



Intra population variability of whistles characteristics in a free-ranging bottlenose dolphins (*Tursiops truncatus*) population



Clémentine SEGUIGNE^(1,2), Séverine METHION⁽¹⁾, Bruno DIAZ LOPEZ⁽¹⁾

(1) Bottlenose Dolphin Research Institute BDRI, Avenida Beiramar 192, 36980 O Grove, Pontevedra, Spain
(2) Museum National d'Histoire Naturelle de Paris, 57 rue Cuvier, 75005 Paris, France



Introduction

Bottlenose dolphin (*Tursiops truncatus*) is a particularly vocal and social species. The main part of acoustics studies about whistles has been done in captivity. Nevertheless, studying animals in the wild is the only way to understand better their social communication under natural conditions at the level of a population. The aim of this study is to determine the possible causes of whistle variability among the free-ranging *Tursiops truncatus* population of the Ria of Arousa, NW Spain.



Fig. 1 : The Ria of Arousa

Material & Methods

An omnidirectional hydrophone coupled to a mobile digital recorder was used to collect samples from 20 Hz to 93.8 kHz onboard the BDRI's research vessel from February to August 2016. Spectrogram analysis and sounds discrimination have been done following Díaz López (2011). Then, PCA and MANOVA were done using RStudio® software.

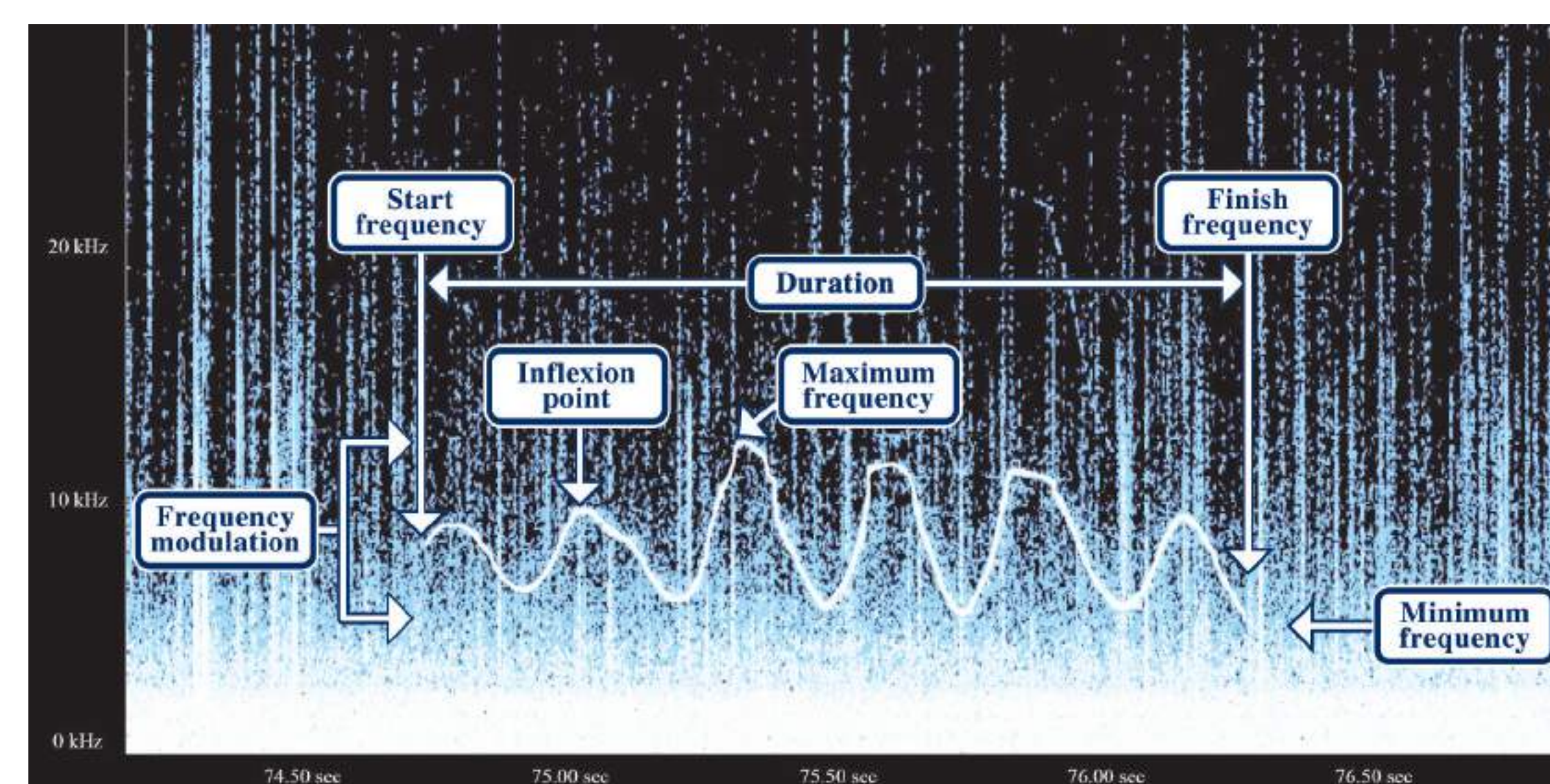


Fig. 2 : Spectrogram of a bottlenose dolphin's whistle recorded in the Ria of Arousa indicating the acoustic variables analyzed.

