

# Comparing *Quercus* model from Duputie vs. van der Meersch

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## Overview

For the mean results for *Quercus* we wondered whether the Leaf model parameterization was driving the results. To check this we created an updated file (`Quercus_robur_ADuputie_updated23June2023.species`) using the leaf model parameterization from Van der Meersch & Chuine 2023 (`cmaes_fit_subset2_rep2.species`). After reviewing the results, Victor replied:

I am surprised by the fitness with the updated parameters, which seems veeery low, though there are *Quercus* individuals in these latitude. Maybe it is because we only extracted the leaf/flower parameters from the inverse calibration set? If it is not time consuming, you could try to run simulations directly with the "`cmaes_fit_subset2_rep2.species`" file, even though extra precautions must be taken when analysing the results.

And Isabelle agreed so now I ran with the new parameter set. Below is a comparison of the results between the FULL updated parameters and Duputie.

## Based on historical climate

See bottom panels of Fig. 1-2, trends are similar (MaturationIndex dominates fitness) but now fitness is now low as of latitudes 41 and 44 and higher. I was also struck by how the FruitMatDate changed (see Fig. 3) which now clearly gets later at higher latitudes, and matters to fitness (whereas before neither of these things happened).

## Based on simulated climate with mean warming

See Fig. 4-5. Fitness is again affected mostly by MaturationIndex, and low at high warming.

## Based on simulated climate with changing variance

See Fig. 6-7. Fitness dominated by FruitIndex (I think) and decreasing with increasing variance.

