

Supplementary Tables and Figures

Supplementary Table S1. Locations of sampling sites, sampling methods (line transect or point) and the numbers of line or points (N) at each site along the elevational gradient on Mount Emei, China.

Sampling sites	Longitude (°E)	Latitude (°N)	Elevation	Sampling methods	N
Huangwan Village	103.43	29.58	500	line transect	2
Baoguo Temple	103.44	29.57	530	line transect	2
Lianghekou	103.41	29.59	650	line transect	1
Qingyin Pavilion	103.39	29.57	730	line transect	1
Shenshui Pavilion	103.41	29.56	800	line transect	2
Baiguo Village	103.34	29.43	860	line transect	1
Chadi Village	103.36	29.59	914	line transect	1
Weigan Village	103.31	29.60	1100	line transect	1
Longdong Village	103.28	29.58	1250	line transect	2
Qiliping	103.25	29.57	1280	line transect	1
Linggongli	103.29	29.58	1340	line transect	2
Kuhaoping	103.27	29.45	1470	line transect	2
Changshou Bridge	103.35	29.56	1540	line transect	1
Jinchuan Village	103.24	29.44	1560	line transect	2
Longqiaogou	103.35	29.55	1900	line transect	1
Jingding	103.33	29.52	3050	line transect	1
Shouxing Bridge	103.37	29.55	1280	sampling point	1
Shuangshuijing	103.32	29.55	2230	sampling point	1
Leidongping	103.33	29.55	2433	sampling point	1

<i>Odorrana margaretae</i>	1	1	1	1	1	1	1	1	0	0	0	0	0
<i>Odorrana schmackeri</i>	1	1	0	0	0	0	0	0	0	0	0	0	0
<i>Oreolalax major</i>	0	0	0	0	0	1	1	1	0	0	0	0	0
<i>Oreolalax multipunctatus</i>	0	0	0	0	0	0	1	1	0	0	0	0	0
<i>Oreolalax omeimontis</i>	0	1	1	1	1	1	1	1	0	0	0	0	0
<i>Oreolalax popei</i>	0	0	1	1	1	1	1	1	0	0	0	0	0
<i>Oreolalax schmidti</i>	0	0	0	0	0	1	1	1	1	1	0	0	0
<i>Pelophylax nigromaculatus</i>	1	1	1	1	1	0	0	0	0	0	0	0	0
<i>Polypedates megacephalus</i>	0	1	1	1	1	1	0	0	0	0	0	0	0
<i>Quasipaa boulengeri</i>	1	1	1	1	1	1	1	1	0	0	0	0	0
<i>Rana chevronta</i>	0	0	0	0	0	0	1	0	0	0	0	0	0
<i>Rana omeimontis</i>	1	1	1	1	1	1	1	1	0	0	0	0	0
<i>Rhacophorus chenfui</i>	0	1	1	1	1	1	0	0	0	0	0	0	0
<i>Rhacophorus dugritei</i>	0	0	0	0	0	1	1	1	1	1	1	1	1
<i>Rhacophorus omeimontis</i>	1	1	1	1	1	1	1	0	0	0	0	0	0
<i>Scutiger chintingensis</i>	0	0	0	0	0	0	0	0	0	0	0	1	1
<i>Xenophrys minor</i>	1	1	1	1	1	1	0	0	0	0	0	0	0
<i>Xenophrys omeimontis</i>	1	1	1	1	1	1	1	1	0	0	0	0	0

Supplementary Table S3. List of nine functional traits associated with morphology, reproduction, habitat, food acquisition, and locomotion.

Functional traits	Description	Type	Functional meaning
Reproductive			
Development mode	eggs terrestrial and larvae aquatic (0); eggs and larvae aquatic (1)	binary	Strategy and reproductive success and habitat use
Reproductive cycle	seasonal reproduction (0), un-seasonal reproduction (1)	binary	Strategy and reproductive success
Egg size	the mean diameter of eggs of each species	continuous	Strategy and reproductive success
Habitat-related			
Adult microhabitat	aquatic, semi-aquatic, terrestrial and arboreal	categorical	Habitat use
Primary larval habitat	isolated ponds, stream or connected ponds	categorical	Habitat use
Morphological			
Snout-vent length	direct line distance from tip of snout to posterior margin of vent	continuous	Important trait correlating with many physiological and biochemical processes and determining life history and ecological niche
Head length	from the posterior of the jaws to the tip of the snout	continuous	Prey detection; predation and anti-predatory strategies; prey shape and food acquisition
Mobility mode			
Fore limb length	from the body to tip of finger III	continuous	Mobility performances: walking, jumping, climbing,
Hind limb length	measured from vent to tip of toe IV	continuous	swimming

Supplementary Table S4. Functional traits of each species on Mount Emei.

