Appendix A: Voucher information and Genbank accession numbers for *Viburnum* species sampled. Species are grouped by clade name (Clement and Donoghue 2011) and missing data are indicated by a "-." For each species the Collector, Collector number and Herbarium where voucher is located is provided. Herbaria abbreviations are as follows: A: Arnold Arboretum, K: Kew Royal Botanic Garden, MO: Missouri Botanical Garden, NY: New York Botanical Garden; WTU: University of Washington Herbarium, YU Yale University Herbarium.

Clade	Species	Collector	Collection No.	H	psbA-trnH	rpl32	ITS	trnK	matK	rbcL	ndhF	trnC-y6	trnSG	petBD
Coriacea														
	V. coriaceum Bl.	L. Averyanov et al.	VH3300	MO	HQ592071	HQ591881	HQ591960	HQ591792	HQ591572	HQ591717	HQ591650	HQ592125	-	HQ592001
	V. cylindricum Buch.-Ham. ex D. Don	Boufford et al.	29342	A	AY627389	HQ591883	AY265119	AY265165	-	-	-	HQ592127	EF490269	-
	V. hebanthum Wight & Arn.	J. Klackenberg	32	NY	HQ592076	HQ591895	-	HQ591795	HQ591587	HQ591729	HQ591660	HQ592138	HQ591833	HQ592012
Lantana														
	V. bitchiuense Makino	Arnold Arboretum	1797-77A	AA living collection	JX049467	JX049477	JX049448	JX049491	JX049451	JX049471	JX049459	JX049481	JX049495	JX049509
	V. buddleifolium C.H. Wright	Arnold Arboretum	7533B, 00161917	A	JQ805295	JQ805471	-	JQ805551	JX049458	JX049472	JX049462	JX049485	JX049499	-
	V. burejaeticum Regel et Herder	Arnold Arboretum	375-95A, 00223095	A	JQ805297	JQ805472	-	JQ805552	JQ805231	JX049473	JX049463	JX049486	JX049500	JX049513
	V. carlesii Hemsl. Ex Forb. & Hemsl.	M.J. Donoghue & R.C. Winkworth	24	YU	AY627385	HQ591873	AY265115	AY265161	HQ591566	HQ591710	HQ591645	HQ592117	HQ591823	HQ591996
	V. lantana 1 L.	M.J. Donoghue & R.C. Winkworth	26	YU	AY627404	HQ591902	AY265134	AY265180	HQ591595	HQ591736	HQ591667	HQ592145	EF490278	HQ592019
	V. lantana 2 L.	Arnold Arboretum	1294-83B	AA living collection	JQ805300	JQ805474	JX049450	JQ805554	JX049455	JQ805469	-	JX049489	JX049503	JX049516
	V. macrocephalum Fortune	M.J. Donoghue	101	YU	HQ592086	HQ591911	EF462984	EF490247	HQ591604	HQ591745	HQ591673	HQ592153	HQ591842	HQ592027
	V. mongolicum Rehder	M.J. Donoghue	s.n.	YU	HQ592087	HQ591914	EF462985	EF490248	HQ591607	HQ591748	HQ591676	HQ592155	HQ591844	HQ592029
	V. rhytidophyllum Hemsl. Ex Forb. & Hemsl.	M.J. Donoghue & R.C. Winkworth	8	YU	HQ592092	HQ591925	AY265146	AY265192	HQ591618	HQ591759	HQ591685	HQ592166	HQ591850	HQ592036
	V. schensianum Maxim.	Boufford et al.	26082	A	HQ592094	HQ591929	HQ591975	HQ591808	HQ591622	HQ591763	HQ591689	HQ592169	HQ591851	HQ592040
	V. utile Hemsl.	Egolf	2336-E	cultivated plant	AY627424	HQ591945	AY265156	AY265202	HQ591638	HQ591778	HQ591698	HQ592184	EF490291	HQ592054
	V. veitchii C.H. Wright	Bouffourd et al.	27597	A	HQ592106	HQ591946	HQ591985	HQ591817	HQ591639	HQ591779	HQ591699	-	HQ591861	HQ592055
Lentago														
	V. cassinoides L.	Arnold Arboretum	874-85A, 0182773	A	HQ592067	HQ591874	HQ591956	HQ591789	HQ591567	HQ591711	HQ591646	HQ592118	HQ591824	HQ591997
	V. elatum Benth.	M.J. Donoghue	472	YU	AY627394	HQ591887	AY265124	AY265170	HQ591578	HQ591721	-	-	EF490272	HQ592003
	V. lentago L.	M.J. Donoghue & R.C. Winkworth	21	YU	AY627406	HQ591905	AY265136	AY265182	HQ591598	HQ591739	HQ591670	HQ592148	EF490280	HQ592022
	V. prunifolium L.	M.J. Donoghue & R.C. Winkworth	13	YU	AY627413	HQ591922	AY265144	AY265190	HQ591615	HQ591756	HQ591683	HQ592163	EF490286	HQ592033
	V. rufidulum Raf.	M.J. Donoghue & R.C. Winkworth	14	YU	AY627415	HQ591927	AY265147	AY265193	HQ591620	HQ591761	HQ591687	HQ592167	EF490287	HQ592038
Lobata														
	V. acerifolium L.	M.J. Donoghue & R.C. Winkworth	27	YU	AY627384	HQ591863	AY265114	AY265160	HQ591557	HQ591701	HQ591641	HQ592108	HQ591819	HQ591987
