaches average values of correct assignment to individual for birds, recorded in the next spring, did decrease substantially in comparison with values of discrimination within a previous spring. In addition, discrimination values were individual-dependent - some geese had very reliable discrimination over seasons, whereas for others geese the discrimination was poor.

APPROACH 1. Using discriminate functions, counted for a previous spring, for discrimination of calls recorded in the next spring.



Preceding spring	Correct assignment	Next spring	Correct assignment
1985; 3 geese	100%	1986; 1 goose	100%
1986; 5 geese	98.5%	1987; 4 geese	68% (0 – 100%)
1987; 8 geese	98.5%	1988; 5 geese	45.2% (0 – 78%)
1988; 25 geese	87.7%	1989; 11 geese	23.8% (0 – 69%)

APPROACH 2. Using discriminate functions, counted for a few springs in sum (N, N+1 etc.), for discrimination of calls recorded in the next spring (N+2).



All preceding springs	Correct assignment	Next spring	Correct assignment
1985; 3 geese	100%	1986; 1 goose	100%
1985+86; 7 geese	98%	1987; 5 geese	48.1% (3 – 88%)
1985+86+87; 10 geese	94.5%	1988; 5 geese	55.9% (17 – 86%)
1985+86+87+ 88; 29 geese	83.3%	1989; 11 geese	37.7% (0 – 100%)

PERSPECTIVES OF ACOUSTICAL MONITORING IN NATURE

In nature, Red-breasted geese nest in small colonies from 3 to 10 pairs, separated by a few kilometers. The two-syllable call is the most often emitted call in nature. Guarding males usually use this call for mobbing humans, dogs and polar foxes and these calls may be easily recorded. Probably, small sizes of natural nesting colonies may provide more accuracy of vocal identification in this species in comparison with our data. In summary, distant acoustical monitoring of populations is promising for the Red-breasted goose. However, aspects of call stability over years should be studied more thoroughly.