

Additional file 1 – Molecular phylogenetic trees with reconstructed shifts in geographic distribution and flowering patterns (flowering durations and flowering midpoint) indicated.

Unless otherwise indicated, shifts in flowering patterns are in the direction consistent with past climatic change; shifts in flowering midpoint are from the summer towards the spring, and shifts in flowering duration are reductions in the number of months of flowering. Where nodes optimised at different states are separated by nodes in which the ancestral state is undetermined, we have marked on the basal-most possible location of the shift.

Bruniaceae (1 Cape clade): Tree 1

Cyperaceae (*Ficinia* & *Tetraria*): Tree 2

Disa (1 Cape clade): Tree 3

Ehrharta (1 Cape clade): Tree 4

Genistoids (Crotalariaeae & Podalyrieae): Tree 5

Heliophila: Tree 6

Indigofera: Tree 7

Moraea: Tree 8

Muraltia: Tree 9

Oxalis: Tree 10

Pelargonium: Tree 11

Pentaschistis: Tree 12

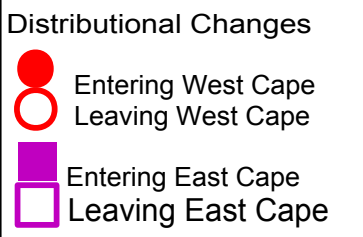
Phylica: Tree 13

Restionaceae: Tree 14

Satyrium: Tree 15

Zygophyllum: Tree 16

Tree 1: Bruniaceae



Cape clade

Non-Cape relatives

Significant Evolutionary Character Changes

▼ Flowering Midpoint Time
(No significant changes)

▲ Flowering Duration
(No significant changes)

Distributional Changes

● Entering West Cape
○ Leaving West Cape

■ Entering East Cape
□ Leaving East Cape

Sampling of Cape species
Ficinia: 21%
Tetraria: 19%

Bootstrap values: Parsimony, 1000 replicates

Tree 2: Cyperaceae



Significant Evolutionary
Character Changes

-  Flowering Midpoint Time
-  Flowering Duration
(No significant changes)
- Distributional Changes

