The effects of mutualism on trait evolution - Residuals from ClimPC

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Contents

Submitted to Ecology Letters, Evolution or Evolution Letters – well let's see what we find!

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Analyses accounting for climate

The results below follow the same rationale as the ones from the main document. However, in the cases below all analyses use the plant traits already accounted for climatic effects by using the residuals from the regressions between each trait and the first three Principal Components of the climatic variables obtained from BioClim (REF).

Methods

Appendages

PC1 - Parameters

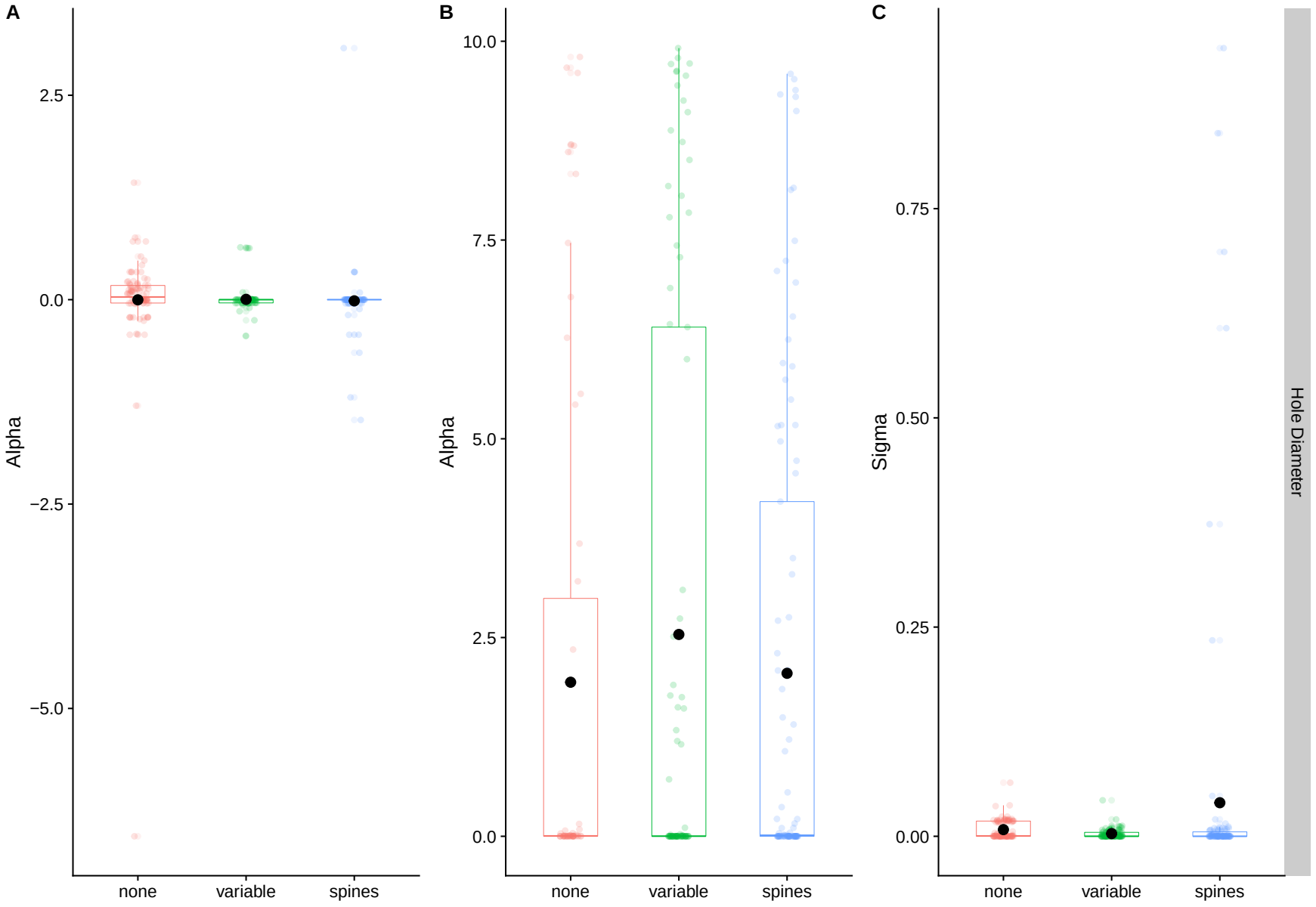

Figure 1: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Appendage.

PC1 - Parameter differences

Table 1: Differences in Theta values for PC1 analysis of Appendages. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	none	variable	spines
none	0	51	49
variable	49	0	43
spines	51	39	0

Table 2: Differences in Alpha values for PC1 analysis of Appendages. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	none	variable	spines
none	0	90	95
variable	10	0	41
spines	5	31	0

Table 3: Differences in Sigma values for PC1 analysis of Appendages. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	none	variable	spines
none	0	46	40
variable	11	0	24
spines	17	33	0

PC2 - Parameters

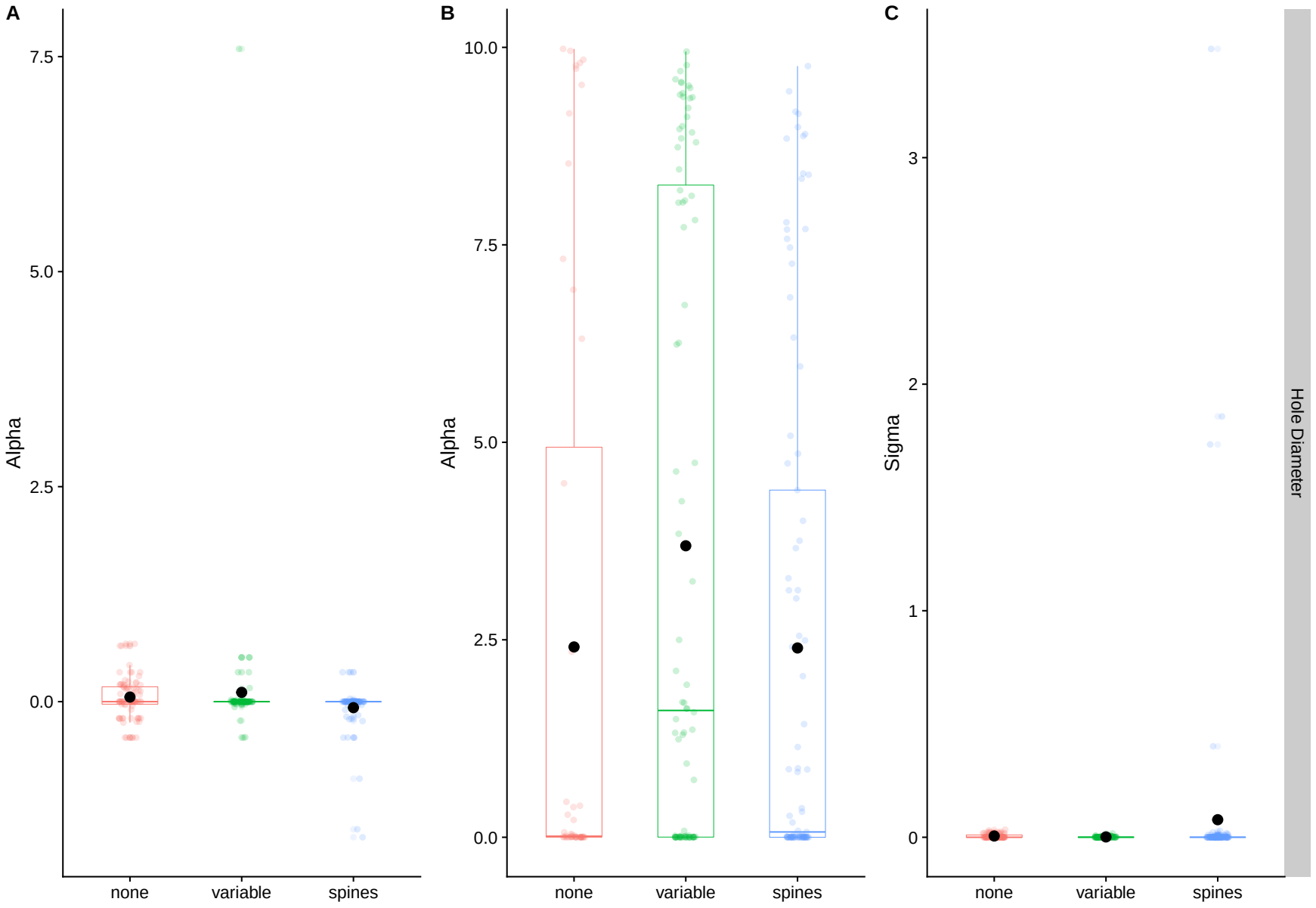

Figure 2: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Appendage.

PC2 - Parameter differences

Table 4: Differences in Theta values for PC2 analysis of Appendages. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	none	variable	spines
none	0	62	54
variable	38	0	41
spines	46	41	0

Table 5: Differences in Alpha values for PC2 analysis of Appendages. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	none	variable	spines
none	0	85	91
variable	15	0	55
spines	9	27	0

Table 6: Differences in Sigma values for PC2 analysis of Appendages. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	none	variable	spines
none	0	43	36
variable	13	0	27
spines	21	30	0

PC3 - Parameters

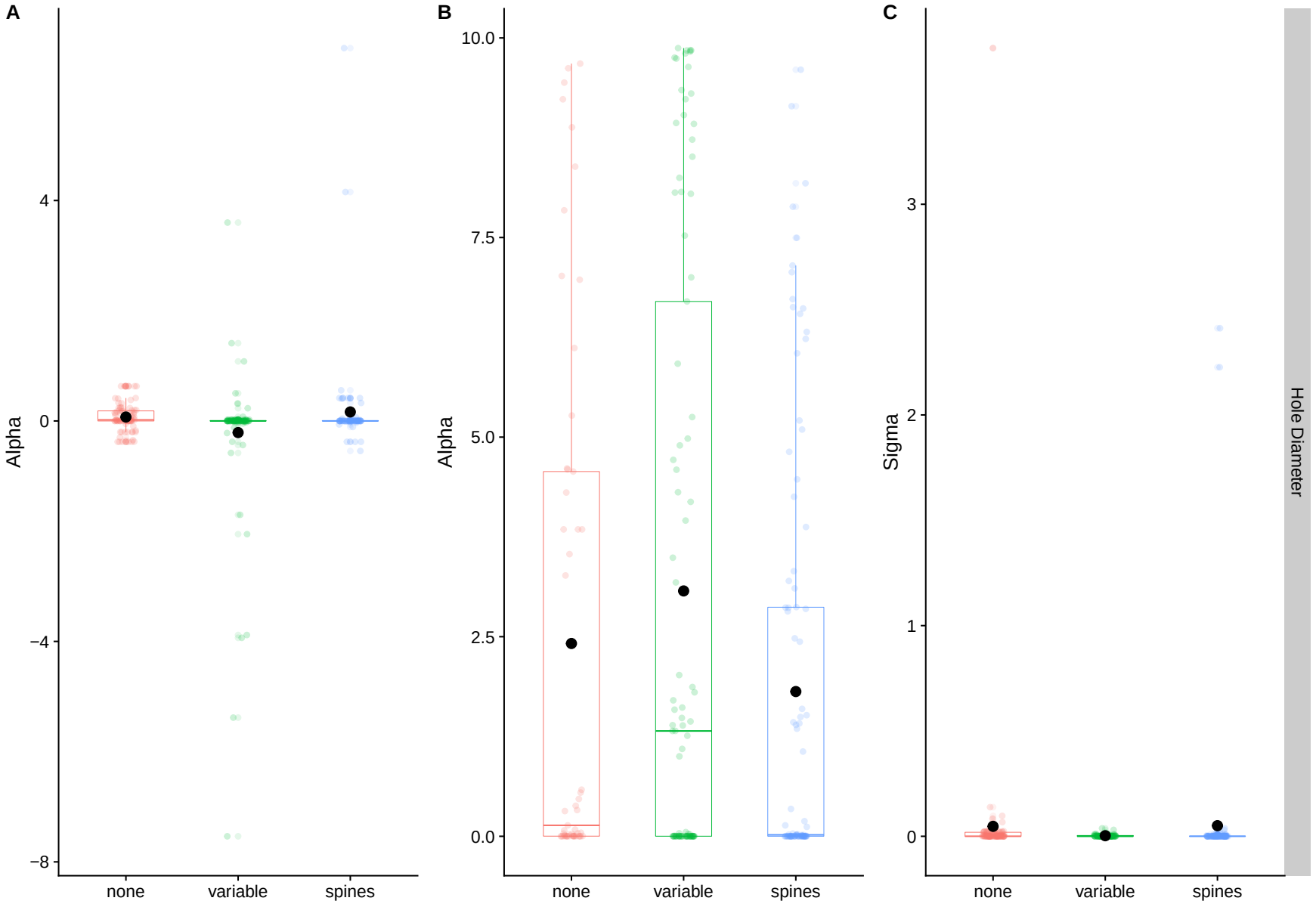

Figure 3: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Appendage.

