

# The acoustic repertoire of free-ranging bottlenose dolphins (*Tursiops truncatus*) in southwest Abaco, Bahamas



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## Introduction

- The types and characteristics of sounds produced by free-ranging bottlenose dolphins (*Tursiops truncatus*) have been found to vary across geographic regions.
- It is therefore critical to identify specific regional vocal repertoires as the basis for future studies investigating signal functionality, the further development of passive acoustic monitoring techniques and to assess the potential impact of anthropogenic noise.
- This study describes the acoustic repertoire of free-ranging bottlenose dolphins in southwest Abaco, Bahamas.**

## Statistics for acoustic parameters of identified sounds

Table 1: Acoustic characteristics of sound types produced by bottlenose dolphins in southwest Abaco, Bahamas.

Sound type	Statistics	Start Freq (kHz)	End Freq (kHz)	Min Freq (kHz)	Max Freq (kHz)	Freq Range (kHz)	Peak Freq (kHz)	Inflection Points (n)	Duration (s)	Pulse rep. rate (p/s)
Whistles	n	204	204	204	204	204	204	204	204	-
	Mean (± SD)	6.83 (1.73)	13.21 (3.20)	6.47 (1.50)	13.88 (2.99)	7.41 (3.11)	9.01 (2.10)	0.48 (0.93)	0.31 (0.15)	-
	Range	2.20 - 12.89	5.20 - 27.10	2.60 - 10.60	7.30 - 26.40	1.01 - 23.80	4.29 (15.30)	0.00 - 7.00	0.10 - 1.10	-
	CV	25	24	23	22	42	23	196	49	-
Chirps	n	92	92	92	92	92	92	-	92	-
	Mean (± SD)	4.89 (2.60)	4.14 (1.81)	3.89 (1.65)	5.03 (2.64)	1.14 (1.28)	4.31 (2.03)	-	0.04 (0.02)	-
	Range	1.36 - 13.08	1.95 - 9.86	1.17 - 8.78	2.24 - 12.89	0.10 - 5.37	2.14 - 12.59	-	0.01 - 0.09	-
	CV	53	44	42	53	113	47	-	44	-
BP	n	-	-	-	-	-	-	-	196	176
	Mean (± SD)	-	-	-	-	-	-	-	0.15 (0.11)	435 (91)
	Range	-	-	-	-	-	-	-	0.01 - 0.69	214 - 853
	CV	-	-	-	-	-	-	-	74	21

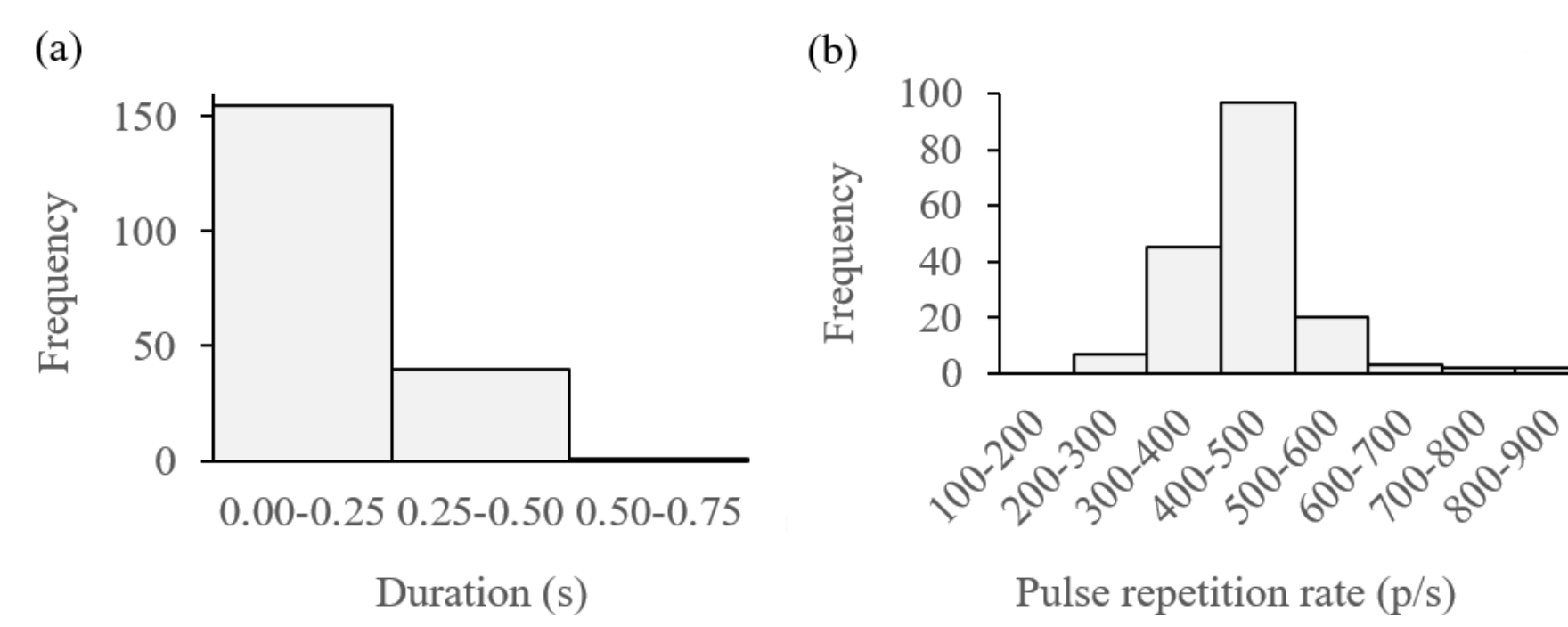
## Methods

### Field work

Visual survey data and acoustic recordings were collected during the summer months from 2008 to 2016.