 Entering West Cape

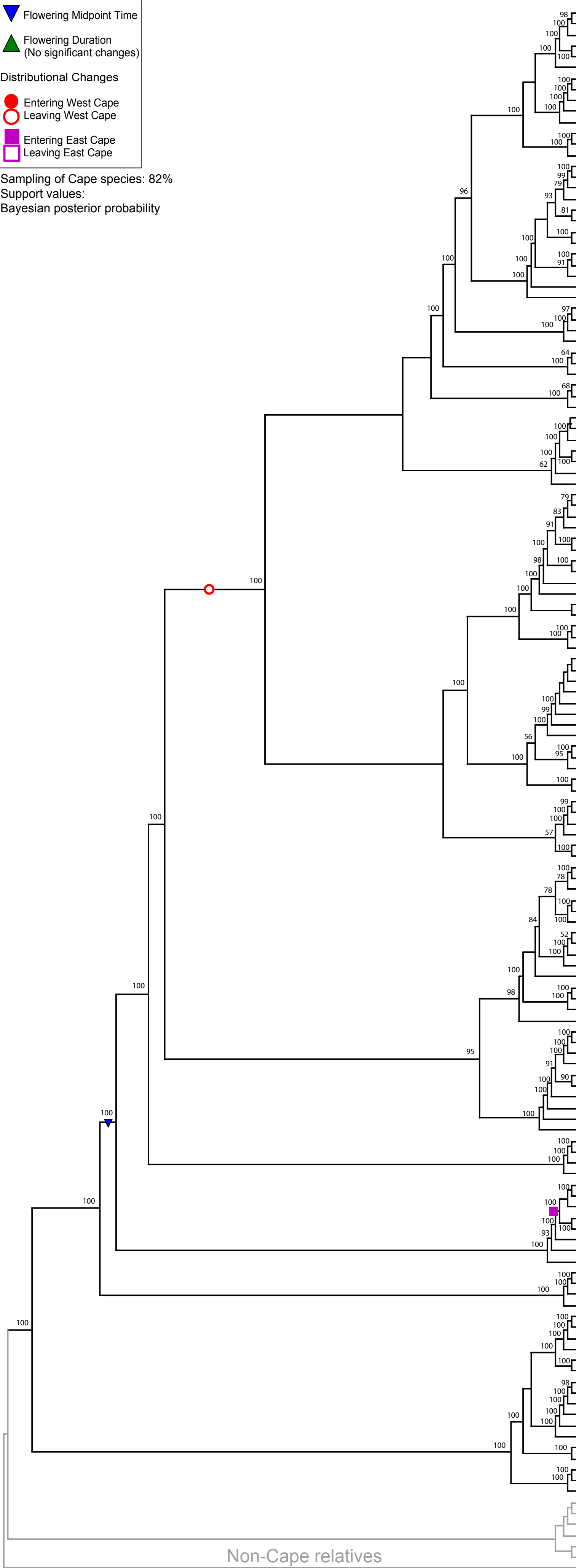
 Leaving West Cape

 Entering East Cape

 Leaving East Cape

Sampling of Cape species: 82%
Support values:
Bayesian posterior probability

Tree 3: *Disa*



Significant Evolutionary
Character Changes

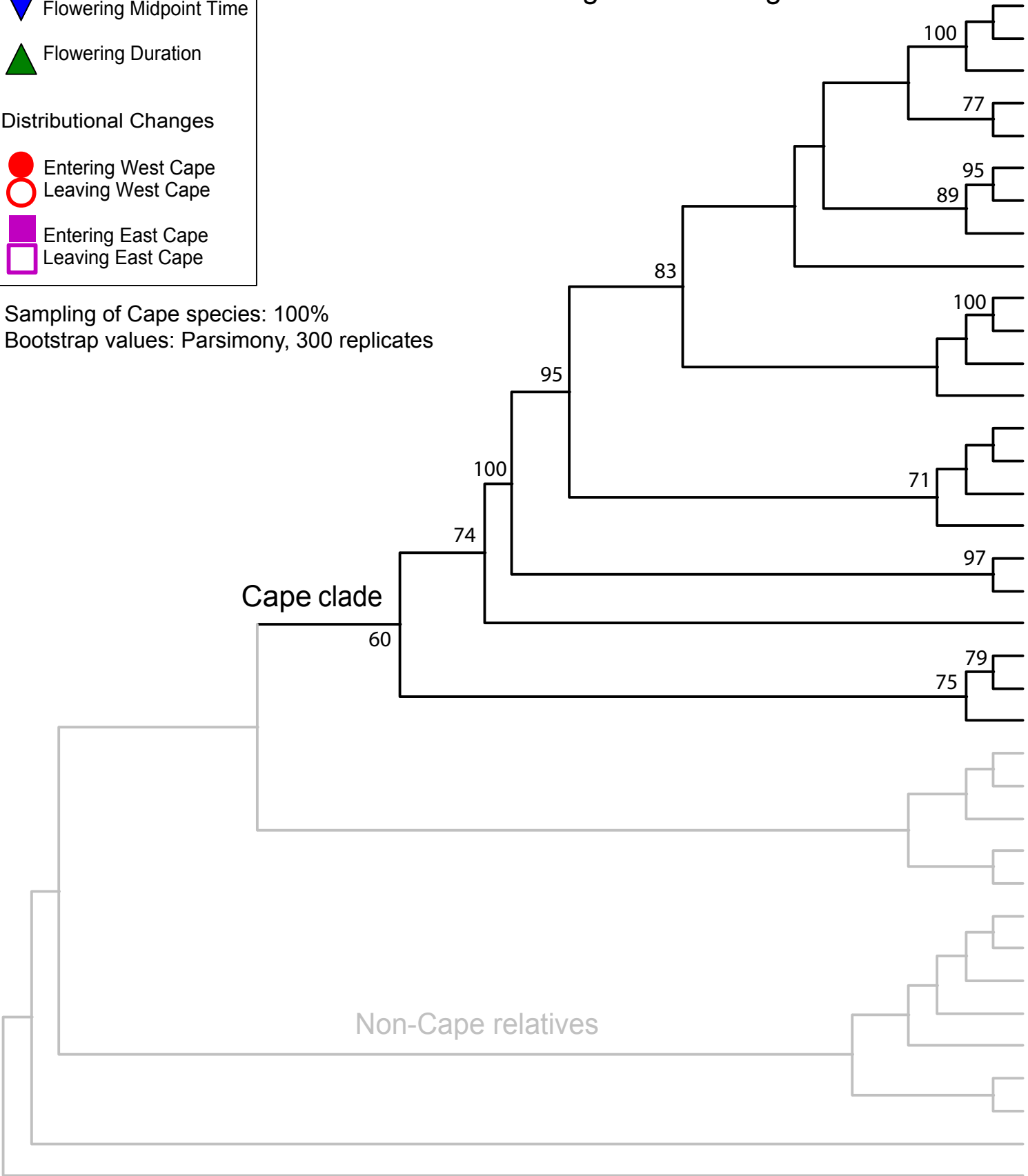
- ▼ Flowering Midpoint Time
- ▲ Flowering Duration

Distributional Changes

- Entering West Cape
- Leaving West Cape
- Entering East Cape
- Leaving East Cape

Sampling of Cape species: 100%
Bootstrap values: Parsimony, 300 replicates

Tree 4: *Ehrharta*
- there are no significant changes



Significant Evolutionary Character Changes

 Flowering Midpoint Time
(Note the hollow triangle is in the opposite direction to that predicted under climate change)