	V. kansuense Batalin	Boufford et al.	27416	A	AY627403	HQ591901	AY265133	AY265179	HQ591594	HQ591735	HQ591666	HQ592144	EF490276	HQ592018
	V. orientale Pall.	Merello et al.	2291	MO	HQ592089	HQ591919	EF462986	EF490249	HQ591612	HQ591753	HQ591680	HQ592160	EF490284	HQ592031
Lutescentia														
	V. colebrookeanum Wall.	Parker	3220	A	HQ592070	HQ591879	HQ591959	HQ591791	HQ591570	HQ591715	-	HQ592123	-	HQ592000
	V. lutescens Blume	Wu et al.	WP531	A	-	HQ591909	HQ591969	HQ591802	HQ591602	HQ591743	HQ591672	HQ592151	HQ591841	HQ592025
Mollodontotinus														
	V. bracteatum Rehder	Arnold Arboretum	1067-87A, 0227564	A	HQ592065	HQ591871	-	-	HQ591564	HQ591708	HQ591643	HQ592115	HQ591822	HQ591994
	V. ellipticum Hook.	M.J. Donoghue	NVI		AY627395	-	AY265125	AY265171	HQ591579	HQ591722	HQ591653	HQ592131	HQ591830	HQ592004
	V. molle Michx.	M.J. Donoghue & R.C. Winkworth	5	YU	AY627409	HQ591913	AY265139	AY265185	HQ591606	HQ591747	HQ591675	HQ592154	EF490281	-
	V. rafinesquianum Schult.	Arnold Arboretum	4622-2B, 00184665	A	JX049470	JX049480	JX049449	JX049494	JX049454	JX049476	JX049461	JX049484	JX049498	JX049512
Opulus														
	V. edule (Michaux) Raf.	NVI	-	-	AY627393	-	AY265123	AY265169	HQ591577	HQ591720	-	-	EF490271	-
	V. koreanum Nakai	H. Yamaji	5170	MO	HQ592081	-	EF462983	EF490246	-	-	-	-	EF490277	-
	V. opulus L.	W.L. Clement	250	YU	-	HQ591918	HQ591972	HQ591805	HQ591611	HQ591752	HQ591679	HQ592159	HQ591847	-
	V. sargentii Koehne	M.J. Donoghue & R.C. Winkworth	17	YU	AY627416	HQ591928	AY265148	AY265194	HQ591621	HQ591762	HQ591688	HQ592168	EF490288	HQ592039
	V. trilobum Marshall	Arnold Arboretum	22900A, 0174487	AA	HQ592104	HQ591942	HQ591983	HQ591815	HQ591635	HQ591775	HQ591695	HQ592182	EF490290	HQ592051
Oreinodontotinus														
	V. caudatum Greenm.	M.J. Donoghue	64	YU	HQ592068	HQ591875	HQ591957	HQ591790	-	-	-	HQ592119	HQ591825	-
	V. dentatum 1 L.	Arnold Arboretum	18008, 00223755	A	JQ805312	JQ805484	-	-	JX049456	JQ805385	JX049464	JX049487	JX049502	JX049514
	V. dentatum 2 L.	M.J. Donoghue & R.C. Winkworth	33	YU	AY627391	HQ591884	AY265121	AY265167	HQ591574	HQ591718	HQ591651	HQ592128	HQ591827	HQ592002
	V. dentatum 3 L.	Arnold Arboretum	1253-83C	AA living collection	JX049468	JX049478	JX049447	JX049492	JX049452	JX049474	-	JX049482	JX049496	JX049510
	V. dentatum 4 L.	Arnold Arboretum	101-38A, 00224160	A	JQ805313	JQ805483	JQ805165	JQ805565	JX049457	JQ805386	-	JX049488	JX049501	JX049515
	V. dentatum 5 L.	Arnold Arboretum	1471-83B, 00192902	A	JQ805337	JQ805507	JQ805189	JQ805585	JQ805261	JQ805387	JX049465	JX049490	JX049504	-
	V. hartwegii Benth.	M.J. Donoghue	486	YU	AY627400	HQ591894	AY265130	AY265176	HQ591586	-	HQ591659	HQ592137	HQ591832	HQ592011
	V. loeseneri Graebn.	M.J. Donoghue	2547	YU	HQ592084	HQ591908	HQ591968	HQ591801	HQ591601	HQ591742	-	HQ592150	-	HQ592024
	V. stenocalyx Hemsl.	M.J. Donoghue	60	YU	HQ592097	HQ591933	HQ591978	HQ591810	HQ591626	HQ591767	-	HQ592173	-	HQ592043
	V. triphyllum Benth.	P.W. Sweeney, W.L. Clement, J. Yepez.	PWS1783	YU	HQ592105	HQ591943	HQ591984	HQ591816	HQ591636	HQ591776	HQ591696	HQ592183	HQ591859	HQ592052
Pseudotinus														
	V. furcatum Bl. ex Hook.f. & Thomson	Tsugaru & Takashi	19958	MO	AY627399	HQ591893	AY265129	AY265175	HQ591585	HQ591728	HQ591658	HQ592136	EF490275	HQ592010
	V. lantanoides Michx.	M.J. Donoghue & R.C. Winkworth	2	YU	AY627405	HQ591903	AY265135	AY265181	HQ591596	HQ591737	HQ591668	HQ592146	EF490279	HQ592020
	V. nervosum D. Don	Boufford et al.	27388	A	AY627388	HQ591880	AY265118	AY265164	HQ591571	HQ591716	HQ591649	HQ592124	EF490268	-
	V. sympodiale Graebn.	Lai & Shan	4529	MO	HQ592100	HQ591937	EF462988	EF490252	HQ591630	HQ591770	-	HQ592177	EF490289	HQ592046
Punctata														
	V. lepidotulum Merr. & Chun	Lau	27991	A	HQ592083	HQ591906	-	HQ591800	HQ591599	HQ591740	-	-	-	-