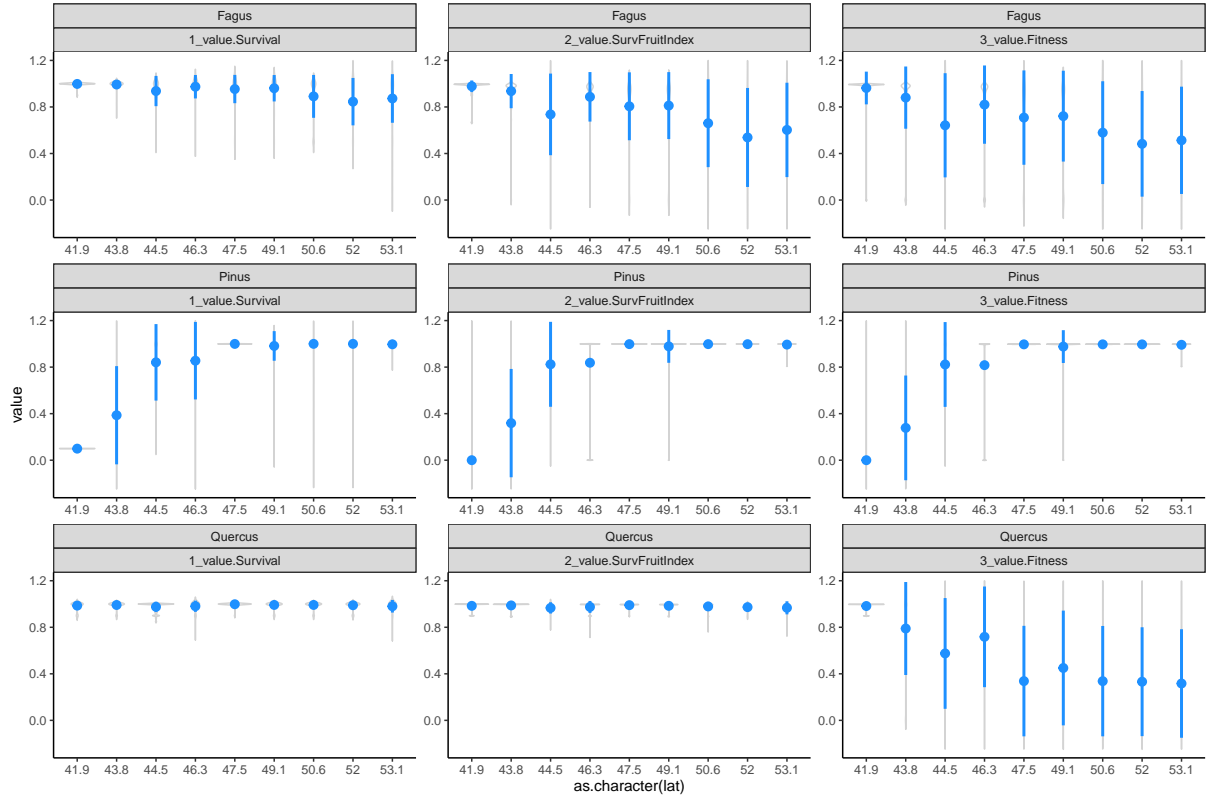


Figure 1: *Quercus* fitness across latitude (historical climate data) based on Duputie parameters. You can see PHENOFIT4 output at [https://github.com/lizzieinvancouver/climatehazards/tree/main/analyses/input/phenofit/querob\\_19512020\\_Duputie](https://github.com/lizzieinvancouver/climatehazards/tree/main/analyses/input/phenofit/querob_19512020_Duputie).

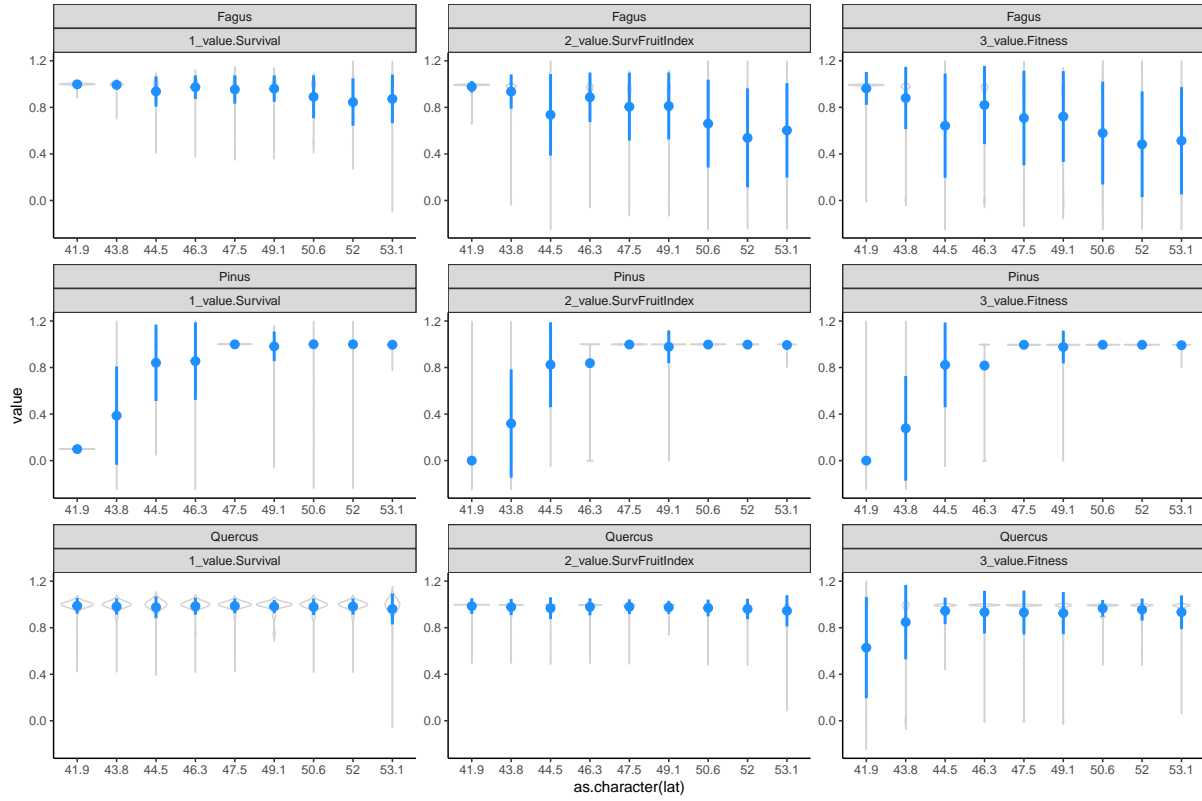


Figure 2: *Quercus* fitness across latitude (historical climate data) based on updated ALL model parameters. You can see PHENOFIT4 output at [https://github.com/lizzieinvancouver/climatehazards/tree/main/analyses/input/phenofit/querob\\_19512020](https://github.com/lizzieinvancouver/climatehazards/tree/main/analyses/input/phenofit/querob_19512020).