 Flowering Duration

Distributional Changes

 Entering West Cape

 Leaving West Cape

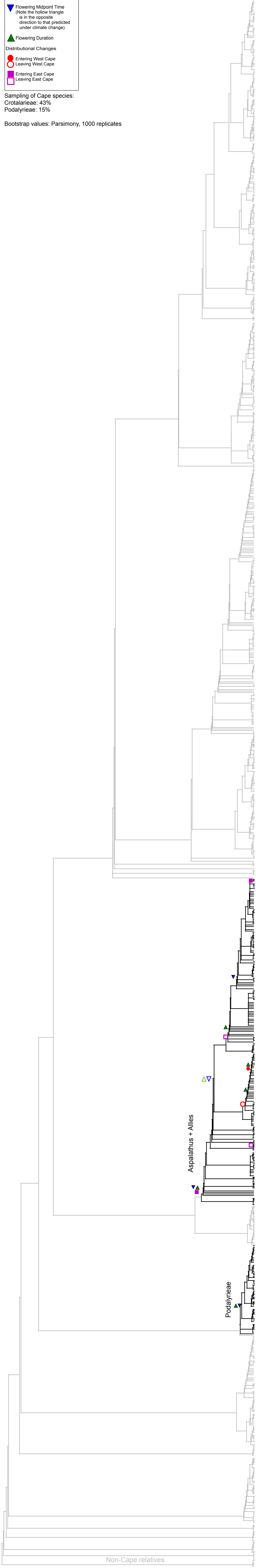
 Entering East Cape

 Leaving East Cape

Sampling of Cape species:
Crotalariaeae: 43%
Podalyrieae: 15%

Bootstrap values: Parsimony, 1000 replicates

Tree 5: Genistoids



Significant Evolutionary Character Changes

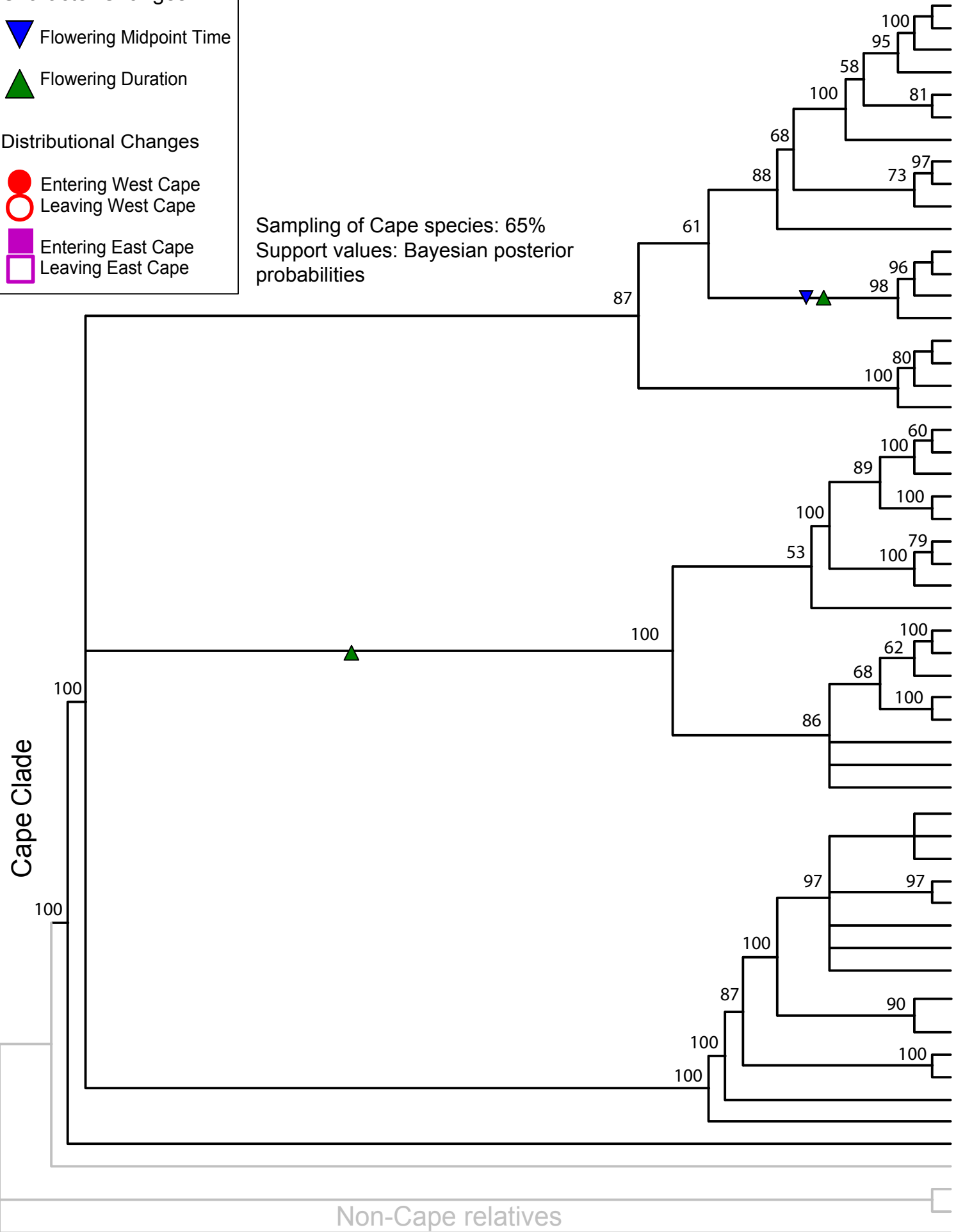
- Flowering Midpoint Time
- Flowering Duration

Distributional Changes

- Entering West Cape
- Leaving West Cape
- Entering East Cape
- Leaving East Cape

Tree 6: *Heliophila*

Sampling of Cape species: 65%
Support values: Bayesian posterior probabilities



Significant Evolutionary
Character Changes

▼

Flowering Midpoint Time
(No significant change)

▲

Flowering Duration
(No significant change)

