Appendix S1: Supplemental figures and table

Table S1: Average traits values among ʻilima leaves at each site. $SD_{abaxial}$ is the stomatal density per mm^2 on the abaxial (lower) surface; $SD_{adaxial}$ is the stomatal density per mm^2 on the adaxial (upper) surface; $GCL_{abaxial}$ is the guard cell length in µm on the abaxial (lower) surface; $GCL_{adaxial}$ is the guard cell length in µm on the adaxial (upper) surface; Leaf thickness is the length from upper cuticle to lower cuticle in µm; A is the photosynthetic rate in µmol CO_2 m^{-2} s^{-1}; g_{sw} is the stomatal conductance to water vapor in mol m^{-2} s^{-1}.

Site	Island	Habitat	$SD_{abaxial}$	$SD_{adaxial}$	$GCL_{abaxial}$	$GCL_{adaxial}$	Leaf thickness	A	g_{sw}
Kaloko-Honokōhau national historical park	Hawaiʻi	coastal	412.99	92.31	14.73	20.32	189.60	17.40	0.123
Puakō petroglyph park	Hawaiʻi	coastal	310.12	52.55	13.35	20.94	194.20	17.85	0.134
Kahuku Point	Oʻahu	coastal	420.43	80.80	16.23	22.77	304.24	20.88	0.155
Kaloko beach	Oʻahu	coastal	400.27	109.03	15.69	23.26	399.54	31.28	0.314
Kaʻena Point	Oʻahu	coastal	370.14	120.34	17.61	22.89	295.82	34.77	0.336
Makapuʻu beach	Oʻahu	coastal	408.28	23.18	15.99	22.03	249.71	32.87	0.349
Hāloa ʻĀina	Hawaiʻi	montane	307.94	7.61	16.49	22.59	149.41	13.07	0.116
Kaʻohe game management area	Hawaiʻi	montane	270.24	13.07	14.87	21.51	183.72	12.94	0.130
Koaiʻa tree sanctuary	Hawaiʻi	montane	318.58	9.55	13.89	22.86	138.89	27.88	0.358
Hawaiʻi loa ridge	Oʻahu	montane	329.25	115.56	17.83	21.76	205.97	21.95	0.215
Mauʻumae Ridge	Oʻahu	montane	298.77	138.32	16.53	20.72	162.02	24.60	0.436
Waʻahila ridge	Oʻahu	montane	346.75	150.26	17.76	20.61	193.33	13.96	0.194

