Variability of vocalisation rates of baleen whales : implications on optimal monitoring using passive acoustics

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Southwest Whale Ecology Study

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Outline

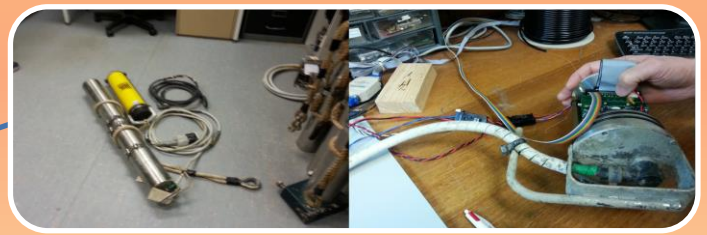
- Underwater noise, acoustics and conservation
- Baleen whale sounds and vocalisation rates
- Methods
- Preliminary results

Underwater noise

Underwater Sound

Impacts

Monitoring and mitigation



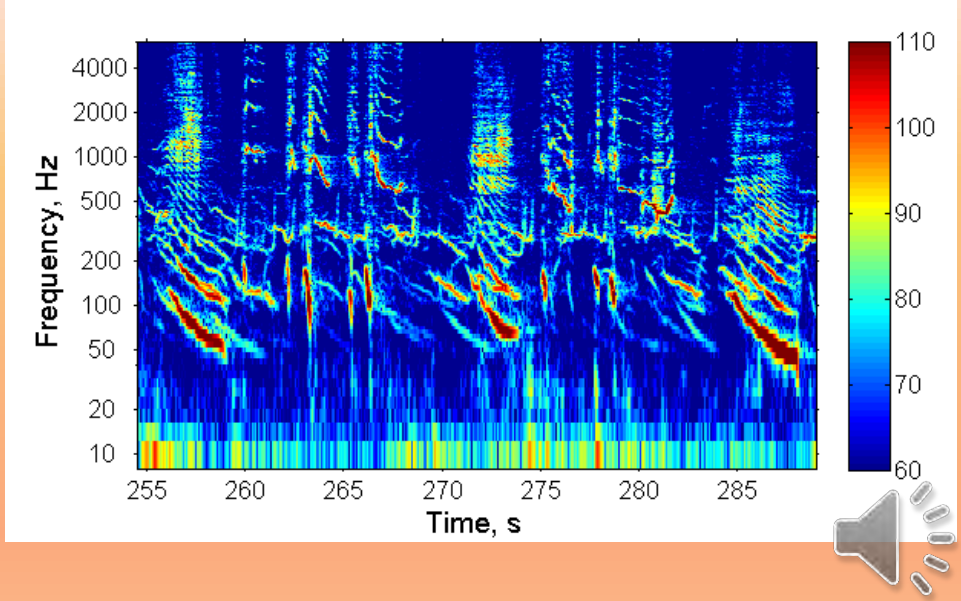
PAM

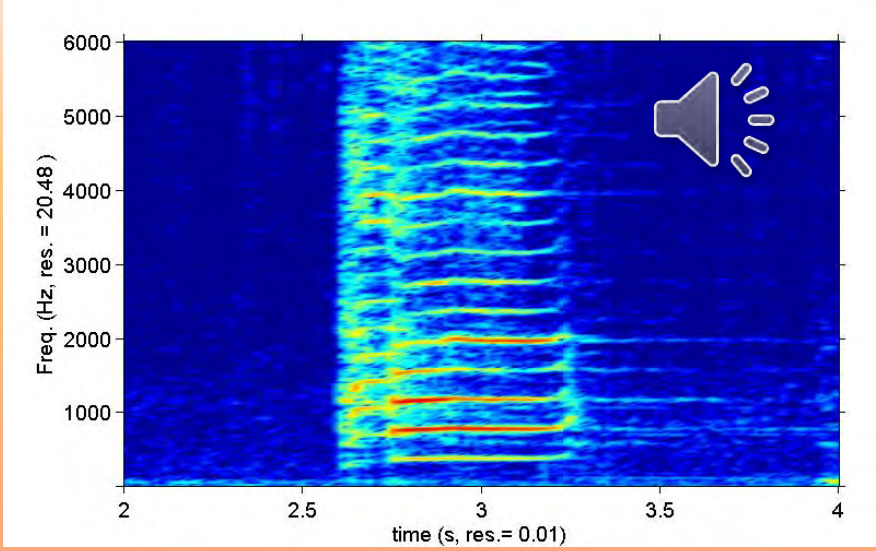
Objectives

- Vocalisation rates and its variability for three species: humpback, blue and right whales in three areas of South Western Australia
- Detection probabilities
- Optimal monitoring guidelines

