Results from scenario with 2 diploids, 3 tetraploids, 1-3 hybridizations

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1   Scenarios

Scenarios shown in Fig 1. All genes have length 500. Population sizes are 100,000 at tips, and at rootward ends of branches, and 200,000 at tipward ends of internal branches and at the root. The root height is 0.012.

Strict clock branch rates assumed in simulation and BEAST.

HKY substitution model assumed in simulation and BEAST. In simulations, the Seq-Gen parameters are kappa=3, frequencies .3 A and T, .2 C and G. (Seq-Gen called with `-t3.0 -f0.3,0.2,0.2,0.3`. These are estimated in BEAST.

No site rate heterogeneity assumed within genes in simulation and BEAST.

Genes have the same mutation rate in simulations. Rates are estimated in BEAST.

Priors on population size scaling factor η, relative mutation rates of genes, and the 'event rate' (something like a diversification rate) λ for the diploid and tetraploid trees in the network, are all diffuse lognormals.

G=3,9. N=1,3. T=8×10^{-8}, 1.6×10^{-7}.

When T $= 8 \times 10^{-8}$, then root height is $.012/(8 \times 10^{-8}) = 150{,}000$ generations. When T $= 1.6 \times 10^{-7}$, then root height is 75,000. The expected time for a coalesecence between two genes in the same population of size 100,000 (100,000 gene copies per diploid genome) is 100,000 generations.

MCMC chains are 3,000,000 generations with first 1,000,000 discarded as burnin.

Fig 2 shows the simulated gene trees for scenario D, with G=9, N=1, T=8×10^{-8}, replicate 1.

2   Results

Fig 3 shows the posterior probabilities for the number of hybridizations being equal to the correct value. Each graph shows ten replicates.

