

To Study the Different Types of Vocalizations in Domestic Cats (*Felis catus*)

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Abstract:- Having coexisted with humans for at least 10,000 years, the cat (*Felis catus*, Linnaeus 1758) is currently one of the most popular pets worldwide, with over 600 million owners. People love domestic cats because they are good companions and can get rid of vermin. Together with body language unique to cats, cats can communicate through vocalisations such as meowing, purring, trilling, hissing, growling, and grunting. The sounds produced by mice and other small creatures, which are too high in frequency or too weak for human ears, are audible to it. The study was conducted from December 2023 to January 2024. The audio recording of household cats' vocalizations was collected. Every recording Analysis of sound (wavelength/frequency) is performed. The many vocalisations made by cats and their possible acoustic characteristics, such as frequency and wavelength, are briefly described.

Keywords:- Vocalization, Wavelength, Frequency, Sound, Domestic Cats.

I. INTRODUCTION

According to Turner and Bateson (2000), there are currently over 600 million cats worldwide as pets, and they have coexisted with humans for at least 10,000 years. The species is known as *Felis catus*, Linnaeus 1758. Given their social structure, nocturnal habits, and extended periods of bonding with their young, domestic cats have developed a more varied, sophisticated, and broad vocal repertoire than the majority of other carnivorous species Bradshaw (2012). Surprisingly little, however, is known about the phonetic properties of these sounds or the communication between cats and people. Domestic cats are tiny carnivorous mammals of the genus *Felis*. The feline is the only domesticated animal in the Felidae family, and to differentiate it from the untamed members of the same family, it is commonly called the domestic cat.

Humans love domestic cats for their companionship and for their capacity to eradicate rodents. Several cat registries recognise about sixty different breeds of cats. The anatomy of cats and other felid animals is similar: they have strong, flexible bodies, fast reflexes, keen teeth, and retractable claws

that are designed to destroy small prey. It has highly developed senses of smell and night vision. Meowing, purring, trilling, hissing, growling, and grunting are examples of cat vocalisations. Cats may also communicate through body language.

The cat is a gregarious animal that hunts alone, yet it is also a solitary predator that is most active at dawn and twilight (crepuscular). It is capable of hearing noises produced by mice and other small creatures that are either too high in frequency or too faint for human hearing. Pheromones are sensed and secreted by cats as well. From spring to late autumn, female domestic cats can give birth to kittens; typical litter sizes range from two to five kittens. Cat fancy is the pastime of breeding domestic cats for exhibition as registered pedigreed cats at events.

While spaying and neutering cats can help reduce their population, their overpopulation due to pet abandonment has led to a massive global feral cat population, which has contributed to the extinction of entire bird, mammal, and reptile species. Cats were believed to have been domesticated in Western Asia circa 7500 BC, but new discoveries in archaeology and genetics have challenged the long-held belief that this happened in ancient Egypt, where cats were worshipped starting around 3100 BC. The world's cat population was projected to be 480 million stray and 220 million owned.

II. STUDY AREA

Madehgunj is a Locality in Lucknow City in Uttar Pradesh State, India. It belongs to Lucknow district, Uttar Pradesh, India, 226020. The size of the area is about 0.69 square kilometres.

It is located at a distance of 1.92 km from Daliganj and 4.46 km from Aliganj Mahanagar (4.53 Km), and Sahadat Nagar Garha. The locality belongs to the Lucknow Division. It is known for its residential places, schools, hospitals, and property rates. Madehgunj is a developing area with plans to set up new police stations in the near future. The locality is also known for its police station, Madehganj.



Fig 1: Map of Madehgunj, Lucknow

III. MATERIALS AND METHODS

➤ Preparation and Data Collection

The study was conducted from December 2023 to January 2024. For the collection of vocalisation of domestic cats audio recording was done using mobile and photography was also done using Redmi Note 12 mobile camera and Additional recordings were done with Realme 11 mobile. All the recordings were transferred to a Laptop for Further Analysis.

➤ Sound (Wave Length/ Frequency) Analysis

The Microphone Sound Analyzer JavaScript Progressive Web App (PWA) was used to records the sound from mobile device microphone and it displays its amplitude and frequency spectrum. The spectrum analyser was used for graph of all the frequencies that are present in a sound recording. The resulting graph is known as a spectrogram. The darker areas are those where the frequencies have very low intensities, and the orange and yellow areas represent frequencies that have high intensities in the sound. Window Picture Manager was used as a Designing Tool.

IV. RESULT AND DISCUSSION

Cats are fascinating creatures with a wide range of vocalizations, each serving different purposes in their communication repertoire. While it's challenging to provide a precise scientific illustration of cat vocalizations with wavelength and frequency without specific data, I can give you a general idea of the types of sounds cats make and their potential acoustic properties.

➤ Purring:

- Purring is often associated with contentment or comfort in cats.
- It typically consists of low-frequency vibrations, ranging from 25 to 150 Hertz (Hz).
- The wavelength of purring sounds can vary depending on the individual cat and the intensity of the purr, but they tend to be longer waves due to the lower frequency.