Distributional Changes

●

Entering West Cape

○

Leaving West Cape

■

Entering East Cape

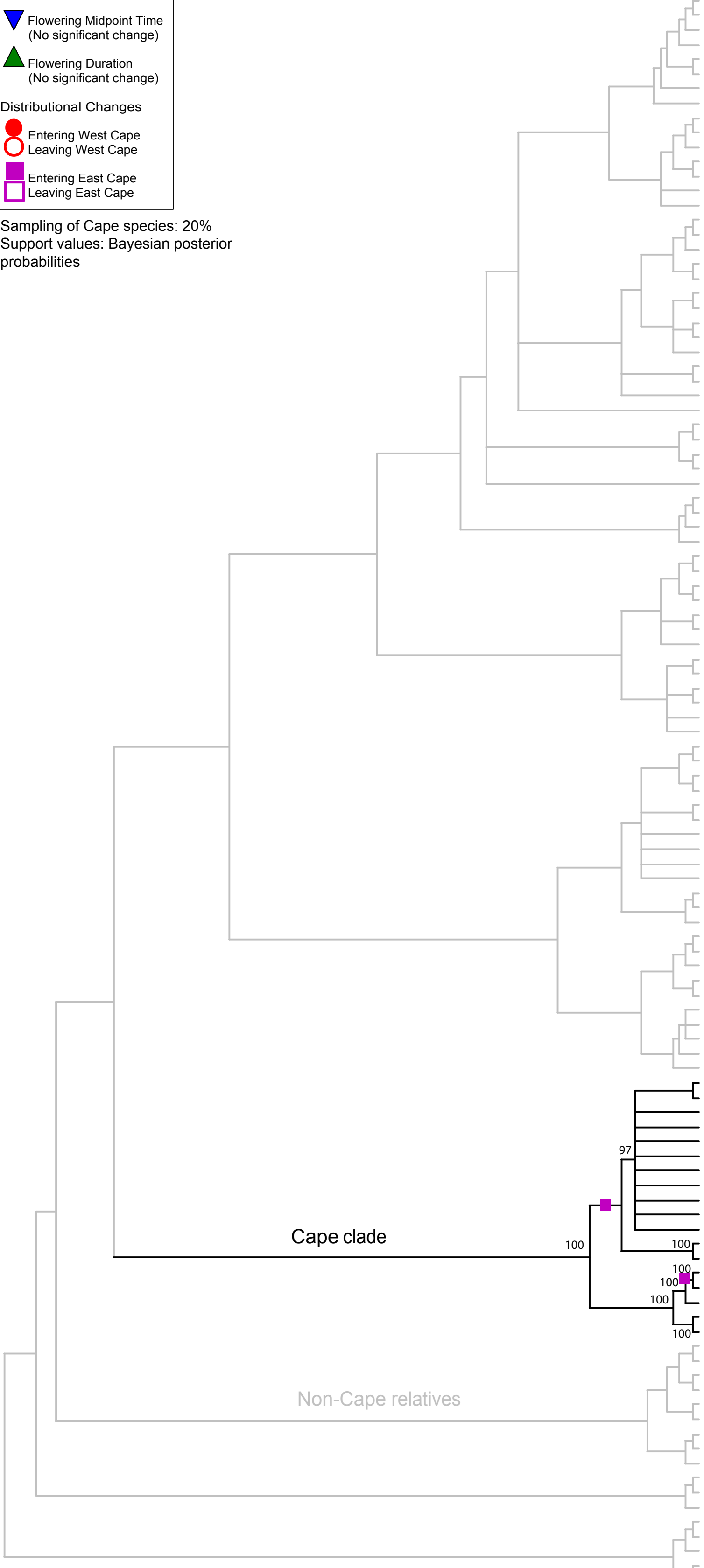
□

Leaving East Cape

Sampling of Cape species: 20%

Support values: Bayesian posterior
probabilities

Tree 7: *Indigofera*



Significant Evolutionary Character Changes

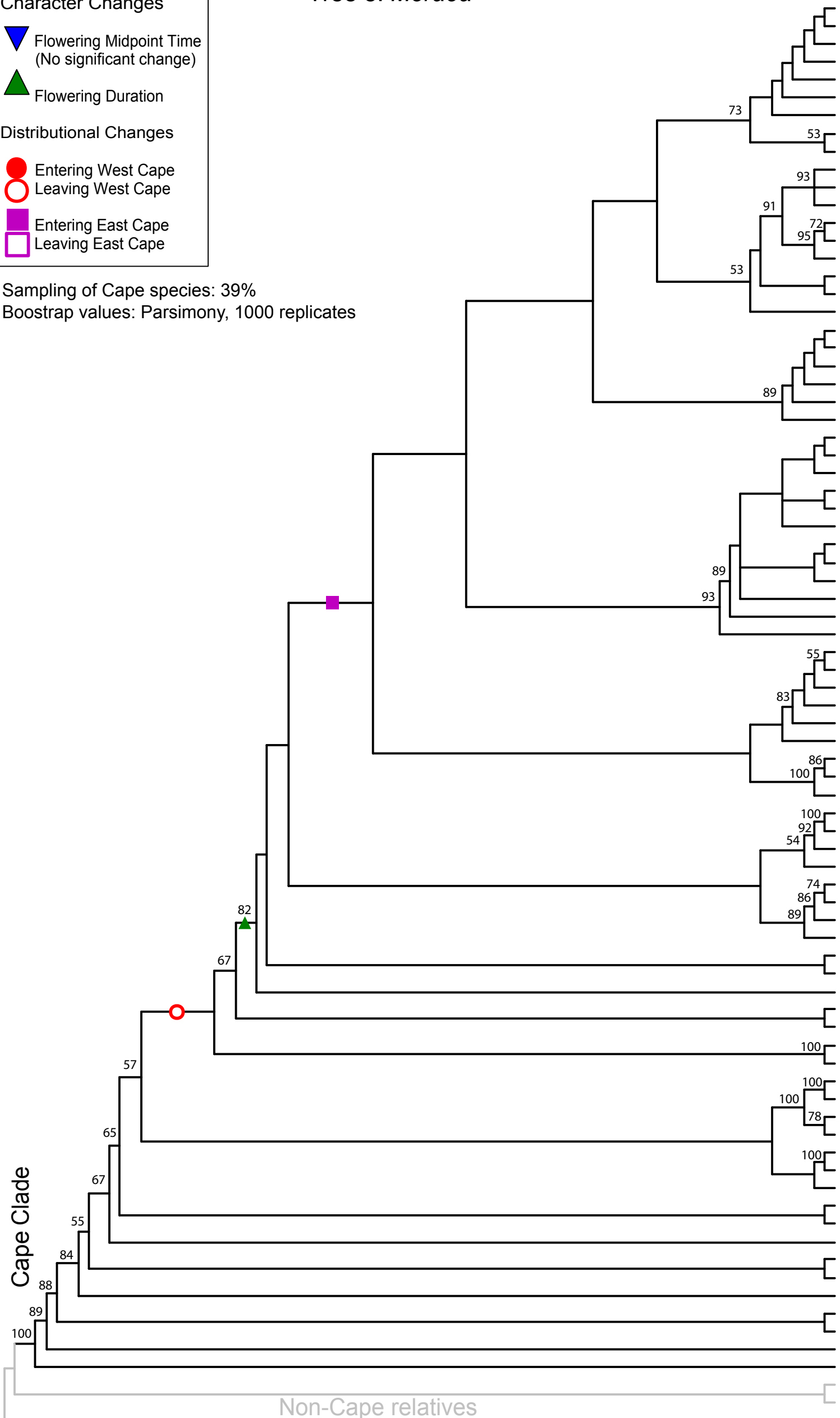
- Flowering Midpoint Time (No significant change)
- Flowering Duration

Distributional Changes

- Entering West Cape
- Leaving West Cape
- Entering East Cape
- Leaving East Cape

