Demographic inference using skyline plots on approximate bayesian computation
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**Demographic Inference Using Skyline Plots on Approximate Bayesian Computation**

Miguel Navascués & Concetta Burgarella

**Bayesian Skyline Plots** are representations of the posterior probability density of the effective population size in function of time. A model with several periods of constant population size is used to explore the demographies that best explain the data. Instead of estimating the posterior probability density for parameters of the model (i.e. size at each interval) the probability density of population size in function of time (i.e. size at each generation) is estimated. This method is currently implemented in BEAST (Drummond & Rambaut 2007 BMC Evol Biol), which uses an MCMC estimation of likelihood under the coalescent.

We have implemented the same approach under an **Approximate Bayesian Computation** analysis. The purpose of this is to facilitate analysis of dataset were the MCMC approach is inappropriate, such as analysis of DNA sequences with intragenic recombination. The performance of the method has been evaluated with simulated datasets (see table). Simulations for the ABC procedure were performed with FASTSIMCOAL (Excoffier & Foll 2011 Bioinformatics), using a model with 10 periods of constant size. Sample were of 50 diploid individuals typed at 100 microsatellite loci. Summary statistics were calculated with ARLSUMSTATS (from Arlequin). Relative root of mean squared error, relative bias and proportion of times the true value fall outside the 95%HPD interval were estimated from 50 simulations of target data.

<table>
<thead>
<tr>
<th></th>
<th>PRIOR</th>
<th>POSTERIOR (1 random simulation)</th>
<th>POSTERIOR (50 simulations)</th>
<th>ERROR</th>
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<tbody>
<tr>
<td>CONSTANT SIZE</td>
<td><img src="image" alt="Constant Size Prior" /></td>
<td><img src="image" alt="Constant Size Posterior Random" /></td>
<td><img src="image" alt="Constant Size Posterior 50 Sim" /></td>
<td><img src="image" alt="Constant Size Error" /></td>
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<td>EXPANSION</td>
<td><img src="image" alt="Expansion Prior" /></td>
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<tr>
<td>BOTTLENECK</td>
<td><img src="image" alt="Bottleneck Prior" /></td>
<td><img src="image" alt="Bottleneck Posterior Random" /></td>
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</table>

**Application to European Yew** (*Taxus baccata*)


Distribution in the Iberian Peninsula

ABC Skyline Plots from seven microsatellite markers (model with 3 periods)