V. punctatum Buch.-Ham. Ex D. Don	Sino-British Expedition	133	A	HQ592091	HQ591923	HQ591973	HQ591806	HQ591616	HQ591757	-	HQ592164	HQ591848	HQ592034
Sambucina													
V. inopinatum Craib	Rock	1603	A	HQ592079	-	-	-	HQ591590	JQ805447	-	HQ592141	-	-
V. ternatum Rehder	Bartholomew et al.	2268	A	HQ592102	HQ591939	HQ591981	HQ591813	HQ591632	HQ591772	-	HQ592179	HQ591856	HQ592048
Solenotinus													
V. amplificatum J. Kern	Pereira et al.	JTP 677	A	HQ592058	HQ591865	HQ591949	-	-	JQ805448	-	-	-	-
V. awabuki Hort.Berol. Ex K. Koch	Liu	141	A	HQ592060	HQ591867	HQ591951	HQ591783	HQ591560	HQ591704	-	HQ592111	-	HQ591990
V. brachybotryum Hemsl. Ex Forb. & Hemsl.	NVI	-	-	HQ592064	-	HQ591954	HQ591787	-	-	-	-	-	-
V. chingii P.S. Hsu	Bartholomew et al.	973	A	HQ592069	HQ591876	HQ591958	-	-	HQ591712	-	HQ592120	-	-
V. erubescens Wall.	Boufford et al.	27190	A	AY627397	HQ591889	AY265127	AY265173	HQ591581	HQ591724	HQ591655	HQ592133	HQ591831	HQ592006
V. farreri Stearn	M.J. Donoghue & R.C. Winkworth	18	YU	AY627398	HQ591890	AY265128	AY265174	HQ591582	HQ591725	HQ591656	HQ592134	EF490274	HQ502007
V. odoratissimum Ker-Gawl.	R. Olmstead	118	WTU	AY627411	HQ591916	AY265141	AY265187	HQ591609	HQ591750	HQ591678	HQ592157	HQ591845	-
V. oliganthum Batalin	Bouffourd et al.	27175	A	HQ592088	HQ591917	HQ591971	HQ591804	HQ591610	HQ591751	-	HQ592158	HQ591846	-
V. sieboldii Miq.	M.J. Donoghue & R.C. Winkworth	3	YU	AY627417	HQ591932	AY265149	AY265195	HQ591625	HQ591766	HQ591691	HQ592172	HQ591853	HQ592042
V. subalpinum Hand.-Mazz.	Heng	11878	A	HQ592098	HQ591934	HQ591979	HQ591811	HQ591627	HQ591768	-	HQ592174	-	HQ592044
V. suspensum Lindl.	M.J. Donoghue & R.C. Winkworth	36	YU	AY627419	HQ591936	AY265151	AY265197	HQ591629	HQ591769	HQ591692	HQ592176	HQ591854	HQ592045
Succodontotinus													
V. betulifolium Batalin	Boufford et al.	29335	A	HQ592061	HQ591868	-	HQ591784	HQ591561	HQ591705	-	HQ592112	-	HQ591991
V. cf. corylifolium Hook f. & Thomson	Arnold Arboretum	103-99A	AA living collection	JX049469	JX049479	-	JX049493	JX049453	JX049475	JX049460	JX049483	JX049497	JX049511
V. dilatatum Thunberg	M.J. Donoghue & R.C. Winkworth	19	YU	AY627392	HQ591885	AY265122	AY265168	HQ591575	HQ591719	HQ591652	HQ592129	HQ591828	-
V. erosum Thunberg	M.J. Donoghue & R.C. Winkworth	16	YU	AY627396	HQ591888	AY265126	AY165172	HQ591580	HQ591723	HQ591654	HQ592132	EF490273	HQ592005
V. flavescens W.W. Smith	Boufford et al.	32758	A	HQ592074	HQ591891	HQ591962	HQ591794	HQ591583	HQ591726	HQ591657	-	JX049505	HQ592008
V. foetidum Wall.	C.-H. Lin	563	MO	HQ592075	HQ591892	HQ591963	EF490245	HQ591584	HQ591727	-	HQ592135	JX049506	HQ592009
