Acoustic characterization of woodpecker drumming in view of European species identification

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Recent studies on bird song identification have primarily used mean spectral content to describe vocalizations. This strategy is certain to fail for some species, for example when the temporal structure of the song is critical. The drumming of woodpeckers falls into this last category. For woodpeckers, drumming achieves territory defense and partner attraction to such an extent that some species have no song (Dendrocopos major, Dendrocopos leucotos). Hence drumming sounds bear species markers and their acoustic description is a necessity. For that purpose, a database of 361 drumming recordings is assembled from the online archives Xeno-Canto (the Xeno-Canto Foundation) and Tierstimmen (Museum fÃijr Naturkunde Berlin) with samples from the nine European woodpecker species that drum. Our objective is the recognition of drumming in a continuous sound flow and the identification of woodpecker species through a generic supervised classification algorithm such as KNN. 2666 drumming rolls are thus extracted from the Xeno-Canto and Tierstimmen sound files using a characterization of drumming as the repetition of a brief signal with a beat between 30 ms and 120 ms and with the bulk of the spectral components lying below 1500 Hz. The drumming rolls are also sorted in series of the same bird hitting on the same tree; this allows taking into account the possible duets between different birds or the potential tree changes. On that basis, the characteristic time interval between successive drumming rolls of the same bird is evaluated. Other acoustic features used in the classification are the duration of drumming rolls, their time structure (acceleration or deceleration while hitting) and a rough spectral description. The final feature ranges are compared to existing literature data.