Sampling of Cape species: 39%
Bootstrap values: Parsimony, 1000 replicates

Tree 8: *Moraea*



Significant Evolutionary Character Changes

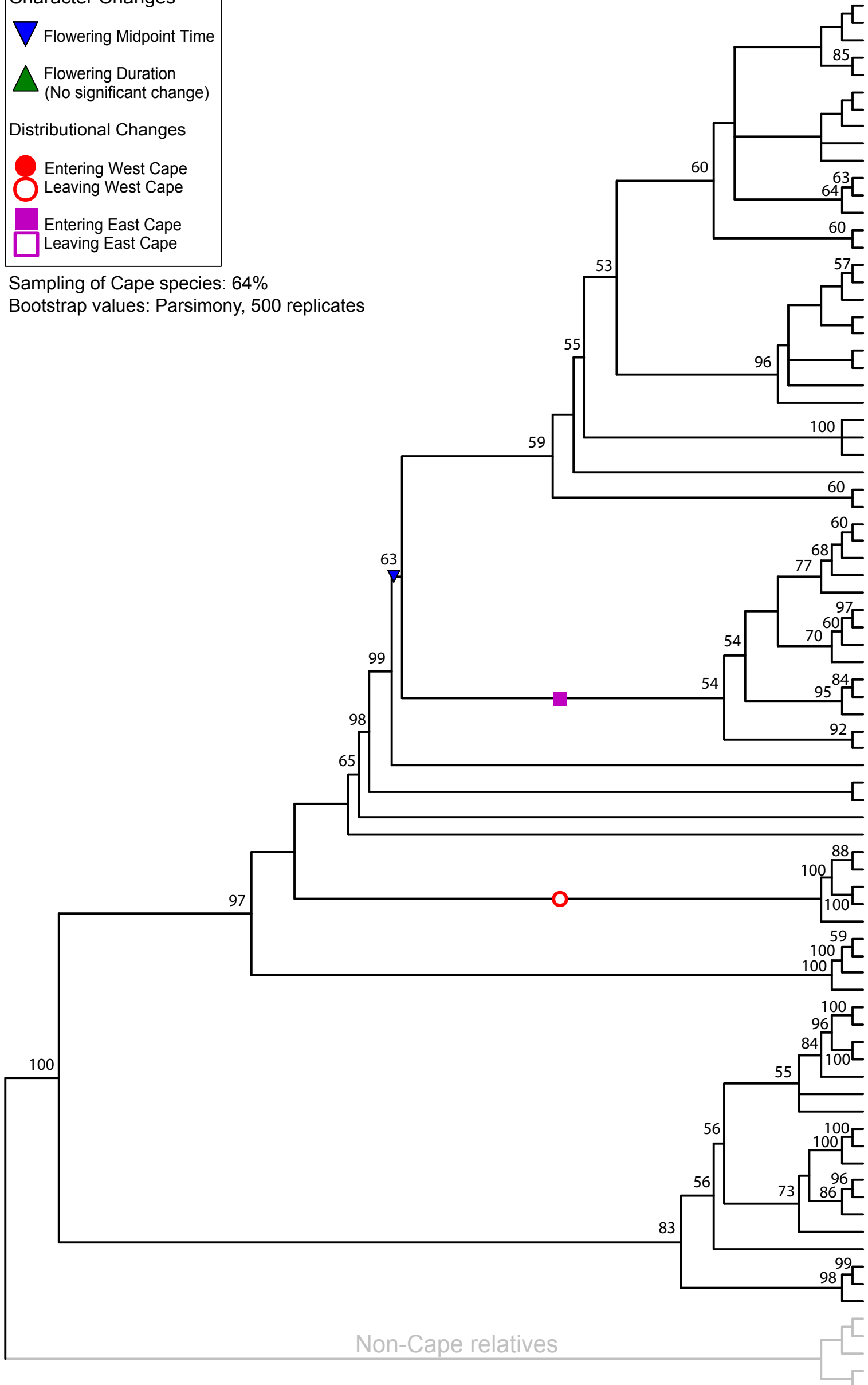
- Flowering Midpoint Time
- Flowering Duration (No significant change)

Distributional Changes

- Entering West Cape
- Leaving West Cape
- Entering East Cape
- Leaving East Cape

Sampling of Cape species: 64%
Bootstrap values: Parsimony, 500 replicates

Tree 9: *Muraltia*



Significant Evolutionary Character Changes

 Flowering Midpoint time
(Note that the hollow blue triangle represents a shift from late-autumn towards the winter)