V. hupehense Rehder	Bartholomew et al.	1286	A	HQ592077	HQ591896	HQ591964	HQ591796	HQ591588	HQ591730	HQ591661	HQ592139	HQ591834	HQ592013
V. ichangense Rehder	Bartholomew et al.	1889	A	HQ592078	HQ591897	HQ591965	HQ591797	HQ591589	HQ591731	HQ591662	HQ592140	HQ591835	HQ592014
V. japonicum Spreng	NVI	-	-	AY627401	HQ591899	AY265131	AY265177	HQ591592	HQ591733	HQ591664	HQ592143	HQ591837	HQ592016
V. lobophyllum Graebn.	M.J. Donoghue & R.C. Winkworth	25	YU	AY627407	HQ591907	AY265137	AY265183	HQ591600	HQ591741	HQ591671	HQ592149	HQ591840	HQ592023
V. luzonicum Rolfe	Shen	673	A	HQ592085	HQ591910	HQ591970	HQ591803	HQ591603	HQ591744	JX049466	HQ592152	JX049507	HQ592026
V. melanocarpum P.S. Hsu	M.J. Donoghue & R.C. Winkworth	12	YU	AY627408	HQ591912	AY265138	AY265184	HQ591605	HQ591746	HQ591674	-	HQ591843	HQ502028
V. sempervirens K. Koch	Hu & But	21891	A	HQ592095	HQ591930	HQ591976	HQ591809	HQ591623	HQ591764	-	HQ592170	-	-
V. setigerum Hance	M.J. Donoghue	102	YU	HQ592096	HQ591931	HQ591977	EF490251	HQ591624	HQ591765	HQ591690	HQ592171	HQ591852	HQ592041
V. wrightii Miquel	Yonekura	1362	A	HQ592107	HQ591947	HQ591986	HQ591818	HQ591640	HQ591780	HQ591700	HQ592185	HQ591862	HQ592056
Tinus													
V. atrocyaneum C.B. Clarke	Boufford et al.	34956	A	HQ592059	HQ591866	HQ591950	HQ591782	HQ591559	HQ591703	HQ591642	HQ592110	HQ591820	HQ591989
V. calvum Rehder	Li & Soukup	934	A	HQ592066	HQ591872	HQ591955	HQ591788	HQ591565	HQ591709	HQ591644	HQ592116	JX049508	HQ591995
V. cinnamomifolium Rehder	Olmstead	120	WTU	AY627386	HQ591877	AY265116	AY265162	HQ591568	HQ591713	HQ591647	HQ592121	HQ591826	HQ591998
V. propinquum Hemsl.	M.J. Donoghue	100	YU	HQ592090	HQ591921	EF462987	EF490250	HQ591614	HQ591755	HQ591682	HQ592162	-	-
V. rigidum Ventenat	Stearn	1116	A	HQ592093	HQ591926	HQ591974	HQ591807	HQ591619	HQ591760	HQ591686	-	-	HQ592037
V. tinus L.	M.J. Donoghue & R.C. Winkworth	35	YU	AY627420	HQ591940	AY265152	AY265198	HQ591633	HQ591773	HQ591693	HQ592180	HQ591857	HQ592049
Tomentosa													
V. plicatum Thunberg	M.J. Donoghue & R.C. Winkworth	10	YU	AY627412	HQ591920	AY265143	AY265189	HQ591613	HQ591754	HQ591681	HQ592161	EF490285	HQ592032
Unassigned													
V. clemensiae Kern	J. Beaman	11781	K	AY627387	HQ591878	AY265117	AY265163	HQ591569	HQ591714	HQ591648	HQ592122	EF490267	HQ591999
V. taiwanianum Hayata	W.-H. Hu et al.	2186	MO	HQ592101	HQ591938	EF462989	EF490253	HQ591631	HQ591771	-	HQ592178	HQ591855	HQ592047
V. urceolatum S. & Z.	M.J. Donoghue	NVI	-	AY627423	HQ591944	AY265155	AY265201	HQ591637	HQ591777	HQ591697	-	HQ591860	HQ592053