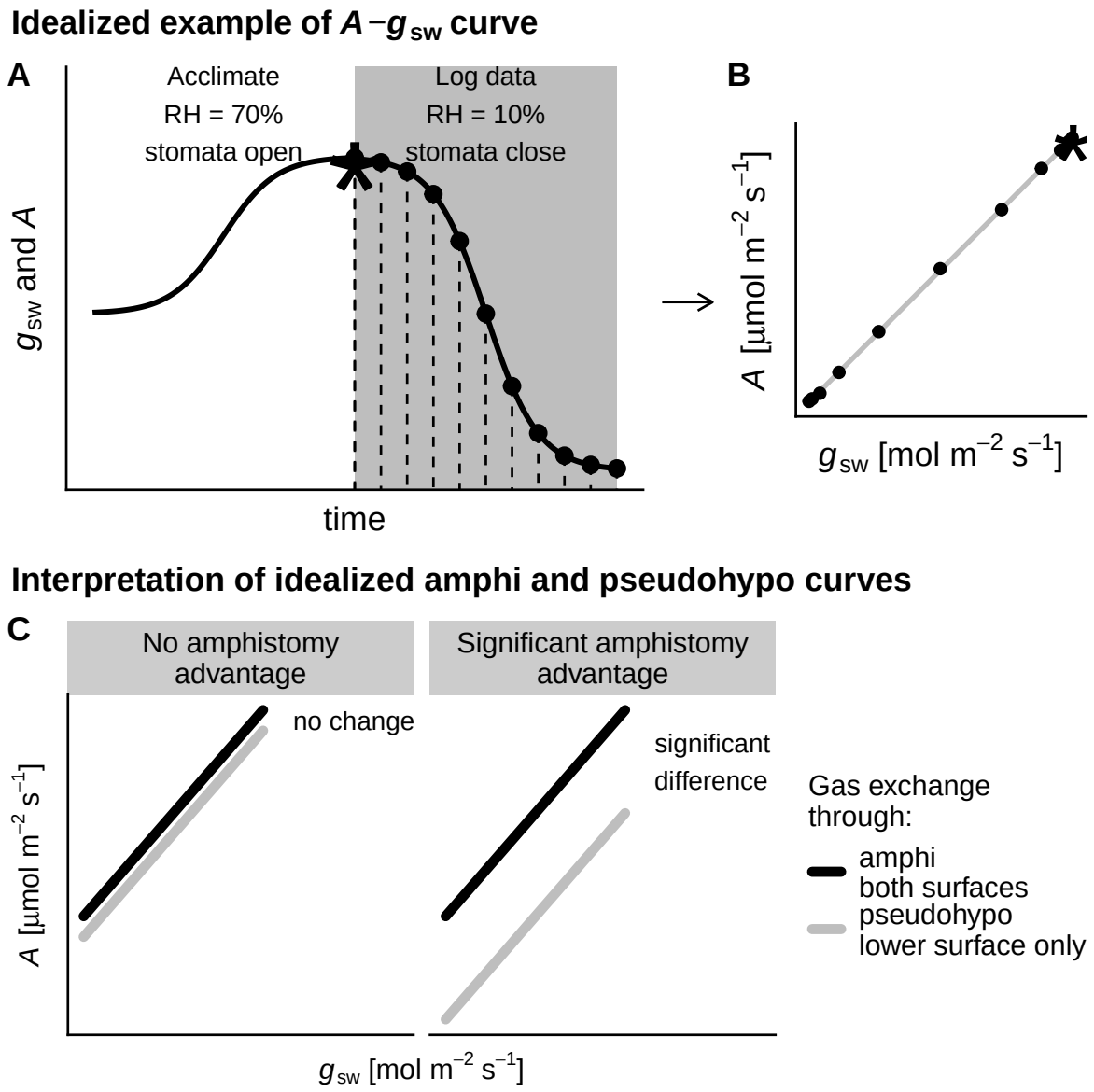

Figure S1: Idealized method for collecting A–g_{sw} curves on either amphi or pseudohypo leaves. (A) After clamping the leaf into the LI-6800 chamber, it acclimates to high light (PPFD $=$ 2000 mol m^{-2} s^{-1}) and humidity (RH $= 70\%$). This induces stomata to open, increasing g_{sw} and A until they reach a maximum. We abruptly lower the chamber humidity to $\approx 10\%$ to close stomata and log data (black points) until g_{sw} and A reach their nadir. (B) We fit A–g_{sw} curves to logged data points. The asterisk in both panels indicates the data point used for maximum A and g_{sw}. (C) AA is low (left panel) when the photosynthetic rate of an amphi leaf is similar to a pseudohypo leaf at the same total g_{sw} (x-axes); large AA (right panel) is indicated when an amphi leaf has a higher photosynthetic rate than a pseudohypo leaf. Abbreviations: A is the photosynthetic rate; AA is the amphistomy advantage; g_{sw} is the stomatal conductance to water vapor; PPFD is photosynthetic photon flux density; RH is relative humidity.

