Purrfect sounds

A cat’s purr may be music to our ears. But is it simply a sign of contentment? Cat behaviourist Dr Sarah Ellis of Lincoln University takes a closer look at the science behind the purr and its importance in feline communication.

Sarah Ellis
A nyone who owns a cat knows one of the things that cats do a lot of is purr! It truly is one of the distinguishing features of the felid species, with the only other animals producing a true purr being members of the Viverriidae family (civets, genets and mongooses). Alongside domestic cats, most of the wild species of felid have been reported to purr with the exception of the large roaring cats (lions, leopards and tigers) from the genus Panthera. In this group of roaring cats, structures surrounding their voice box (larynx) aren’t stiff enough to produce a purr.

How do cats purr?

Purring is one of the lowest pitch sounds (average frequency of approximately 27 Hz) made by the cat, with other vocalisations such as the miaow occurring at much higher frequencies. Produced by muscular contraction of the laryngeal muscle when the mouth is closed during respiration, the purr can be heard both during inhalation and exhalation, giving it a rhythmic quality which can be sustained for long periods of time.

Purring frequency is relatively stable for each individual and does not tend to alter with age. However, cats can alter the volume at which they purr, presumably depending on how intense the emotion behind the purr is. What is perhaps even more variable is the volume of the purr between individual cats, with some purring at barely audible levels and others purring so loudly that owners report they cannot sleep in the same room as their cat as it keeps them awake at night!

When and why do cats purr?

Purring is a life-long occupation for cats which occurs in a variety of contexts. Although we understand how cat purrs are produced, research is only in its infancy in helping us understand why cats purr and whether purring in different situations means different things. From a few days after birth, cats have the ability to purr and do so during suckling from their mother. It is unknown exactly why they purr during this time but potential explanations comprise soliciting care from the mother, encouraging milk flow to the teats, maintaining contact and communicating contentment. Interestingly, mother cats also are reported to purr during nursing, perhaps to maintain contact with their kittens.

In adult life, cats also purr when they are in physical contact with other familiar cats with which they have positive relationships. Such contact includes when resting together, when being groomed by another and when rubbing on another cat. Interaction with people that the cat perceives as positive also often leads to purring, be it during stroking, being talked to or resting on someone’s knee. During such interactions with people, cats are often also seen to tread their paws in an alternate fashion. Such treading is also performed against the mother’s body during suckling. Thus, the simultaneous occurrence of purring and treading is suggestive of neonatal behaviours that have been retained into adulthood. Such behaviours orientated towards people may hold the same possible function as they do in kittens: to solicit care and indicate contentment. We interpret such behaviours as signals that our cats are happy and that the interaction may continue.

Another situation in which cats purr is when they want something. For those of us who own cats, I am sure we have all experienced occasions when we are rudely awoken in the morning by a very ‘purry’ cat who is demanding attention! The type of purr emitted in this situation is very different from that produced in relaxed and content situations. In fact, scientists have recorded purrs produced when cats are stroked (known as the non-solicitation purr) and when cats are anticipating food (known as the solicitation purr) and compared them acoustically as well as asking humans to rate them in terms of pleasantness and urgency. Solicitation purrs generally were emitted at a faster rate and were much more likely to contain high frequency peaks similar to those of a baby’s cry. Humans are particularly sensitive to such high frequencies and, consequently, people perceived the solicitation purrs as more urgent and less pleasant. Authors concluded that these types of purrs were harder to ignore and likely to tap into our innate need to provide care when hearing.

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Vocalisations

Researchers have noted 19 different vocal patterns in cats — although individual cats may add their own personal sounds that they only use with their owners. Most of the sounds cats make fall into three groups: the purr or little chirrup they make when they greet us, the sounds they make when they are fearful or emotionally charged (eg, hissing, growling, spitting) and the miaow. Cats can manipulate the miaow sound to make it very different depending on the circumstances.

Individual cats vary in how much they ‘talk’. Some breeds are notably noisier than others, for example, the Siamese is known for being talkative. Part of this variation though is linked to how much we talk to them. If, when they miaow to us, we reply or ask them what they want, and their communication is answered with something rewarding, such as attention or food, then they’re very likely to do the same thing again. They learn quickly how to manipulate us with a miaow.

Perhaps the most appealing communication of all is the ‘silent miaow’, where the cat goes through the mouth-opening motions of miaowing but no sound comes out — it has been suggested that they do indeed make a sound but the frequency is too high for us to hear.

For more fascinating behavioural insights, see the ‘Why do cats...?’ section on www.icatcare.org
such high frequency ‘cries’. Thus, our clever cats may have adjusted their purrs to maximise their chances of soliciting care from us in the form of food and attention. Interestingly, my own cat produces this type of purr when standing at the door and asking to go outside.

However, not all purrs occur in positive situations or have positive outcomes for our cats. There are other cases where cats purr where they may not be content and, thus, reading a cat’s body language and acknowledging the context or situation in which the purr is produced is really important to gain as clear a picture as possible as to what our cats may be feeling. Veterinarians and scientists have reported commonly hearing cats purring continuously when they are chronically ill, appear to be in severe pain and when they are dying, although currently there is no empirical research to conclude just how prevalent such purring is. Suggestions have been made that purrs in such situations have potential self-healing functions leading to recovery from disease or injury, particularly, bone fractures, by means of purring oscillations. However, alternative explanations include a communicative function in that cats may be ‘asking for help’ or purring may help a cat to calm itself in negative situations. To date, no validated evidence for these theories is currently available although research into this area is worthy and much needed as understanding if and why cats purr during pain and/or distress could help improve feline welfare.

Complicated messages

The cat purr is not as simple and straightforward as originally thought. We cannot simply assume that just because a cat is purring, he is happy and content; he may well want something or he may be in pain or distress. Understanding the context, associated behaviours and recognising the potential acoustic differences in the different purrs will greatly aid our care and management of our beloved cats.

Additional reading

- Eklund R, Peters G and Duthie ED. An acoustic analysis of purring in the cheetah (Acinonyx jubatus) and in the domestic cat (Felis catus). Proceedings, FONETIK 2010, Department of Phonetics, Centre for Languages and Literature, Lund University, Sweden, 2010.
- Von Muggenthaler E and Wright E. Solving the mystery of the cat’s purr using the world’s smallest accelerometer. Acoustics Australia 2003; 31: 69.