Results

- **12 days** at sea and **15 groups** of dolphins recorded
- **75 hours** of observations and simultaneous recordings and **337 whistles** of good quality detected

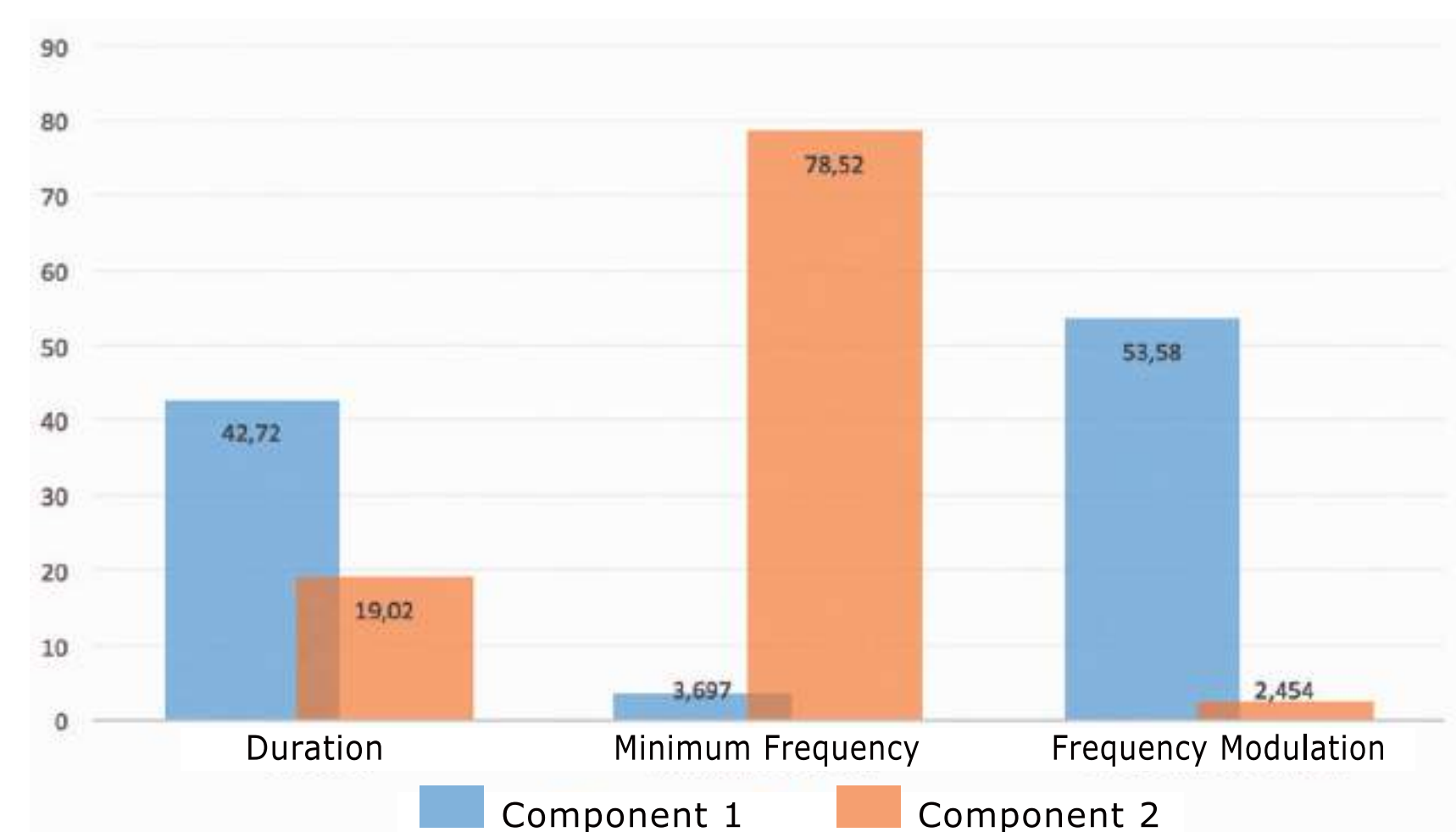


Fig. 3 : Contribution in % of the whistles characteristics selected to the two components used in the PCA.