Species	DM	AQ	SA	TR	AR	IsoP	SCP	RC	Egg size	SVL	HL	FLL	HLL
<i>Amolops chunganensis</i>	1	0	0	1	0	0	1	0	0.73	39.66	14.09	19.11	75.42
<i>Amolops mantzorum</i>	1	0	1	0	0	0	1	0	0.83	58.90	19.52	30.54	108.27
<i>Andrias davidianus</i>	1	1	0	0	0	0	1	1	1.39	412.90	99.10	68.52	83.62
<i>Atympanophrys shapingensis</i>	1	0	1	0	0	0	1	0	0.81	85.10	29.32	39.13	131.90
<i>Babina daunchina</i>	0	0	1	0	0	1	0	1	0.94	45.26	17.08	18.33	77.43
<i>Batrachuperus londongensis</i>	1	1	0	0	0	0	1	0	1.02	94.13	23.38	23.75	27.33
<i>Batrachuperus pinchonii</i>	1	1	0	0	0	0	1	0	0.97	75.72	20.85	19.08	22.15
<i>Bufo gargarizans</i>	0	0	0	1	0	0	1	1	0.9	86.33	28.56	42.81	129.45
<i>Fejervarya multistriata</i>	1	0	1	0	0	1	0	1	0.87	42.75	15.82	15.71	64.55
<i>Hyla annectans</i>	1	0	1	0	0	1	0	0	0.86	36.05	10.41	18.72	57.52
<i>Hylarana guentheri</i>	1	1	0	0	0	1	0	0	0.99	71.56	23.82	29.61	116.07
<i>Kaloula rugifera</i>	1	0	0	1	0	1	0	0	0.8	41.20	11.53	18.77	56.44
<i>Leptobrachium boringii</i>	1	0	1	0	0	0	1	0	1.15	65.99	25.70	35.54	91.07
<i>Leptolalax oshanensis</i>	1	0	1	0	0	0	1	0	0.9	28.61	10.26	12.54	45.14
<i>Microhyla fissipes</i>	1	0	0	1	0	1	0	1	0.97	22.75	6.60	8.55	34.35
<i>Odorrana graminea</i>	1	0	1	0	0	0	1	0	0.52	71.97	26.79	34.88	135.58
<i>Odorrana margaretae</i>	1	0	1	0	0	0	1	1	0.79	85.31	32.00	39.18	165.21
<i>Odorrana schmackeri</i>	1	0	1	0	0	0	1	0	0.56	79.98	29.02	36.34	154.31
<i>Oreolalax major</i>	1	0	0	1	0	0	1	0	0.96	67.47	24.41	36.13	109.75
<i>Oreolalax multipunctatus</i>	1	0	1	0	0	0	1	0	1	48.10	17.80	23.60	75.90

<i>Oreolalax omeimontis</i>	1	0	0	1	0	0	1	0	0.99	52.69	18.79	26.19	84.29
<i>Oreolalax popei</i>	1	1	0	0	0	0	1	0	1.05	60.36	22.64	28.56	108.02
<i>Oreolalax schmidti</i>	1	1	0	0	0	1	0	0	0.85	41.91	14.20	17.61	66.12
<i>Pelophylax nigromaculatus</i>	1	0	1	0	0	1	0	0	0.84	72.13	26.41	29.66	119.28
<i>Polypedates megacephalus</i>	0	0	0	1	0	1	0	1	0.73	44.48	16.21	21.22	75.49
<i>Quasipaa boulengeri</i>	1	0	1	0	0	0	1	1	0.92	84.87	32.91	36.48	147.12
<i>Rana chevronta</i>	1	0	0	1	0	1	0	0	0.77	44.92	15.28	20.50	82.58
<i>Rana omeimontis</i>	1	0	0	1	0	1	0	0	0.9	56.99	19.84	23.50	113.62
<i>Rhacophorus chenfui</i>	1	0	1	0	0	1	0	0	0.72	39.42	14.07	19.41	60.18
<i>Rhacophorus dugritei</i>	0	0	1	0	0	1	0	0	0.71	44.80	15.81	23.19	66.94
<i>Rhacophorus omeimontis</i>	0	0	0	0	1	1	0	1	0.78	61.25	20.98	31.74	101.08
<i>Scutigera chintingensis</i>	1	0	1	0	0	0	1	0	0.83	43.43	14.88	19.09	61.41
<i>Xenophrys minor</i>	1	0	1	0	0	0	1	1	0.85	39.05	12.88	16.76	61.80
<i>Xenophrys omeimontis</i>	1	0	1	0	0	0	1	0	0.8	57.27	20.83	24.10	100.99