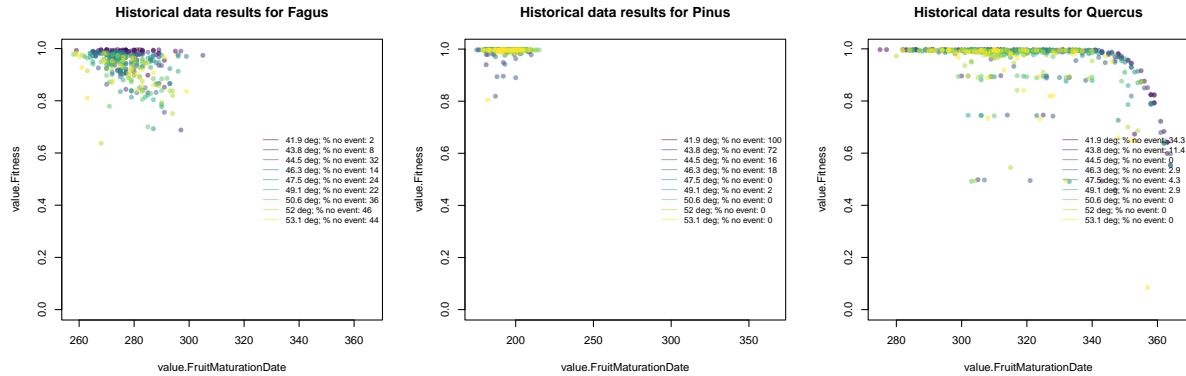


Figure 3: *Quercus* fitness as a function of FruitMaturationDate (historical climate data) based on updated ALL model parameters. You can see the previous plot using the Duputie parameters at [https://github.com/lizzieinvancouver/climatehazards/blob/faaca3adcab9bf8d615732abf1ebfe00a1d52370/analyses/graphs/phenofit/historical/allsp\\_xypoints\\_wprint\\_fruitmatdate\\_vsfitness.pdf](https://github.com/lizzieinvancouver/climatehazards/blob/faaca3adcab9bf8d615732abf1ebfe00a1d52370/analyses/graphs/phenofit/historical/allsp_xypoints_wprint_fruitmatdate_vsfitness.pdf).

