

# Aquaria and Zoos as Labs: Recording Vocalizations of Marine Mammals using Audacity

**Kathleen Nolan, Kristy Biolsi, Francine Foo, Andrew Salzillo, Afia Azaah, and Allen Burdowski**

St. Francis College, Biology and Health Promotion, and Health Care Management Department,  
180 Remsen St., Brooklyn, New York 11201 USA

([knolan@sfc.edu](mailto:knolan@sfc.edu); [kbiolsi@sfc.edu](mailto:kbiolsi@sfc.edu); [ffoo@sfc.edu](mailto:ffoo@sfc.edu); [asalzillo@sfc.edu](mailto:asalzillo@sfc.edu); [aazaah@sfc.edu](mailto:aazaah@sfc.edu); [aburdowski@sfc.edu](mailto:aburdowski@sfc.edu))

Students and professors at St. Francis College visited aquaria and zoos in the New York City region with a focus of learning more about marine mammals. Behavior of some of the marine mammals (sea lions, seals and a fur seal) was recorded in a journal, and vocalizations were recorded using *Audacity*, a free down-loadable software. Correlations of vocalizations and behavior were then noted. The participants in these mini “field trips” were able to help develop useful biology laboratory curricula for ecology, marine biology, and marine mammal cognition courses and to collect data for research projects.

**Keywords:** marine mammals, aquaria, zoos

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## Introduction

There are a rich array of aquaria and zoos in the New York metropolitan area, and over 214 such facilities in the United States alone. There has been a shift from entertainment to education and conservation. (However, names die hard. In 1993 *The Bronx Zoo* tried to change its name to the *Wild International Wildlife Conservation Park* but that name did not take, so it is now back to its former name.) Randall (2012) and Schwan *et al.* (2014) found that young peoples’ attitudes changed for the better toward espousing conservation values after zoo visits.

We realized that these places, besides being educational and inspiring awe in our students, could serve as reservoirs of data for our students to collect. We decided to make the study of vocalizations of sea lions one of our projects, and used the program *Audacity* to capture vocalization of sea lion data. There is a whole body of literature dedicated to sea lion vocalization and behavior. For example, Pitcher *et al.* (2010) showed that female sea lions could recognize their own pup calls within the first 48 hours of birth of the offspring. Kunc and Wolf (2008) found that vocalizations in Galapagos sea lions seemed to be important

in male interactions and for establishing territories, and for females to assess the health of males.

We are in the process of currently analyzing *Audacity* data obtained from many sea lion recordings. We are also recording numbers of marine mammals in the facilities, age and sex, and approximate sizes. This data constantly changes; two new sea lions were born in the Bronx Zoo during the first week of July! We are recording the times that the animals vocalize, which is usually during a feeding time. Sometimes they are prompted to vocalize by trainers. Recording the sea lions slows the students down so that they really focus on the animals, albeit for a relatively short period of time duration, usually from around twenty minutes to a half hour.

After aquaria and zoo trips students might use selected readings and exercises to augment their experiences. For instance, Beri *et al.* (2010) conducted a study of the economic impact of zoos, and suggested that governments increase revenue toward their support. They use the word stakeholder; we have conducted projects with students in the past in which we ask them to make a table of stakeholders and their points of view; these have been very successful

and engaging exercises for the students, and they rate them high as learning experiences (Nolan, 2009). Esson *et al.* (2010) show that concepts such as resource management and cultural sensitivity can also be translocated skills to students that visit zoos. Gordon (2010) suggests that urban students such as ours need to have connections with nature and their own lives pointed out to them. Patrick *et al.* (2007) purport that linking conservation goals with education should be possible in zoo settings. Clayton *et al.* (2014) recommend that zoo visits might provide an impetus for a serious discussion about climate change. Packer and Ballantyne (2010) suggest that multiple visits may be necessary to build on knowledge gained from previous visits and to allow processing of the experience. Having students visit multiple sites to record sea lions will build upon this constructivist approach.

## Student Outline

### Students:

1. Download the free software *Audacity* onto your computer (it should have a microphone---you can test it before the field trip). (Note: *Audacity* does not work with I Pads.)
2. Find out the time of a sea lion feeding before you arrive at the zoo.
3. Arrive at the sea lion enclosure fifteen minutes before the feeding.
4. Form into teams of three: One person will work the computer and the *Audacity* program; the second person will record in a notebook the time of each vocalization and the third person will take a video of some of the behaviors of the sea lions.
5. Open up *Audacity*. You should be able to keep the computer facing you so you can see the spectrograms while it is recording.
6. Have your partner take notes such as the time of each vocalization and the amount of time between each vocalization.
7. Be careful for splashing!
8. Record for twenty minutes.
9. Save the program, and try to analyze the data before you close it. Otherwise, it saves the data as a folder of MP3 files that are 6 seconds long---this is harder to analyze.