DM: eggs terrestrial and larvae aquatic (0), eggs and larvae aquatic (1). AQ: aquatic (0 or 1). SA: semi-aquatic (0 or 1). TR: terrestrial (0 or 1). AR: arboreal (0 or 1). IsoP: isolated ponds (0 or 1). SCP: stream or connected ponds (0 or 1). RC: seasonal reproduction (0), un-seasonal reproduction (1). SVL: snout-vent length; HL: head length; FLL: fore limb length; HLL: hind limb length.

Supplementary Table S5. Traits used to measure functional diversity and the phylogenetic signals (more details see Table S3).

Trait types	Trait	Phylogenetic signal	P_{Brownian}	P_{random}
statistic D values				
Reproduction	Development mode	D = 0.2288	0.406	0.054
	Reproductive cycle	D = 0.7917	0.044	0.243
Habitat-related	Aquatic	D = -0.0214	0.519	0.012
	Semi-aquatic	D = 0.5422	0.140	0.048
	Terrestrial	D = 0.6478	0.085	0.144
	Arboreal	D = 3.0478	0.138	0.690
	Isolated ponds	D = -0.0002	0.541	<0.001
	Stream or connected ponds	D = -0.0071	0.541	0.001
Pagel's λ values				
Reproduction	Egg size	$\lambda = 0.9858$		<0.001
Morphology	Snout–vent length	$\lambda = 0.9999$		<0.001
	Head length	$\lambda = 0.9999$		<0.001
Mobility mode	Fore limb length	$\lambda = 0.9739$		0.090
	Hind limb length	$\lambda = 0.8228$		0.022

Significant phylogenetic signals ($P_{\text{random}} < 0.05$) are in boldface.

Supplementary Table S6. Climatic variables compiled to depict the influences of climate on multidimensional biodiversity patterns and community structures.

Abbreviation	Variable defines	Included in the study
bio01	Annual mean temperature	No
bio02	Mean monthly temperature range	Yes
bio03	Isothermality	No
bio04	Temperature seasonality	Yes
bio05	Max temperature of the warmest month	No
bio06	Min temperature of the coldest month	No
bio07	Temperature annual range	Yes
bio08	Mean temperature of the wettest quarter	No
bio09	Mean temperature of the driest quarter	No
bio10	Mean temperature of the warmest quarter	No
bio11	Mean temperature of the coldest quarter	No
bio12	Annual precipitation	Yes
bio13	Precipitation of the wettest month	No
bio14	Precipitation of the driest month	No
bio15	Precipitation seasonality	No
bio16	Precipitation of the wettest quarter	No
bio17	Precipitation of the driest quarter	No
bio18	Precipitation of the warmest quarter	No
bio19	Precipitation of the coldest quarter	No

Supplementary Table S7. Elevational patterns of multidimensional diversity (i.e., phylogenetic diversity, PD; functional diversity, FD; standardized effect size of phylogenetic diversity, SES. PD; SES. FD and phylogenetic NRI/NTI, functional NRI/NTI) based on polynomial regressions models.