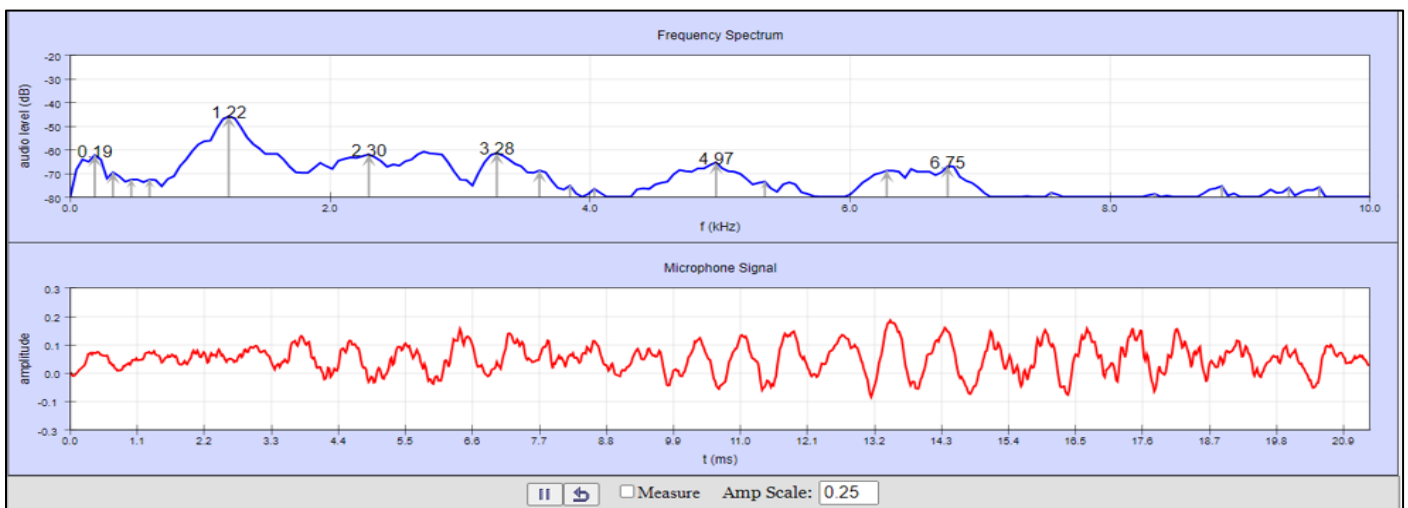


Fig 2: Spectrum Analyser Showing Frequency and Wavelength of the Purring Cat Sound

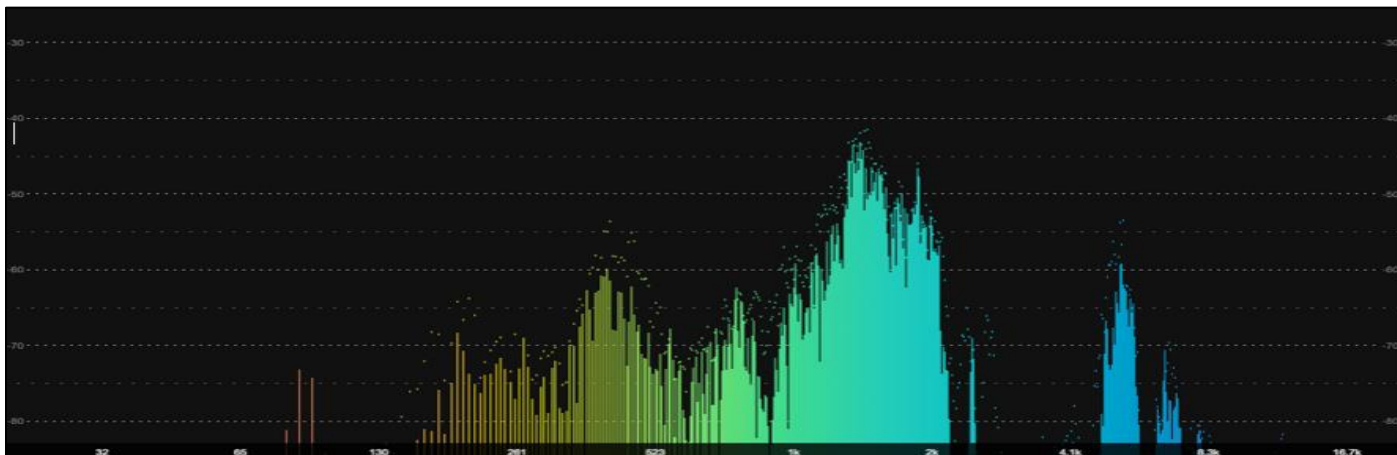


Fig 3: Spectrogram showing Purring Cat Sound

➤ *Meowing:*

- Meowing is a versatile vocalization used by cats to communicate various needs or desires, such as hunger, attention, or greeting.

- Meows can vary greatly in frequency and wavelength depending on the cat's size, breed, and emotional state.
- Frequencies of meows can range from around 200 to 2000 Hz, with shorter wavelengths compared to purring due to higher frequencies.