### Make a Record of:

1. The number of vocalizations.
2. The length of time for each short vocalization period (could include multiple barks).
3. If there is a series of barks, how long is each one?
4. How many barks are in each vocalization?
5. What is the range (in Hertz) of the sounds?

### For Your Lab Report:

1. Find one article on the use of aquaria and zoos in teaching.
2. A research paper on any aspect of sea lions or other pinnipeds.
3. In your *Introduction*, state some information (include data) from these two papers, as well as your purpose in conducting the lab.
4. For your *Materials and Methods*, describe the enclosure of the sea lion and how many you are recording. Research the sea lions and determine how many there are, what their names, sex, age and weight are, and note information about how they eat and how they are trained.
5. State how you used *Audacity*, your type of computer, and the length of time that you recorded the animals. State approximately how many people were present before and during the show. Children or adults? How many trainers were there?
6. For your *Results*, make a table in which you give the above-listed information about the vocalizations. Write an overview of your results in paragraph form. Add any additional observations about their behavior.
7. In your *Discussion* section, cite what you think the meaning and applications are of your work. Can you think of any additional experiments you could conduct or observations you could record?

## Notes for the Instructor

### Selected Results

Sea lions, fur seals, and true seals were observed during 13 trips to the New York Aquarium, Bronx Zoo, Central Park Zoo, Queens Zoo, Prospect Park Zoo, the Maritime Aquarium, and the Aquarium of Niagara. An additional solo trip was made by KN to the Seattle Aquarium. A journal was kept of all observations. If the animals were vocal, they were recorded with *Audacity*, a free down-loadable software program. Sometimes they would only vocalize if a trainer gave them a fish reward (Figs. 1 and 2 illustrate a depiction of *Audacity* recordings and Table 1 is a subset of the data collected.).

We learned much about the animals such as the fact that the animals often get cataracts and other eye diseases. Also, one male sea lion had been branded, because he got into fishermen’s nets. He thus become a rescue and now resides at the Queens Zoo. We also discovered the Macauley Library of Sounds, which has over fifty sea lion recordings in both captivity and in the wild. We have begun analyzing this data set in addition to our own.

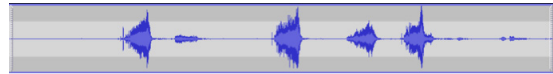


Figure 1. Ten-month old pup vocalizations (captive)



Figure 2. Pup responding to its mothers call (wild) McCauley Library.

Table 1. Subset of vocalization data.

Captivity Location	Species	Number of Pinnipeds	Number of Vocalizations per 20 minutes	Average Time per Vocalization	Average Time between Vocalization
Bronx Zoo NY	California Sea Lions	5 Total - 1 female pup - 4 adult females	47 Total - 41 (from pup) - 6 (all from mother)	0.6 sec 1.6 sec	~21 sec ~4 min
Queens Zoo NY	California Sea Lions	4 Total - all males	58 Total	1.2 – 1.5 sec	Simultaneously vocalize for 12 seconds. ~4.6 min between these group vocalizations.
Central Park Zoo NY	California Sea Lions	5 Total - 3 females (2 adults, 1 pup) - 2 males (1 pup, 1 juvenile)	33 Total - 28 barks from juvenile male	~ 1.9 sec. 0.7 sec	1 every 45 – 50 sec. ~every 4 minute
Prospect Park Zoo NY	California Sea Lions	3 Total - female adults	8 Total	1.4 sec	Every 4 –4 .5 minutes
Maritime Aquarium CT	Harbor Seals	4 Total - all females	0 Total *3 vocalizations during show, which were targets from trainers	*4.5 sec	N/A

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## About the Authors

Kathleen A. Nolan, Ph.D. is a professor of biology and Chair of the Biology, Health Promotion and Health Care Management Department at St. Francis College. She has been a long-time ABLE member and has presented numerous major and mini-workshops at ABLE conferences. She is interested in a wide variety of topics, including fish population genetics and biology laboratory education.

Kristy Biolsi, Ph.D. is an associate professor of psychology who studies sea lion behavior. She is also the Director of the BA/MA Program in Applied Psychology. She is the true backbone behind this work and is the founder and Director of the new Center for the Study of Pinniped Behavior and Cognition (C-SPEC). [www.sfc.edu/pinniped](http://www.sfc.edu/pinniped)

Allen J. Burdowski, Ph.D. is a professor of biology and the Academic Dean Pre-Health Science Advisor at St. Francis College. He suggested the use of *Audacity* for this project. He is a biologist who has conducted research on many topics, especially hematology. His current interests include the study of cancer, anatomy and physiology, and oral surgery.

Francine Foo, Andrew Salzillo, and Afia Azaah are students at St. Francis College who assisted in the data collection.

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