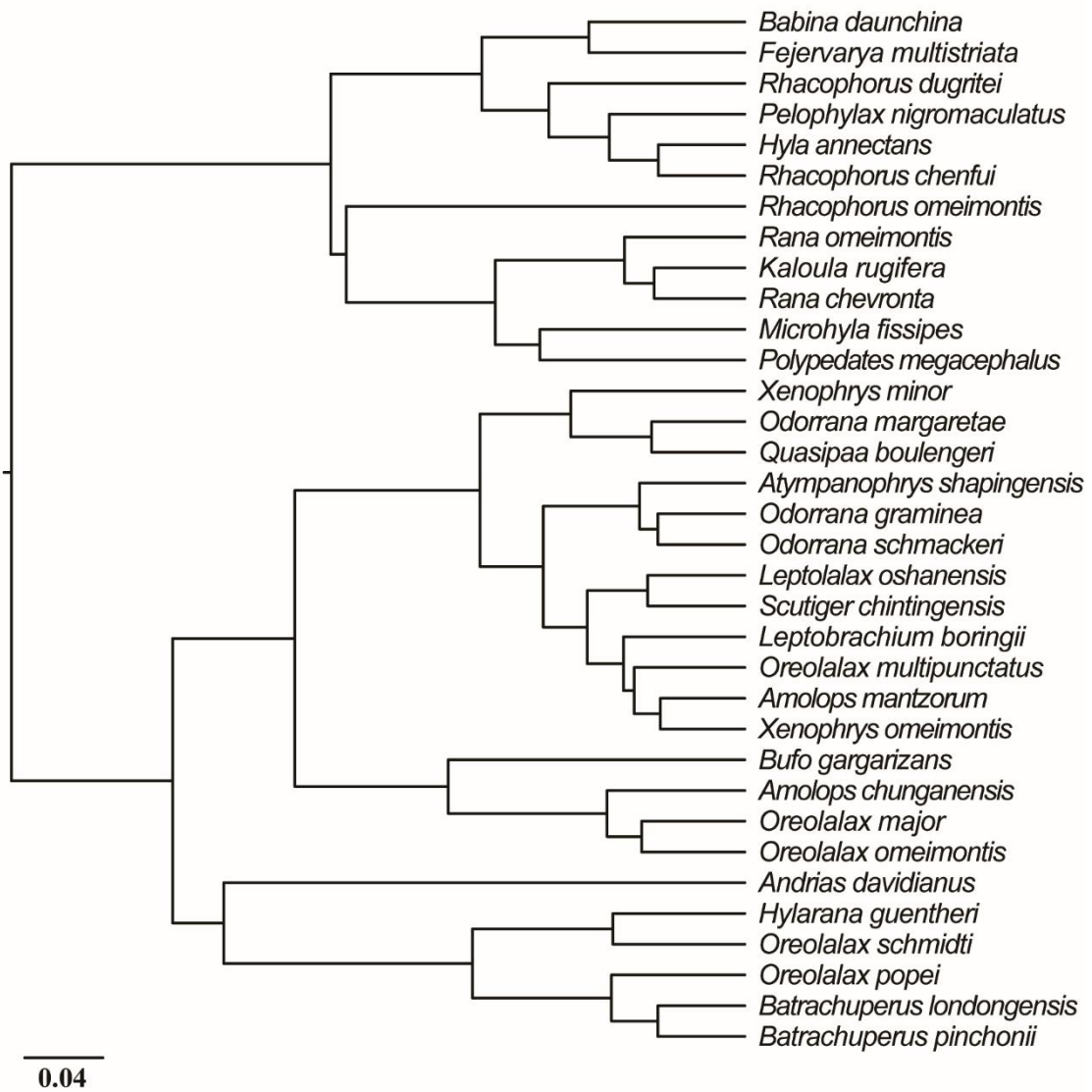
Polynomial regressions	PD	FD	SES.PD	SES.FD	Phylogenetic NRI	Phylogenetic NTI	Functional NRI	Functional NTI
First-order R ²	0.81***	0.77***	0.57**	0.38*	0.56**	0.51**	0.68***	0.20
AICc	183.75	22.43	45.35	43.04	46.01	36.90	34.92	40.79
Second-order R ²	0.84***	0.81***	0.58*	0.36	0.58*	0.51*	0.69**	0.26
AICc	185.86	24.05	49.34	47.22	49.70	41.23	38.82	44.18
Third-order R ²	0.93***	0.92***	0.72**	0.39	0.65*	0.86***	0.70*	0.31
AICc	179.70	18.42	49.76	52.20	52.84	30.41	43.95	48.87

Tested effects were significant at: * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$. Bold numbers indicated that the model best accounted for variation in the diversity and structures along elevation based on the smallest AICc value.