PC3 - Parameter differences

Table 7: Differences in Theta values for PC3 analysis of Appendages. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	none	variable	spines
none	0	60	66
variable	40	0	45
spines	34	36	0

Table 8: Differences in Alpha values for PC3 analysis of Appendages. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	none	variable	spines
none	0	80	93
variable	20	0	52
spines	7	32	0

Table 9: Differences in Sigma values for PC3 analysis of Appendages. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	none	variable	spines
none	0	49	39
variable	6	0	26
spines	16	29	0

Architecture

PC1 - Parameters

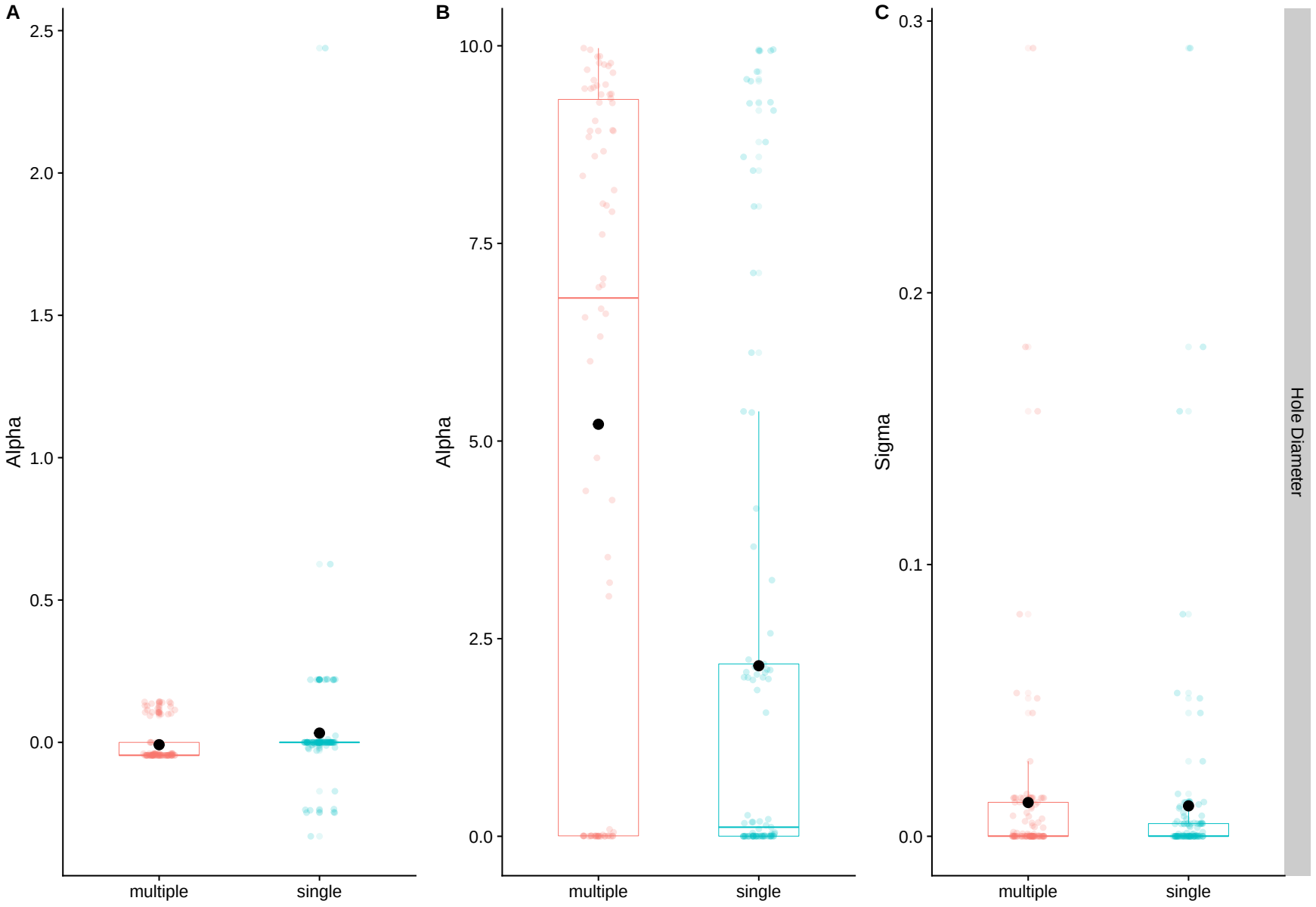

Figure 4: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Archendage.

PC1 - Parameter differences

Table 10: Differences in Theta values for PC1 analysis of Architecture. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	multiple	single
multiple	0	20
single	80	0

Table 11: Differences in Alpha values for PC1 analysis of Architecture. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	multiple	single
multiple	0	72
single	28	0

Table 12: Differences in Sigma values for PC1 analysis of Architecture. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	multiple	single
multiple	0	14
single	0	0

PC2 - Parameters

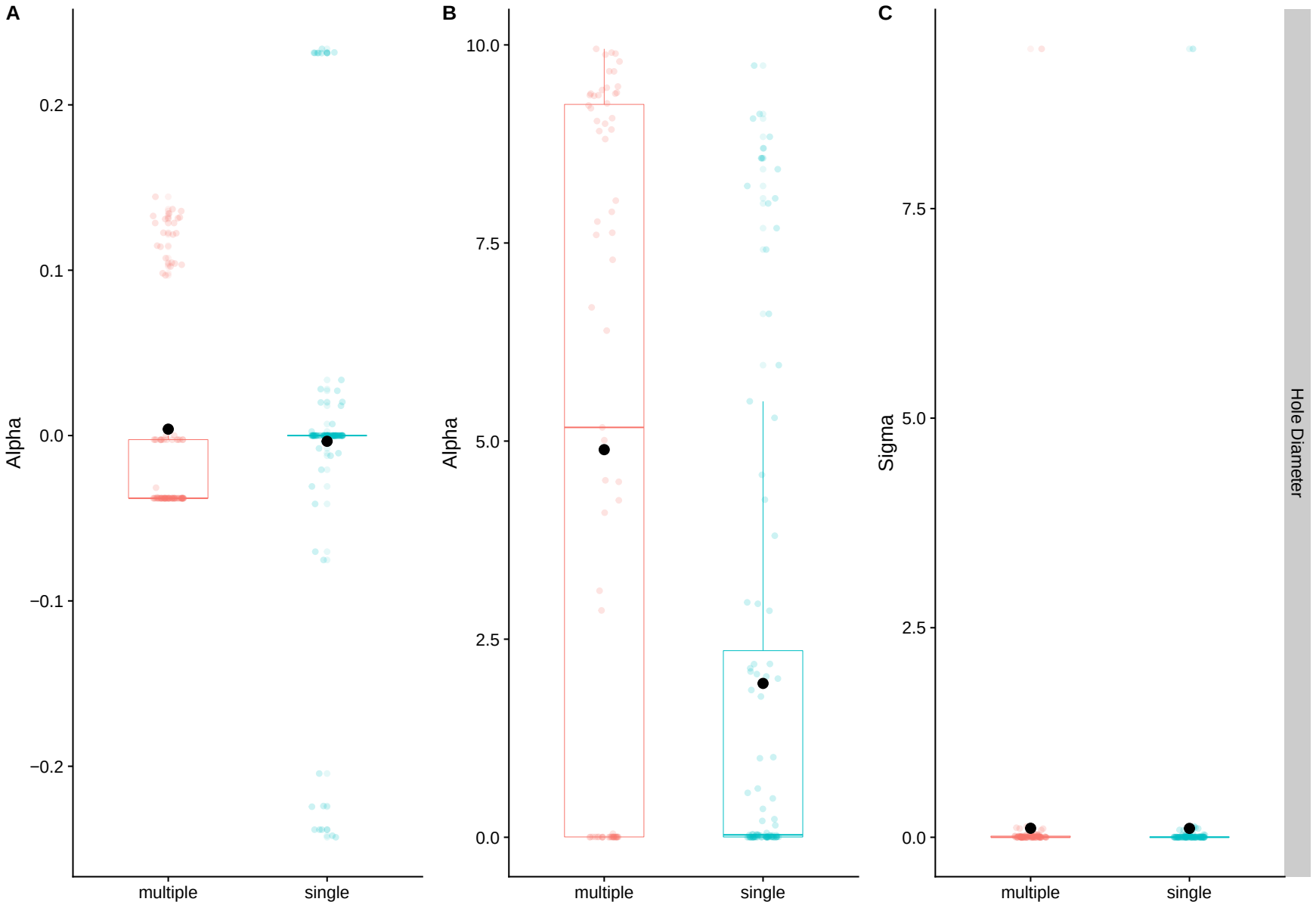

Figure 5: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Archendage.

PC2 - Parameter differences

Table 13: Differences in Theta values for PC2 analysis of Architecture. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	multiple	single
multiple	0	26
single	74	0

Table 14: Differences in Alpha values for PC2 analysis of Architecture. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	multiple	single
multiple	0	81
single	19	0

Table 15: Differences in Sigma values for PC2 analysis of Architecture. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	multiple	single
multiple	0	17
single	0	0

PC3 - Parameters

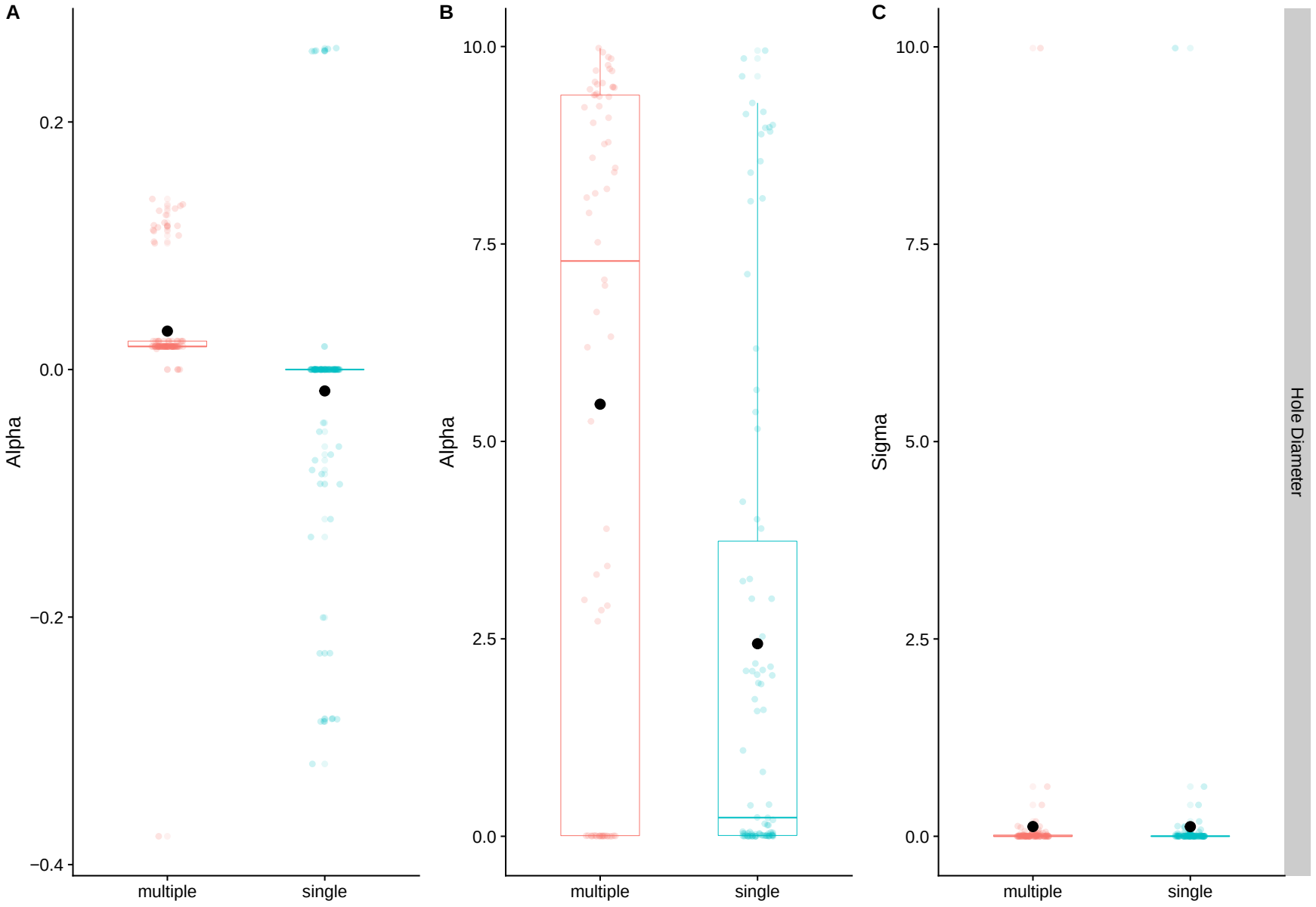

Figure 6: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Archendage.

