

Wolf species have 'howling dialects'

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Arctic wolf. Credit: Arik Kershenbaum

Largest quantitative study of howling, and first to use machine learning, defines different howl types and finds that wolves use these types more or less depending on their species, resembling a howling dialect. Researchers say findings could help conservation efforts and shed light on the earliest evolution of our own use of language.

The largest ever study of howling in the 'canid' family of [species](#) – which includes wolves, jackals and domestic dogs – has shown that the various species and subspecies have distinguishing repertoires of howling, or "vocal fingerprints": different types of howls are used with varying regularity depending on the canid species.

Researchers used computer algorithms for the first time to analyse howling, distilling over 2,000 different howls into 21 howl types based on pitch and fluctuation, and then matching up patterns of howling.

They found that the frequency with which types of howls are used – from flat to highly modulated – corresponded to the species of canid, whether dog

or coyote, as well as to the subspecies of wolf.

For example, the howling repertoire of the timber wolf is heavy with low, flat howls but doesn't feature the high, looping vocal that is the most frequently used in the range of howls deployed by critically-endangered red wolves.

Lead researcher Dr Arik Kershenbaum from the University of Cambridge describes these distinctive howl repertoires as resembling vocal dialects, with each species having its own identifiable use of the various howl types. He says the findings could be used to track and manage wild wolf populations better, and help mitigate conflict with farmers.



Northwestern wolves at the Wolf Conservation Trust, UK. Credit: arik Kershenbaum

The origins of language development in humans are mysterious, as the vocalisations of our closest existing biological relatives such as chimpanzees are relatively simple. Kershenbaum and colleagues believe that studying the sounds of other intelligent species that use vocal communication for cooperative behaviour – such as wolves and dolphins – may provide clues to the earliest evolution of our own use of language.

"Wolves may not be close to us taxonomically, but ecologically their behaviour in a social structure is

remarkably close to that of humans. That's why we domesticated dogs – they are very similar to us," said Kershenbaum, from Cambridge's Department of Zoology.

"Understanding the communication of existing social species is essential to uncovering the evolutionary trajectories that led to more complex communication in the past, eventually leading to our own linguistic ability" he said.

The research was conducted by a team of scientists from the UK, US, Spain and India, and is published in the journal *Behavioural Processes*.

The researchers made use of howls recorded from both captive and wild animals, from Australia and India, to Europe and the United States, creating a database of 6,000 howls that was whittled down to 2,000 for the study. This included combing YouTube for domestic dog howls.

These were then fed into machine learning algorithms to classify the howls into discrete types. Studies on howling in the past have had to rely on subjective human comparisons by looking at soundwave patterns, but the new algorithms allowed the howl types to be compared objectively, revealing that the various species have characteristically different repertoires of howl type usage.

While the howling repertoires of most of the 13 species analysed were very distinct, some bore close similarities to each other that may influence interbreeding and, in at least one case, threaten the survival of a species.

Red wolves, hunted to the brink of extinction in the mid-20th century, were the focus of a reintroduction programme instigated by the US government, which has recently been halted due to a lack of success.

Part of the problem was red wolves breeding with coyotes, and the resultant hybridisation diluted attempts to maintain this rare wolf species. The researchers found significant overlap between the howling vocabulary of the red wolf and the coyote – with both favouring highly modulated, whining

howls such as the one classed by researchers as 'type three'.

"The survival of [red wolves](#) in the wild is threatened by interbreeding with coyotes, and we found that the howling behaviour of the two species is very similar. This may be one reason why they are so likely to mate with each other, and perhaps we can take advantage of the subtle differences in howling behaviour we have now discovered to keep the populations apart," said Kershenbaum.

Other conservation uses for the new findings may involve refining the use of playbacks to recreate more accurate howling behaviours that imitate territorial markings, thereby encouraging wolf packs to steer clear of farms and livestock.

However, we know very little about the meaning of different howl types and what they are actually communicating, says Kershenbaum, because – as with dolphins, that other highly vocal, smart and social species which he studies – wolves are extremely difficult to study in the wild.

"You don't observe natural wolf behaviour in zoos, only in the wild, and you need to know where the animals are when howling before you can really begin to try and discern meanings. But, as with dolphin pods, physically following a wild wolf pack is virtually impossible," explained Kershenbaum.

"We are currently working on research in Yellowstone National Park in the US using multiple recording devices and triangulation technology to try and pick up howl sounds and location. In this way we might be able to tell whether certain calls relate to distance communication or pack warnings, for example," he said.

For Kershenbaum, wolves and dolphins show remarkable parallels with each other in social behaviour, intelligence and vocal communication – all comparisons that extend to humans.

"As well as being intelligent and cooperative species, wolves and dolphins have remarkably similar vocal characteristics. If you slow a dolphin whistle down about 30 times it sounds just like a wolf howl, something I often do in my lectures," he

said.

"The presence of complex referential communication in species that must communicate to survive was probably a crucial step in the evolution of language. I think we can shed a lot of light on early evolution of our own use of language by studying the vocalisation of animals that are socially and behaviourally similar to us, if not necessarily taxonomically closely related."

More information: Arik Kershenbaum et al. Disentangling canid howls across multiple species and subspecies: Structure in a complex communication channel, *Behavioural Processes* (2016). [DOI: 10.1016/j.beproc.2016.01.006](https://doi.org/10.1016/j.beproc.2016.01.006)

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