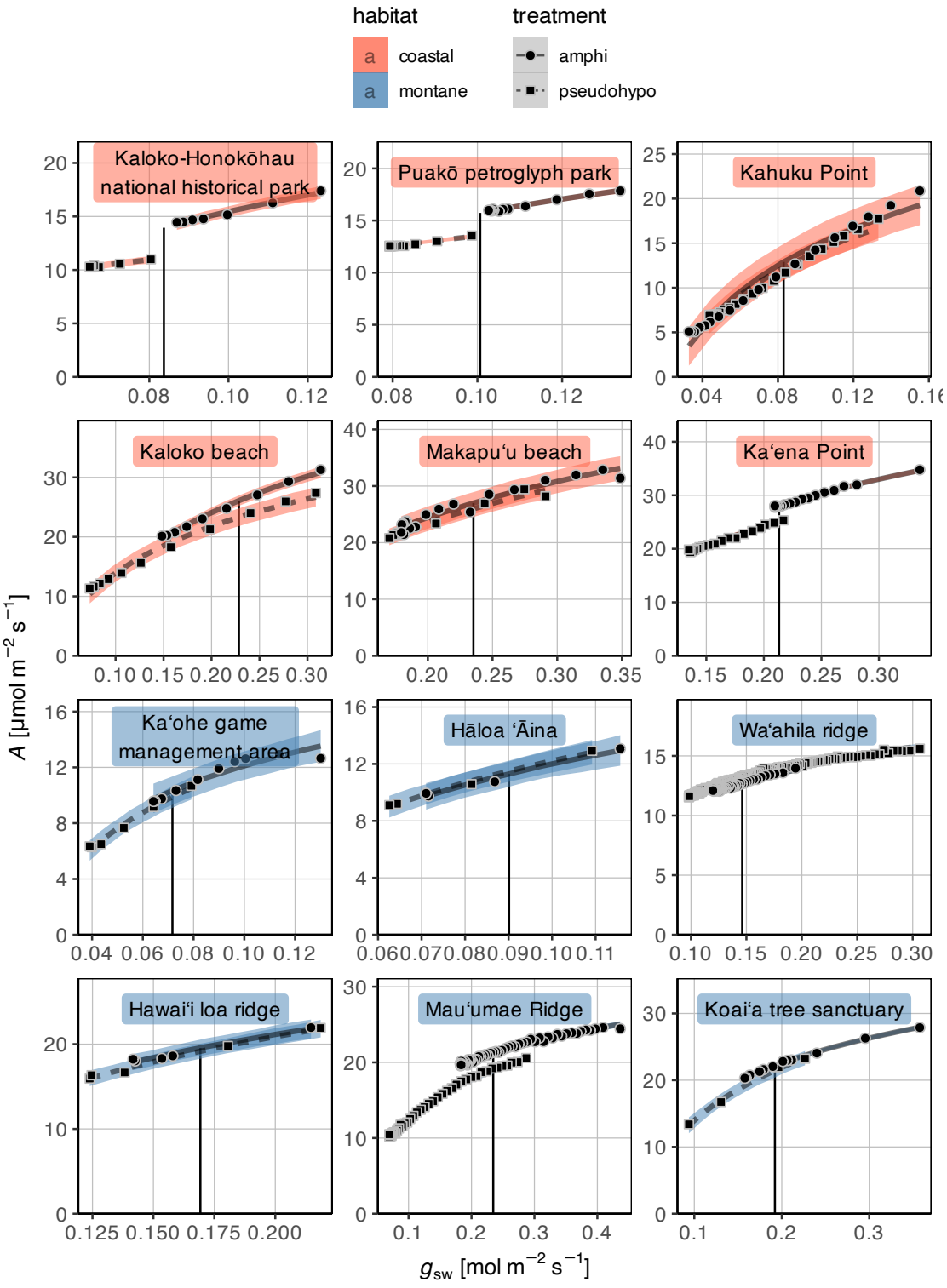

Figure S2: See next page.