Baleen Whale Acoustics

- Visualizing sound





- Sound type: song vs non-song

- Vocalisation rates – detection probabilities

Methods

Acoustics

- Acoustic tracking: logger array

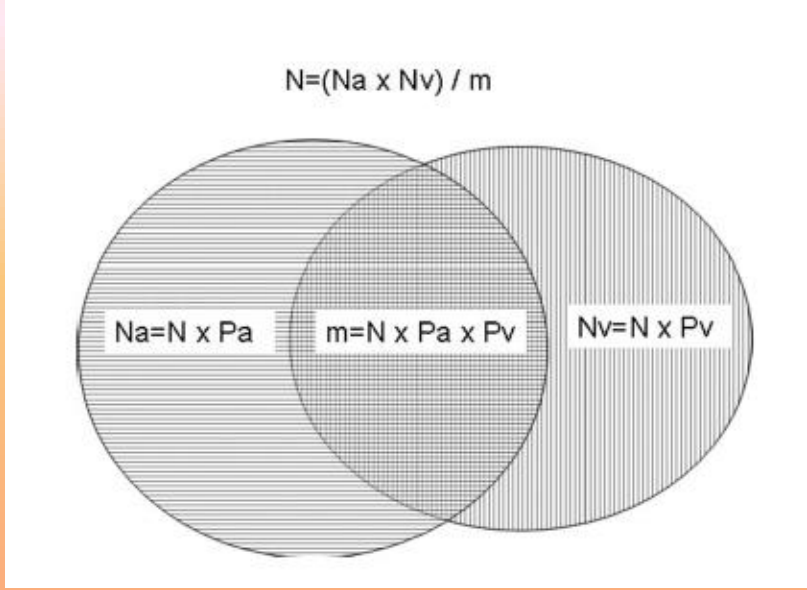
- Analysis

Land-based

- Theodolite tracking

Quantitative Analysis

Probability of individual been recorded and spotted	**Probability of individual been recorded and not spotted**
Probability of individual been spotted and not recorded	**Probability of individual not been recorded or spotted**



$$C_{j,adj} = \sum_{i=1}^{24} C_{ij,raw} \left(\frac{N_{ij}}{N_{ref}} \right)^{2/\alpha}.$$

(Ponce *et al.* 2012)

$$P_a\_\text{estimate} = N_m / N_v$$

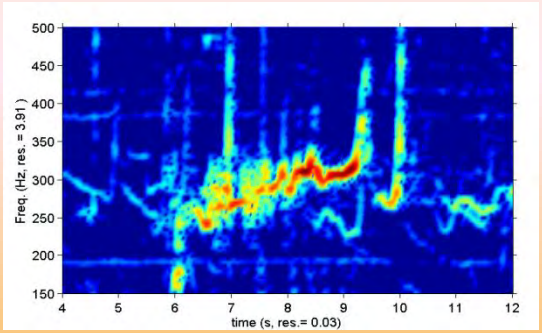
$$P_v\_\text{estimate} = N_m / N_a.$$

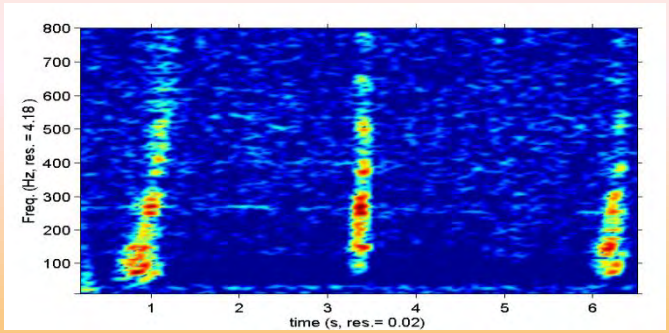
(Akamatsu *et al.* 2008)