1

D

a
zA
yA
xA
xB
yB
zB
b

0.012 0.09 0.06 0.03 0.0

E

a
zA
yA
xA
xB
yB
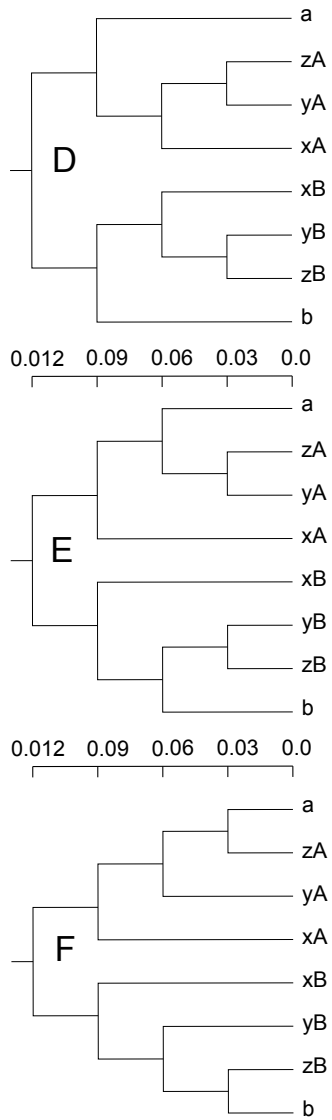zB
b

0.012 0.09 0.06 0.03 0.0

F

a
zA
yA
xA
xB
yB
zB
b

Figure 1: Scenario D,E,F: the true MUL-trees

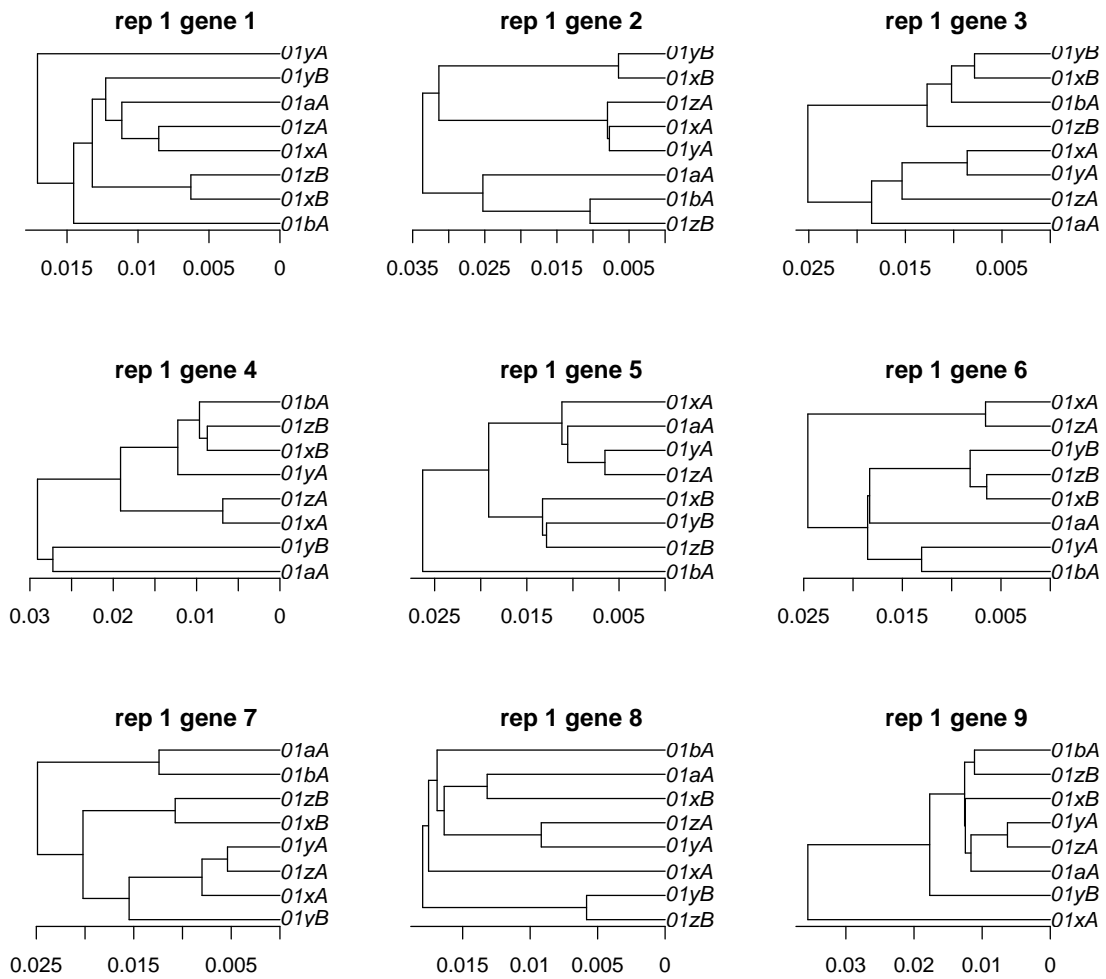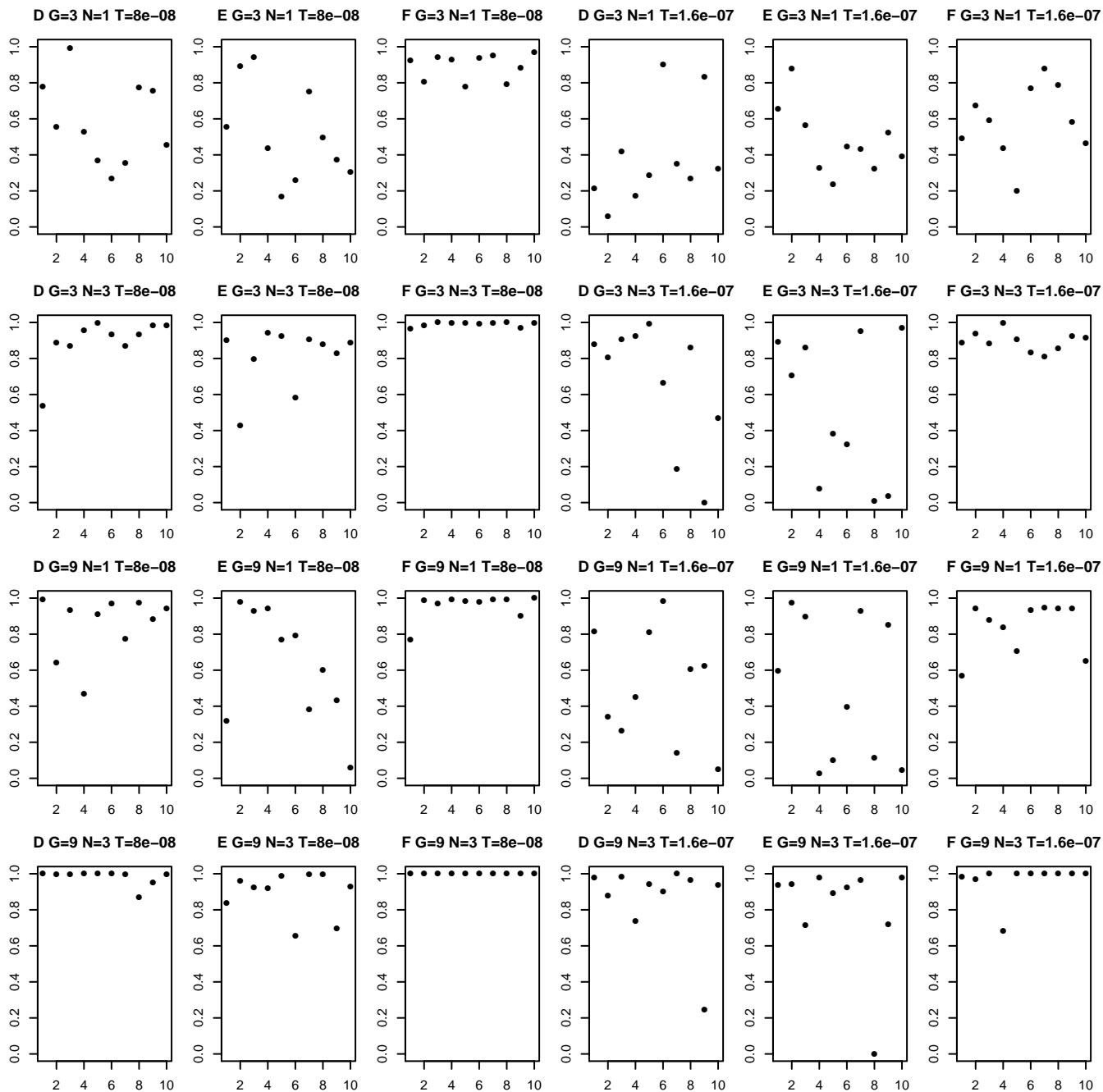Figure 2: Simulated gene trees for scenario D, with G=9, N=1, T=8e-8, replicate 1.

