# ANTHROPOGENIC IMPACTS ON THE BEHAVIOR OF FISH AND MARINE TURTLES IN THE LARGEST VISITOR CENTER OF PROJETO TAMAR, PRAIA DO FORTE, BAHIA, BRAZIL

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### INTRODUCTION

Projeto TAMAR possesses one of the larger Brazilian aquatic museums, maintaining live animals such as fishes and marine turtles in pools for public visitation.

The present work aims to describe the initial observations of different anthropogenic noises (public visitation, music concerts and a near construction) and their possible impacts on the captive animals.







Figure 1. Shark pool during routine days.



Figure 5. Map of Projeto TAMAR's visitor center. (1. Shark pool; 2. Beach pool; 3. Male pool)

## **RESULTS AND DISCUSSION**



Figure 6. Recording underwater noise.

Music Concerts presented the highest frequency amplitude (10701.3 Hz), while in visitation days it was registered at 6005.1 Hz and pile driving at 274.4 Hz (see table 1 for details).



### Figure 7. Spectograms of the recordings during music concerts.



Figure 2. Pile driving.

Figure 3. Music concerts.



outside shark pool

Figure 8. Spectograms of the recordings during routine days.



Figure 4. Location of Projeto TAMAR's visitor center.



outside beach pool

Figure 9. Spectograms of the recordings during pile driving.

 Table 1. Frequencies of the recordings.

File #	Low Freq (Hz)	High Freq (Hz)	Center Freq (Hz)	Delta Freq (Hz)
During the concerts - Sound-check cabin	115.1	10816.4	258.4	10701.3
During the concerts - inside shark pool	103.6	2175.6	129.2	2072.0
During the concerts - outside shark pool	100.5	5328.2	172.3	5227.7
Routine days - outside shark pool	46.9	6052.0	86.1	6005.1
Routine days - inside beach pool	25.3	556.3	86.1	531.0
Routine days - outside beach pool	82.9	497.4	172.3	414.5
Routine days - inside shark pool	93.8	7037.2	559.9	6943.4
Routine days - Sound-check cabin	93.8	3143.3	215.3	3049.5
Pile driving operation - inside shark pool	28.4	302.8	93.8	274.4
Pile driving operation - inside male pool	14.4	272.8	93.8	258.4

#### MATERIAL AND METHODS

Acoustic recordings were collected between November/2012 and March/2013, at three different pools (inside/ outside) using a Reson TC4013 hydrophone (frequency response 1 Hz – 170 kHz; receiving sensitivity – 211dB ffl 3 dB re 1V/忠Pa).

To record in-air sound intensity a ITDEC 4010 digital sound level meter (range: 30dB~130dB RS-232 Pclink) was utilized.

We collected ten 3-min samples from each pool, during the concerts and pile driving operation and duringvisitation days, totaling 120 minutes.

The behavior of the captive animals was observed during recordings following the *Adlibitum* method. The relative values for sound intensity were collected by the amplitude peak and converted to dB with "Conversion of sound units (levels)" software. Routine behaviors were characterized by slow movement patterns and long bouts underwater (near the bottom). We did not observe any major changes in routine behaviors of the *Ginglymostoma cirratum, Dasyatissp., Chelonia mydas* and *Caretta caretta*.

In contrast, the noise generated by the pile driving operation resulted in a negative behavioral responsefor a group of 15 *Caranxsp.*, consisting of multidirectionalgroup movementsfollowing the pulses. Noise inside and outside of the pools did not present significant variation. We recommend continued acoustic monitoring to build on these findings and to subsidize tourism and conservation of museums and public parks.

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