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MULTIVARIATE ACOUSTIC STRUCTURE OF VOCALISATIONS DURING FEED ANTICIPATION IN YOUNG WATER BUFFALOES

Madalina MINCU-IORGA[1]*, Dinu GAVOJDIAN[1], Adrian BOTA[2], Celine TALLET[3]

[1] Cattle Production Systems and Welfare Laboratory, Research and Development Institute for Bovine, Balotesti, Romania
[2] Research and Development Station for Buffalo, Academy of Agricultural and Forestry Sciences, Sercaia, Romania
[3] PEGASE, INRAE, Institut Agro Rennes Angers, Rennes, France
* Corresponding author: madalina.mincu@icdcb.ro

Abstract

We explored acoustic relationships among 81 vocalisations from young water buffaloes before routine feeding. Principal component analysis of nine descriptors identified three components explaining 69.8% of the variance. These preliminary findings describe complementary dimensions of acoustic variation within one recording session.

Introduction

Understanding the acoustic structure of livestock vocalisations may help identify complementary descriptors for behavioural research. This study aimed to characterise the multivariate relationships among acoustic parameters of young water buffalo vocalisations recorded during feed anticipation.



Figure 1. Water buffaloes and acoustic recording equipment

Materials and methods

We recorded 26 buffaloes of both sexes, aged 6–7 months, under outdoor management, focusing on the final 15 minutes before afternoon concentrate feeding under outdoor management. Feeding occurred at the same time daily, providing a predictable routine that may have enabled anticipation. We used a Sennheiser MKH416-P48U3 microphone and Marantz PMD661 recorder at 5–6 m, recording at 44.1 kHz and 16-bit resolution. An automated source–filter script in Praat v6.0.31 extracted 29 acoustic parameters. We selected nine descriptors from 81 calls, log-transformed seven and standardised all variables before PCA in R v4.6.0. Parallel analysis with 2,000 permutations guided component retention.

Results and discussion

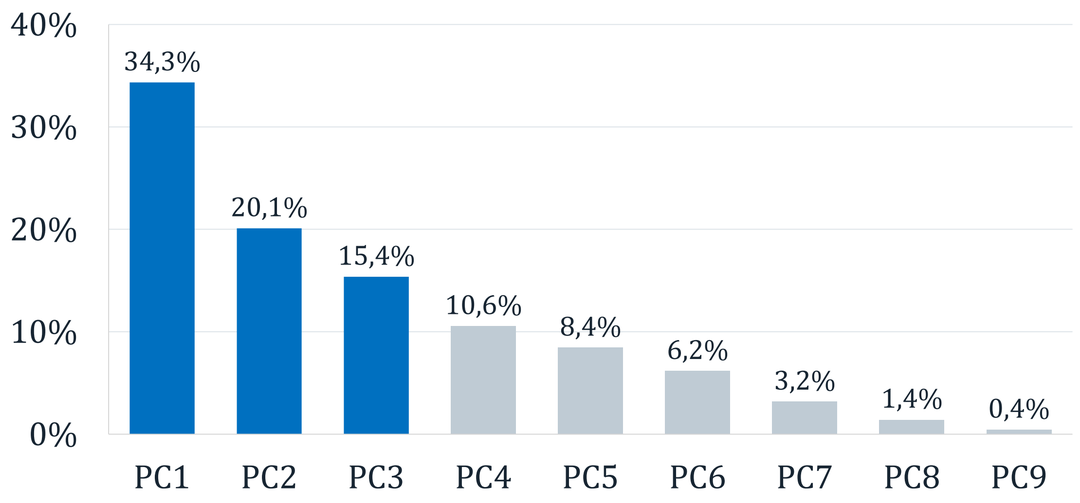


Figure 2. Percentage of variance explained by each principal component. PC1–PC3 explain 69.8% cumulatively. Blue bars indicate the components retained by parallel analysis.

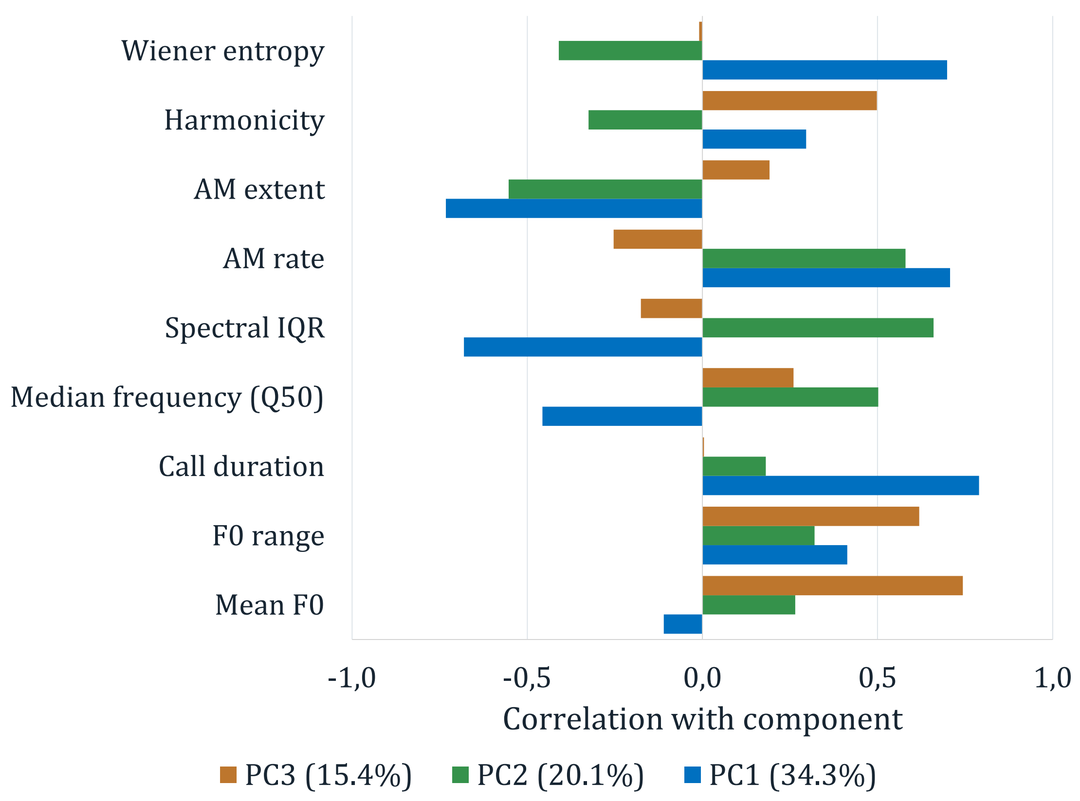


Figure 3. Relationships between acoustic descriptors and the first three principal components (PC1–PC3). Bars show variable–component correlations for PC1 (blue), PC2 (green), and PC3 (orange). AM, amplitude modulation; IQR, interquartile range; F0, fundamental frequency.

PC1 contrasted longer calls, faster AM and higher entropy with greater AM extent and broader spectral bandwidth. PC2 combined spectral characteristics and AM. PC3 mainly reflected F0.

Conclusions and next steps

These preliminary results describe acoustic variation within one session. Repeated sessions with identified callers and a baseline comparison are needed to assess behavioural significance. Future work will compare the pre-feeding period with earlier recordings and explore recordings with delayed feeding.

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