

The Mystery of the Purr

Michael Calvin, June 2002

The big cat vibrated as I spoke his name. "Inca, how are you this morning?" Sitting in the early morning sun warming his old bones with its radiant glow, his purring seemed to be a barometer of his contentment. Although Inca is no longer here I can still hear his loud purr as I enter the gate to Cheetah Outreach. There is something magical about purring. Cheetahs purr with such vigour that the hairs on their chest and throat pulsate in response. Their purring elicits a heartfelt sigh from people hearing a cheetah purr for the first time. It is somehow as comforting to us as it appears to be for the cheetah. Yet, even though the act of purring is one of the best-known sounds in the animal world, it is enveloped in mystery.

As with all good mysteries, there are many questions and opinions but few definitive answers. Our knowledge is usually limited to the view that purring is a sign of contentment. However, purring appears to have a much deeper and more complex purpose. The intention of this paper is consolidate information about purring in cheetahs and other animals.

What is purring?

There is no scientific definition of purring. Webster's dictionary describes purring as "the low, continuous, vibrating sound a cat makes, as when content or any similar sound." To date we do not really know what the mechanisms of purring are, but there are three widely held theories:

The false vocal chord theory. This theory sees purring as originating in the cat's voice box. Cats have a second pair of structures in addition to the normal vocal chords called vestibular folds or false vocal chords. These false vocal chords are thought to be the source of purring as air passing over these false chords produce the characteristic sound, much like snoring in humans.

The soft-palate theory. This theory is proposed by Dr. Richard Jakowski, associate professor of pathology at Tufts University School of Veterinary Medicine, who noted voluntary skeletal muscle fibres in the cat's elongated soft palate in the back of the throat. His theory is that a cat can voluntarily "flutter" its soft palate producing the purring sound.

The turbulent blood theory. This theory sees purring as originating from an increased flow of blood through a cat's main arteries. As the flow increases turbulence increases, especially near the junction of the main artery and the heart where there is a constriction. The sound of the swirling blood in the vicinity of this constriction is thought to be amplified by the diaphragm and the sound carried up through the animal's windpipe and into the sinus cavities of the skull where the purring sound is emitted.

Author's speculation: The vibrating hairs on a cheetah's chest when it purrs seem to support the turbulent blood theory, but vibrating hairs are not visible on domestic cats.

As can be expected, there are continuous debates among experts and researchers as to which is the correct theory. It is surprising that even today this age-old mystery cannot be fully explained.

Who purrs?

The lack of agreement on what makes a purr a purr causes a problem when determining which cats or even other animals purr. There is a lot of contradictory and confusing information concerning purring. For example, some sources say cats that roar can not purr, yet many noted researchers have documented purring in lions and other so-called roaring cats (genus; *panthera*). One researcher questions if any of the wild cats, including the cheetah, can purr in a strictly defined sense. Some indicate that many young non-felids also purr. So what animals, in particular felines, purr? The following are some extracts from various credible sources.

Purring in Cats

- The domestic cat sets the standard by which purring in other animals is compared. It should be noted that the domestic cat purrs on exhalation and inhalation.
- Snow leopards and cheetahs purr, like the domestic cat, during both exhalation and inhalation.
- The Fauna Communications Research Group has recorded purrs from many felids, including cheetah, puma, serval and ocelot.
- The clouded leopard of Asia is known to purr in the same manner as the domestic cat
- Small wild cats of the genus *felis* also purr. In Africa, these include the black-footed cat, African wild cat, sand cat, swamp cat, serval cat, caracal, and golden cat. Interestingly, the African wild cat was domesticated by the ancient Egyptians and is believed to be the direct ancestor of the modern domestic cat.
- Widely held assertions that the roaring cats above are not able to purr have now been disproved. George B. Schaller reports purring in the lion, tiger, and leopard, as well as in the cheetah, but remarks that in the lion the sound is produced only during exhalation and appears to be a much less common vocalization than in the domestic cat.
- Leopards purr loudly, especially before and after feeding.
- Lions have also been known to purr before eating. Purring in lions has been described as a hum. There is speculation that this low frequency sound helps to calm caught prey as has recently been discovered in tigers.

Purring in other animals

- Young raccoons and young black bears produce a purr like sound.
- Young nursing spotted hyenas purr.
- Purring has been recorded in five species of *viverrids* (genets, civets, and mongooses).

It appears by most standards that purring is common in cats big and small, wild and domestic although the form and magnitude of purring varies widely.

Why do cats purr?

Probably the most intriguing question about purring in cats is its purpose. We tend to think of purring as a means to convey contentment, but cats also purr when excited, in pain, when severely injured or near death. Females often purr when giving birth, and when suckling their kittens. Some studies suggest that domestic cats purr when it is appropriate to project not just contentment but reassurance, lack of hostility or submission. However, if purring is solely a means of communication, then it's a very mixed message that the cat sends. Communication in the animal world must be clear and unambiguous. What if a growl were used both in the context of a threat and a friendly greeting? This could result in a dangerous situation for the cat. This would suggest that purring in cats might have a purpose beyond simple communication.

The rules of natural selection dictate that a particular trait in an animal be advantageous to it. Since purring has existed in many cat species over time there might be something vital about the purr that the cat needs. This idea has led to some new hypotheses about purring in cats. According to the Faunal Communication Research Institute (FCRI), purring may have physiological benefits to the cat. They recorded purring from over 45 cats, including cheetahs, ocelots, servals, and domestic cats. From these recordings, spectrographs were produced. The results showed that all cats produced strong frequencies in the range of 25 Hz to 150 Hz. What is most interesting is that these frequencies corresponded to the vibrational frequencies used in the medical treatment for bone growth/fractures, pain, edema, joint flexibility, dyspnea, and muscle growth/strain.

There is another clue found in a study performed in New Zealand. A dying cat that could not breathe was found to breathe normally once it began purring. The purring opened up the cat's airway, and improvement was "so remarkable and the next day it commenced to eat..." . Three species of cats have a strong harmonic at exactly 100 Hz, the vibrational frequency found to relieve dyspnoea. Dr David Purdie, from Hull University, has a theory that the human skeleton needs stimulation to prevent it losing calcium. He says that purring could be the cat's way of providing that stimulation for its own bones. This could have implications for bone density loss by astronauts in zero gravity. Cats are well known for their sedentary ways, yet studies show that consistent exercise is an important factor in bone, tendon and ligament strength. Could purring be a means to compensate for its spending the greater part of the day (approximately 18 hours in cheetahs) in a prone position?

The above offers a few tantalizing explanations to the age-old question of why cats purr. Although more research needs to be done, it is possible that cats possess a mechanism for natural healing of bones and other organs.

Conclusion

So the mystery of the purr is far from being answered. Even the mechanism of purring cannot be agreed upon, which makes the task of determining which cats purr difficult and prone to dispute. However, we can say that the cheetah and many other wild cats purr in the same manner as the domestic cat.

Purring almost certainly means more to cats than just a simple sign of contentment and in turn, it may mean more to us than just a soothing vibration. It's poignant to note that the purr is the first link a newborn kitten has with its mother and is often the last act of a dying cat. Maybe the secret of the purr is only meant to be known by the cat itself.

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