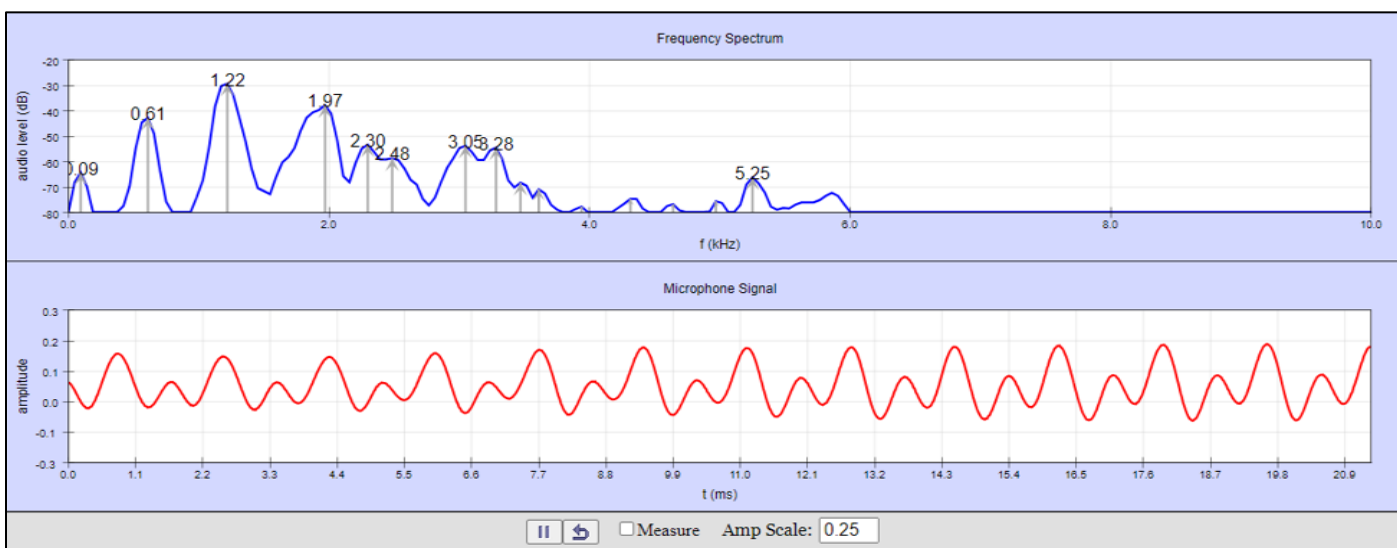


Fig 4: Spectrum Analyser Showing Frequency and Wavelength of the Meowing Cat Sound

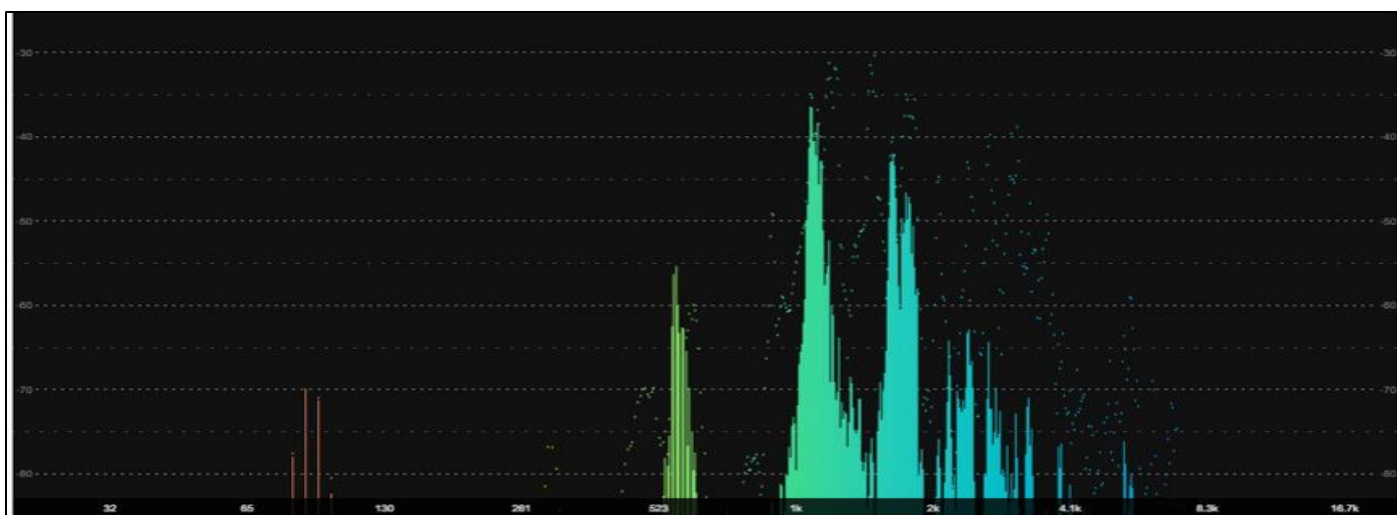


Fig 5: Spectrogram showing Meowing Cat Sound

➤ *Chirping or Chattering:*

- Cats often make chirping or chattering sounds when observing prey, such as birds or squirrels.