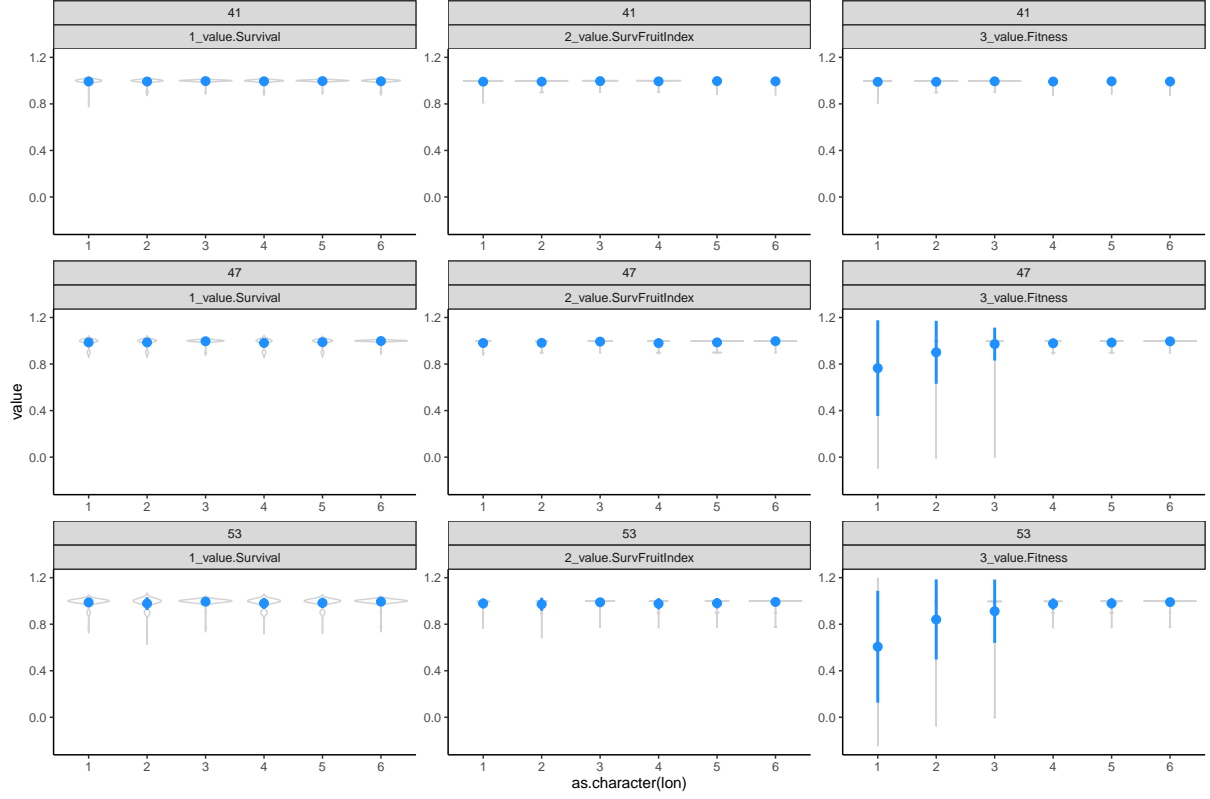


Figure 4: *Quercus* across 0 (1) to +5 (6) mean warming, based on Duputie parameters. To see the underlying components of the model, look for ‘meansim’ QR files at [https://github.com/lizzieinvancouver/climatehazards/tree/main/analyses/graphs/phenofit/sims/querob\\_Duputie](https://github.com/lizzieinvancouver/climatehazards/tree/main/analyses/graphs/phenofit/sims/querob_Duputie).

