NON-INVASIVE VOCAL SEX DETERMINATION IN

WHITE-FACED WHISTLING DUCK, SPECIES

WITHOUT OF VISIBLE SEXUAL DIMORPHISM





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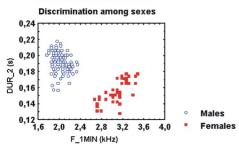
INTRODUCTION

Whistling ducks represent an opposite endpoint to sexual dimorphism in birds, both by exterior and behaviour. Size, coloration, sitting on eggs, offspring care are shared by sexes. Our recent study of vocal variability in Dendrocygna bicolor showed that vocal production of this species is also of "unisex" style, excluding a single call type - loud whistle, that provided the name "whistling ducks" to Dendrocygna species. In present work we investigated sexual and individual differences in the loud whistles of white-faced whistling duck D. viduata.

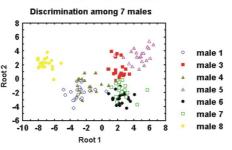


RESULTS

Sexual differences



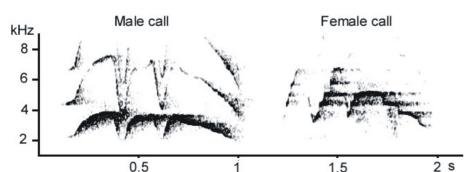
Individual differences



Five randomly selected calls from each of 9 males and 22 and 20 calls from 2 females correspondingly were included into analysis of sexual differences. Discriminate function analysis on sex showed 100% of correct assignment. Stepwise procedure revealed that fmin1 and dur2 have mainly contributed into discrimination to sex. The 100% correct assignment was observed even in the case when either all the frequency or all the time parameters were omitted from the analysis.

Discriminate function analysis on personal identity based on 18 to 22 calls per individual for 7 males and 2 females (totally 182 calls) 95.6% correct assignment, exceeding significantly the random value, that is equal 11.1% for 9 birds. Individual percentages of correct assignment varied from 88.9 to 100%, indicating that all birds without of any exclusion were discriminated from total call set.

Discriminate function analysis on personal identity for 7 males only (totally 140 calls) showed 97.9% correct assignment (only 3 calls were uncorrectly determined).



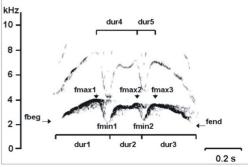
Values of frequency parameters in males and females (Mean+SD)

Sex	n calls	fbeg	fmax1	fmin1	fmax2	fmin2	fmax3	fend
Males	45	2.266	4.043	2.028	3.792	2.326	3.550	1.905
		0.123	0.167	0.120	0.174	0.154	0.167	0.215
Females	42	3.334	6.975	3.091	6.703	3.424	5.154	2.672
		0.316	0.722	0.216	0.775	0.267	0.475	0.203

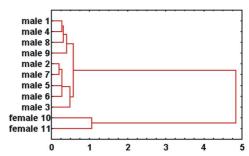
Frequency parameter values of white-faced ducks loud whistles were strongly and significantly higher in females than in males (Mann-Whitney U-test; U=0, p<0.001 for all parameters). Differences in temporal parameters between the sexes were more intricate.

ANIMALS AND METHODS

Overall 194 calls were tape recorded from individually marked adult 9 males and 2 females, exposed together in outdoor enclosure of Moscow Zoo. The calls were digitised with 22 kHz sampling frequency and analysed using Avisoft-SASLab Pro software. Five time and seven frequency measurements were taken from each of these calls (see Figure). To test how accurately call parameters could be used to identify callers, a discriminate function analysis was performed in STATISTICA package using those variables selected by the stepwise analysis.



Comparison between individual and sexual differences



The unweighted average linkage clasterogram shows correspondence among individual and sexual differences in loud whistles of the white-faced ducks. It's obvious, that differences between sexes are expressed more strongly in comparison with interindividual differences. However, these relatively "small" interindividual differences already provide more then 95% probability for individual identification.

CONCLUSION

The data suggested, that the white-faced whistling ducks can brake their sexual incognito in any moment, simply by production of the extremely sexually dimorphic whistle. However, additional studies of behaviour biology are needed to answer a question what benefits individuals of this species have from concealing and advertising of own sex.

male Solution: male female

