Dolphin whistle warnings

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A team of researchers in Italy, Portugal, Spain, France, Britain and the United States has demonstrated that remotely monitoring the acoustical structures of dolphin vocalizations can effectively detect "evolutionarily significant units" of the mammal—distinct populations that may be tracked for prioritizing and planning conservation efforts.

This finding, presented at the 167th meeting of the Acoustical Society of America, to be held May 5-9, 2014, in Providence, Rhode Island, suggests that placing remote acoustical monitoring platforms on ocean buoys and the like may be a viable, low-cost and automated way of monitoring populations of dolphins and rapidly alerting ecologists to the threats that confront them.

"Acoustical changes can be used for constant and continuous monitoring of population belonging to endangered species," said Elena Papale of the University of Torino, who led the research. "We found that [by remotely monitoring dolphin whistles], it is possible to distinguish between evolutionary significant units."

The discovery emerged from a large, multinational collaboration that pulled together data from five research groups based in Italy, Portugal, Spain, Britain and France. Those groups were already monitoring dolphins for a number of existing scientific studies. Other groups in the United States collaborated by providing sound analysis equipment. Shepherding all these groups of people and the flood of data they produced was a challenge, Papale said, but the greater challenge was working out how to distinguish the flood of whistles from one group of

dolphins from another.

Animal vocalizations have acoustic characteristics that reflect an organism's genes, its adaptation to ecological conditions and the interactions between their genes and the environment. The differences between groups of dolphins within the same species may be slight and hard to detect however, because morphological features, ecological conditions and socio-behavioral aspects of the creatures influence the structure of whistle. The problem is also a dynamic one, since vocalizations may vary in short time scale.

So at the start of the research, it was not clear whether acoustical analyses alone would be able to tease apart the common threads for given groups of dolphins and differentiate between them.

Papale and her colleagues compared 123 sightings of three dolphin species from the Atlantic Ocean and the Mediterranean Sea (Stenella coeruleoalba, Delphinus delphis and Tursiops truncatus). They analyzed whistles from 49 hours of audio recordings made at the same time as the sightings and tested whether they could definitively identify dolphin populations by analyzing the acoustical parameters of the whistles.

This allowed them to correctly assign more that 82 percent of data to the correct dolphin population, based solely on the acoustic structure, a proof of principle that the acoustic structure of whistles can be used to monitor recent or rapid changes in the local population biology.

"More work is still needed to develop an automatic system for population recognition," Papale said. She added that other research groups are focusing on the development of software but for the moment only for species-specific identification, not intra-specific recognition.