

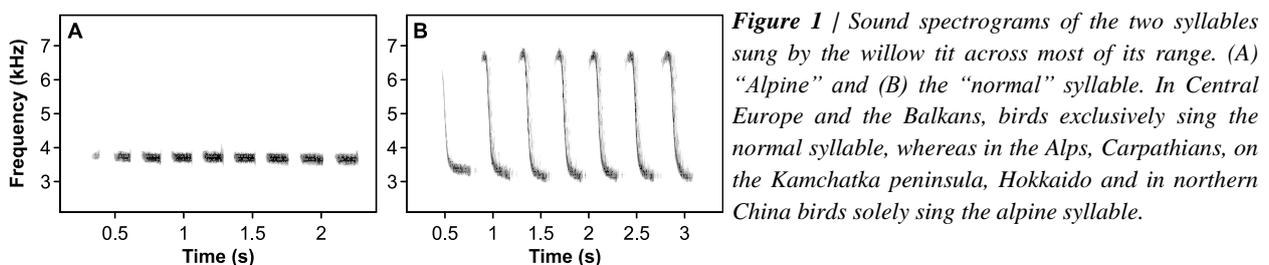
MASTER / IRT3 PROJECT

Characterizing willow tit song — a culturally transmitted mating trait

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Birdsong is an excellent system for the study of cultural speciation because it is learned in oscine passerines (“songbirds”) and it is the target of culturally-transmitted mating preferences by the opposite sex (Whitehead *et al.* 2019). Therefore, birdsong can be subject to sexual selection, which may lead to the build-up of prezygotic barriers to gene flow and eventually to reproductive isolation between populations, and eventually speciation (Verzijden *et al.* 2012). However, to what extent culture affects the evolution of new species is currently debated.

Willow tits (*Poecile montanus*) are an ideal model system to study the impact of culturally transmitted birdsong on genetic divergence because they (1) have a simple song structure, where song syllables are constructed by repeating the same element several times in a row (Fig. 1). (2) They form narrow hybrid zones where different song types meet.



Across most of its range, individual willow tits sing both syllable types (Martens & Nazarenko 1993; Figs. 1A and B). However, several subspecies in the periphery of the distribution sing only one or the other syllable (“regiolect”), a pattern that is especially pronounced in Central Europe and the Balkans, where they form narrow song hybrid zones and mixed-singers occur. The area in which both song types are present has been constant for at least 70 years (Antoniazza 2018) and together with its narrow width and the short dispersal distances, this suggests that sexual or natural selection is maintaining the hybrid zones.

Here we will use neural networks and semi-automated feature extraction techniques for an in-depth characterization of the different willow tit syllable types. First, we will download and prepare existing song recordings and then train an artificial neural network to recognize the different song types, which will allow us to characterize recordings I made in the Bavarian hybrid zone. Second, we will use a semi-automated feature extraction technique to extract the relevant parameters separating the different syllable types. Finally, we will generate artificial song types and play them back to wild willow tits to test their response.

References

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