Chirping Cats: Predictors of Vocalizations Among Domestic Cats *(Felis catus)*

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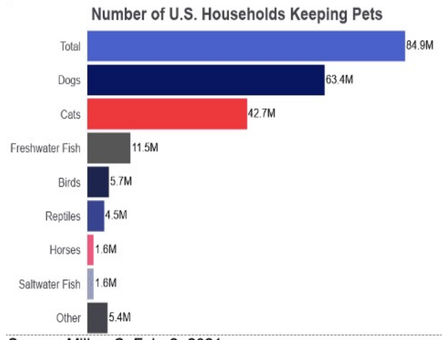
Background

Cats are the second most common pet in the United States (Miller, 2021). Despite this we often do not fully understand what their needs are. Given there are 42.7 million cat custodians in the United States, it is important to learn how to best serve our companion animals and understanding some their communicatory nuances is part of that.

Even though cats have evolved to communicate with humans, we still have trouble accurately interpreting the vocalizations which is why Mcloughlin et al. (2019) demonstrated the need for automated bioacoustics to interpret animal vocalizations.

Figure 1
2021 Pet Ownership Statistics



Source: Miller, C. Feb. 2, 2021

While Nicastro and Owren (2003) found that humans can identify and interpret domestic cat vocalizations, Prato et al (2020) showed the opposite. Even in the one that demonstrated significance, the ability to correctly interpret the context of the vocalization was mainly relegated to those who had prior experience with cats and even then, it was still difficult to distinguish them. Ironically, Ntalampiras et al (2019) found the possibility that cat vocalizations have evolved to match human frequency in order to communicate with humans.

Three studies attempted to interpret emotions from cat behavior, but each did it in various ways. Bennett et al (2017) used the behavior of a confined cat and compared it to Leyhausen's seminal treatise which found that they exhibited aggressive and threatened behaviors of hissing, nose licking, and dropping of the jaw. Farley et al (1992) used classical conditioning with a human stimulus and only recorded meows but possibly found a new vocalization but further research was necessary. Fermo et al (2019) used positive (food) and negative (riding in a car) stimuli to observe the cat's behavior and determine their emotional valence. A study by Schötz (2013) of three domestic cats in the presence of prey, showed that the chirp vocalizations were used more often than the chatter, tweedle and twitter. Further, Loyd et al (2013) in a study analyzed the effects of free-roaming domestic cat predation on the wildlife that lived near them. It was found that even though most of the wildlife was not caught or killed, there were still detrimental effects on the environment and the prey since they consistently had to engage in antipredator behavior.

Empirical Question: *What is the diversity of contexts in which cats chirp?*

Proposed Method

Target Species

Four domestic cats (2 female, 2 male, half fixed) from the Pixie Project will be purposively sampled (more vocal animals) for inclusion in this study

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Materials

The materials required for this project include audio and video equipment, Wyze V2 Pet Camera™ and Kaleidoscope™ Wildlife Acoustics spectrograph software for spectrographic analysis of recorded vocalizations. Televised stimuli will be projected from a Sansui 24" 720P Basic S24 LED HD High Resolution Flat Screen television with a reported refresh rate of 60Hz. The videos used as stimuli (i.e., robin, mouse, unfamiliar conspecific and human) will come from YouTube (robin: https://youtu.be/_o8iuc97vJM, mice: https://youtu.be/6pbreU5ChmA) and both the unfamiliar conspecific and human will be live. The unfamiliar human will be a fellow researcher who the cats have never met, and the unfamiliar conspecific will be one of the other four cats, who have also never met each other.

Design and Procedure

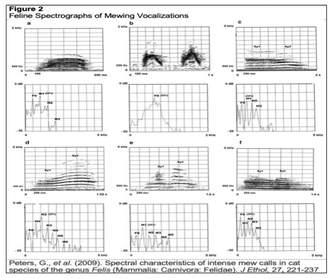
The four cats will be transported to the laboratory by myself and another researcher. Each of us will be responsible for picking up two of the cats from the Pixie Project shelter. The cats will be specifically selected for their vocalness from the shelter and then handled by the workers in the shelter and put into a crate and transported by car to the laboratory. They will then be place in a designated white room with no windows and no other stimuli present to reduce the chance of any confounds. Once in the designated room in the laboratory, each cat will be given an hour to familiarize themselves with the room and, eat, drink, and use the bathroom before the experiment will begin.

This experimental study will involve random assignment of the cat subjects to the different contexts of the independent variable, prey observation context (e.g., robin, mouse, unfamiliar conspecific, and unfamiliar human) with spectrographic v*ocalizations* serving as the dependent, measured variable. Each stimuli will be shown for a total of 5 minutes.

Image 1
Vocal Chirping to television squirrel

Photo credit: The Nantucket Cat

Figure 2
Feline Spectrographs of Mewing Vocalizations



Peters, G., *et al.* (2009). Spectral characteristics of intense mew calls in cat species of the genus *Felis* (Mammalia: Carnivora: Felidae). *J Ethol, 27*, 221-237

Proposed Results

In order to assess the effect of the independent variables on behavior and specifically vocalizations, 2 (sex) x 4 (context) analysis of variance will be conducted with an effect size estimate for magnitude of estimation in any within or between subjects' main effects and interactions. Further, descriptive analyses will be conducted across vocalizations.

Discussion

It is predicted that cats will only chirp during the prey context (e.g., bird and mouse) and that it will be most frequent in the bird context than in the mouse context. Cats will hiss at the unfamiliar conspecific because hissing is often used when they feel threatened, which we expect to occur when they meet an unfamiliar conspecific in 'their' territory. Cats will sniff, meow or hiss at the unfamiliar human because they will either see the human as a threat, which requires a defensive response, or as an object to investigate and communicate with, since the human is simply another nonthreatening animal.

Conclusions

Vocalizations carry individual, emotional, and physiological information which can be used to assess overall animal welfare. Humans now have 42.7 million cats as pets in the US alone and this demonstrates that it is vital that we know how to properly care for them, which includes understanding their vocalizations since that is how they communicate with humans. Furthermore, domestic cats are not the usual predators of resident wildlife, such as migratory birds, and the increase in predation could affect their behavior drastically. This change in behavior of resident wildlife could then affect the environment, since much of the resident wildlife are an important part of that ecosystem. All of these factors illustrate the imperativeness of this study and the necessity for more studies like these in the field of comparative behavior.

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For a complete list of references email, geni6816@pacificu.edu