

Caller IDs for Marine Mammals

CROWD-SOURCING HELPS SORT WHALE, DOLPHIN VOCALIZATIONS

by Tara Thean



Frants Jensen/WHOI, under NMFS permit #14241

With thousands of recordings of pilot whales like these and other marine mammals, scientists were confronted with a daunting amount of data.

Imagine extraterrestrials come to Earth, seeking to understand human life. They dangle recording devices beneath the clouds or occasionally tag people with retrievable recorders. They collect thousands of bits of conversations—from individuals and groups of people, at cocktails parties, Thanksgiving gatherings, baseball stadiums, and bedrooms.

They have mounds of data, but in a language they don't understand. Yet within those mounds are patterns—repeated phrases, sounds, inflections, rhythms. Unraveling those patterns is a key to revealing what humans are saying and doing.

Now imagine the poor extraterrestrial whose job it is to sort through all those snippets of sound and identify the patterns.

Marine mammal scientists face a similar situation. They have collected troves of recordings of calls from pilot whales, killer whales, dolphins, and other marine mammals. Many of these calls have similar acoustic features that biologists can categorize into call types. But examining and comparing thousands of calls and making careful judgments on how to sort them consumes huge chunks of time.

Alexander Von Benda-Beckmann, an astrophysicist at the Astrophysical Institute Potsdam, proposed an innovative solution to Peter Tyack, a marine mammal biologist formerly at Woods Hole Oceanographic Institution (WHOI) and now at the University of St. Andrews. The idea was to plug into the power of crowd-sourcing. Von Benda-Beckmann

remembered Zooniverse, a citizen-science hub that asks people to help classify galaxy images from NASA's Hubble Space Telescope according to their shapes. He realized that something similar could be done for marine mammal calls. That led to the creation of Whale FM (<http://whale.fm/>), a website that asks the public "to help us understand what whales are saying."

"We didn't have to round up volunteers," WHOI biologist Laela Sayigh said. They came to the scientists.

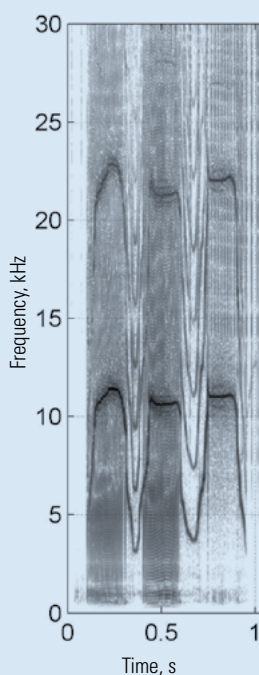
Since the fall of 2011, more than 10,000 people have linked to Whale FM to listen to recorded whale calls and look at their spectrograms, or visual representations of the sounds. They compare a given call with a list of other spectrograms, clicking a "✓" next to calls that are similar, or an "X" button to discard calls that don't match. Visitors from around the world, averaging 30 call matches per visit, have categorized nearly 200,000 calls—not for cash, prizes, or even recognition.

"People seem to feel rewarded," Sayigh said—by helping science, or furthering understanding of marine mammals, or perhaps just by the game of "spot-the-difference."

Scientists have been trying to automate the classification process, and early work suggests that mathematical algorithms may work. University of Tennessee researcher Arik Kershenbaum is experimenting with adapting a human music recognition code for use in dolphin whistle classification.

Still, even the most advanced computers tend to overlook or can't discern subtle features of the vocalizations, say Sayigh and Tyack. They are confident that at this stage, the human brain trumps mathematical algorithms to sort out marine mammal vocalizations.

"Humans are unbelievably good at perceiving complex patterns," Tyack said. ▲



On Whale FM, people examine spectrograms, or visual representations of sounds, to help categorize marine mammal calls.

Whale FM is sponsored by Scientific American and the University of St. Andrews. The research was funded by the Office of Naval Research.