- These sounds are typically short bursts of higher frequency sounds, with frequencies ranging from 500 to 1500 Hz.
- The wavelengths of chirping sounds are relatively short due to their higher frequencies.

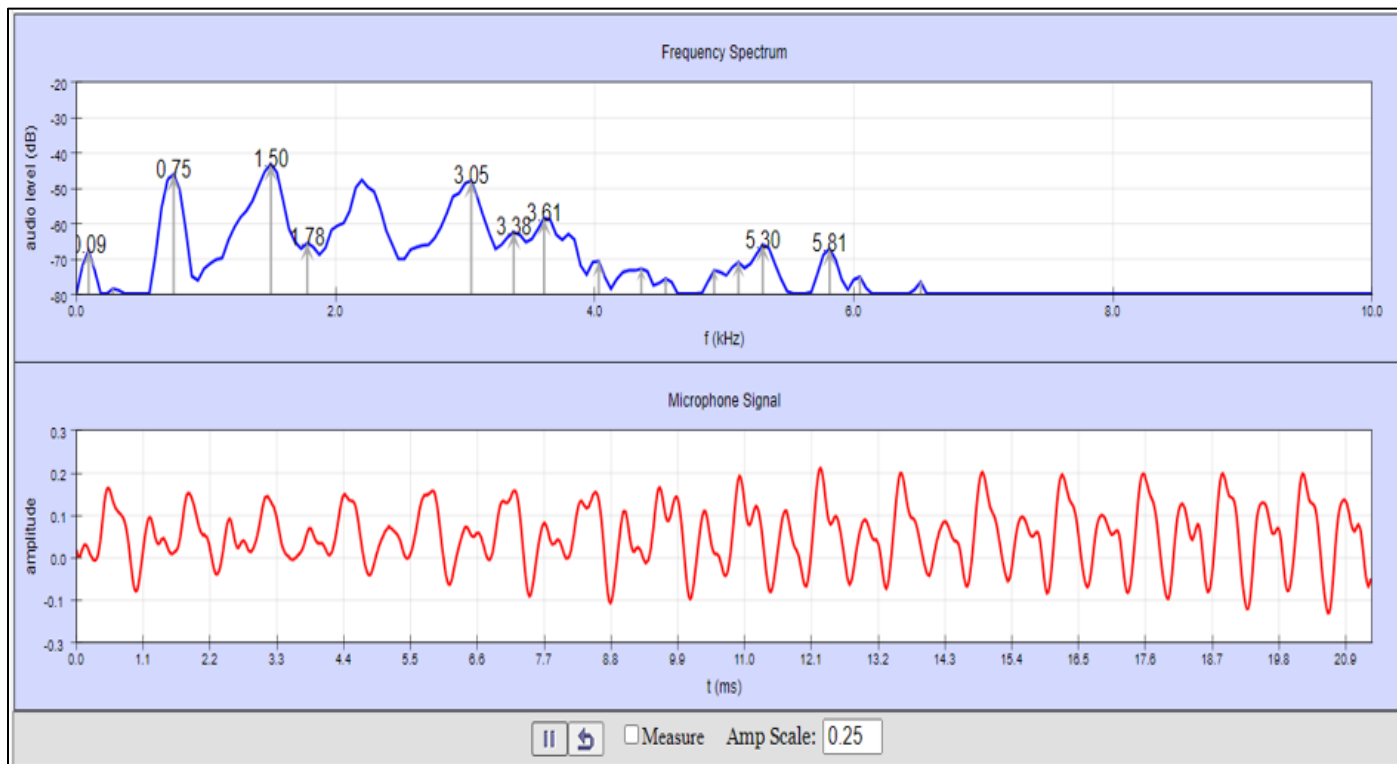


Fig 6: Spectrum Analyser Showing Frequency and Wavelength of the Chirping or Chattering Cat Sound