- Reduction to **3 whistles features** from the 7 initial characteristics (frequency modulation, minimum frequency, duration)
- **82.29%** of the variance explained using **2 main components**

- **Significant influence of behavior and of the presence of calves** on whistles characteristics (MANOVA : p-value < 0.05)
- **SOCIAL** significantly different from **TRAVEL** for **Component 2** (post-hoc tests) : principally in terms of **minimum frequency**
- **PRESENCE** significantly different from **ABSENCE** for **Component 2** (post-hoc tests) : principally in terms of **minimum frequency**
- Lowest variability for social event - for groups containing only adults

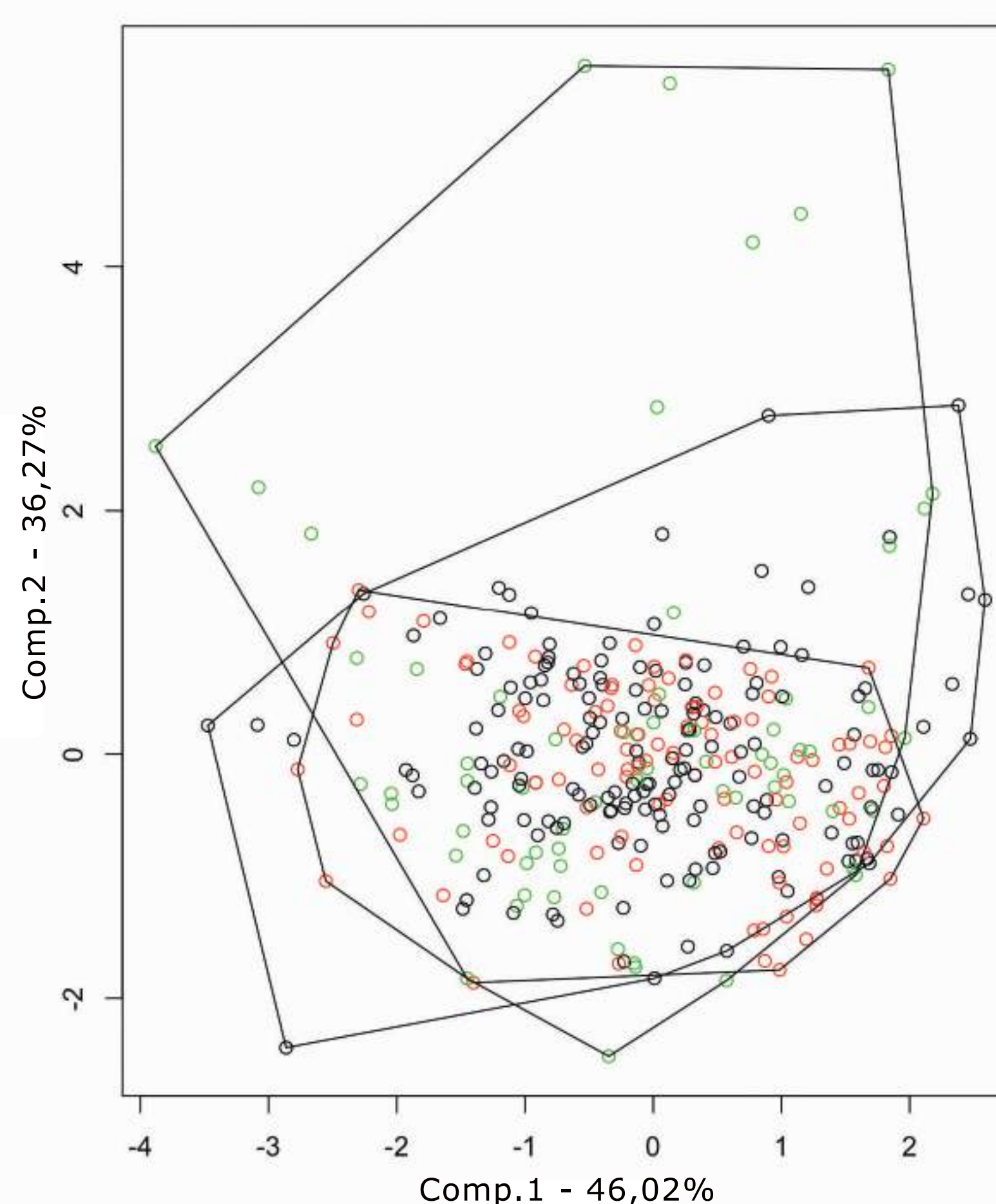


Fig. 4 : Results of the PCA on the reduced data. SOCIAL - FEEDING - TRAVEL

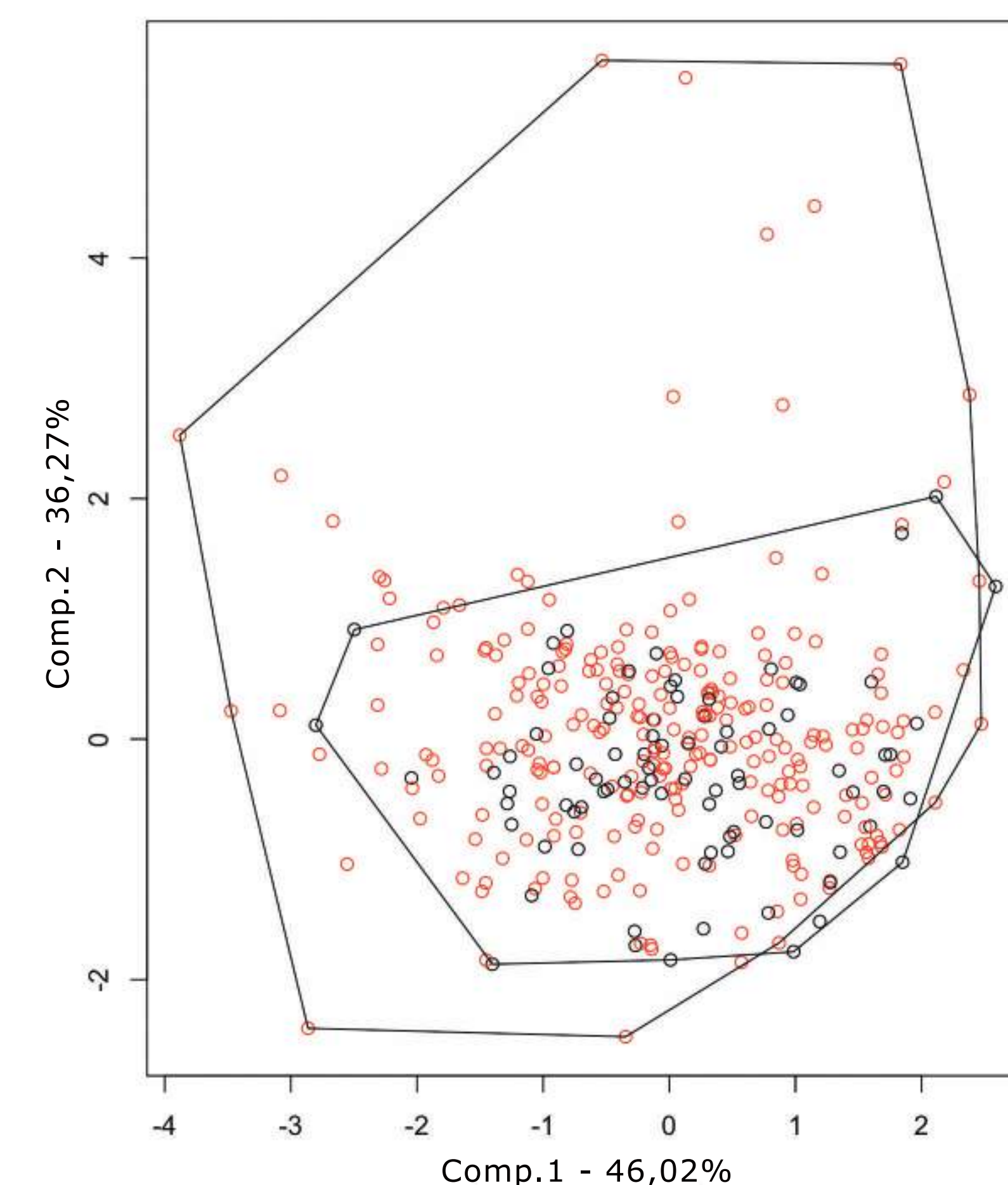


Fig. 5 : Results of the PCA on the reduced data. PRESENCE - ABSENCE

Discussion

- Crucial importance of considering these factors in acoustical studies, principally for the **comparison of different populations**
- Variation of whistles could be principally related to **motivational states**
- Behavior strongly dependent to the seasonality : **seasonal succession** of behaviors
- Presence of calves strongly dependent to group size : as the **number of individuals** increases, the **number of potential variation** can increase

References

Díaz López, B. 2011. Whistle characteristics in free-ranging bottlenose dolphins (*Tursiops truncatus*) in the Mediterranean Sea: Influence of behaviour. Mammalian Biology-Zeitschrift für Säugetierkunde, 76(2), 180-189.

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