Figure 3: Posterior probabilities for the correct number of hybridizations

3   Configuration files

D - one hybridization

```
PROGRAMPARAMETERS
beastseed 652989819
beastchainlength 3000000
beastscreen.logevery 10000
beastparams.logevery 1000
beastgtrees.logevery 1000
beastmultree.logevery 1000
beastdbugtune.logevery 10000
treeannburnin 1001
SCENARIO
nofGNRT 4
3 1 10 8e-8 1.6e-7
3 3 10 8e-8 1.6e-7
9 1 10 8e-8 1.6e-7
9 3 10 8e-8 1.6e-7
genelength 500
nofdips 2
noftets 3
aA                                       hgt 0      hybhgt *      tipp 100000 rootp 100000 hybp *
bA                                       hgt 0      hybhgt *      tipp 100000 rootp 100000 hybp *
zA                                       hgt 0      hybhgt *      tipp 100000 rootp 100000 hybp *
zB                                       hgt 0      hybhgt *      tipp 100000 rootp 100000 hybp *
yA                                       hgt 0      hybhgt *      tipp 100000 rootp 100000 hybp *
yB                                       hgt 0      hybhgt *      tipp 100000 rootp 100000 hybp *
xA                                       hgt 0      hybhgt *      tipp 100000 rootp 100000 hybp *
xB                                       hgt 0      hybhgt *      tipp 100000 rootp 100000 hybp *
(zA,yA)                                  hgt 0.003  hybhgt *      tipp *      rootp 100000 hybp *
(zB,yB)                                  hgt 0.003  hybhgt *      tipp *      rootp 100000 hybp *
((zA,yA),xA)                             hgt 0.006  hybhgt 0.008  tipp *      rootp 100000 hybp 100000
((zB,yB),xB)                             hgt 0.006  hybhgt 0.008  tipp *      rootp 100000 hybp 100000
(aA,((zA,yA),xA))                        hgt 0.009  hybhgt *      tipp *      rootp 100000 hybp *
(bA,((zB,yB),xB))                        hgt 0.009  hybhgt *      tipp *      rootp 100000 hybp *
((aA,((zA,yA),xA)),(bA,((zB,yB),xB)))    hgt 0.012  hybhgt *      tipp *      rootp 100000 hybp *
```

