Unsupervised Classification of Marine Soundscape with Non-Negative Matrix Factorization

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INTRODUCTION
• Marine soundscape represents a combination of geophony, biophony and anthrophony in the marine environment (i.e. sound of geological processes, biological sounds and anthropogenic noise)
• Study species: Indo-Pacific humpback dolphin (Sousa chinensis)
  □ Inhabits inshore coastal waters with depth < 20m
  □ Highly susceptible to anthropogenic impacts
• This study aims to classify marine soundscape with nonnegative matrix factorization (NMF) with unsupervised approach to provide a quantitative acoustic measure of humpback dolphin habitats in Hong Kong waters

METHODS

RESULTS
• No prior labelling of the core habitat / non-core habitat is given in NMF decomposition (Unsupervised approach on spectral decomposition)
• New encoding matrix of the entire input data (600 recordings) was trained by using NMF (Fig 2)
• Decomposed spectral features were used to classify site-specific soundscape composition (Fig 3) (Supervised classification of marine soundscape)
• Spatial change of relative strength of each basis in different recording locations were constructed (Fig 4)

DISCUSSION
• Coastal soundscape vary spatially in the habitat of Indo-Pacific humpback dolphins in Hong Kong waters
• Relative Strength of Spectral Characteristics corresponds with dolphin distribution data
• Information retrieval of sound-source contribution improves traditional approach delineating strength of spectral contribution along different frequency ranges

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