PC3 - Parameter differences

Table 16: Differences in Theta values for PC3 analysis of Architecture. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	multiple	single
multiple	0	91
single	9	0

Table 17: Differences in Alpha values for PC3 analysis of Architecture. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	multiple	single
multiple	0	77
single	23	0

Table 18: Differences in Sigma values for PC3 analysis of Architecture. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	multiple	single
multiple	0	11
single	0	0

Domatium Growth

PC1 - Parameters

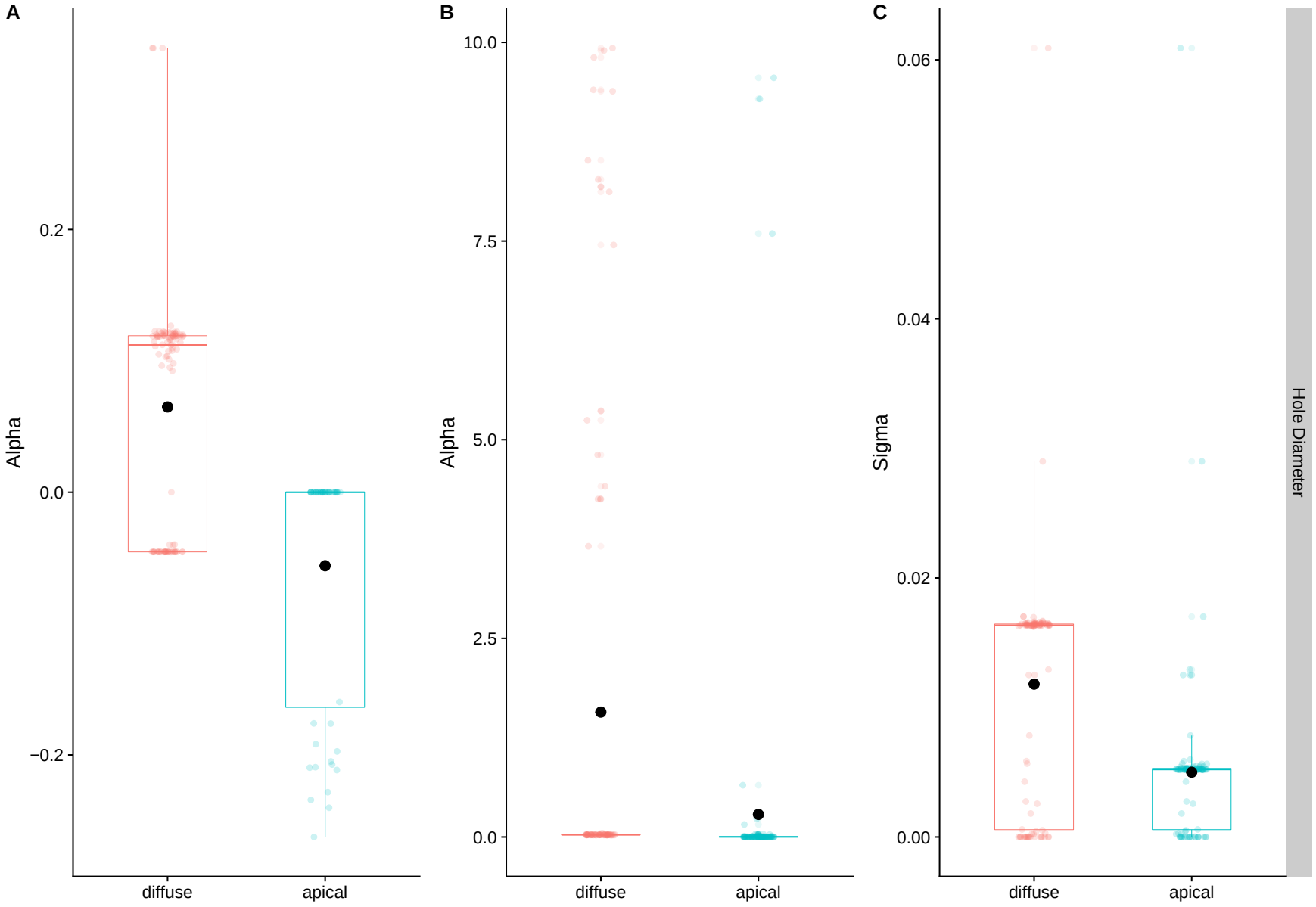

Figure 7: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Domgrowendage.

PC1 - Parameter differences

Table 19: Differences in Theta values for PC1 analysis of Domatium Growth. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	diffuse	apical
diffuse	0	65
apical	35	0

Table 20: Differences in Alpha values for PC1 analysis of Domatium Growth. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	diffuse	apical
diffuse	0	98
apical	2	0

Table 21: Differences in Sigma values for PC1 analysis of Domatium Growth. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	diffuse	apical
diffuse	0	61
apical	0	0

PC2 - Parameters

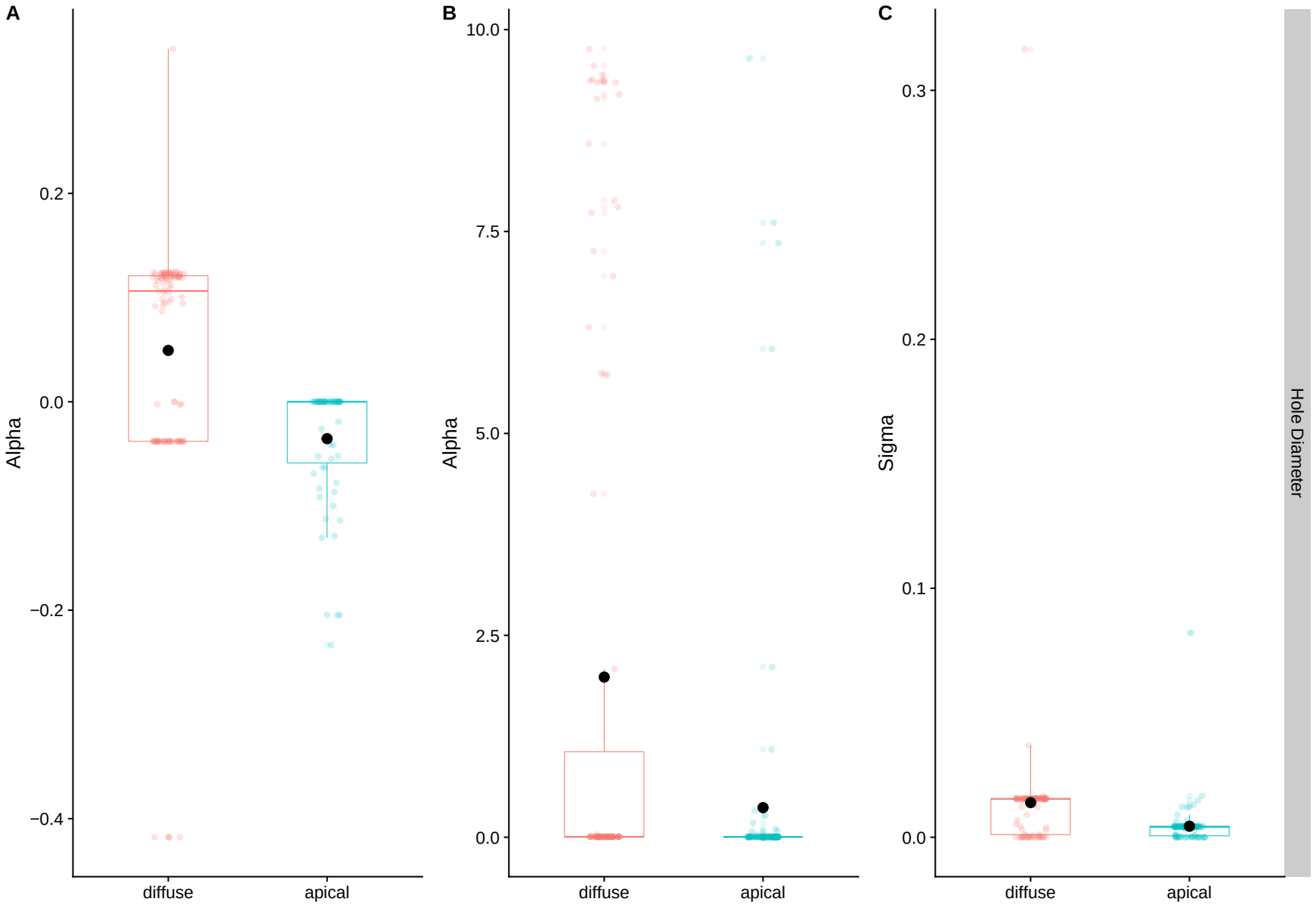

Figure 8: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Domgrowendage.

PC2 - Parameter differences

Table 22: Differences in Theta values for PC2 analysis of Domatium Growth. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	diffuse	apical
diffuse	0	64
apical	36	0

Table 23: Differences in Alpha values for PC2 analysis of Domatium Growth. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	diffuse	apical
diffuse	0	95
apical	5	0

Table 24: Differences in Sigma values for PC2 analysis of Domatium Growth. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	diffuse	apical
diffuse	0	66
apical	0	0

PC3 - Parameters

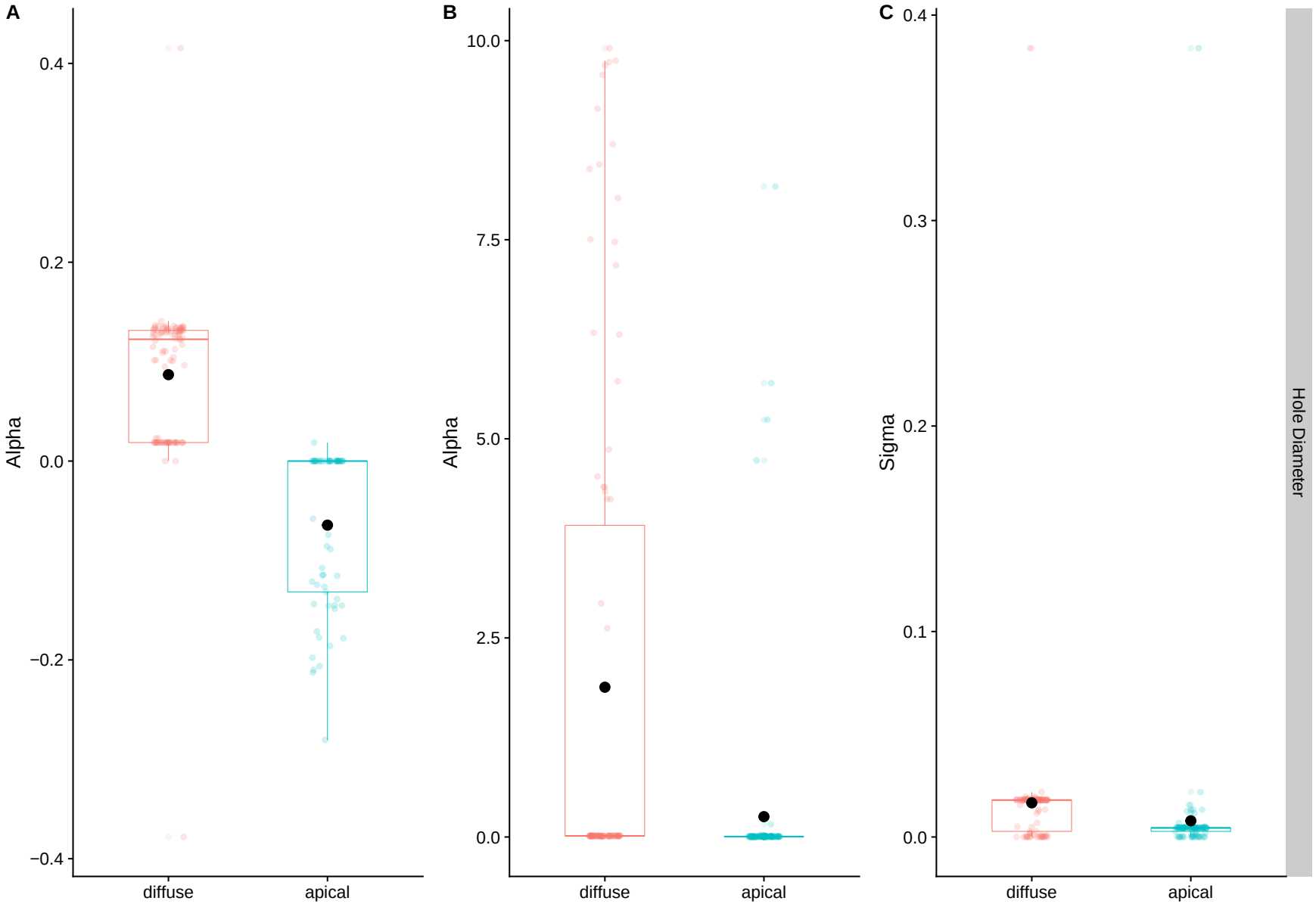

Figure 9: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Domgrowendage.

