Developing Novel, Low-Cost Methods to Support Citizen Scientists in the Conservation of Bat Species

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Bats have immense ecological benefits: consuming insects, pollinating plants, and preventing diseases spreading. Conservation work is hampered by high costs and difficult methods, consequently, citizen-scientists' participation is restricted. Addressing this required developing a low-cost and multifunctional detector, accurate genetic tests, and a central repository for pooled data. The detector's prototype used a Raspberry P in combination with a range of low-cost parts. Custom software was developed to record calls, analyse them, and present information to the user. Recorded calls were calibrated against verified data from Bat Conservation Ireland. Certain bat species cannot be identified through echolocation, consequently, a genetic test was developed using mitochondrial gene sequences. Six primer sets were designed for a single PCR-based reaction to identify between the nine Irish bat species. Our repository allows citizen-scientists to upload calls, identify species, and access information. An API was made accessible to detector manufacturers and researchers. Identifying information (spectrograms and time-expansion audio) is crowd-sourced so calls can be efficiently identified. The prototype represents a 57% reduction in cost and provides multiple detector features including: live and recorded time-expansion and heterodyne playback, sound-activated recording, and spectrogram display. The primers, selected from the Cytochrome C Oxidase I (COI) and the Cytochrome b (cytB) genes, facilitated our requirement for one PCR reaction, thus producing faster results at a lower cost. The development of a low-cost bat detector, a repository for calls and a rapid PCR identification method provide more effective tools to support the conservation of bat species.

Awards Won:
Intel ISEF Best of Category Award of $5,000
First Award of $3,000
China Association for Science and Technology (CAST): Award of $1,200