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Neonate of a Franciscana dolphin  
(*Pontoporia blainvillei*) emit distinct  
echolocation clicks: implications for their  
future study in the wild

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INTERNATIONAL  
WHALING COMMISSION

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10 **ABSTRACT**

11 While waiting for a high tide to start with rescue procedures, clicks a female calf of Franciscana dolphin were  
12 recorded in a tide pool for about two hours. The individual still had part of the umbilical cord attached. To learn how  
13 calves of Franciscana dolphins vocalize in the wild, their echolocation clicks were analyzed. They produce distinct  
14 echolocation clicks compared to adults, with different peak frequencies, ranging between 40 and 140 kHz. Also,  
15 their bandwidth is typically about 120 kHz. These differences allow us to differentiate between adults and calves  
16 well enough to be able to use passive acoustic monitoring in the wild to better assess population structure.

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18 **KEYWORDS:** ECHOLOCATION, ACOUSTICS, VOCALISATIONS, SOUTH AMERICA

19  
20 **INTRODUCTION**

21 Franciscana dolphins (*P. blainvillei*) are considered vulnerable according to the IUCN; however, it is extremely  
22 difficult to study this species in the wild given its small size, coloration and rare aerial displays. Passive acoustic  
23 monitoring is a non-invasive method that has been increasingly used in the last years to study cetaceans, but little is  
24 known on the vocal behavior *P. blainvillei* in its natural habitat.

25 A calf stranded alive and swimming in a tide pool until the tide increased and she could freely swim into the ocean  
26 with minimal disturbance to the individual. Its vocalizations were recorded for about two hours, allowing us to study  
27 the echolocation clicks of a newborn of Franciscana dolphin in the wild.

28  
29 **MATERIAL AND METHODS**

30 The Franciscana dolphin was found on December 16, 2011 in the Rio Negro Estuary, located in the Northeast  
31 Patagonia, Argentina. The individual recorded was a female, without external lesions or injuries, nor net marks. The  
32 animal was actively swimming, with breathing reflex and behavior apparently normal up to its natural release into  
33 the ocean. It still had attached part of the umbilical cord, indicating that the animal was only few days old.

34  
35 **Acoustic recordings**

36 A hydrophone Reson TC 4033 was placed at the bottom of the tide pool while the animal was swimming around.  
37 The sound was digitized by Avisoft Ultrasound-Gate (connected with the Ultrasound-Gate charge amplifier), with a  
38 sampling rate of 500 kHz and stored as 1 min wav-files in a laptop.

### 39 Data analysis

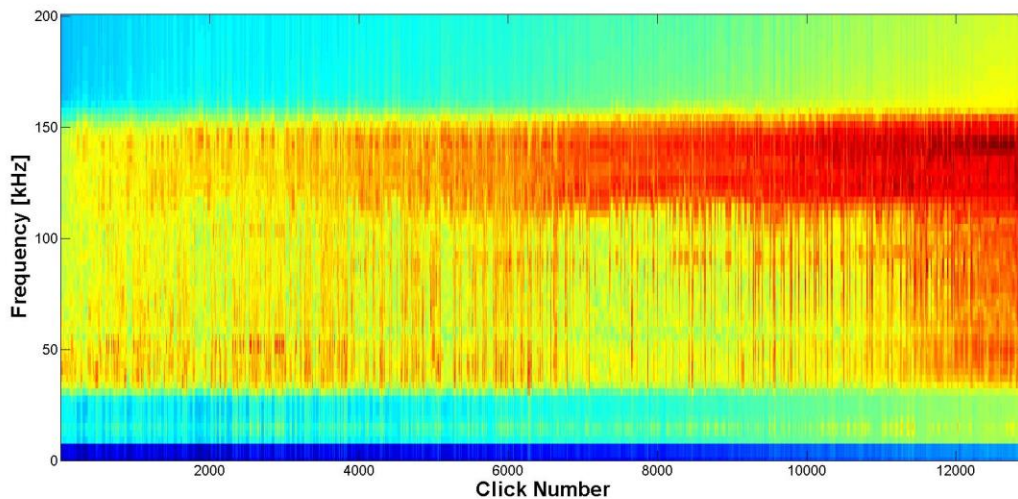
40 Data analysis was performed with custom-written scripts in MATLAB 7. A detector was created to automatically  
41 extract echolocation signals of this individual of Franciscana dolphin. We only picked echolocation signals with a  
42 signal-to-noise ratio over 12 dB, which was also our criterion for click onset. For this study, 12961 clicks were  
43 analyzed and sorted in ascending order of their frequencies.

44

## 45 RESULTS AND DISCUSSION

46 Click extraction revealed that this calf produces clicks with varying peak frequencies, between  $40\pm 3$  kHz and  $133\pm 3$   
47 kHz (see Fig. 1). In contrast to a previous study conducted on two calves in captivity (Tellechea and Norbis, 2014),  
48 we were not able to clearly distinguish between low frequency and high frequency clicks, since the peak frequency  
49 could be anywhere within the aforementioned range. It is unclear whether these differences are due to the  
50 methodology used to analyze clicks or to the different recording situations.

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52

53 Figure 1- Concatenated spectra of a calf of Franciscana dolphin in ascending order of frequencies. The amplitude is  
54 represented by the color- dark red indicates highest amplitude whereas dark blue represents the lowest.

55

56 An important result from our analysis consists of the huge bandwidth that calves seem to have compared to adults.  
57 While from these recordings we obtained a bandwidth of  $120\pm 6$  kHz, studies of adults of Franciscana dolphins show  
58 a typical bandwidth of 20 kHz (e.g. Melcón *et al*, 2012), which would make sense since this species is known to  
59 emit narrow band high frequency clicks (von Fersen *et al*, 1997, Melcón *et al*, 2012). The fact that there is such a  
60 big difference between echolocation clicks of calves and adults indicates the possibility of distinguishing them with  
61 passive acoustic monitoring in the wild. In terms of conservation, it means that we are one step closer to  
62 understanding their population structure through this method.

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