New technology lets scientists identify wild wolves by their howls

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A wolf in Yellowstone National Park. Photo courtesy of Yellowstone National Park

Wild wolves play an essential ecological role, so researchers must be able to track them accurately. Unfortunately, because wolves travel over wide ranges, tracking them visually is very difficult. The ability to use sound to identify wolves would make wolf surveys much more reliable. PhD student Holly Root-Gutteridge and her team at Nottingham Trent University have developed software that enables them to identify individual wild wolves by their howls. The research appears in the journal *Bioacoustics*.

Wolves howl to protect their territories, contact other pack members and bond socially. They howl both individually and as part of a chorus, with howls overlapping one another. A wild wolf's howl, which is audible

over at least ten kilometers, provides information about the wolf's identity. Tracking individual wolves by their howls would be more cost-effective than other tracking methods, such as the use of GPS technology.

A previous attempt to use audio sampling to identify wild wolves achieved an accuracy rate of only 75.7 percent. The scientists who performed this study analyzed the pitch of the howls, but not their amplitude. Root-Gutteridge and her team believe that the failure to examine amplitude caused the low level of accuracy. Recent studies of California sea otters, Australian sea lions and giant pandas have shown that including amplitude in sound analyses increases accuracy of identification.

To correct this problem, the team developed bespoke sound analysis software that included both frequency and amplitude in its algorithms. In an earlier study, they used this software to identify six captive eastern gray wolves by their howls. They were able to identify the wolves with 100 percent accuracy. While this study demonstrated the potential advantage of using this software, because it used wolves in captivity, it did not account for issues that arise when studying wild wolves, such as attenuation of sound over long distances and interference from environmental noises, such as wind and rain.

In this later study, Root-Gutteridge and her colleagues used their software to analyze British Library recordings of wild eastern gray wolf howls, taken at unknown distances. The researchers studied 67 high-quality recordings of solo howls from 10 individual wolves and 112 low-quality recordings, which included both solo and chorus howls, from 109 wolves. Some of the low-quality recordings included wind and water noise. The researchers identified wolves howling on their own with 100 percent accuracy. They achieved a 97.4 percent accuracy rate when analyzing overlapping chorus howls, where the second wolf's howl began

before the first wolf's howl ended.

The team suggests that bioacoustic researchers perform further studies on wolves in their natural habitats, examining how changes in distance and weather affect the ability to identify wolves by sound.

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