PC3 - Parameter differences

Table 25: Differences in Theta values for PC3 analysis of Domatium Growth. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	diffuse	apical
diffuse	0	98
apical	2	0

Table 26: Differences in Alpha values for PC3 analysis of Domatium Growth. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	diffuse	apical
diffuse	0	97
apical	3	0

Table 27: Differences in Sigma values for PC3 analysis of Domatium Growth. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	diffuse	apical
diffuse	0	64
apical	0	0

Leaf Structure

PC1 - Parameters

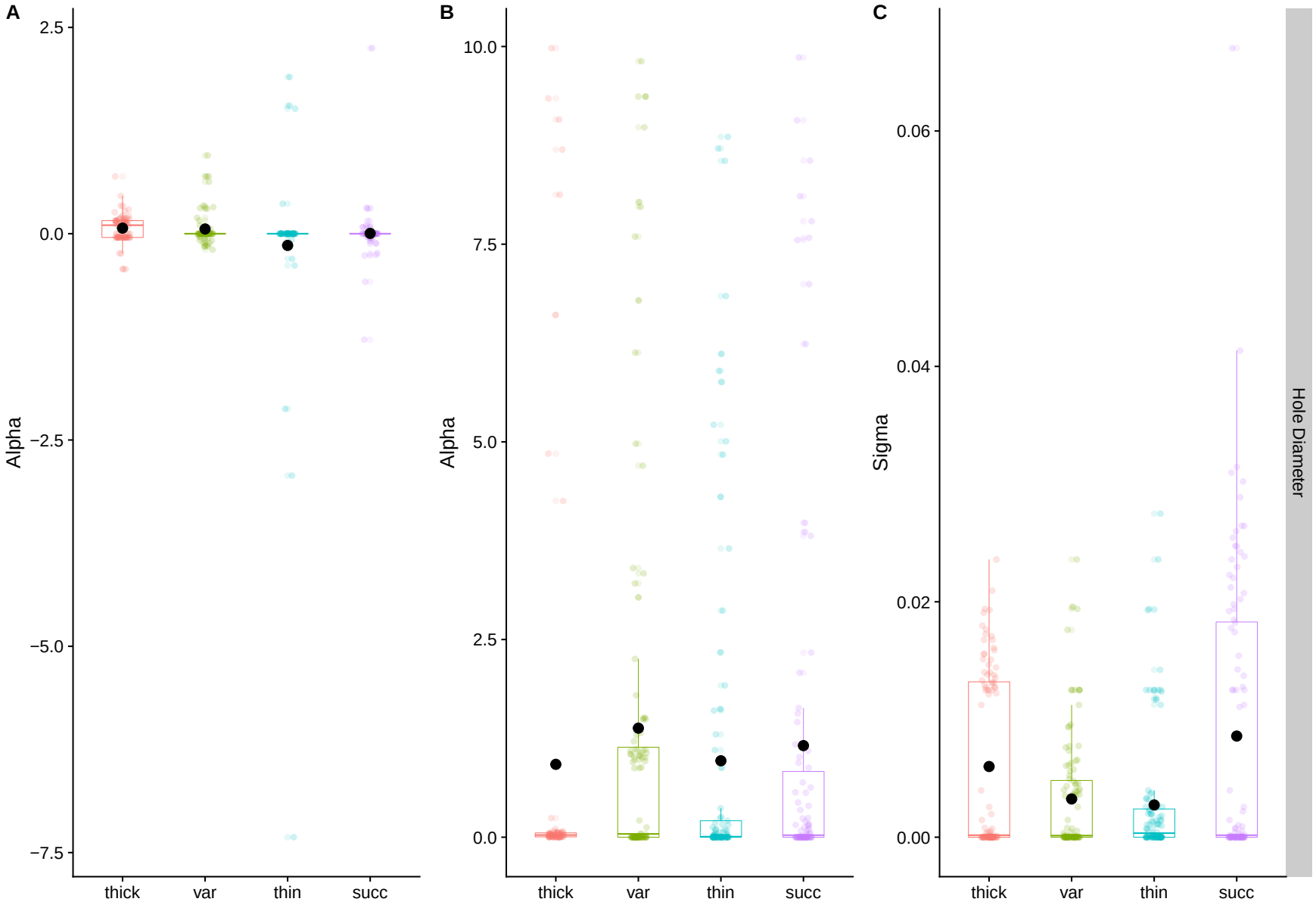

Figure 10: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Leafstrucendage.

PC1 - Parameter differences

Table 28: Differences in Theta values for PC1 analysis of Leaf Structure. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter			
	thick	var	thin	succ
thick	0	49	34	50
var	51	0	27	52
thin	66	56	0	63
succ	50	36	26	0

Table 29: Differences in Alpha values for PC1 analysis of Leaf Structure. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter			
	thick	var	thin	succ
thick	0	69	76	68
var	31	0	40	38
thin	24	30	0	23
succ	32	32	47	0

Table 30: Differences in Sigma values for PC1 analysis of Leaf Structure. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter			
	thick	var	thin	succ
thick	0	33	31	10
var	8	0	31	8
thin	10	10	0	10
succ	31	33	31	0

PC2 - Parameters

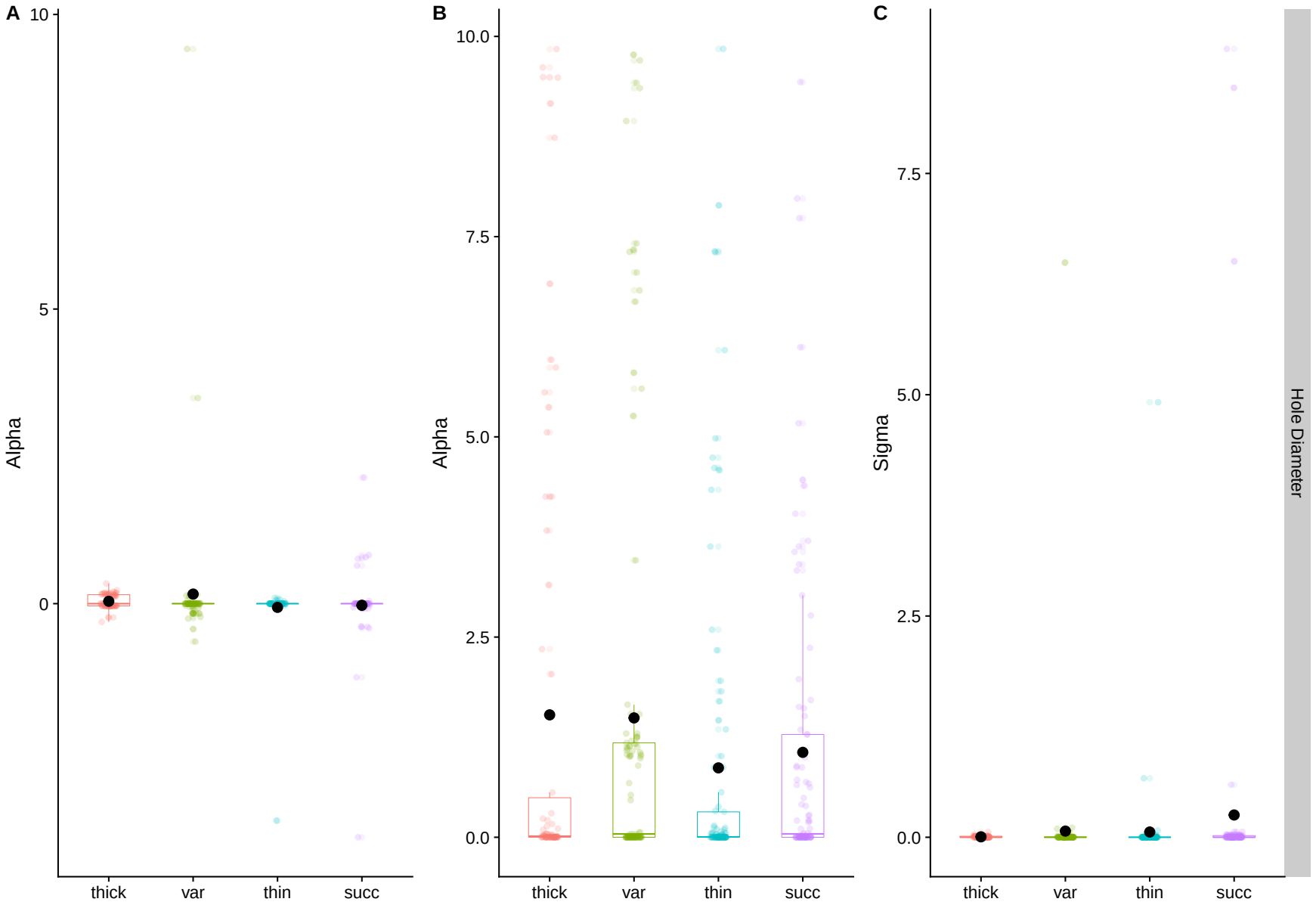

Figure 11: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Leafstrucendage.

PC2 - Parameter differences

Table 31: Differences in Theta values for PC2 analysis of Leaf Structure. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter			
	thick	var	thin	succ
thick	0	49	42	48
var	51	0	33	28
thin	58	48	0	39
succ	52	50	43	0

Table 32: Differences in Alpha values for PC2 analysis of Leaf Structure. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter			
	thick	var	thin	succ
thick	0	71	83	69
var	29	0	40	39
thin	17	31	0	22
succ	31	32	49	0

Table 33: Differences in Sigma values for PC2 analysis of Leaf Structure. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter			
	thick	var	thin	succ
thick	0	32	26	9
var	9	0	23	11
thin	16	19	0	11
succ	33	31	31	0

PC3 - Parameters

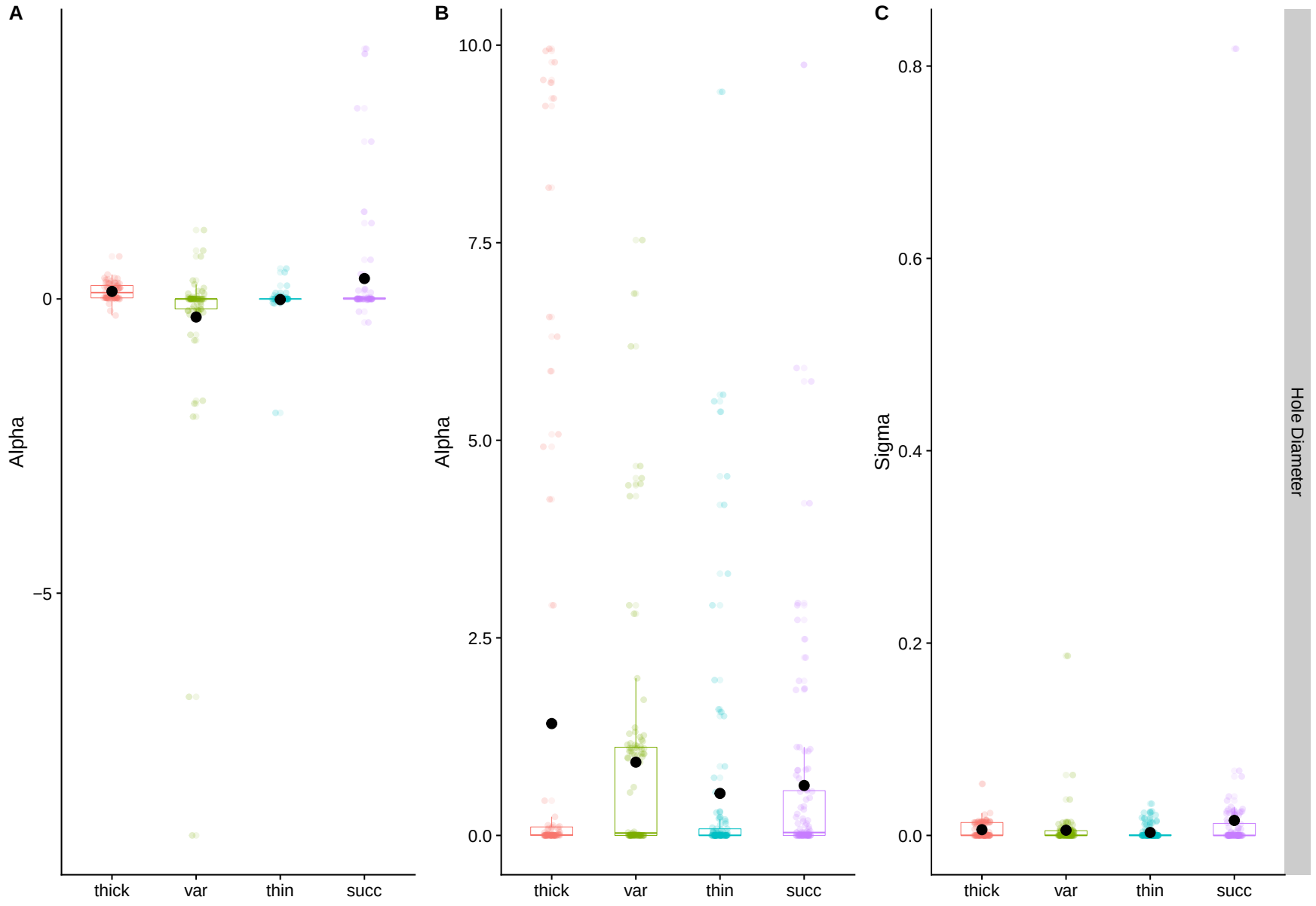

Figure 12: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Leafstrucendage.