 Flowering Duration

Distributional Changes

 Entering West Cape

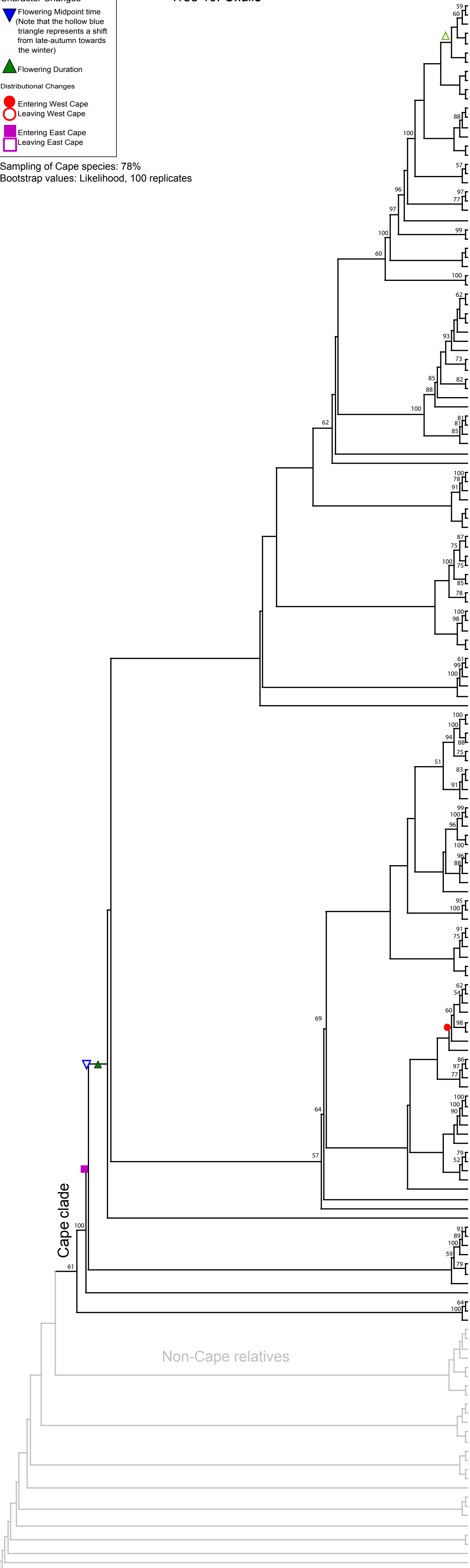
 Leaving West Cape

 Entering East Cape

 Leaving East Cape

Tree 10: *Oxalis*

Sampling of Cape species: 78%
Bootstrap values: Likelihood, 100 replicates



Significant Evolutionary
Character Changes

▼

 Flowering Midpoint Time

▲

 Flowering Duration

Distributional Changes

●

 Entering West Cape

○

 Leaving West Cape

■

 Entering East Cape

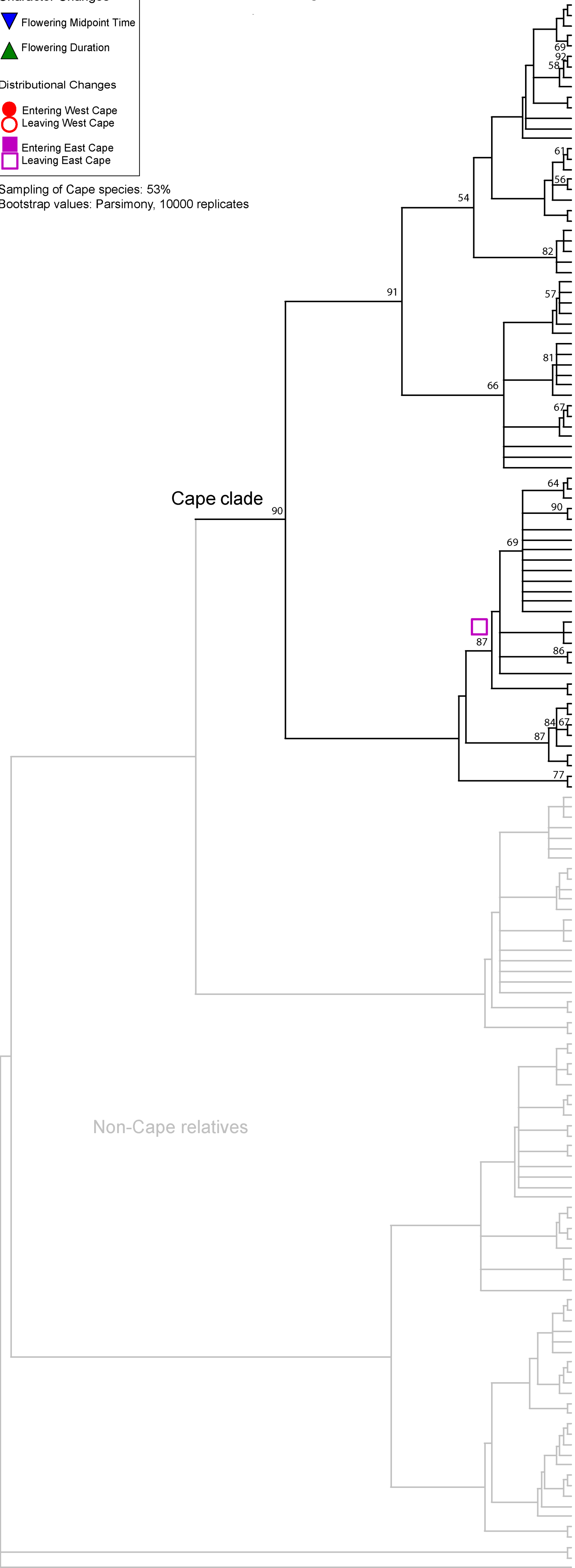
□

 Leaving East Cape

Sampling of Cape species: 53%

Bootstrap values: Parsimony, 10000 replicates

Tree 11: *Pelargonium*



