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**Title:** Evaluation and Application of a Deep Neural Network, BirdNET, for Bird Sound Detection

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**Abstract (250 words):** Spatiotemporal variation of avian biodiversity is a commonly used indicator of environmental change. Conventionally, such information was derived with human observers, while passive acoustic monitoring (PAM) with autonomous recording units (ARU) is rapidly emerging as an alternative survey method. Given the large amount of acoustic data PAM can potentially collect, effort has been made to develop algorithms to automatically classify acoustic data. One of the most successful attempts is the recent development of a deep neural network, BirdNET, that can identify 984 North American and European bird species by their sound. However, systematic evaluation of this neural network is lacking. In this study, we aimed to evaluate the accuracy of BirdNET for detecting bird species in western Canada. A total of 66 ARUs were set up in John Prince Research Forest, BC Canada during May - July 2020 and 2021, resulting in about 67,000 one-minute recordings (about 1,000 hours) of acoustic data. We applied BirdNET to the dataset and assessed the accuracy in detecting 20 common local species that vary in their level of vocal activity. For each species, we selected 180 three-second sound segments identified by BirdNET, and compared the observed detection (by human listener) with predicted detection (BirdNET detection confidence). Our results indicate that BirdNET had fairly strong detection accuracy, but did vary slightly between species and habitats. This study provides a foundation for future studies that requires application of automatic detection in avian biodiversity monitoring using PAM techniques.

**Key words**: BirdNET, automatic detection, identification, vocalization