PC3 - Parameter differences

Table 34: Differences in Theta values for PC3 analysis of Leaf Structure. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter			
	thick	var	thin	succ
thick	0	74	74	69
var	26	0	23	19
thin	26	61	0	38
succ	31	64	46	0

Table 35: Differences in Alpha values for PC3 analysis of Leaf Structure. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter			
	thick	var	thin	succ
thick	0	63	81	69
var	36	0	49	42
thin	18	19	0	21
succ	30	25	47	0

Table 36: Differences in Sigma values for PC3 analysis of Leaf Structure. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter			
	thick	var	thin	succ
thick	0	33	28	13
var	7	0	25	11
thin	12	15	0	11
succ	27	29	29	0

Mating System

PC1 - Parameters

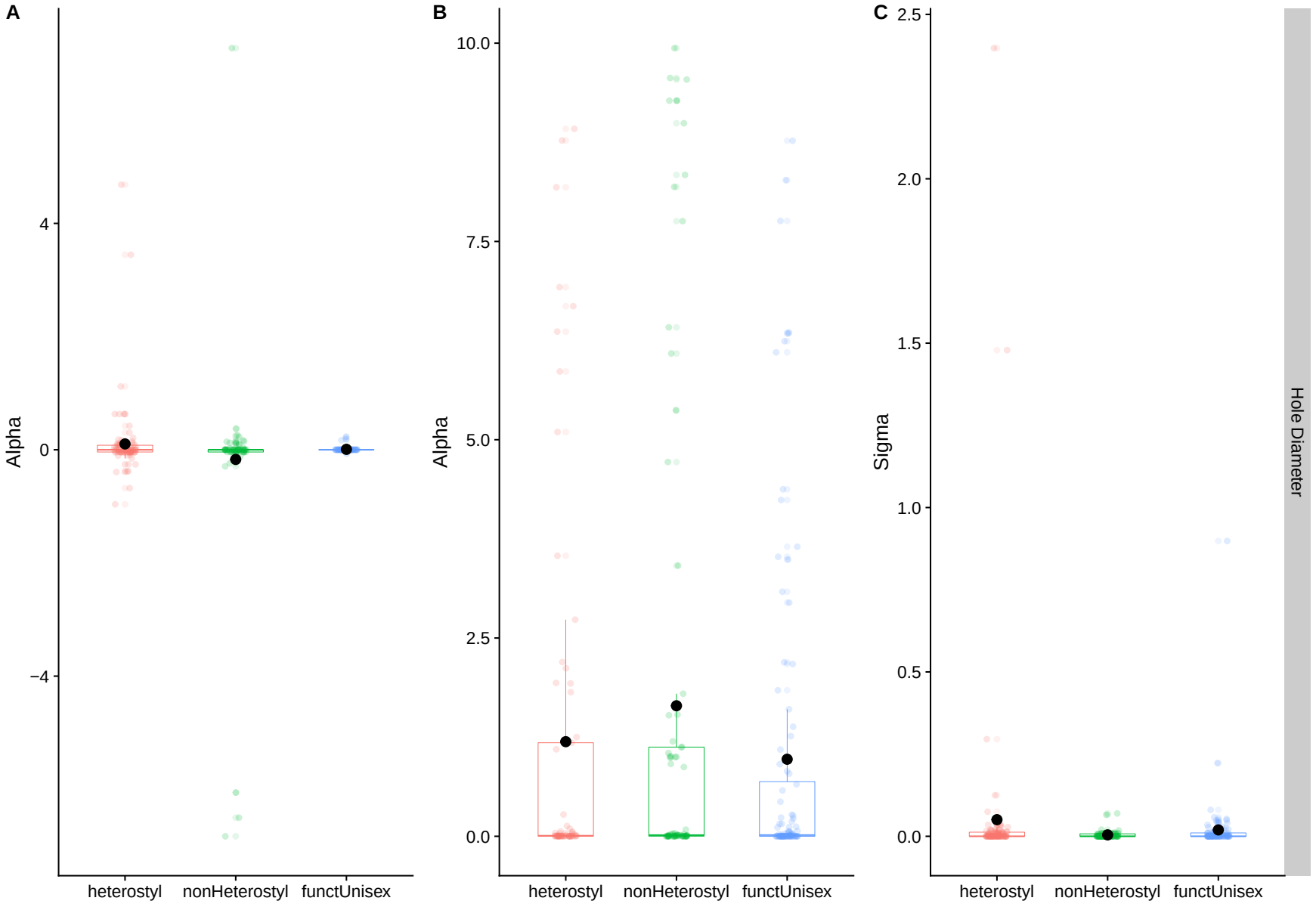

Figure 13: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Matsysendage.

PC1 - Parameter differences

Table 37: Differences in Theta values for PC1 analysis of Mating System. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	heterostyl	nonHeterostyl	functUnisex
heterostyl	0	62	45
nonHeterostyl	38	0	32
functUnisex	55	60	0

Table 38: Differences in Alpha values for PC1 analysis of Mating System. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	heterostyl	nonHeterostyl	functUnisex
heterostyl	0	55	69
nonHeterostyl	45	0	67
functUnisex	31	33	0

Table 39: Differences in Sigma values for PC1 analysis of Mating System. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	heterostyl	nonHeterostyl	functUnisex
heterostyl	0	42	28
nonHeterostyl	11	0	16
functUnisex	25	37	0

PC2 - Parameters

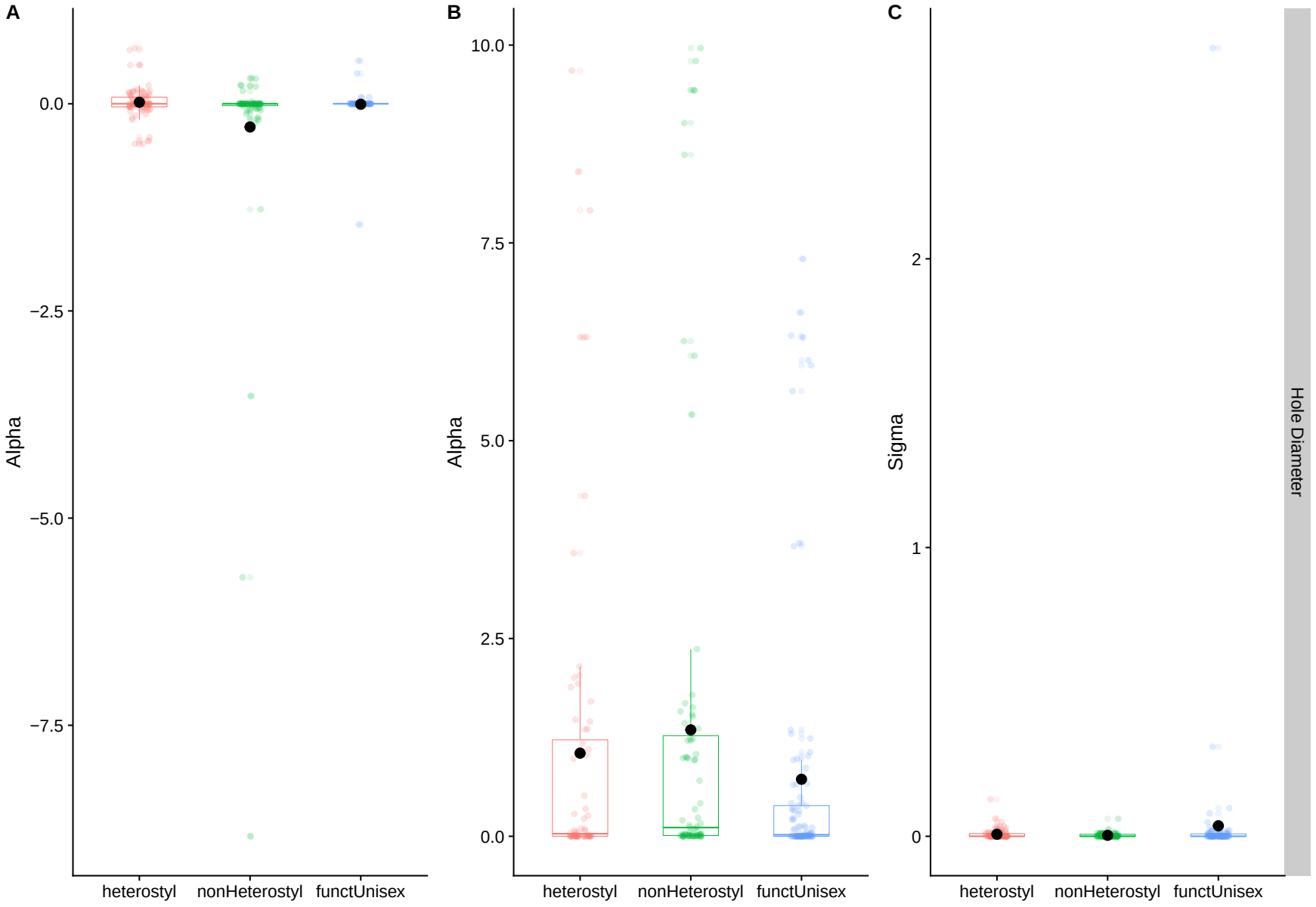

Figure 14: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Matsysendage.

PC2 - Parameter differences

Table 40: Differences in Theta values for PC2 analysis of Mating System. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	heterostyl	nonHeterostyl	functUnisex
heterostyl	0	63	40
nonHeterostyl	37	0	35
functUnisex	60	62	0

Table 41: Differences in Alpha values for PC2 analysis of Mating System. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	heterostyl	nonHeterostyl	functUnisex
heterostyl	0	52	66
nonHeterostyl	48	0	69
functUnisex	34	29	0

Table 42: Differences in Sigma values for PC2 analysis of Mating System. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	heterostyl	nonHeterostyl	functUnisex
heterostyl	0	36	24
nonHeterostyl	11	0	17
functUnisex	23	31	0

PC3 - Parameters

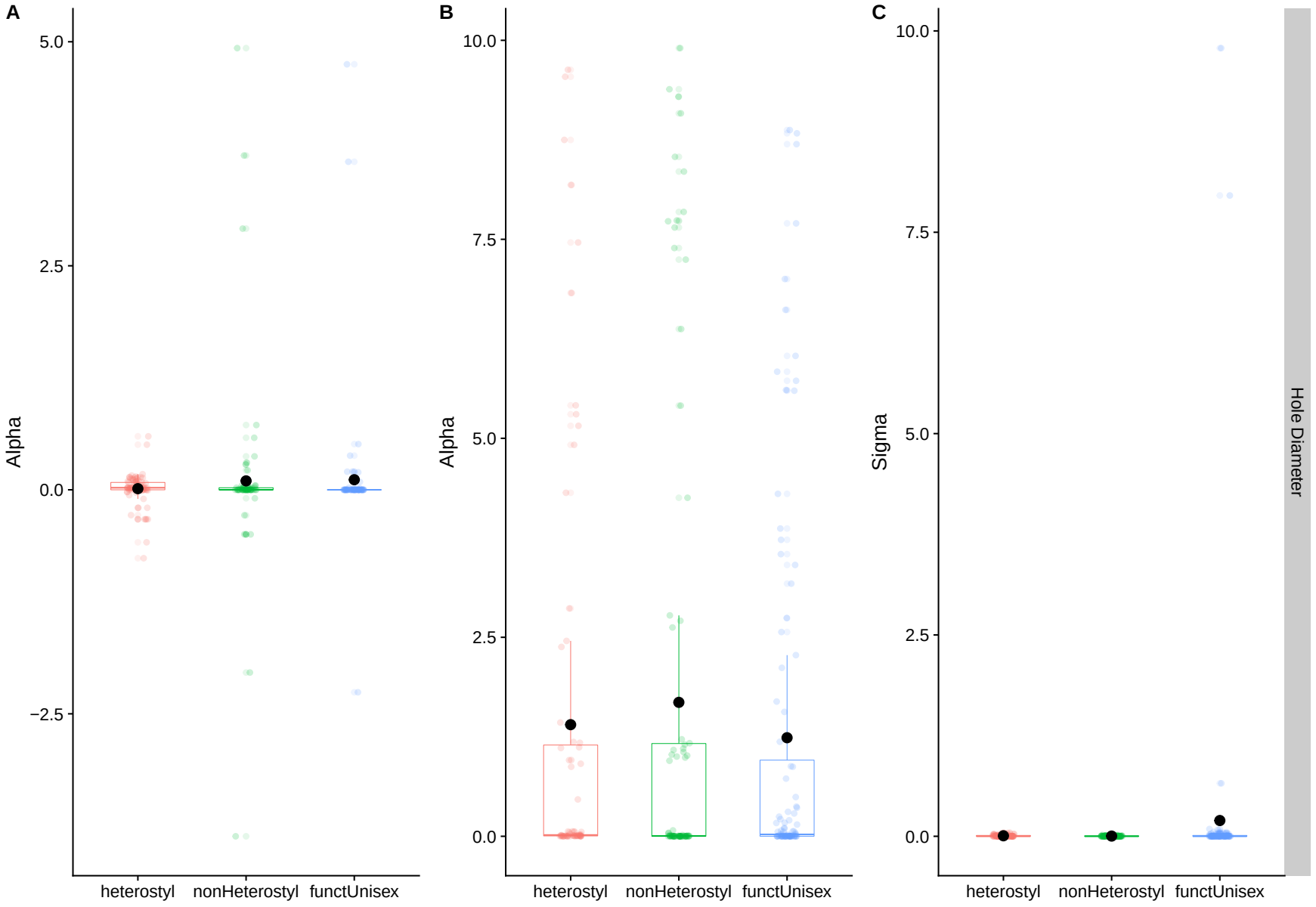

Figure 15: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Matsysendage.