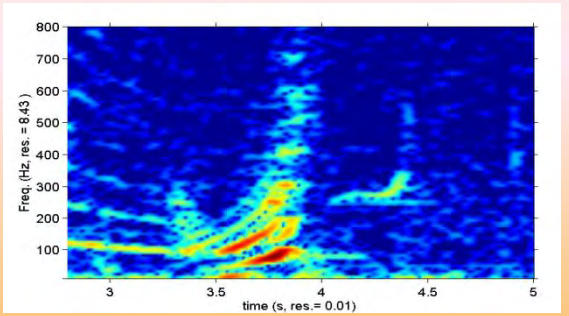
Correlated with time - effort
Influenced by a detection function

Preliminary Results

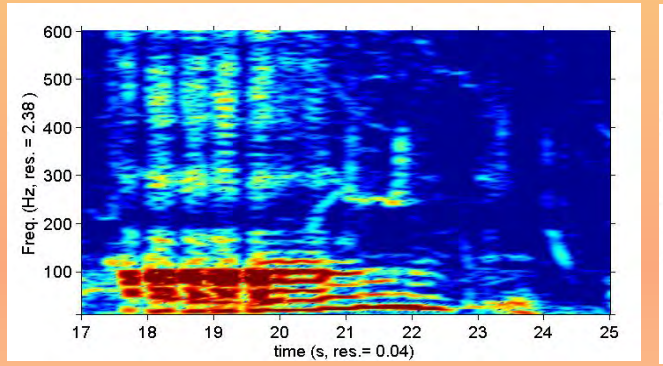
- Humpback whales (26 - Recalde-Salas *et al.* 2013)

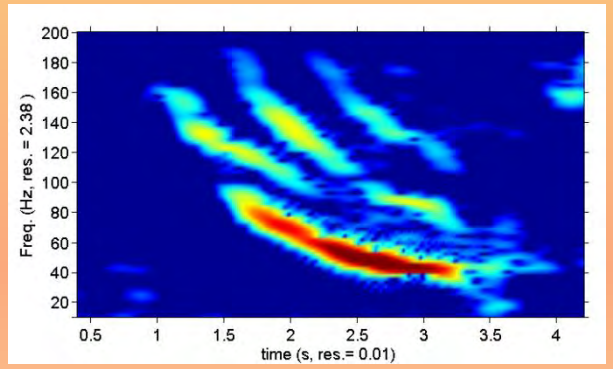


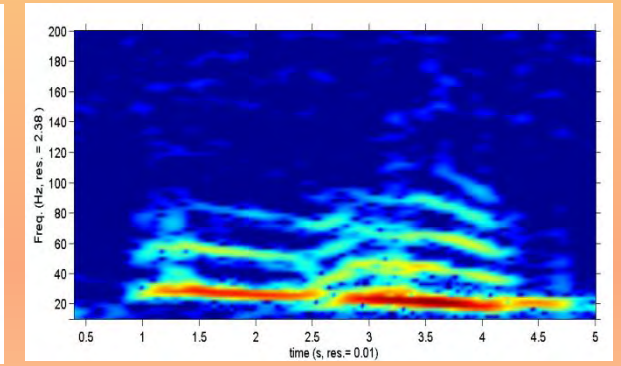




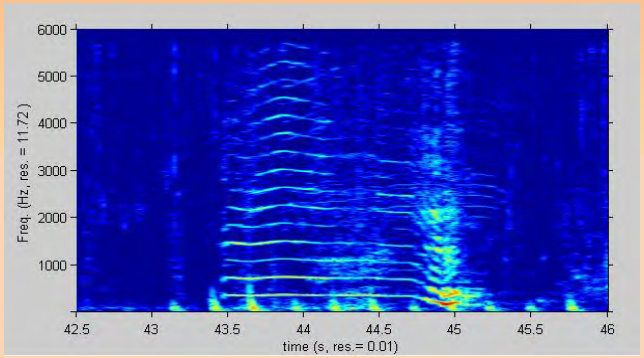
- Blue whales (6 - Gavrilov *et al.* 2011, Recalde- Salas *et al.* 2014)