Appendix B.

Quantifying leaf shape: We assembled leaf images for 88 focal taxa both from living *Viburnum* plants at the Arnold Arboretum of Harvard University (Jamaica Plain, MA) and from herbarium specimens in the Harvard University Herbaria (HUH) and the Yale Herbarium in the Peabody Museum of Natural History (YU). For the living collections (39 taxa) we photographed the adaxial surface of individual leaves on a white background with a scale bar. For herbarium specimens (49 taxa), we photographed entire herbarium sheets and then digitally traced and excised individual leaves, which were scaled and cropped into their own image files. We digitally cropped the petiole from each leaf, and scaled, reoriented, and binarized these images so that each contained a black silhouette of the adaxial lamina surface on a white background. The resulting dataset included 24-60 individual leaf images for each taxon.

We quantified the leaf outline directly using Elliptical Fourier analysis (EFA). This allows the outline of any closed, two-dimensional shape to be quantified numerically, as a series of coefficients describing a set of harmonic ellipses [1]. McLellan and Endler [2] found that EFA described complex leaf shapes better than either single-parameter metrics of outline shape or traditional multivariate analysis of linear landmark measurements. We used the software suite SHAPE ver. 1.3 [3] to quantify the leaf outline using EFA for the lamina silhouette in each leaf image. We extracted the lamina outline as a chain code, rotationally aligning all outlines along a common homologous vector (leaf midrib), and calculated the elliptic Fourier descriptors for 300 harmonic ellipses for each laminar outline; this was the maximum number of harmonics possible with this software, producing the best possible fit to the original outline.

In EFA, size can be represented as a function of the “0th” Fourier harmonic. However, our preliminary analyses found size to be by far the greatest component of overall shape, obscuring other components of leaf morphology. Therefore we set SHAPE to scale our elliptic Fourier descriptors so that the “0th” harmonic was constant across all leaves, which effectively controlled for variability in size. We then considered size separately from overall shape, measuring leaf area directly from the leaf images.

We used principal component analysis (PCA) to reduce the large set of potentially correlated Fourier descriptors to a smaller set of uncorrelated principal components. These principal components defined independent axes of shape variation in lamina outline, allowing the principal component scores for a leaf to be treated as continuous morphological characters. Because traditional PCA relies on the assumption that all observations are independent, we also performed a phylogenetic PCA [4] using the phylogeny described above. Because these analyses are far more computationally intensive, we analyzed a 10% subsample of the 300 harmonic ellipses (the first 120 EFD coefficients, describing 30 harmonic ellipses). Our phylogenetic PCA analysis produced nearly identical results to the non-phylogenetic analyses: in both cases, the first two principal component axes together accounted for > 95% of the variation in leaf shape observed in *Viburnum*. These axes showed a slight yet significant phylogenetic signal. Multivariate lambda for the principal component axes was near zero ($\lambda \approx 0.045$). Nevertheless, the multivariate lambda value calculated was a better fit (AIC=238564.5) than a multivariate lambda of zero (AIC=241418.5). We conducted all subsequent regression analyses using the phylogenetic PCA axes only.

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Supplemental Table 1. Testing for correlated trait evolution using maximum likelihood. 'Dependent' indicates correlated evolution; best-chosen model highlighted in bold.