Figure S2: (Continued from previous page.) Individual A–g_{sw} curves used to estimate AA. For each leaf, one per site, we measured A (y-axis) over a range of g_{sw} (x-axis) on the same leaf with two treatments: 'amphi' (circles, solid line) leaves were untreated; 'pseudohypo' (squares, dashed line) leaves had no conductance through the upper (adaxial) surface. In all coastal (orange) and montane (blue) leaves, we fit generalized additive models and 95% confidence ribbons to estimate AA at a g_{sw} where the curves overlap (vertical black line). In leaves from Kaloko-Honokōhau national historical park and Puakō petroglyph park, we extrapolated sligtly beyond fitted curves because they did not quite overlap. Symbols: AA, amphistomy advantage; A, photosynthetic rate in μmol CO_2 m^{-2} s^{-1}; g_{sw}, stomatal conductance to water vapor in mol m^{-2} s^{-1}.

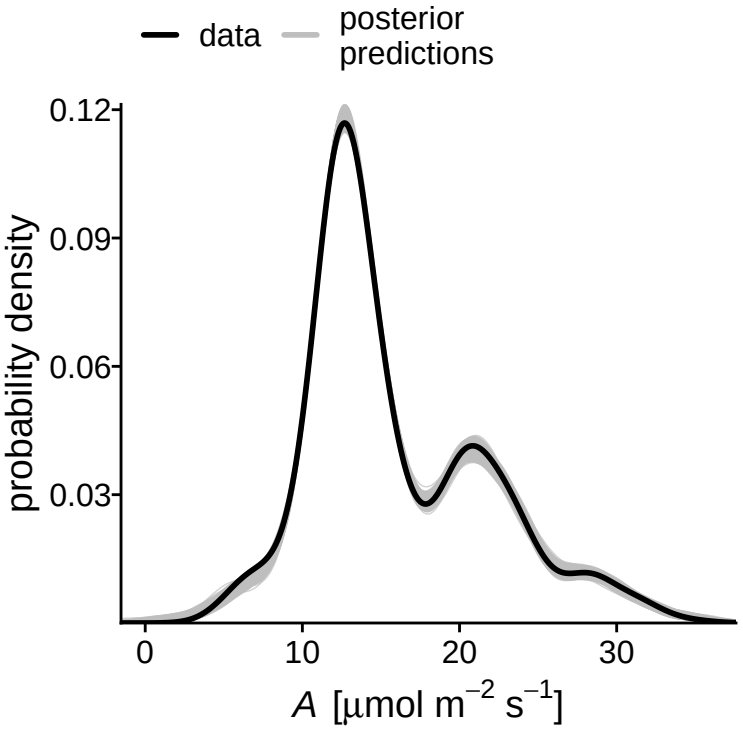

Figure S3: Posterior predictions (thin grey lines) from fitted A–g_{sw} curves closely match the observed distribution (thick black line), indicating that the statistical model adequately captures variation in the response variable over the measured range. Symbols: A, photosynthetic rate in μmol CO_2 m^{-2} s^{-1}; g_{sw}, stomatal conductance to water vapor in mol m^{-2} s^{-1}.