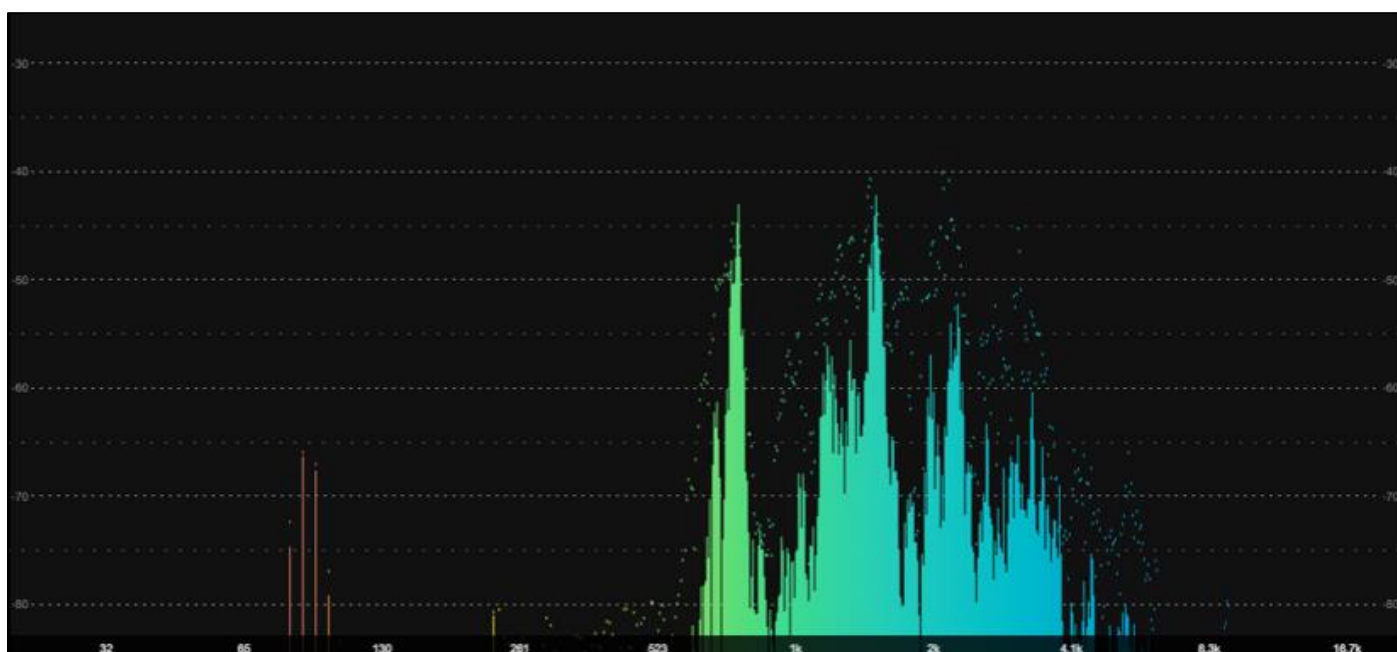


Fig 7: Spectrogram Showing Chirping or Chattering Cat Sound

➤ *Hissing:*

- Hissing is a defensive vocalization used by cats when feeling threatened or cornered.

- It consists of high-frequency bursts of sound, often ranging from 1000 to 5000 Hz or higher.
- Hissing sounds have short wavelengths due to their high frequencies and are often characterized by sharp, piercing tones.

