

## Genetic structure – geography relations of honeybee subspecies in Turkey: A survey and a test of niche overlap

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**Keywords:** *Apis mellifera* subspecies, adaptive traits, ecological niche modeling, climate, distributional range, ecological divergence

Subspecies or “geographic races” of honeybees (*Apis mellifera*) differ in morphology, biogeography and behavior and appear to have diversified following reproductive isolation during the Pleistocene glaciation. Habitat-specific features such as daily temperature, abundance and phenology of nectar flow, length and severity of winter, or predator pressure are expected to influence morphology, foraging strategy, honey storage, production of young, overwintering success, swarming behavior or aggression in different races.

We surveyed potentially adaptive behavioral traits for each genetic component identified by microsatellite-based STRUCTURE analysis, and explored relations with climatic conditions prevalent where those components are geographically concentrated. We used ecological niche modeling by MAXENT to estimate distributional ranges and identify possible climatic drivers of adaptation for four subspecies and one ecotype.

Niche modeling produced ranges for each subspecies/ecotype that roughly correspond with particular ecoregions in Turkey. A comparison of niches, predicted ecological divergence between honeybee subspecies. Hybridization between C and O lineages where niche models overlapped was confirmed with genetic evidence. No models produced were found to be covering the range of another O-lineage subspecies in Eastern Anatolia not included in this study. Relationship between an ecotype in Aegean coast and a scale insect (*Marchalina hellenica*) of East Mediterranean Pine (*Pinus brutia*) that provides an annual cycle of resource availability impact on life history of that ecotype was also concordant with its distribution models and observed distribution of both the pine and the scale insect.

We discuss adaptive values of the traits of honeybees and suggest hypotheses to test these associations at the genome level.