Significant Evolutionary Character Changes

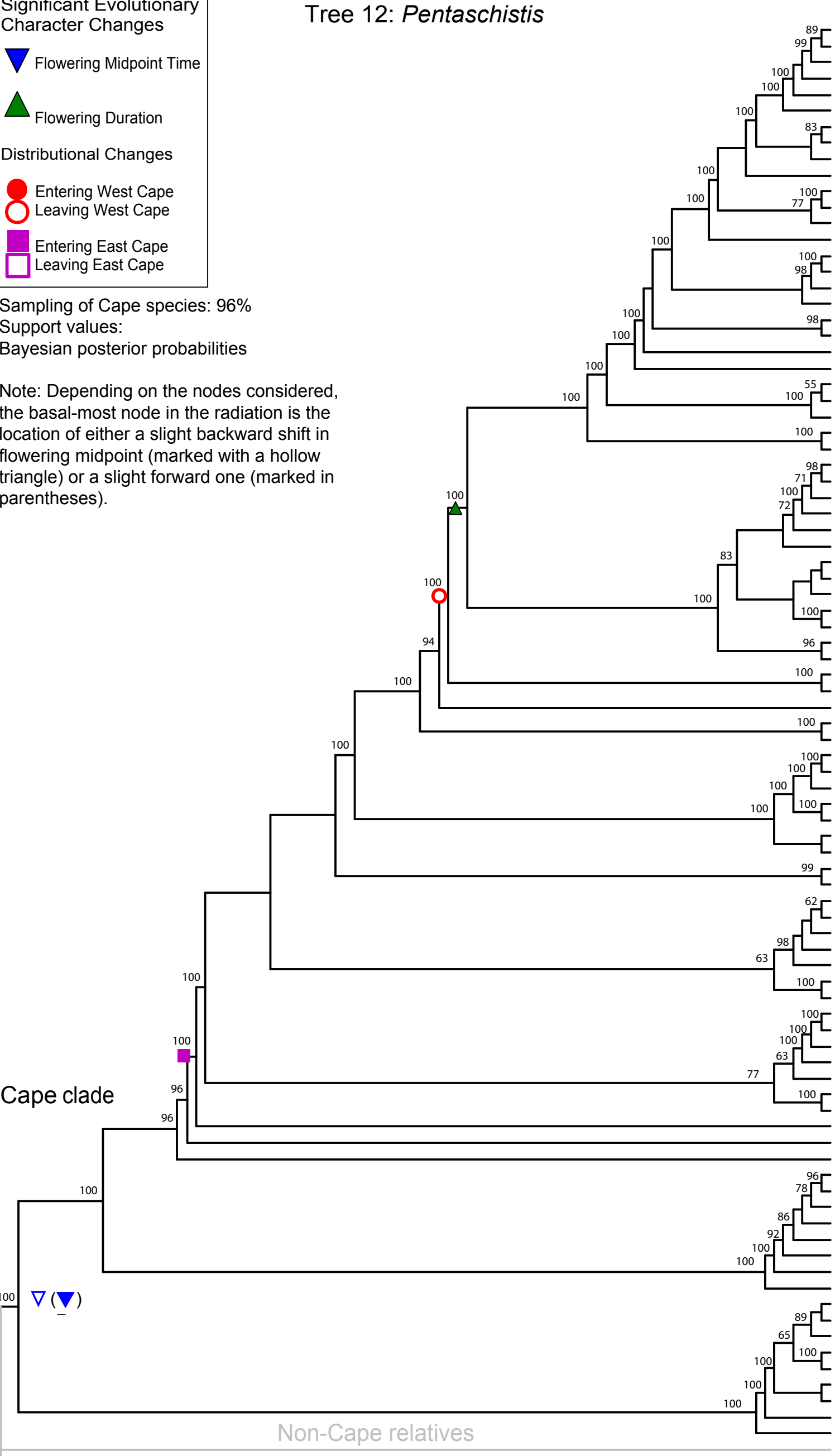
- Flowering Midpoint Time
- Flowering Duration

Distributional Changes

- Entering West Cape
- Leaving West Cape
- Entering East Cape
- Leaving East Cape

Sampling of Cape species: 96%
Support values:
Bayesian posterior probabilities

Note: Depending on the nodes considered, the basal-most node in the radiation is the location of either a slight backward shift in flowering midpoint (marked with a hollow triangle) or a slight forward one (marked in parentheses).



Significant Evolutionary
Character Changes

Flowering Midpoint Time
(No significant change)