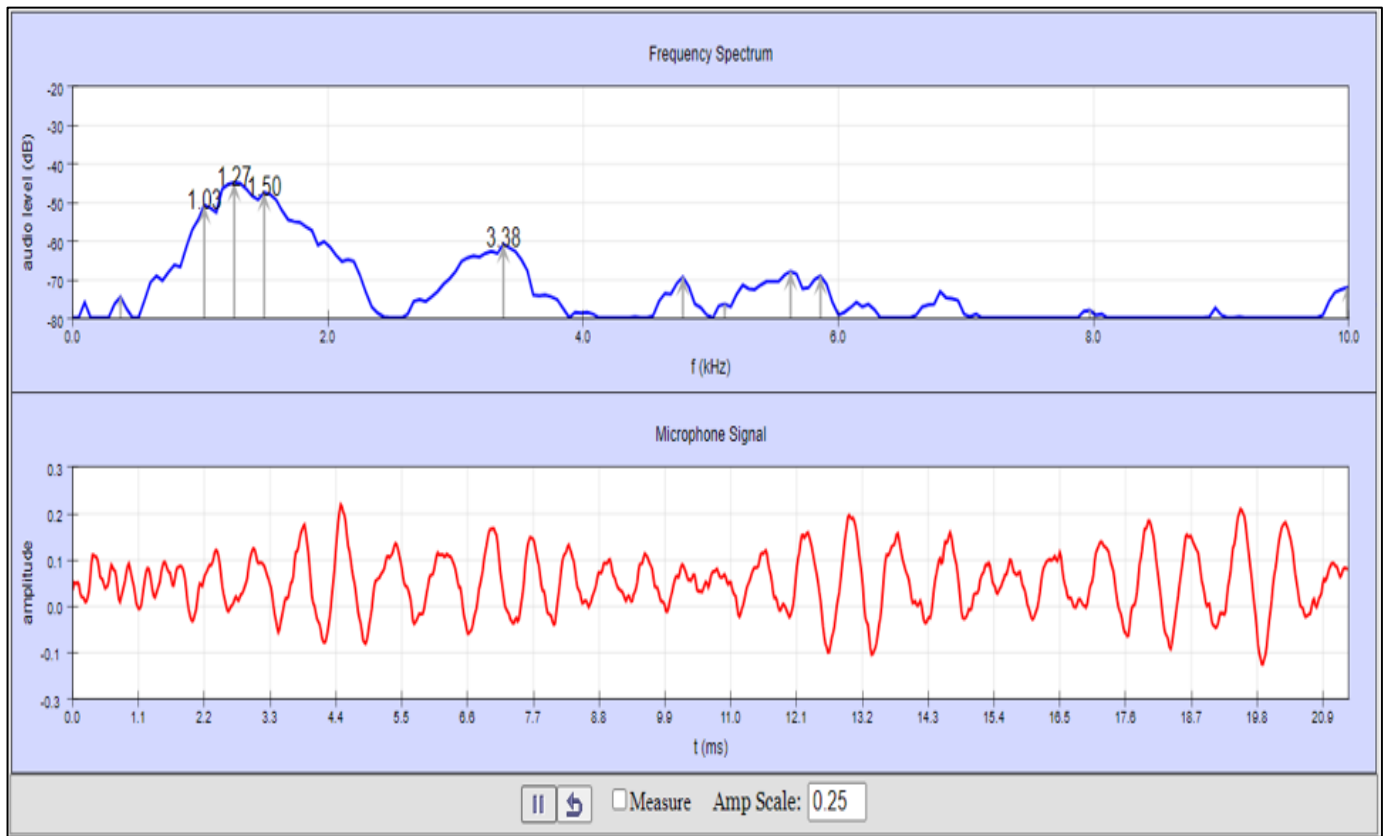


Fig 8: Spectrum Analyser showing Frequency and Wavelength of the Hissing Cat Sound

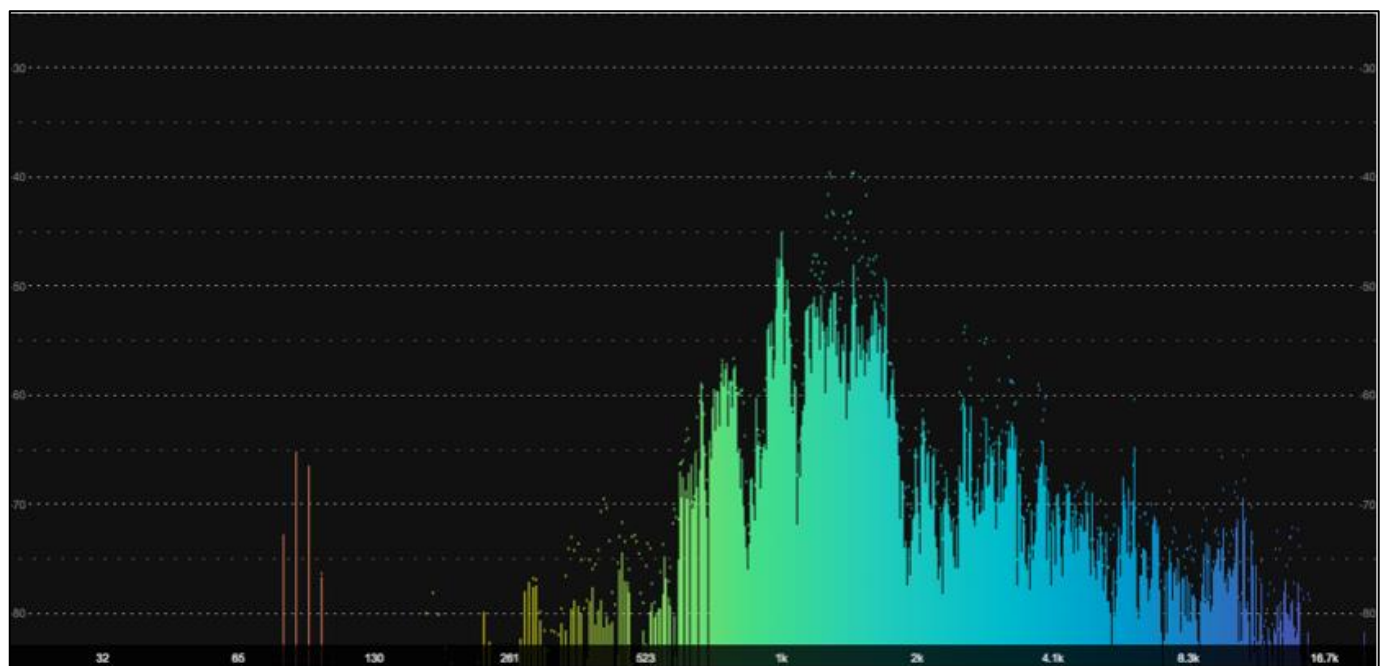


Fig 9: Spectrogram Showing Hissing Cat Sound

➤ *Growling:*

- Growling is another defensive vocalization emitted by cats when feeling threatened or aggressive.

- It typically consists of low-frequency, guttural sounds, with frequencies ranging from 50 to 600 Hz.
- Growling sounds have longer wavelengths compared to hissing due to their lower frequencies, and they often carry a deep, rumbling quality.