	Independent		Dependent Equal-rates		Dependent Symmetric-rates		Dependent All-rates-different	
	lnLik	AIC	lnLik	AIC	lnLik	AIC	lnLik	AIC
HabitatA x MarginTypeA	-59.4	126.7	-60.2	122.5	-53.6	115.2	**-49.0**	**114.1**
HabitatA x MarginTypeB	-79.2	166.4	-86.1	174.2	**-75.2**	**158.4**	-72.3	160.6
HabitatA x LeafHabitA	-70.9	149.9	-73.7	149.5	**-62.7**	**133.5**	-59.3	134.6
HabitatA x LeafHabitB	-77.9	163.9	-83.4	168.9	**-70.5**	**149.1**	-68.0	152.1
HabitatB x MarginTypeA	-82.3	172.6	-84.9	171.9	-75.1	158.1	**-68.1**	**152.3**
HabitatB x MarginTypeB	-102.2	212.3	-103.0	208.0	-86.4	180.7	**-75.7**	**167.4**
HabitatB x LeafHabitA	-93.9	195.8	-95.3	192.6	-87.4	182.9	**-77.8**	**171.6**
HabitatB x LeafHabitB	-100.9	209.8	-101.6	205.3	-87.7	183.4	**-74.4**	**164.7**
HabitatC x MarginTypeA	-63.4	134.7	-64.0	130.1	-56.7	121.4	**-51.1**	**118.2**
HabitatC x MarginTypeB	-83.2	174.4	-88.9	179.7	-79.2	166.4	**-74.2**	**164.4**
HabitatC x LeafHabitA	-74.9	157.9	-77.1	156.3	**-69.5**	**147.0**	-66.2	148.3
HabitatC x LeafHabitB	-82.0	171.9	-86.4	174.8	-72.6	153.2	**-68.0**	**152.0**

HabitatA: tropical vs. cloud forest, warm temperate, and cold temperate (TR vs. CL+WT+CT); HabitatB: cold temperate vs. tropical, warm temperate, and cloud forest (CT vs. TR+WT+CL); HabitatC: tropical and cloud forest vs. warm temperate and cold temperate (TR+CL vs. WT+CT); MarginTypeA: entire margins vs. prominent, regular teeth and reduced/irregular teeth (EN vs. PT+RT); MarginTypeB: prominent, regular teeth vs. reduced/irregular teeth and entire margins (PT vs. RT+EN); LeafHabitA: evergreen vs. leaf-exchanger and seasonally deciduous (EV vs. LE+SD); LeafHabitB: seasonally deciduous vs. leaf-exchanger and evergreen (SD vs. LE+EV).

Supplemental Table 2. Phylogenetic regressions between continuous response variables and discrete character states. Best-chosen models are highlighted in bold.