### Acoustic analysis

- The analysis focused on the identification (visually & aurally) and characterisation of five sound types: **whistles, chirps, low-frequency narrow-band (LFN) sounds, brays and other burst pulse (BP) sounds.**
- Characteristics of sound types were compared to those of other populations.



## Burst pulse sounds

Fig.4. (a) The distribution of burst pulse sound duration. (b) The distribution of pulse repetition rates (p/s) for burst pulse sounds.

## Definition of sound types

- Whistle (Fig.1.):** narrow-band, frequency modulated, tonal sound, > 100 ms
- Chirp (Fig.2.):** short tonal sounds, <100 ms
- LFN sound:** < 100 ms, < 1 kHz
- BP sound (Fig.3.):** broadband clicks, emitted at high pulse repetition rates, inter click interval < 10 ms
- Bray:** distinct vocal units consisting of two sound types such as a BP sound followed by a short downsweep (Janik, 2000)

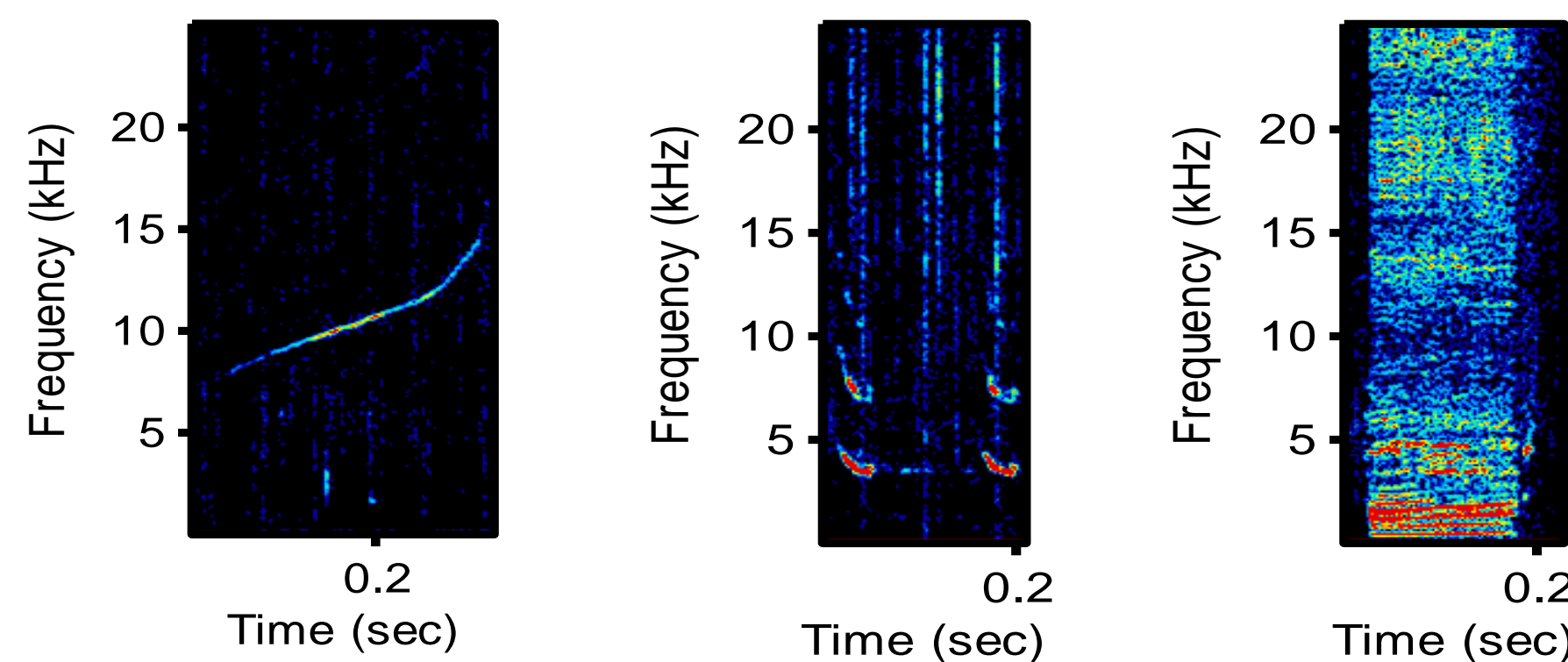


Fig.1. Whistle

Fig.2. Chirp

Fig.3. BP sound

## Comparison of whistles with populations in other geographical regions

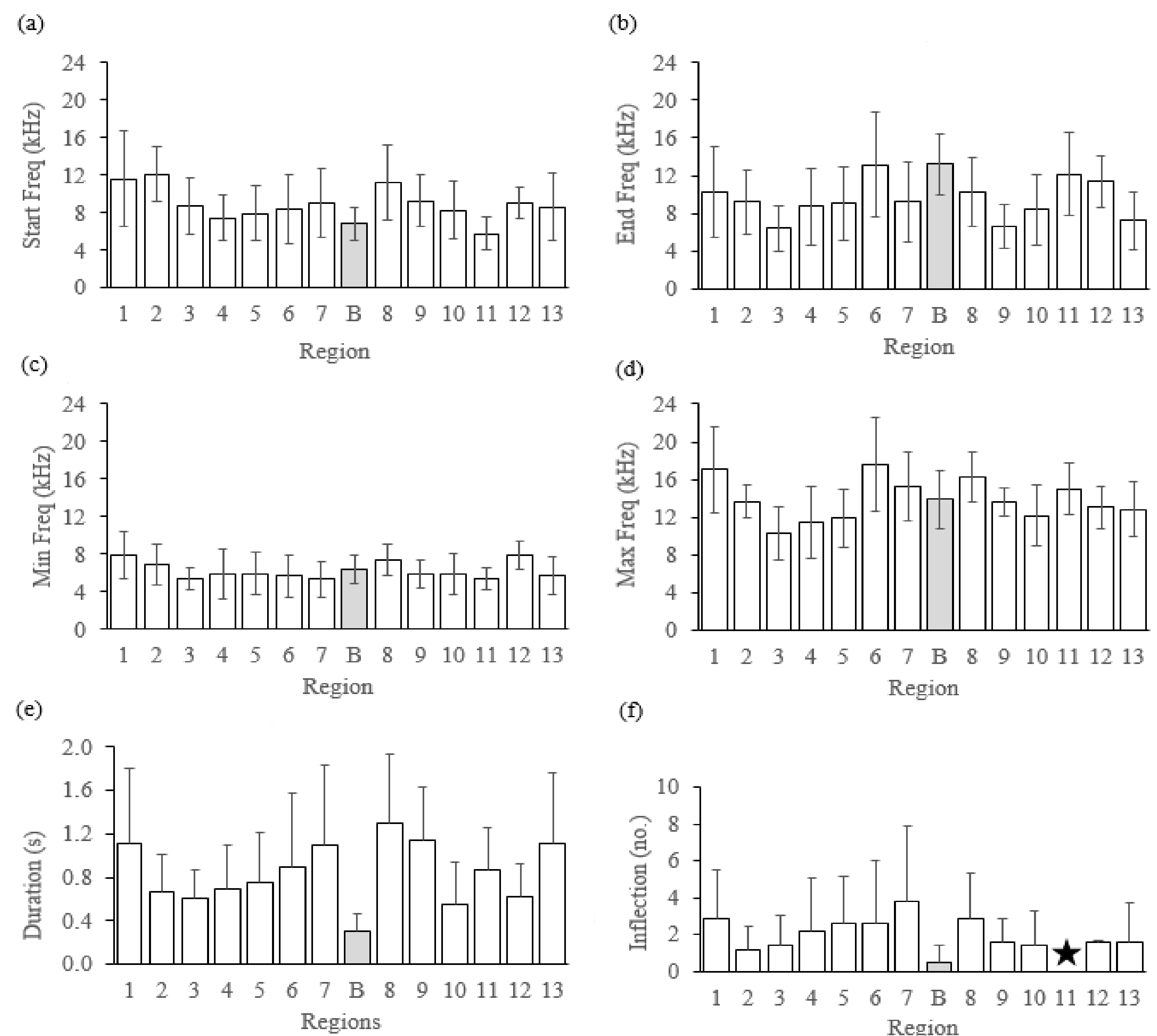


Fig.5. Mean values (±SD) for whistle parameters of bottlenose dolphins from the Bahamas (in grey) and 13 other regions. The different regions are sorted by where the study sites occurred geographically, moving from West (North Pacific) to East (Namibia). The region codes are as follows: (1) North Pacific (2) Gulf of California (3) South Padre Island, Texas, (4) Corpus Christi Texas (5) Galveston Texas (6) Costa Rica (7) Panamá (B) Bahamas - This study (8) Western North Atlantic (9) Argentina (10) South Brazil (11) Portugal (12) Italy (13) Namibia. ★ No data available

## Results

- Acoustic recordings analysed:** 2 h 53 min
- Group size:** ranged from 2-30 dolphins
- Sound types identified:** whistles, chirps and BP sounds (Table1, Fig.4.)
- Sound types not present:** LFN sounds and brays
- Whistle parameter comparison:** Fig.5.

## Conclusion

- The bottlenose dolphins' acoustic repertoire clearly shows geographic variation in types and characteristics of sounds.
- Describing these differences will help future studies on the possible reasons for this variation.