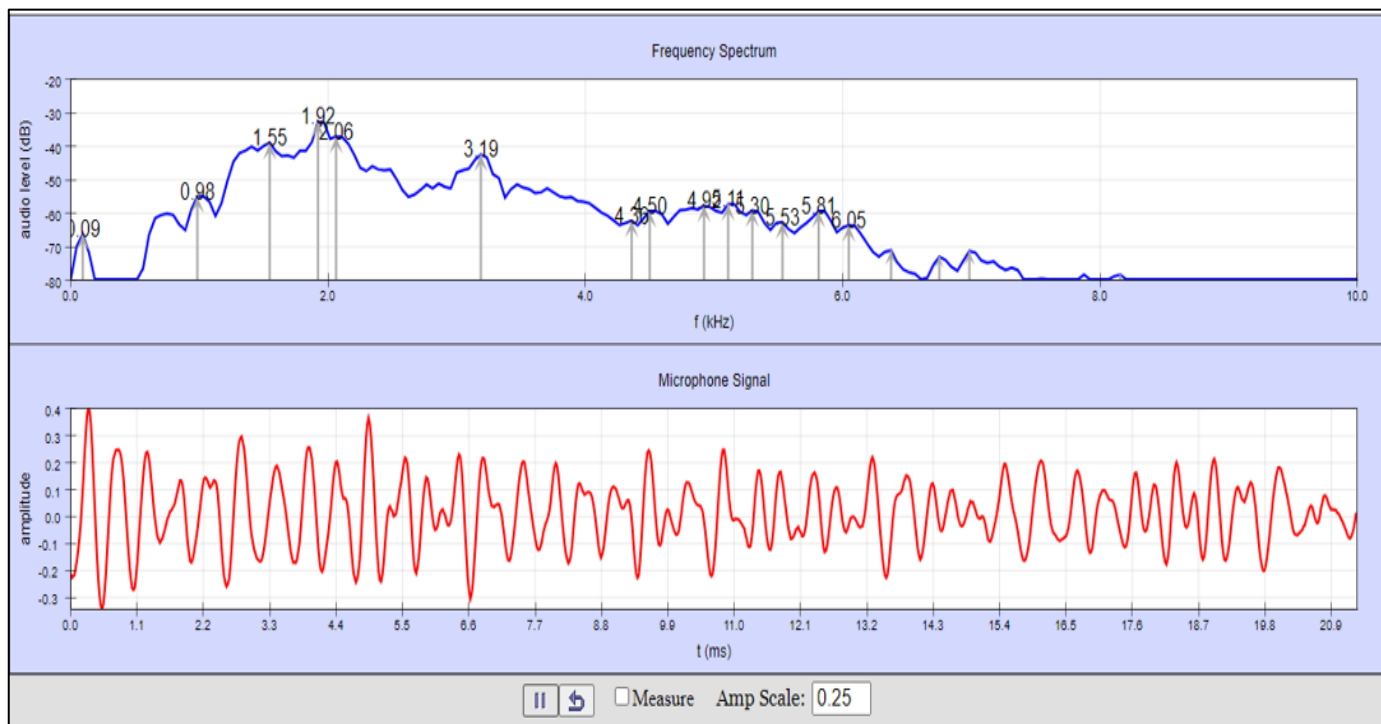


Fig 10: Spectrum Analyser showing Frequency and Wave Length of the Growling Cat Sound

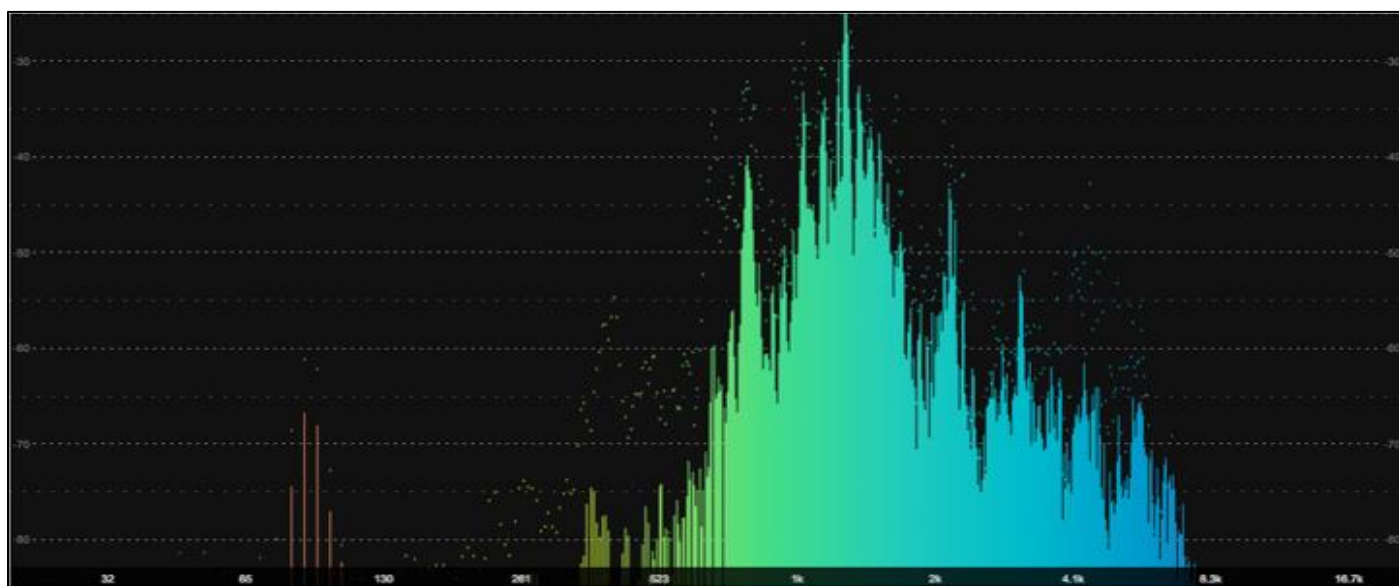


Fig 11: Spectrogram showing Growling Cat Sound

These descriptions provide a basic overview of the types of vocalizations cats make and their potential acoustic properties in terms of frequency and wavelength. However, it's important to note that individual variations among cats, environmental factors, and emotional states can significantly influence the specific characteristics of each vocalization.