Flowering Duration

Distributional Changes

Entering West Cape

Leaving West Cape

Entering East Cape

Leaving East Cape

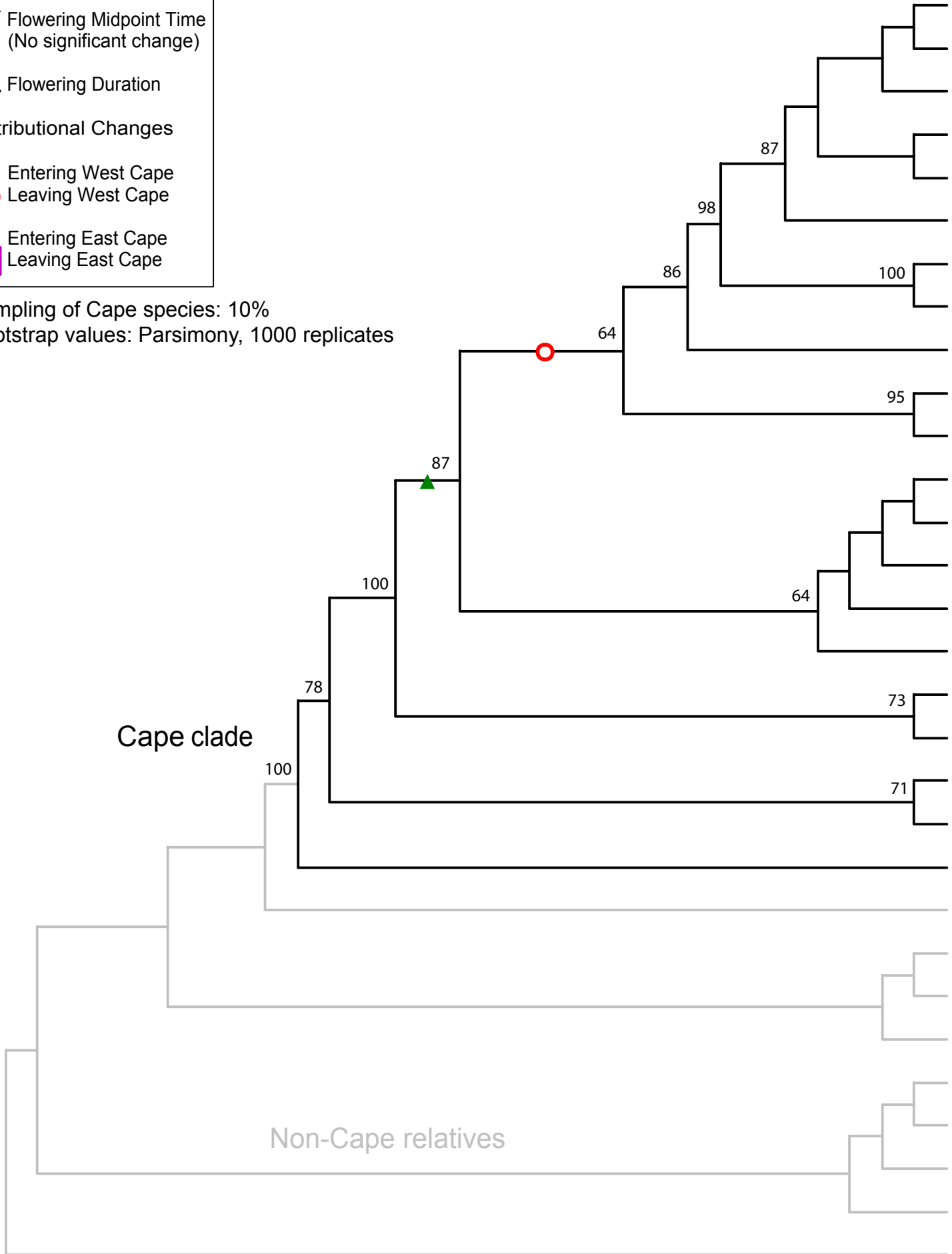
Sampling of Cape species: 10%

Bootstrap values: Parsimony, 1000 replicates

Tree 13: *Phylica*

Cape clade

Non-Cape relatives



▼ Flowering Midpoint Time
(No significant changes)



 Entering West Cape
 Leaving West Cape
 Entering East Cape
 Leaving East Cape

Note: Backward shifts in flowering are indicated with a hollow green triangle and precede forward shifts that concern much smaller numbers of species and are marked in parentheses.



Significant Evolutionary
Character Changes

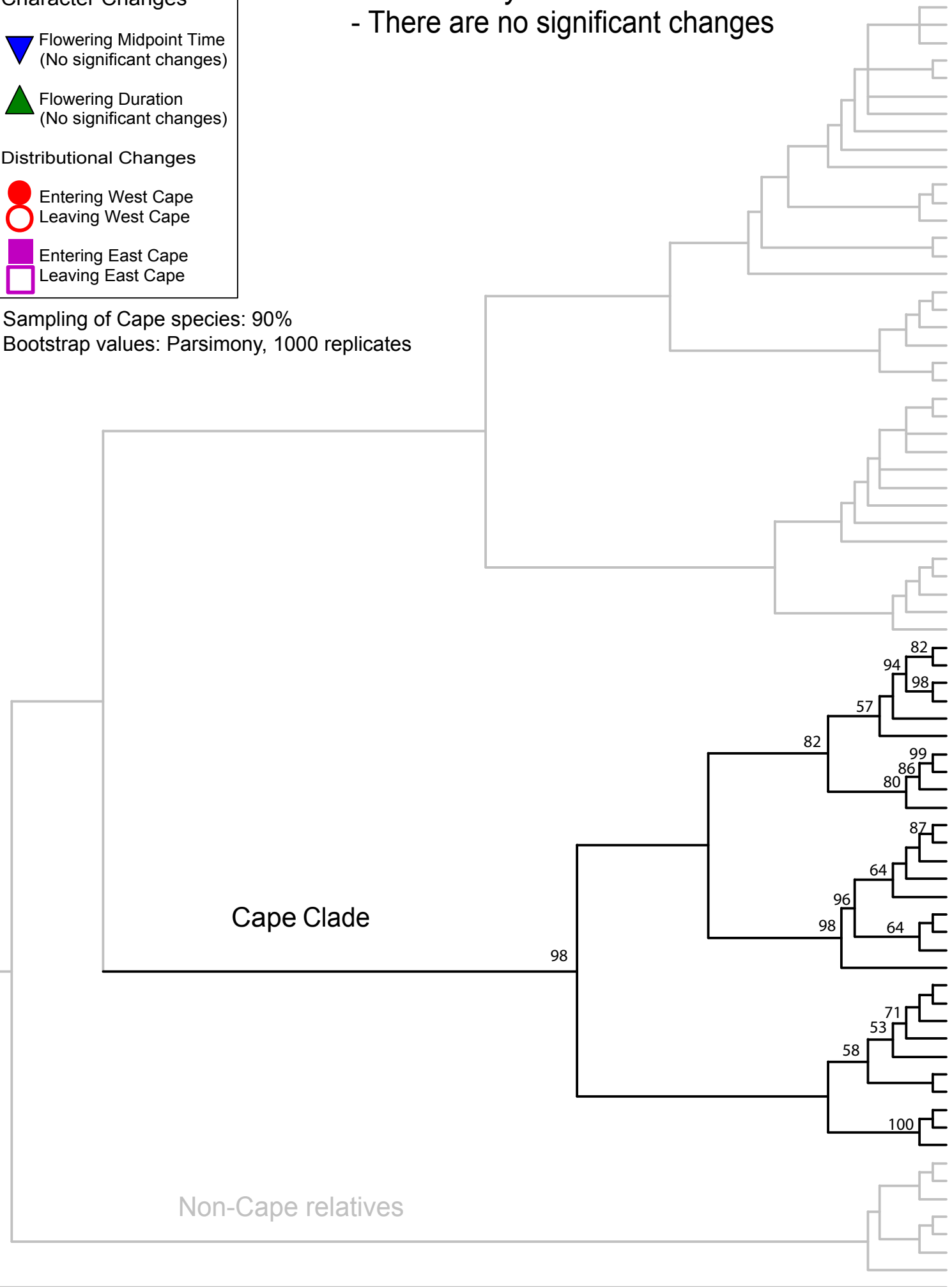
- Flowering Midpoint Time
(No significant changes)
- Flowering Duration
(No significant changes)

Distributional Changes

- Entering West Cape
- Leaving West Cape
- Entering East Cape
- Leaving East Cape

Sampling of Cape species: 90%
Bootstrap values: Parsimony, 1000 replicates

Tree 15: *Satyrium*
- There are no significant changes



Significant Evolutionary
Character Changes

- Flowering Midpoint Time
- Flowering Duration

Distributional Changes

- Entering West Cape
- Leaving West Cape
- Entering East Cape
- Leaving East Cape

Sampling of Cape species: 79%
Support values: Bayesian
posterior probabilities

Tree 16: *Zygophyllum*
- There are no significant changes