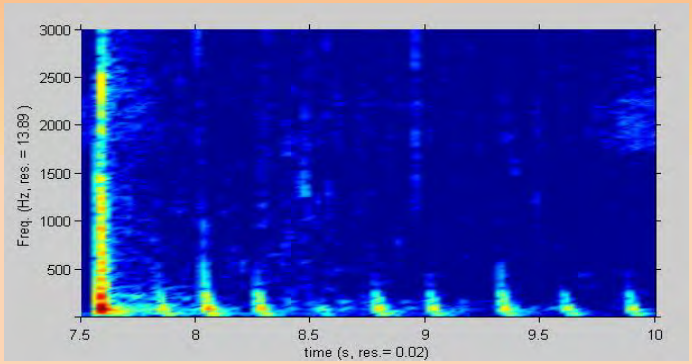






- Right whales (possible non-song sounds – under review)

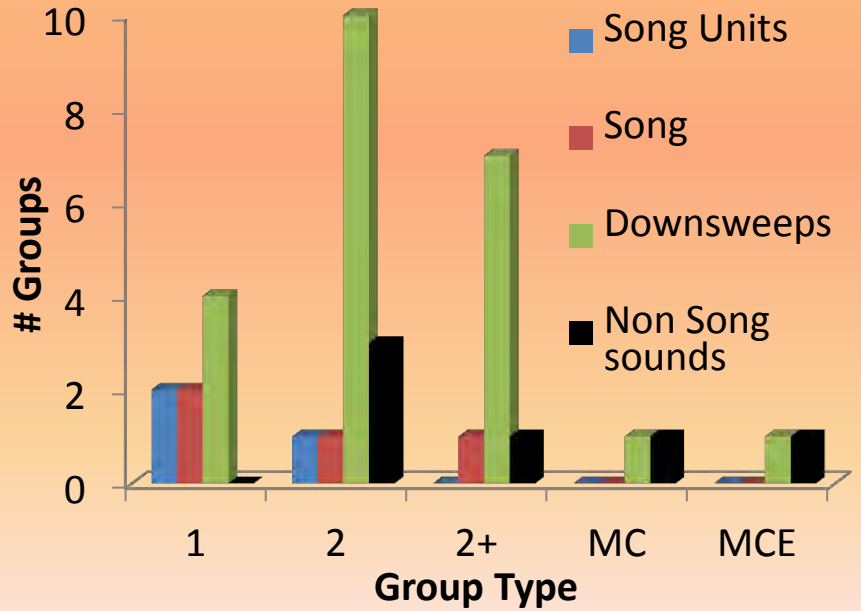


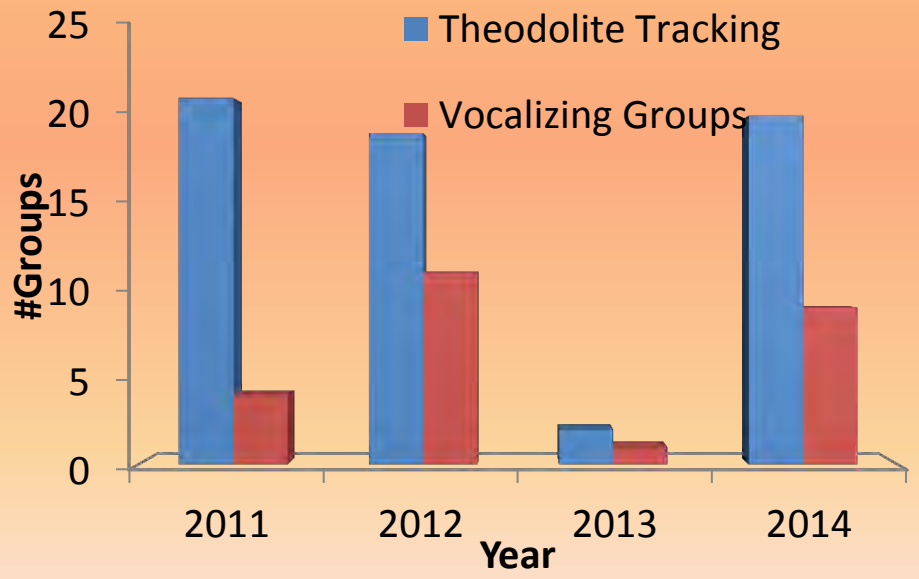


Acoustical Ecology

- **Dominant sound:** differences between species (GB)
  - Humpback whales: song and non-song sounds
  - Blue whales: mostly non-song sound

- **Methods comparison and vocalizing group type (blue whales)**





Acknowledgements

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