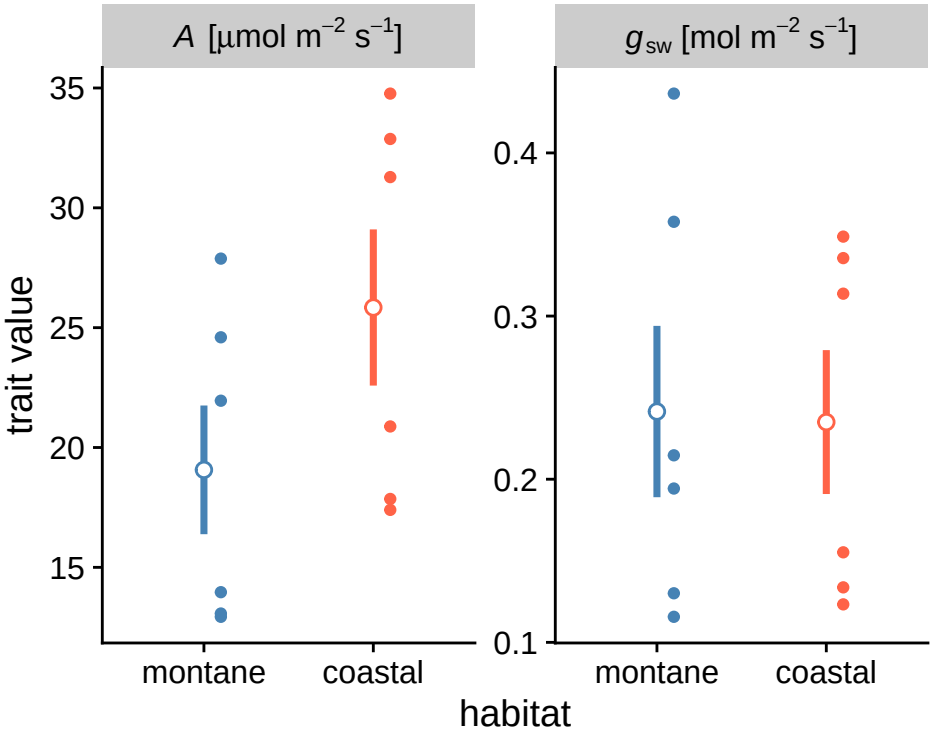

Figure S4: The photsynthetic rate (left panel) and stomatal conductance to water vapor (right panel) of montane (blue) and coastal (orange) ʻilima leaves. Each point-interval is the median posterior estimate plus 95% confidence interval of trait value for that habitat. Smaller points next to each point-interval are the $g_{smax,ratio}$ of individual plants, one per site. Symbols: A, photosynthetic rate in µmol CO_2 m^{-2} s^{-1}; g_{sw}, stomatal conductance to water vapor in mol m^{-2} s^{-1}.

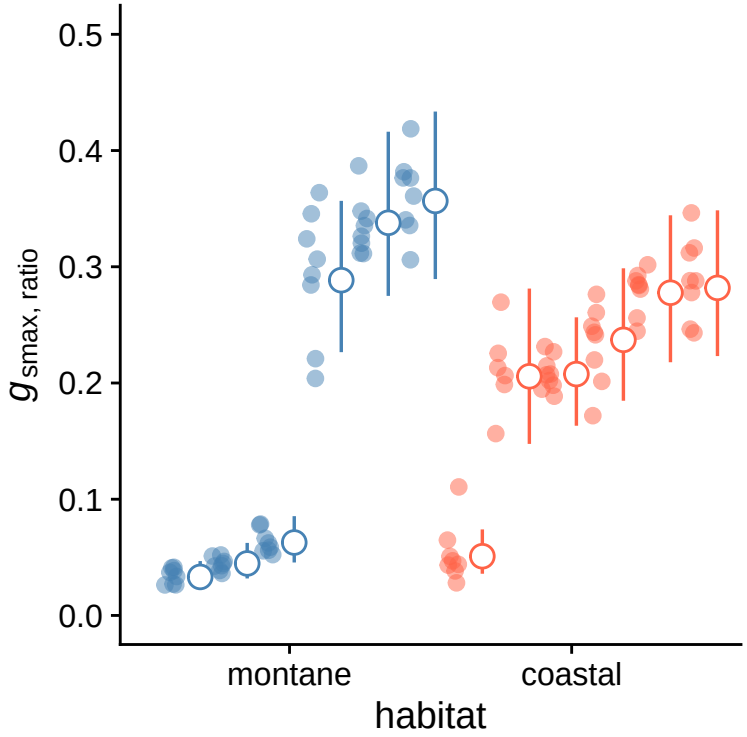

Figure S5: The $g_{smax,ratio}$ (y-axis) of montane (blue) and coastal (orange) ʻilima leaves. Each point-interval is the median posterior estimate plus 95% confidence interval of $g_{smax,ratio}$ for that site. Sites are arranged by habitat and ascending $g_{smax,ratio}$ within habitat. Smaller, transparent points next to each point-interval are the $g_{smax,ratio}$ of individual plants. Symbols: $g_{smax,ratio}$, the ratio of anatomical maximum stomatal conductance to water vapor on the the adaxial surface over the total.