Lab 8 - BioGeoBears

Using biogeography to trace back domestic dog origins

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Lab 1A

Abstract

Domestic dogs have often thought to have followed the spread of humans around the globe, but the geographic origin of the domestic dog is still highly disputed. Using statistical biogeographic model comparisons through BioGeoBears, I found that best fit models generally found a Asian/African origin for domestic dogs.

Introduction

While many of the records for the precise origination dates of many modern breeds are lost in time, biogeographical data of breed origination is much more robust. This makes it a more tractable method for determining the place of origin of the first domestic dogs, as it allows us to maintain a larger amount of tips on the phylogeny. While anthropological data generally used for understanding the movement of domestic dogs across the globe, statistical biogeographic model comparisons allows for statistical power and likelihood methods to be applied to the geographic data.

Methods

Data collection for place of origin for each of the 161 dog breeds was gathered through either the American Kennel Club (AKC) or the United Kennel Club (UKC). A time-calibrated phylogeny using known dates of origination for several breeds was used to run through BioGeoBears [1]. BioGeoBears was used in order to perform a model comparison of ancestral geographic origin for the domestic dogs for six different models, the DEC model [2], DIVA model [3], BAYAREALIKE model [4], and these three models with an added “jump”, or founder event parameter. The BioGeoBears method of statistical biogeography was used in conjunction with R.

Results

According the AIC weights for the six different models, the DEC plus the jump parameter was the model of best fit (AIC weight = .54). However, the DIVALIKE model plus jump parameter also fit the data fairly well (AIC weight = 0.44). Together these two models account for .98 of AIC weights for all six models. According to the DEC + J model, the most recent common ancestor (MRCA) for dogs likely lived somewhere in Africa/Asia/Europe (**Figure 1**). The DIVALIKE + J model converges on a Africa/Asia origin.

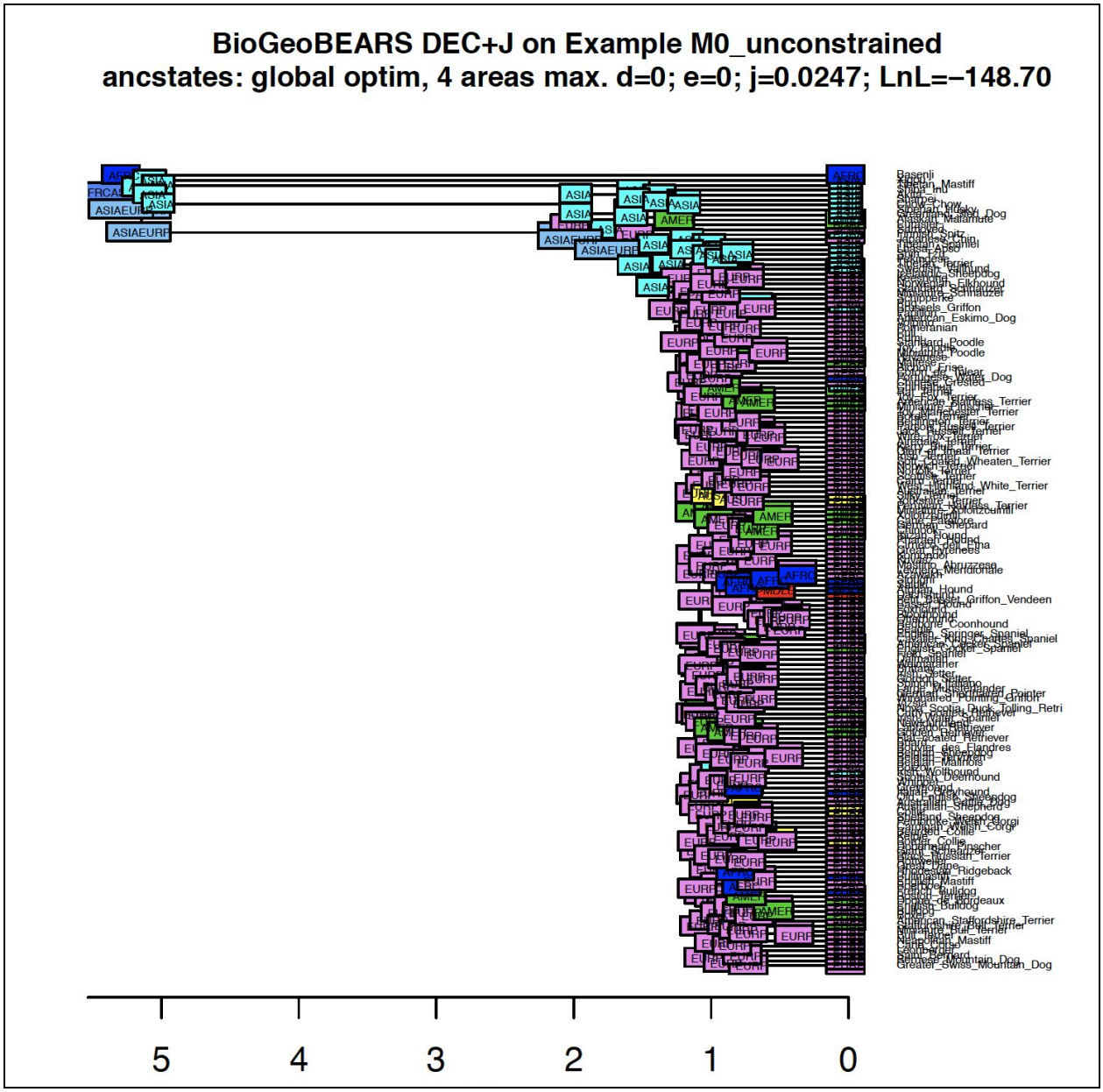

Figure 1: DEC + J model for the biogeography of domestic dogs. European breeds dominate the tree, but much of the older breeds are from Asia and Africa, which leads the model to choose a possible Asia/African/European origin for the first domestic dog. The axis is in thousands of years from the present.

Discussion

Just when and where dogs were first domesticated is still highly contested and has yet to be resolved conclusively with anthropological or genomic evidence. However, it is fairly well known that humans have brought domesticated dogs with them whenever they travel to new places, and have been around since the earliest civilizations, so for the DEC model to conclude that the most recent common ancestor is from the “Old World” is not surprising. It is not surprising that BioGeoBears favored the models with the “jump” parameter, as there were certainly founder

events in the movement of the domestic dog from continent to continent following the movement of human populations.

Literature Cited

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