E - two hybridizations

```
PROGRAMPARAMETERS
beastseed 652989819
beastchainlength 3000000
beastscreen.logevery 10000
beastparams.logevery 1000
beastgtrees.logevery 1000
beastmultree.logevery 1000
beastdbugtune.logevery 10000
treeannburnin 1001
SCENARIO
nofGNRT 4
3 1 10 8e-8 1.6e-7
3 3 10 8e-8 1.6e-7
9 1 10 8e-8 1.6e-7
9 3 10 8e-8 1.6e-7
genelength 500
nofdips 2
noftets 3
aA                                      hgt 0      hybhgt *      tipp 100000 rootp 100000 hybp *
bA                                      hgt 0      hybhgt *      tipp 100000 rootp 100000 hybp *
zA                                      hgt 0      hybhgt *      tipp 100000 rootp 100000 hybp *
zB                                      hgt 0      hybhgt *      tipp 100000 rootp 100000 hybp *
yA                                      hgt 0      hybhgt *      tipp 100000 rootp 100000 hybp *
yB                                      hgt 0      hybhgt *      tipp 100000 rootp 100000 hybp *
xA                                      hgt 0      hybhgt 0.008  tipp 100000 rootp 100000 hybp 100000
xB                                      hgt 0      hybhgt 0.008  tipp 100000 rootp 100000 hybp 100000
(zA,yA)                                 hgt 0.003  hybhgt 0.005  tipp *      rootp 100000 hybp 100000
(zB,yB)                                 hgt 0.003  hybhgt 0.005  tipp *      rootp 100000 hybp 100000
(aA,(zA,yA))                            hgt 0.006  hybhgt *      tipp *      rootp 100000 hybp *
(bA,(zB,yB))                            hgt 0.006  hybhgt *      tipp *      rootp 100000 hybp *
(xA,(aA,(zA,yA)))                       hgt 0.009  hybhgt *      tipp *      rootp 100000 hybp *
(xB,(bA,(zB,yB)))                       hgt 0.009  hybhgt *      tipp *      rootp 100000 hybp *
((xA,(aA,(zA,yA))),(xB,(bA,(zB,yB))))   hgt 0.012  hybhgt *      tipp *      rootp *      hybp *
```

F - three hybridizations


```
PROGRAMPARAMETERS
beastseed 652989819
beastchainlength 3000000
beastscreen.logevery 10000
beastparams.logevery 1000
beastgtrees.logevery 1000
beastmultree.logevery 1000
beastdbugtune.logevery 10000
treeannburnin 1001
SCENARIO
nofGNRT 4
3 1 10 8e-8 1.6e-7
3 3 10 8e-8 1.6e-7
9 1 10 8e-8 1.6e-7
9 3 10 8e-8 1.6e-7
genelength 500
nofdips 2
noftets 3
aA                                      hgt 0      hybhgt *      tipp 100000 rootp 100000 hybp *
bA                                      hgt 0      hybhgt *      tipp 100000 rootp 100000 hybp *
zA                                      hgt 0      hybhgt 0.002  tipp 100000 rootp 100000 hybp 100000
zB                                      hgt 0      hybhgt 0.002  tipp 100000 rootp 100000 hybp 100000
yA                                      hgt 0      hybhgt 0.005  tipp 100000 rootp 100000 hybp 100000
yB                                      hgt 0      hybhgt 0.005  tipp 100000 rootp 100000 hybp 100000
xA                                      hgt 0      hybhgt 0.008  tipp 100000 rootp 100000 hybp 100000
xB                                      hgt 0      hybhgt 0.008  tipp 100000 rootp 100000 hybp 100000
(zA,aA)                                 hgt 0.003  hybhgt *      tipp *      rootp 100000 hybp *
(zB,bA)                                 hgt 0.003  hybhgt *      tipp *      rootp 100000 hybp *
(yA,(zA,aA))                            hgt 0.006  hybhgt *      tipp *      rootp 100000 hybp *
(yB,(zB,bA))                            hgt 0.006  hybhgt *      tipp *      rootp 100000 hybp *
(xA,(yA,(zA,aA)))                       hgt 0.009  hybhgt *      tipp *      rootp 100000 hybp *
(xB,(yB,(zB,bA)))                       hgt 0.009  hybhgt *      tipp *      rootp 100000 hybp *
((xA,(yA,(zA,aA))),(xB,(yB,(zB,bA))))   hgt 0.012  hybhgt *      tipp *      rootp *      hybp *
```