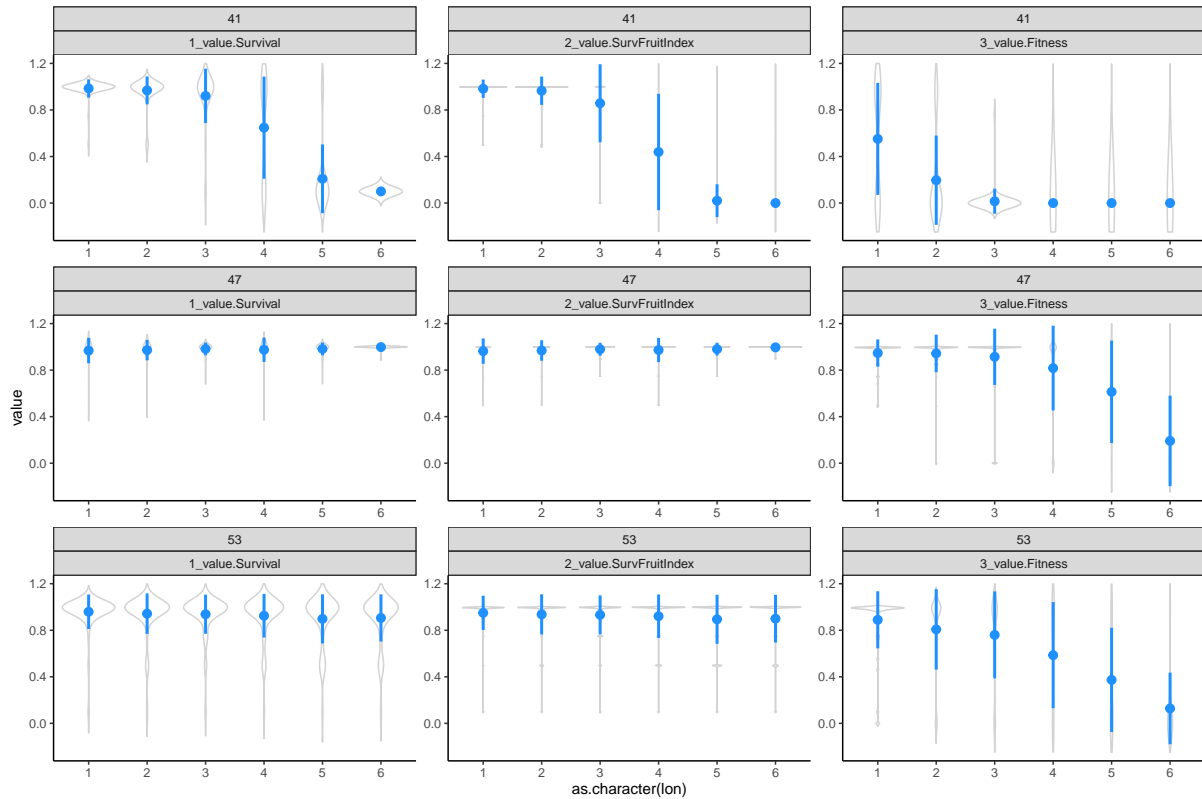


Figure 5: *Quercus* across 0 (1) to +5 (6) mean warming, based on updated parameters. To see the underlying components of the model, look for ‘meansim’ QR files in <https://github.com/lizzieinvancouver/climatehazards/tree/main/analyses/graphs/phenofit/sims>

