



Acoustics 2019

Sound Decisions: Moving forward with Acoustics

Signature whistles of Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) in the Fremantle Inner Harbour, Western Australia

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ABSTRACT

A community of ~21 Indo-Pacific bottlenose dolphins (*Tursiops aduncus*), plus calves, resides in the Swan Canning Riverpark, Perth, Western Australia. A complete photo-identification catalogue has been maintained for close to a decade. Regular visual monitoring of individuals in this community can be laborious and expensive. Bottlenose dolphins elsewhere have been shown to emit so-called signature whistles, by which individual animals can be identified. Passive acoustic listening is an efficient monitoring tool in the marine environment and hence an attractive option for monitoring individuals within this small dolphin community—if individual photo-ID can be matched with signature whistles. Archived underwater acoustic recordings and photographs of individual dolphins at the surface were matched chronologically. Dolphins were always present in groups rather than individually. Consequently, to assess whether distinctive whistles could be associated with certain individuals, the likelihoods that catalogued individuals were present when specific whistle types were heard were computed by calculating the percentage of the total number of occasions individual dolphins were in the study area when the whistle was produced. While a larger sample size is needed to capture all individuals in diverse groupings, this study provides the first step in developing a passive acoustic monitoring program for individuals in this small community.

INTRODUCTION

Photo-identification (photo-ID) of dolphins is a valuable tool for conservation management (Currey *et al.*, 2009; Gormley *et al.*, 2012). But it can be labour-intensive and expensive, requiring people in the field to survey animals and take photographs, as well as people in the office to sort, quality-control, and catalogue those photographs. Additionally, visual surveys and photo-ID are limited to daylight hours and good weather conditions. Other cues by which individual dolphins could be identified over extended periods with less effort would be an attractive alternative. Passive acoustic monitoring has this potential for species such as bottlenose dolphins (*Tursiops* spp.) that produce individual-distinctive whistles (Janik and Sayigh, 2013). The Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) of the Swan-Canning Riverpark, Western Australia, produce signature whistles, judged by the SIGID criterion (Janik *et al.*, 2013; Ward *et al.*, 2016). Since 2001, photo-ID data have been collected identifying all adult and juvenile dolphins based on unique dorsal fin shapes and markings (River Guardians, 2018). Consequently, the aim of this study was to test whether signature whistles could be uniquely matched with sightings of individuals.

METHODS

All observations and recordings were undertaken within the Fremantle Inner Harbour, Western Australia, in 2013, 2014, and 2017. Photographs were taken with a digital SLR camera, while recordings were taken with a hand-held hydrophone or autonomous recorder (McCauley *et al.*, 2017). Whistles were extracted, measured, and grouped based on their spectral features and fundamental frequency contours (Marley *et al.*, 2017; Ward *et al.*, 2016). Visual and acoustic data were matched chronologically.

RESULTS

Whistles were of the following types: upsweeping (1. straight up, 2. starting with a U-shape, 3. having at least one inflection, 4. ending flat, and 5. up-down-up triangular), wavy (1. U-shaped, inverted-U shaped, m-shaped, and sine-shaped), flat, downsweeping (1. straight down, 2. starting flat, and 3. starting with an inverted-U), or stepped (1. stepped upsweep, 2. stepped inverted-U, and stepped sine-shape). Figure 1 shows the percent of occasions that any specific individual dolphin was photographed in the presence of each of these whistles.

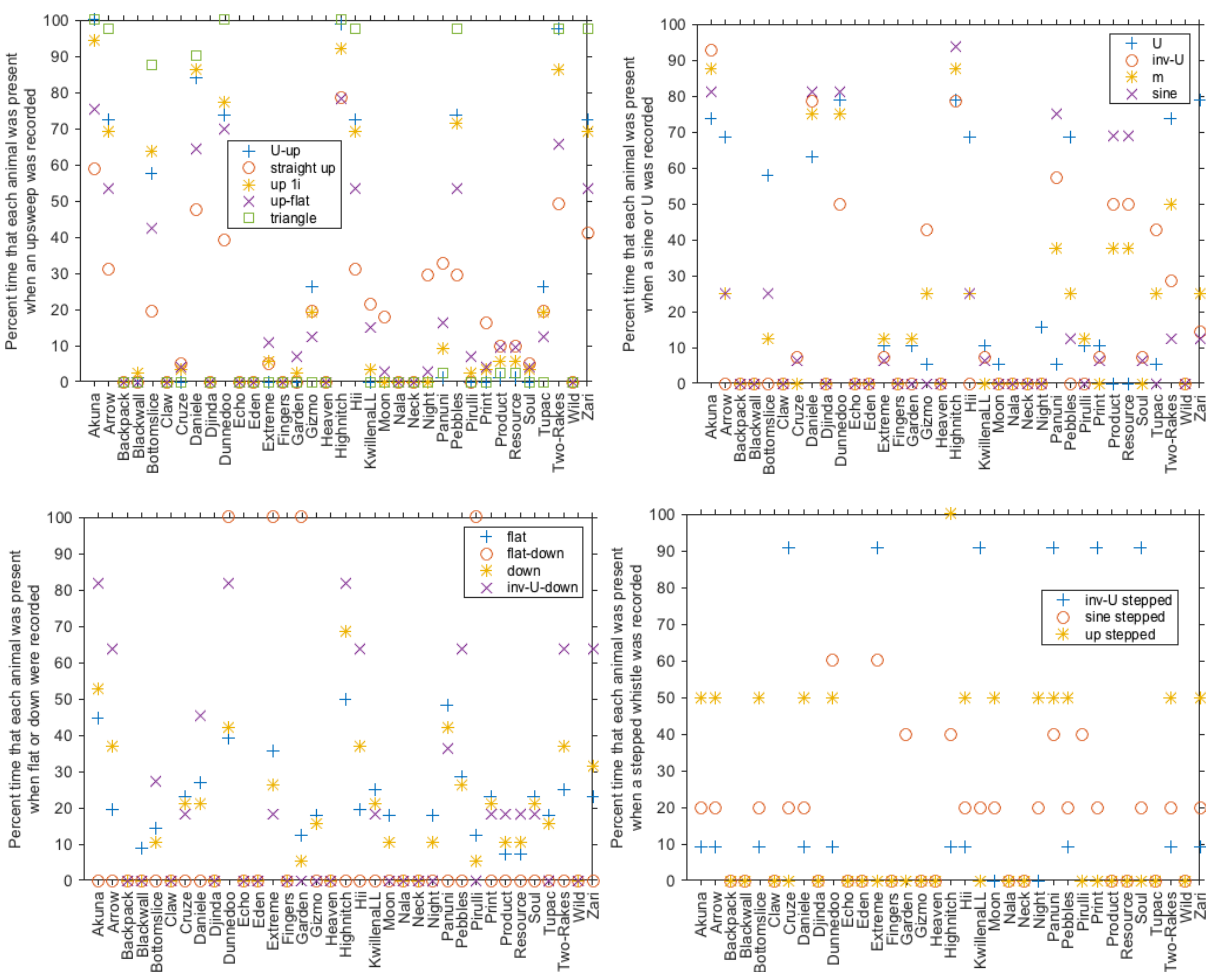


Figure 1: Percentages for the presence of the various individual dolphins during occasions when certain whistles were recorded.

DISCUSSION

While our study only managed to assign probabilities for the co-occurrence of individual dolphins and signature whistles, this is the first step in the development of a dual visual-acoustic catalogue that would allow effective passive acoustic monitoring of this inherently vulnerable dolphin community.

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