PC3 - Parameter differences

Table 43: Differences in Theta values for PC3 analysis of Mating System. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	heterostyl	nonHeterostyl	functUnisex
heterostyl	0	70	56
nonHeterostyl	30	0	46
functUnisex	44	48	0

Table 44: Differences in Alpha values for PC3 analysis of Mating System. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	heterostyl	nonHeterostyl	functUnisex
heterostyl	0	68	77
nonHeterostyl	32	0	51
functUnisex	23	46	0

Table 45: Differences in Sigma values for PC3 analysis of Mating System. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	heterostyl	nonHeterostyl	functUnisex
heterostyl	0	38	19
nonHeterostyl	6	0	10
functUnisex	25	34	0

Reward

PC1 - Parameters

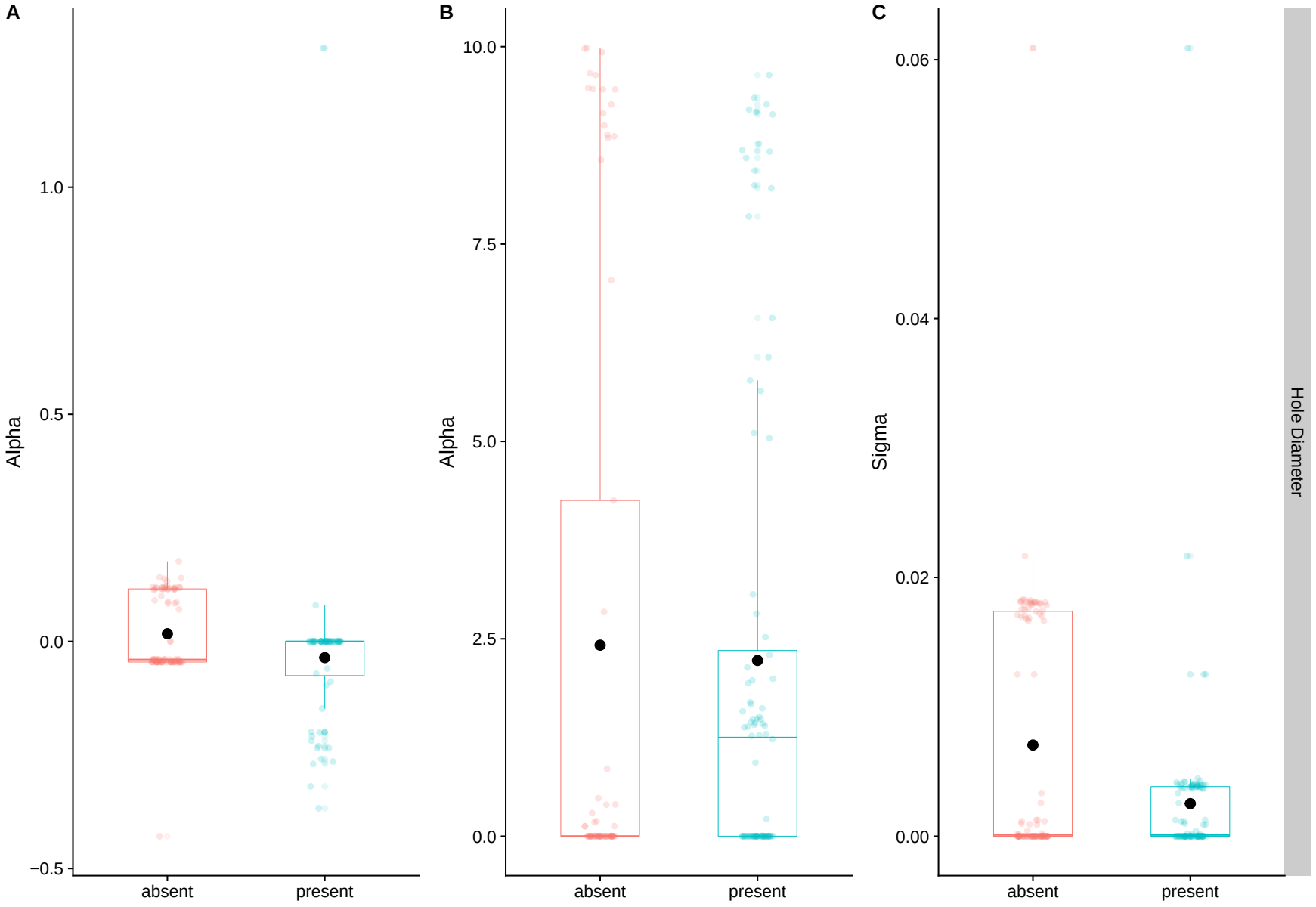

Figure 16: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Rewardendage.

PC1 - Parameter differences

Table 46: Differences in Theta values for PC1 analysis of Reward. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	absent	present
absent	0	49
present	51	0

Table 47: Differences in Alpha values for PC1 analysis of Reward. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	absent	present
absent	0	75
present	25	0

Table 48: Differences in Sigma values for PC1 analysis of Reward. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	absent	present
absent	0	33
present	0	0

PC2 - Parameter

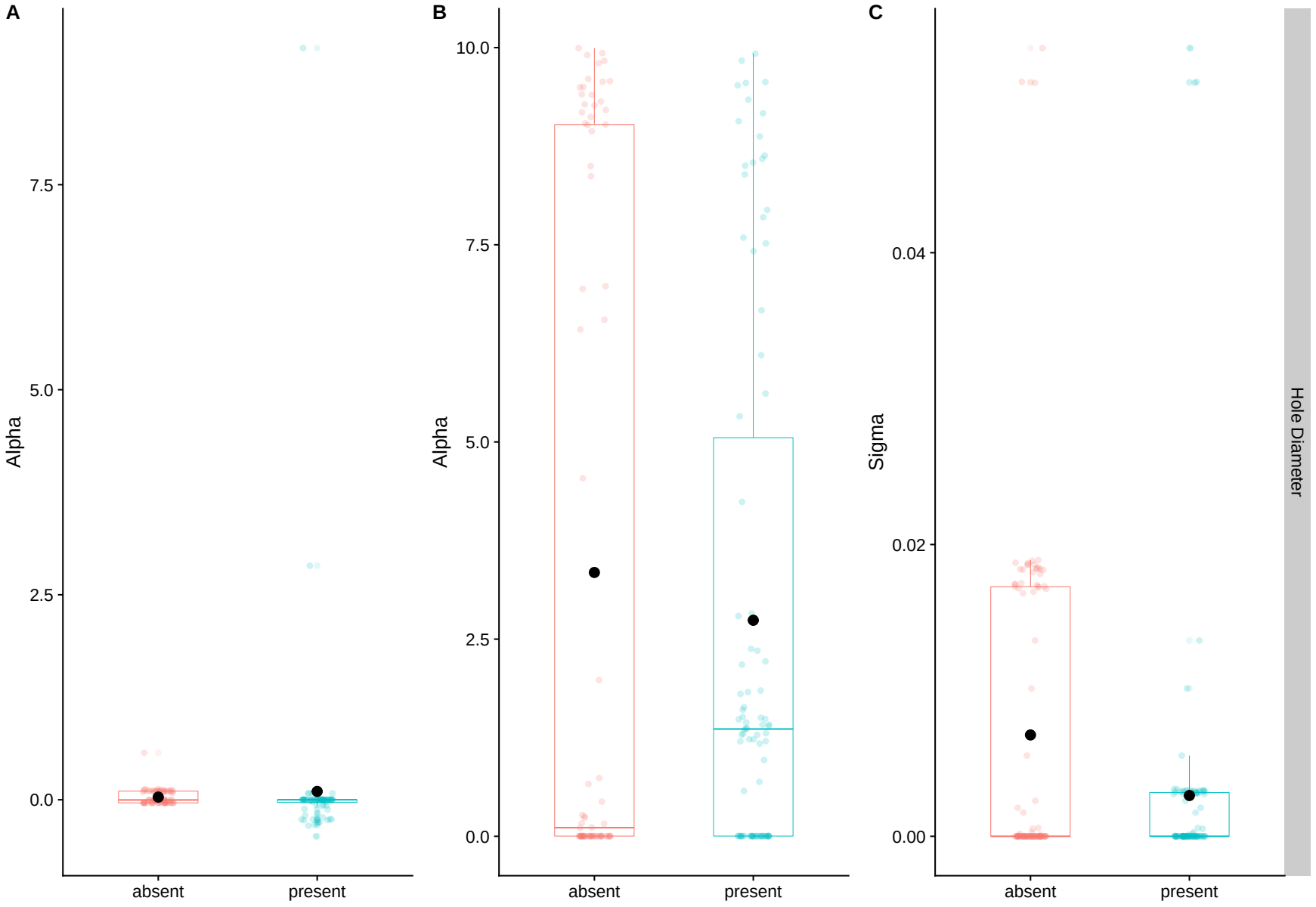

Figure 17: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Rewardendage.

PC2 - Parameter differences

Table 49: Differences in Theta values for PC2 analysis of Reward. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	absent	present
absent	0	46
present	54	0

Table 50: Differences in Alpha values for PC2 analysis of Reward. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	absent	present
absent	0	66
present	34	0

Table 51: Differences in Sigma values for PC2 analysis of Reward. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	absent	present
absent	0	28
present	0	0

PC3 - Parameters

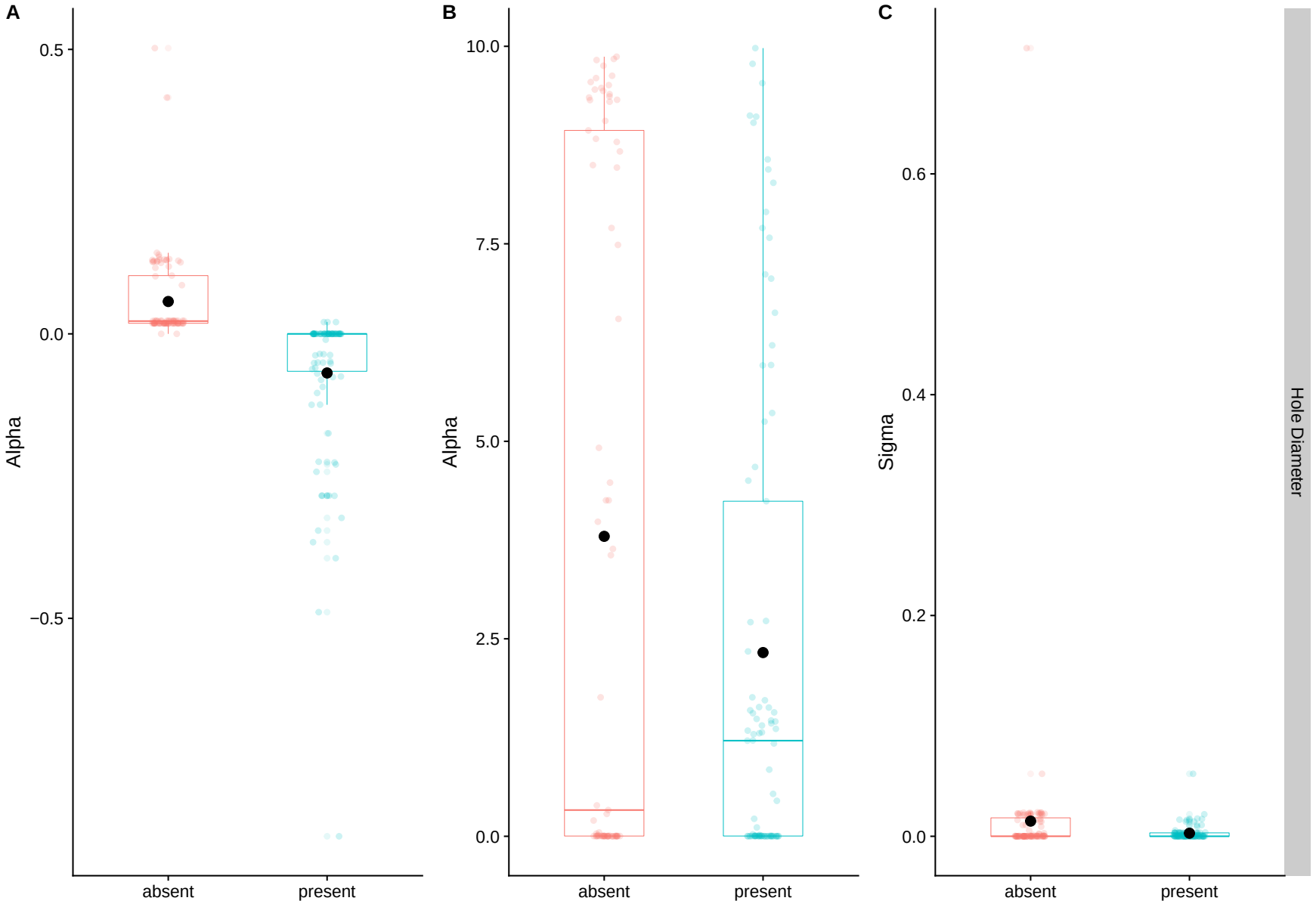

Figure 18: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Rewardendage.