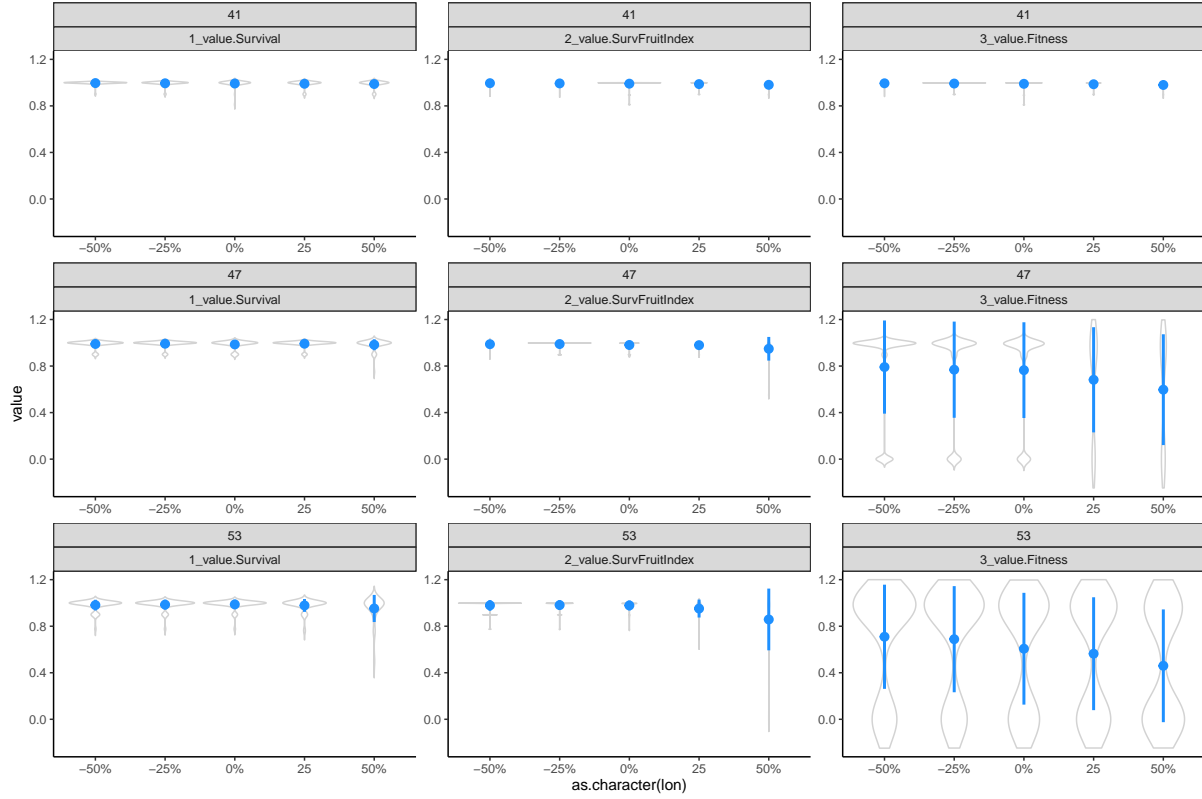


Figure 6: *Quercus* across changing variance, based on Duputie parameters. To see the underlying components of the model, look for ‘dssim’ QR files at [https://github.com/lizzieinvancouver/climatehazards/tree/main/analyses/graphs/phenofit/sims/querob\\_Duputie](https://github.com/lizzieinvancouver/climatehazards/tree/main/analyses/graphs/phenofit/sims/querob_Duputie).

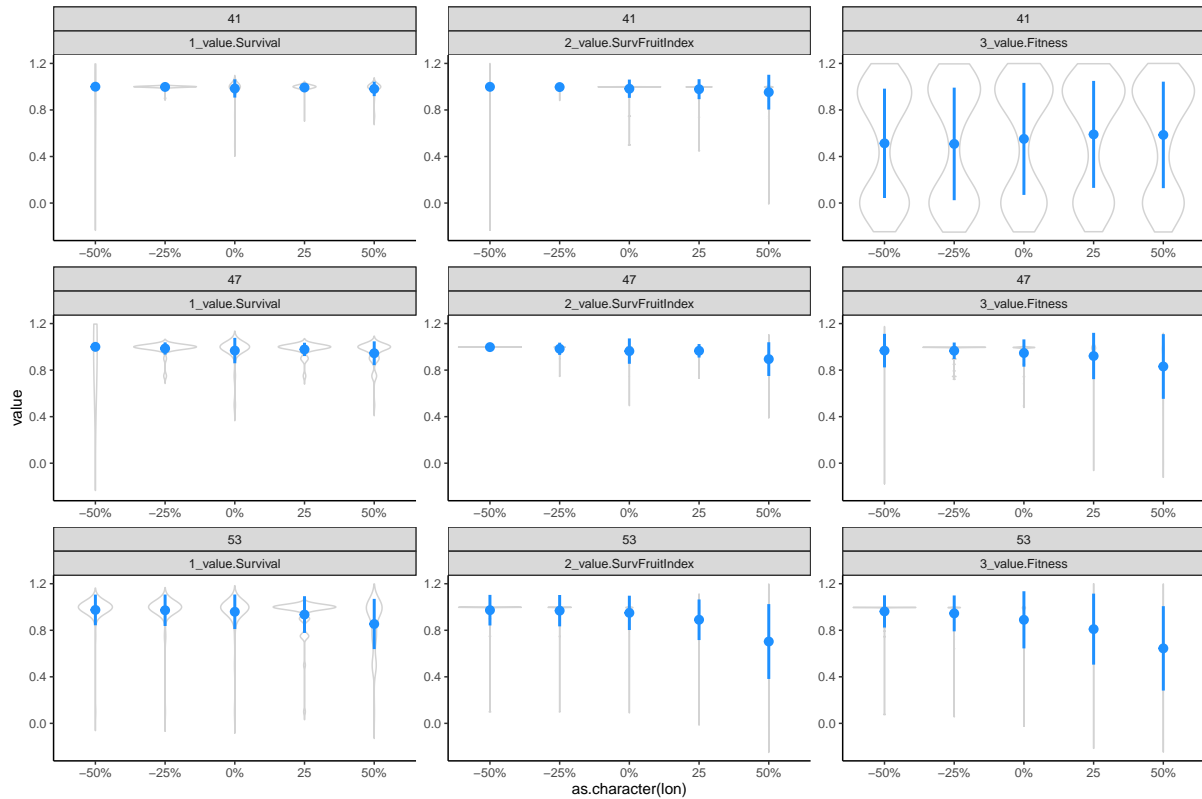


Figure 7: *Quercus* across changing variance, based on updated parameters. To see the underlying components of the model, look for 'sdsim' QR files in <https://github.com/lizzieinvancouver/climatehazards/tree/main/analyses/graphs/phenofit/sims>