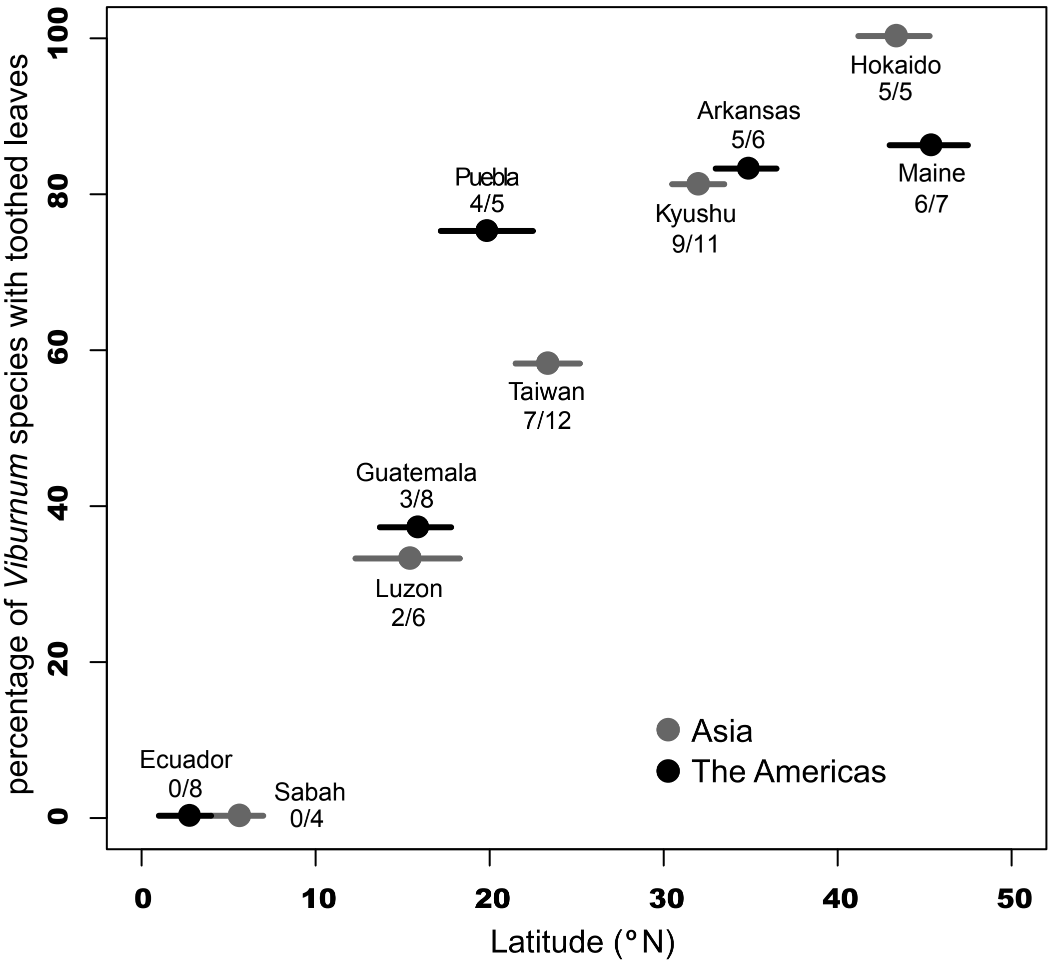
			Habitat			Leaf Habit		Margin Type	
			CT vs. TR+WT+CL	TR+CL vs. WT+CT	TR vs. CL+WT+CT	EV vs. LE+SD	SD vs. LE+EV	PT vs. RT+EN	EN vs. PT+RT
PC1	Brownian	logLik	44.4821	44.01772	42.61533	44.81225	48.67537	51.06358	43.79123
		AIC	-82.9642	-82.03544	-79.23006	-83.6245	-91.35074	-96.12716	-81.5825
		p-value	0.0148	0.0248	0.1282	0.01	0.0002	0.0000	0.032
	O-U	*alpha*	7.496461	5.541	5.875	9.509	8.936	10.039	6.472
		logLik	58.6854	56.42685	55.08705	59.8278	63.6986	67.28433	57.40899
		AIC	-109.3708	-104.8537	-102.1741	-111.6556	-119.3972	-126.5687	-106.818
		p-value	0.0001	0.0017	0.0062	0.0000	0.0000	0.0000	0.0004
	Lambda	*lambda*	**0.602**	0.709	0.720	0.561	**0.575**	**0.524**	0.672
		logLik	**59.64196**	58.32987	54.58742	59.81231	**66.5546**	**69.3601**	58.142
		AIC	**-111.283**	-108.660	-101.175	-111.625	**-125.109**	**-130.720**	-108.284
		p-value	**0.0000**	0.0001	0.004	0.0000	**0.0000**	**0.0000**	0.0001
Leaf Size	Brownian	logLik	-47.61522	-47.15109	-46.78747	-47.56037	-46.23995	-45.8606	-46.0418
		AIC	101.2304	100.3002	99.5750	101.1207	98.47991	97.7211	98.084
		p-value	0.7986	0.8308	0.4660	0.6532	0.4603	0.2575	0.3348
	O-U	*alpha*	16.038	15.064	19.929	16.169	20.429	23.406	18.117
		logLik	-27.64905	-27.26765	-25.91144	-27.61984	-27.02767	-22.49226	-23.6891
		AIC	63.2981	62.53529	59.82288	63.23967	62.05534	52.98451	55.37818
		p-value	0.9494	0.5594	0.0884	0.7896	0.2271	0.1198	0.8368
	Lambda	*lambda*	0.420	0.420	0.402	0.446	0.373	0.368	0.421
		logLik	-26.10665	-25.77938	-24.10344	-25.77807	-25.81855	-25.54796	-25.9324
		AIC	60.21331	59.5588	56.20687	59.5562	59.6371	59.096	59.865
		p-value	0.7566	0.5994	0.0697	0.4379	0.3807	0.2479	0.722

CT= cold temperate; WT= warm temperate; CL= cloud forest; TR=tropical; EV=evergreen; LE=leaf-exchanger; SD=seasonally deciduous; EN=entire margins; RT=reduced/irregular teeth; PT=prominent, regular teeth.