PC3 - Parameter differences

Table 52: Differences in Theta values for PC3 analysis of Reward. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	absent	present
absent	0	97
present	3	0

Table 53: Differences in Alpha values for PC3 analysis of Reward. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	absent	present
absent	0	71
present	28	0

Table 54: Differences in Sigma values for PC3 analysis of Reward. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter	
	absent	present
absent	0	23
present	1	0

Strategy

PC1 - Parameters

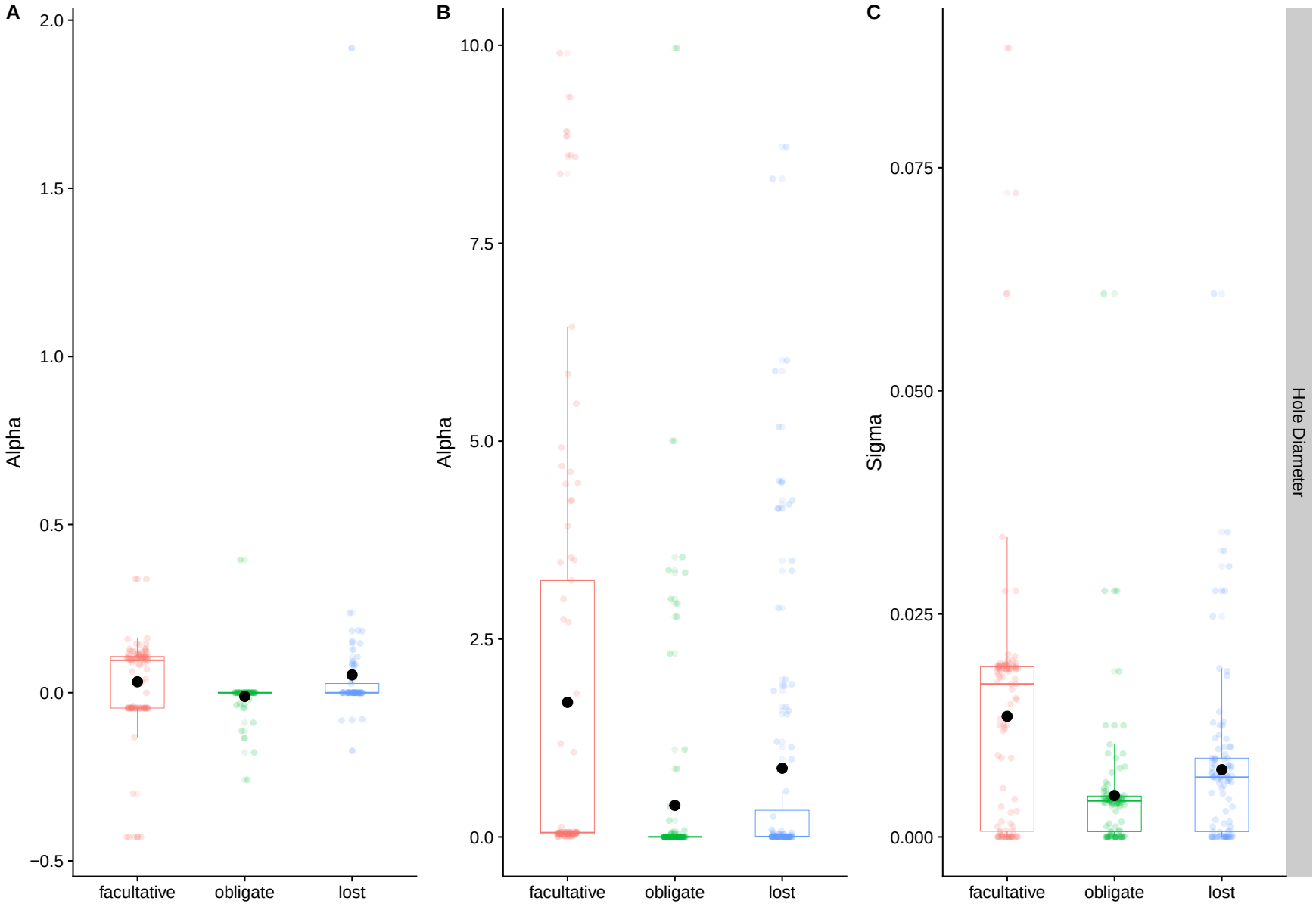

Figure 19: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Strategyendage.

PC1 - Parameter differences

Table 55: Differences in Theta values for PC1 analysis of Strategy. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	facultative	obligate	lost
facultative	0	62	43
obligate	38	0	9
lost	57	81	0

Table 56: Differences in Alpha values for PC1 analysis of Strategy. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	facultative	obligate	lost
facultative	0	94	91
obligate	6	0	12
lost	9	74	0

Table 57: Differences in Sigma values for PC1 analysis of Strategy. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	facultative	obligate	lost
facultative	0	63	54
obligate	3	0	3
lost	13	64	0

PC2 - Parameters

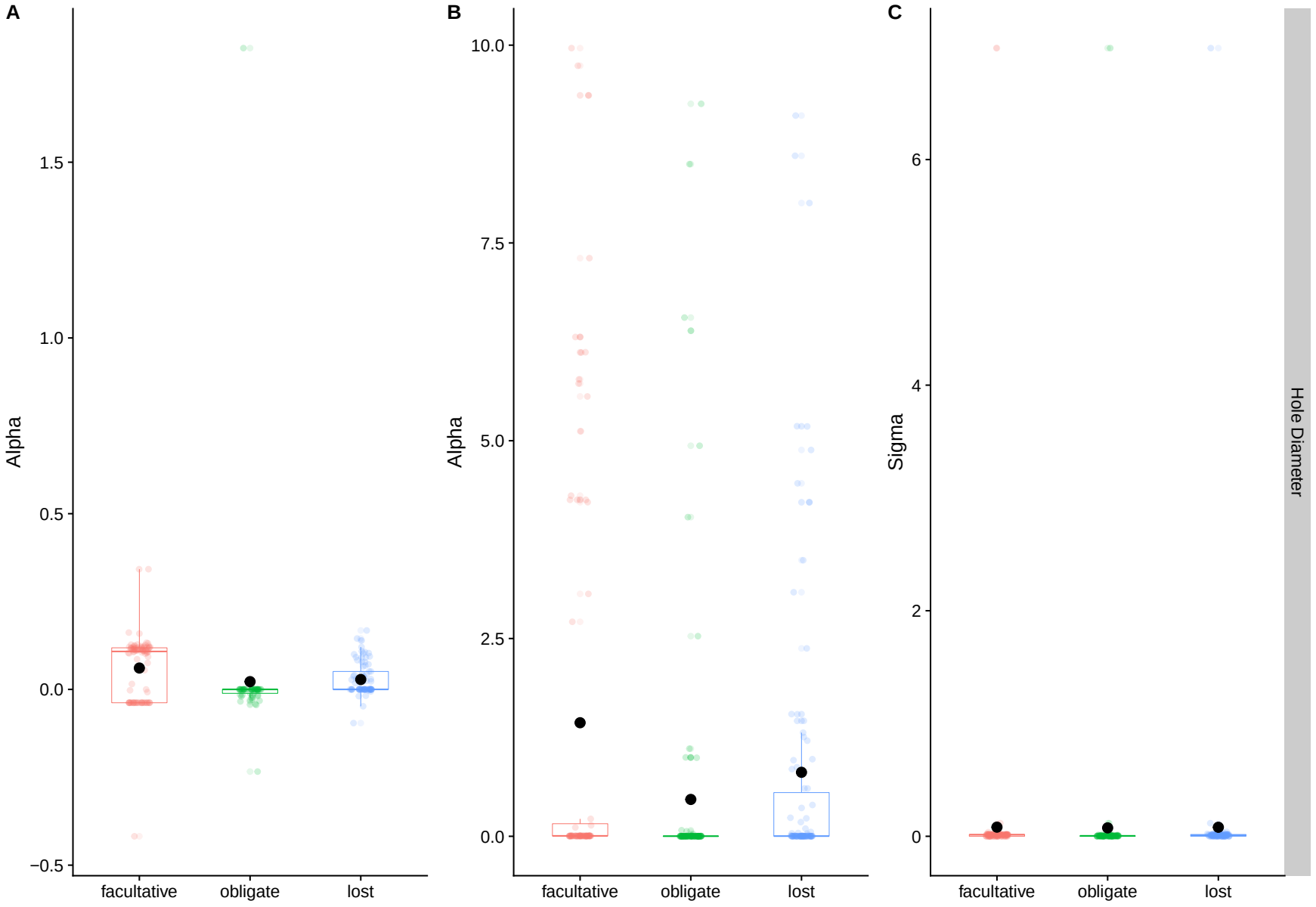

Figure 20: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Strategyendage.

PC2 - Parameter differences

Table 58: Differences in Theta values for PC2 analysis of Strategy. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	facultative	obligate	lost
facultative	0	65	59
obligate	35	0	10
lost	41	76	0

Table 59: Differences in Alpha values for PC2 analysis of Strategy. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	facultative	obligate	lost
facultative	0	94	87
obligate	6	0	7
lost	13	70	0

Table 60: Differences in Sigma values for PC2 analysis of Strategy. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	facultative	obligate	lost
facultative	0	62	36
obligate	1	0	5
lost	26	58	0

PC3 - Parameters

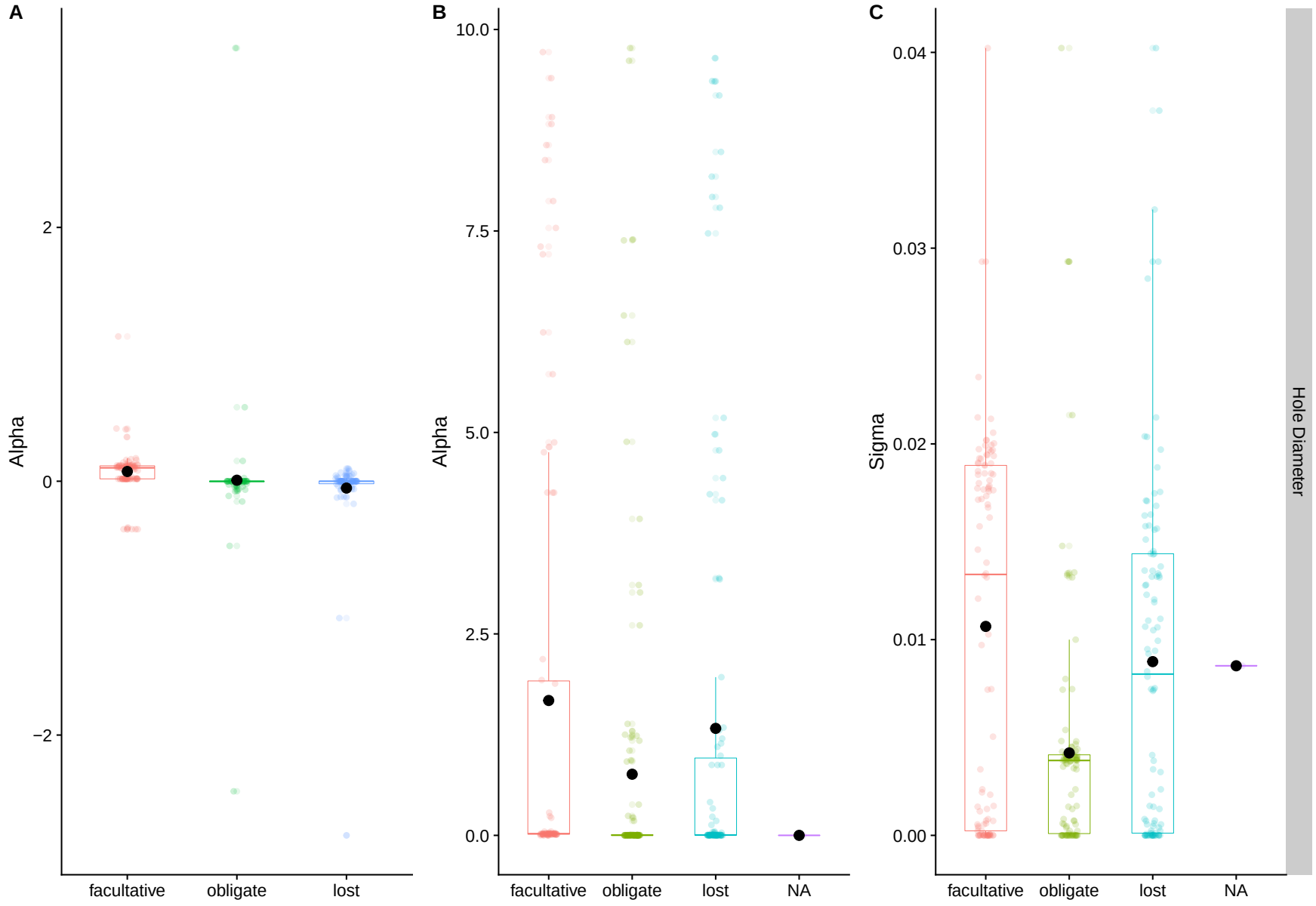

Figure 21: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Strategyendage.