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REFERENCES

- [1]. Beaver B V (2003). *Feline Behaviour: A Guide for Veterinarians*. W. B. Saunders: ST. Louis, MO.
- [2]. Bradshaw, J (1992). *The Behaviour of the Domestic Cat*. Redwood Press, Bristol.
- [3]. Bradshaw, J, Cameron-beaumont, C, (2000). The signalling repertoire of the domestic cat and its undomesticated relatives. In: Turner, D C, Bateson, P (Eds.), *the Domestic Cat: The Biology of its Behaviour*. Cambridge University Press, Cambridge, 67–793.
- [4]. Bradshaw, J (2013). *Cat Sense: The Feline Enigma Revealed*, London: Allen Lane.

- [5]. Brown, K A, Buchwald, J S, Johnson, J R, Mikolich, D J (1978). Vocalization in the cat and kitten. *Developmental Psychobiology*, 11: 559–570.
- [6]. Driscoll, C A, Clutton-Brock, J, Kitchen, A C, O'Brien, S J (2009). The taming of the cat. *Scientific American*, June 2009, 68–75.
- [7]. Eklund, R, Peters, G, Duthie, E D (2010). An acoustic analysis of purring in the cheetah (*Acinonyx jubatus*) and in the domestic cat (*s*). In: *Proceedings of Fonetik 2010*, Lund University, 2–4 June 2010, Lund, 17–22.
- [8]. Eklund, R, Peters, G, Weise, F, Munro, S (2012). A comparative acoustic analysis of purring in four cheetahs. In: *Proceedings from FONETIK 2012*. Gothenburg, 2012, 37–40.
- [9]. Farley, G R, Barlow, S M, Netsell, R, Chmelka, J V, (1992). Vocalizations in the cat: behavioral methodology and spectrographic analysis. *Exp. Brain Res.* 89: 333–340.
- [10]. Houpt, K (2004). *Domestic Animal Behavior for Veterinarians and Animal Scientists*, 4th edition. Blackwell Publishing: Ames, IA.
- [11]. McKinley, P E (1982). Cluster analysis of the domestic cat's vocal repertoire. Unpublished doctoral dissertation. University of Maryland, College Park.
- [12]. Moelk, M (1944) Vocalizing in the House-Cat; A Phonetic and Functional Study. *The American Journal of Psychology*. 57:2: 184–205.
- [13]. Nicastro, N, & Owren, M J (2003). Classification of domestic cat (*Felis catus*) vocalizations by naïve and experienced human listeners. *Journal of Comparative Psychology*, 117: 44–52.
- [14]. Shipley, C, Buchwald, J S, Carterette, E C. (1988). The role of auditory feedback in the vocalization of cats. *Exp. Brain Res.* 69: 431–438.
- [15]. Shipley, C, Carterette, E C, Buchwald, J S (1991). The effects of articulation on the acoustical structure of feline vocalizations. *J. Acoust. Soc. Am.* 89: 902–909.
- [16]. Schötz, S, Eklund, R (2011). A comparative acoustic analysis of purring in four cats. In *Proceedings of Fonetik 2011*, Speech, Music and Hearing, KTH, Stockholm, TMH-QPSR, 51: 9–12.
- [17]. Schötz, S (2012). A phonetic pilot study of vocalisations in three cats. In *Proceedings of Fonetik 2012*, Department of Philosophy, Linguistics and Theory of Science, University of Gothenburg, 45–48.
- [18]. Schötz, S (2013). A phonetic pilot study of chirp, chatter, tweet and tweedle in three domestic cats. In *Proceedings of Fonetik 2013*, Linköping University, 65–68.
- [19]. Schötz, S & van de Weijer, J (2014). A Study of Human Perception of Intonation in Domestic Cat Meows. In *Proceedings of Speech Prosody 2014*, Dublin. Schötz, S (2014). A pilot study of human perception of emotions from domestic cat vocalisations. In *Proceedings of Fonetik 201*, Department of Linguistics, Stockholm University, 95–100.
- [20]. Turner, D C & Bateson, P eds. (2000). *The domestic cat: the biology of its behaviour*, 2nd edn. Cambridge University Press, Cambridge.
- [21]. Yeon, S C, Kim, Y K, Park, S J, Lee, S S, Lee, S Y, Suh, E H, Houpt, K A, Chang, H H, Lee, H C, Yang, B G, Lee, H J (2011). Differences between vocalization evoked by social stimuli in feral cats and house cats, *Behavioural Processes* 87, Issue 2, 183–189.