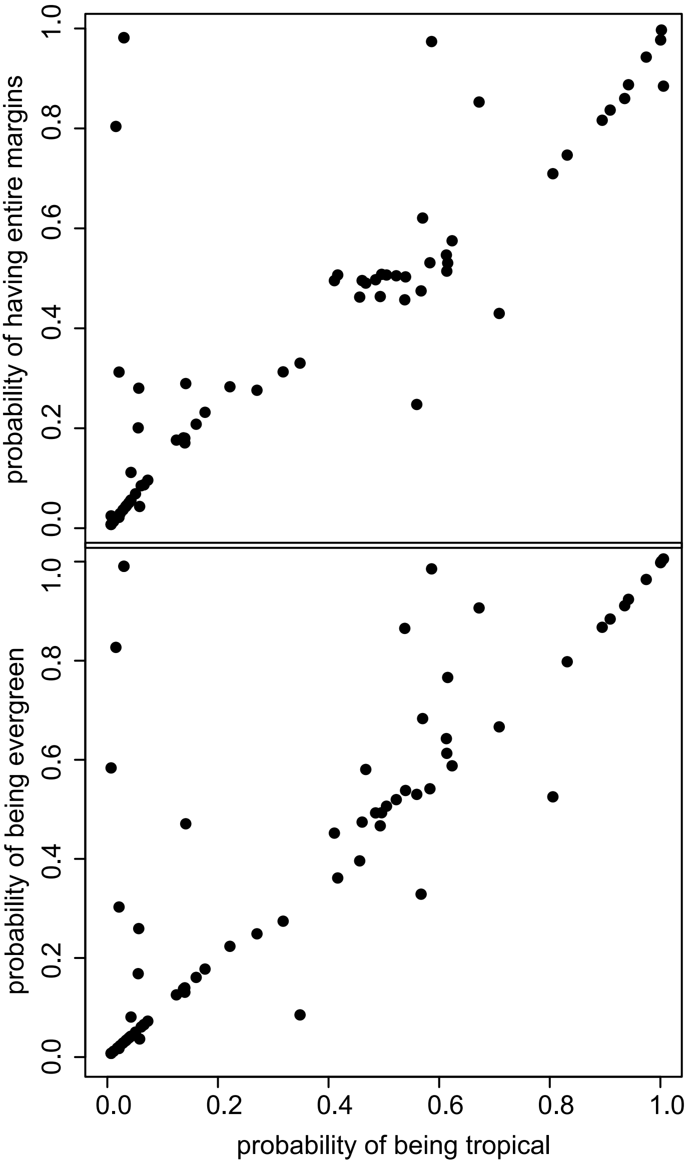
Supplemental Table 3. Phylogenetic regressions between sets of continuous variables. Best-chosen model highlighted in bold.

	Brownian			Ornstein-Uhlenbeck				Lambda			
	logLik	AIC	p-value	*alpha*	logLik	AIC	p-value	*lambda*	logLik	AIC	p-value
PC1~MAT	24.41031	-42.821	0.0401	10.994	37.75977	-67.519	0.0008	0.533	38.71553	-69.431	0.0029
PC1~T_{season}	24.91012	-43.820	0.0233	248.2	38.34749	-68.695	0.0001	**0.526**	**41.33534**	**-74.670**	**0.002**
PC1~cold quarter	25.23764	-44.475	0.0162	13.770	39.22878	-70.457	0.0004	0.496	**41.05933**	**-74.119**	**0.0002**
PC1~warm quarter	22.26535	-38.531	0.7882	6.704	32.92406	-57.848	0.3551	0.653	34.4009	-60.801	0.7117
PC1~MAP	22.67392	-39.347	0.3548	6.679	33.44721	-58.894	0.1730	0.646	35.37754	-62.755	0.1555
PC1~D_{teeth}	34.38676	-62.774	0.0000	**3.916**	**41.91772**	**-75.835**	**0.0000**	**0.742**	**44.78531**	**-81.571**	**0.0000**
PC1~size	43.01979	-80.040	0.0783	4.872	53.33905	-98.678	0.0573	0.809	52.34904	-96.698	0.0582
Size~MAT	-39.25843	84.517	0.6471	55.978	-20.36303	48.726	0.9074	0.341	-18.9102	45.820	0.9083
Size~ T_{season}	-38.91139	83.823	0.3494	83.246	-19.03861	46.077	0.109	0.346	-27.7773	63.555	0.0741
Size~MAP	-39.17014	84.340	0.5381	59.597	-19.84706	47.694	0.3163	0.3159	-21.8911	51.782	0.4428
D_{teeth} ~MAT	-104.8015	215.603	0.0012	**2.878**	**-99.71988**	**207.440**	**0.0014**	**0.818**	**-98.84717**	**205.694**	**0.0003**
D_{teeth} ~T_{season}	-104.8875	215.775	0.0014	**3.659**	**-98.18029**	**204.361**	**0.0003**	**0.728**	**-96.31431**	**200.623**	**0.0001**

D_{teeth} = # teeth*cm^{-1}; MAT = Mean Annual Temperature; T_{season}= Temperature seasonality (standard deviation of monthly temperatures*100); cold quarter= Mean Temperature of the coldest quarter; warm quarter=Mean Temperature of the warmest quarter; MAP=Mean Annual Precipitation



Supplementary Figure 1. Latitudinal gradient in leaf margins in *Viburnum*. In both the Old World and the New World there are more species with entire margins (or highly reduced teeth) at lower latitudes, and more with prominently toothed margins at high latitudes. Each dot marks the mid-point of the latitudinal range of the named geographic region; ratio indicates the number of species with teeth/total number of species in the region.



Supplementary Figure 2. Correlations between probabilites of character states at internal nodes in *Viburnum*.