PC3 - Parameter differences

Table 61: Differences in Theta values for PC3 analysis of Strategy. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	facultative	obligate	lost
facultative	0	89	88
obligate	11	0	34
lost	12	55	0

Table 62: Differences in Alpha values for PC3 analysis of Strategy. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	facultative	obligate	lost
facultative	0	89	89
obligate	11	0	17
lost	11	64	0

Table 63: Differences in Sigma values for PC3 analysis of Strategy. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	facultative	obligate	lost
facultative	0	59	50
obligate	4	0	9
lost	13	53	0

Warts

PC1 - Parameters

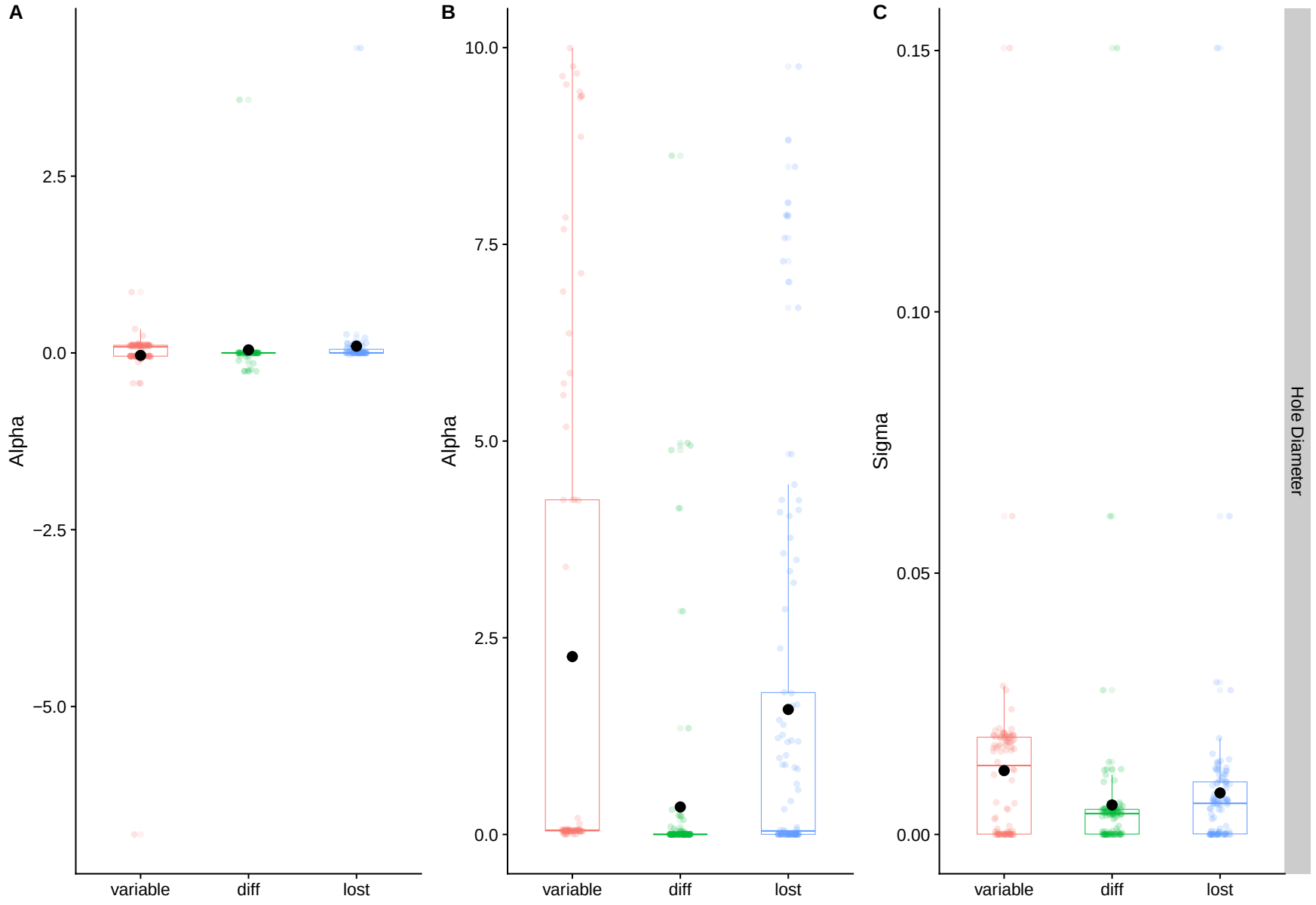

Figure 22: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Wartsendage.

PC1 - Parameter differences

Table 64: Differences in Theta values for PC1 analysis of Warts. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	variable	diff	lost
variable	0	57	40
diff	43	0	9
lost	60	89	0

Table 65: Differences in Alpha values for PC1 analysis of Warts. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	variable	diff	lost
variable	0	90	89
diff	10	0	11
lost	11	82	0

Table 66: Differences in Sigma values for PC1 analysis of Warts. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	variable	diff	lost
variable	0	52	46
diff	9	0	5
lost	14	57	0

PC2 - Parameters

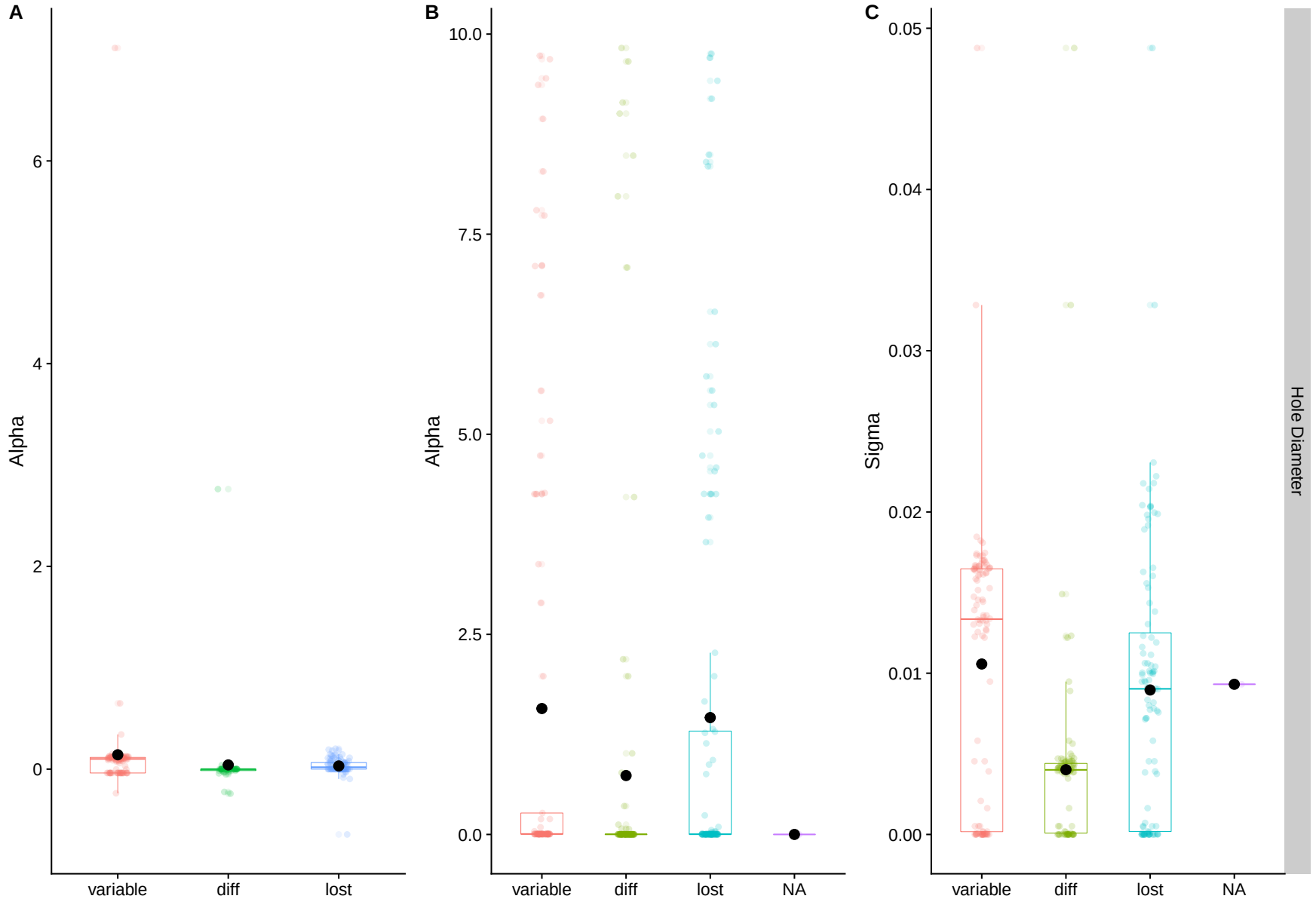

Figure 23: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Wartsendage.

PC2 - Parameter differences

Table 67: Differences in Theta values for PC2 analysis of Warts. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	variable	diff	lost
variable	0	68	54
diff	32	0	10
lost	46	86	0

Table 68: Differences in Alpha values for PC2 analysis of Warts. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	variable	diff	lost
variable	0	93	90
diff	6	0	7
lost	9	76	0

Table 69: Differences in Sigma values for PC2 analysis of Warts. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	variable	diff	lost
variable	0	73	45
diff	2	0	5
lost	30	69	0

PC3 - Parameters

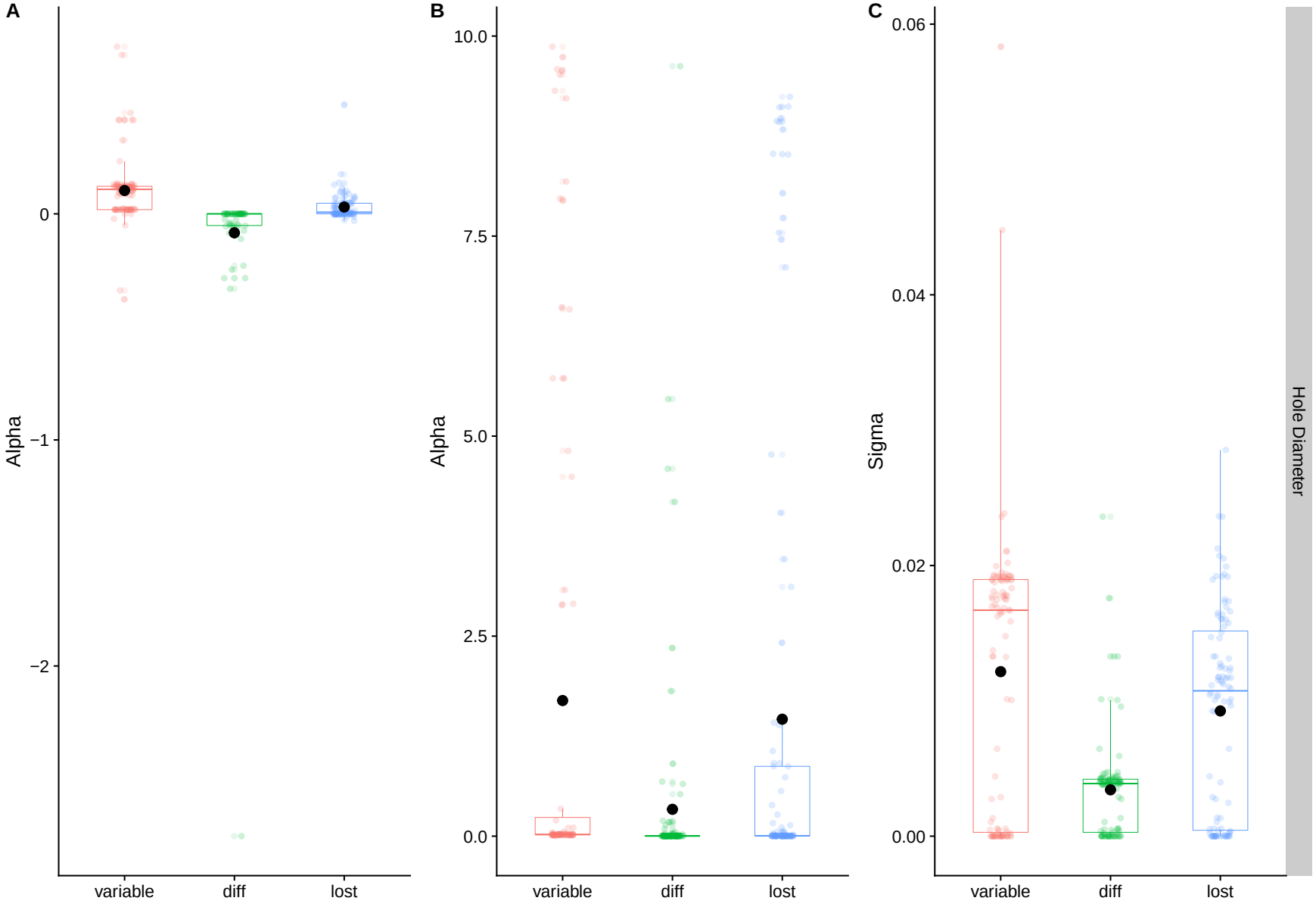

Figure 24: Distribution of Theta (A), Alpha (B) and Sigma (C) values for the OU-based models for each continuous trait in association with different states of Wartsendage.

PC3 - Parameter differences

Table 70: Differences in Theta values for PC3 analysis of Warts. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	variable	diff	lost
variable	0	93	88
diff	7	0	29
lost	12	68	0

Table 71: Differences in Alpha values for PC3 analysis of Warts. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	variable	diff	lost
variable	0	92	89
diff	8	0	12
lost	11	70	0

Table 72: Differences in Sigma values for PC3 analysis of Warts. Each cell contains the number of replicas for which the row state was higher than the column state.

	Hole Diameter		
	variable	diff	lost
variable	0	60	51
diff	14	0	8
lost	25	68	0