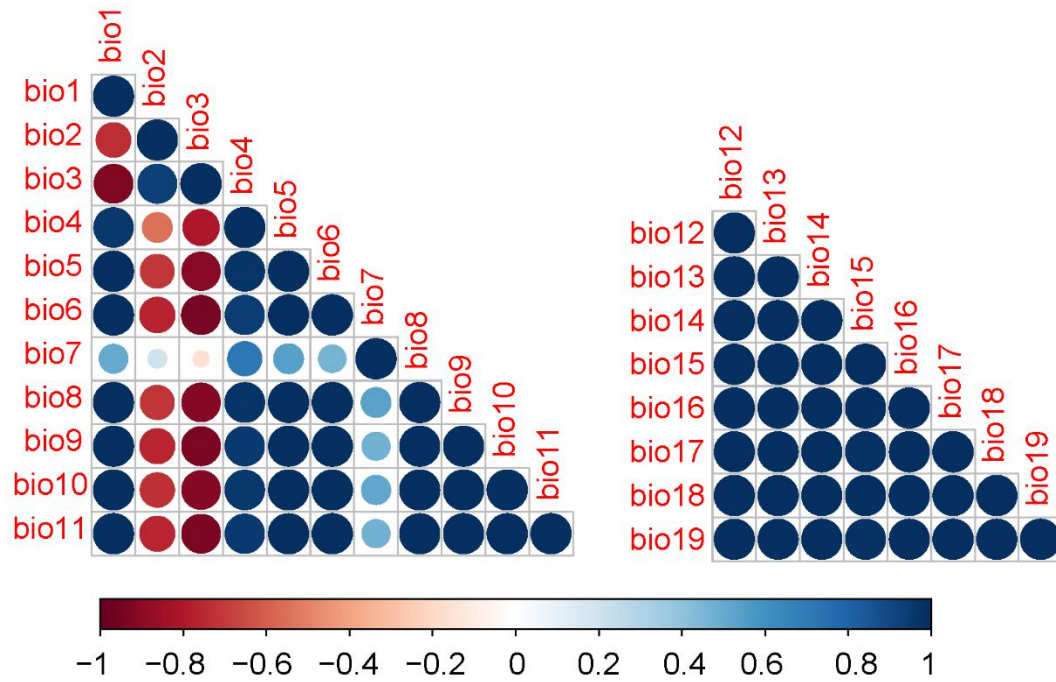
Supplementary Table S8. Model-averaging coefficients and the relative importance of variables for multidimensional metrics.

Metrics	Factors	Estimate	SE	<i>P</i>	<i>Wi</i>
Phylogenetic diversity (PD)	annual precipitation	-6.194	0.886	<0.001	1.00
	temperature seasonality	4.509	1.464	0.003	1.00
	solar radiation	2.235	0.373	<0.001	1.00
	mean monthly temperature	-1.989	0.957	<0.001	0.68
	temperature annual range	-2.411	1.143	<0.001	0.32
Functional diversity (FD)	annual precipitation	-6.722	0.952	<0.001	1.00
	mean monthly temperature	-2.736	1.163	0.022	1.00
	solar radiation	2.565	0.403	<0.001	1.00
	temperature seasonality	3.908	0.403	<0.001	0.72
	temperature annual range	3.100	0.346	<0.001	0.28
SES. PD	mean monthly temperature	5.325	6.149	0.397	0.87
	NDVI	-0.963	0.291	0.004	0.36
	temperature seasonality	17.460	5.333	0.005	0.29
	temperature annual range	-15.41	4.585	0.004	0.29
	Area	-0.523	0.172	0.008	0.21
	annual precipitation	-0.762	0.195	0.001	0.13
Phylogenetic NRI	solar radiation	1.346	0.620	0.037	0.64
	NDVI	1.185	0.689	0.104	0.43
	temperature annual range	4.493	8.147	0.589	0.36
	annual precipitation	0.762	0.195	0.001	0.14
	mean monthly temperature	-13.360	4.136	0.005	0.12
	temperature seasonality	-17.530	5.760	0.008	0.12
	Area	0.344	0.178	0.089	0.10
	potential evapotranspiration	0.748	0.200	0.001	0.10
Phylogenetic NTI	Area	0.903	0.309	0.007	1.00
	mean monthly temperature	-1.475	0.605	0.022	1.00
	annual precipitation	-1.126	0.465	0.036	0.48
	potential evapotranspiration	-0.829	0.404	0.075	0.22
Functional NRI	NDVI	1.332	0.427	0.005	1.00
	annual precipitation	3.866	1.860	0.048	0.53
	temperature annual range	-0.847	0.336	0.027	0.32
	mean monthly temperature	-1.326	0.445	0.006	0.29
	solar radiation	1.500	0.752	0.054	0.29
	potential evapotranspiration	-3.871	1.238	0.007	0.26
	temperature seasonality	-1.800	0.640	0.015	0.13

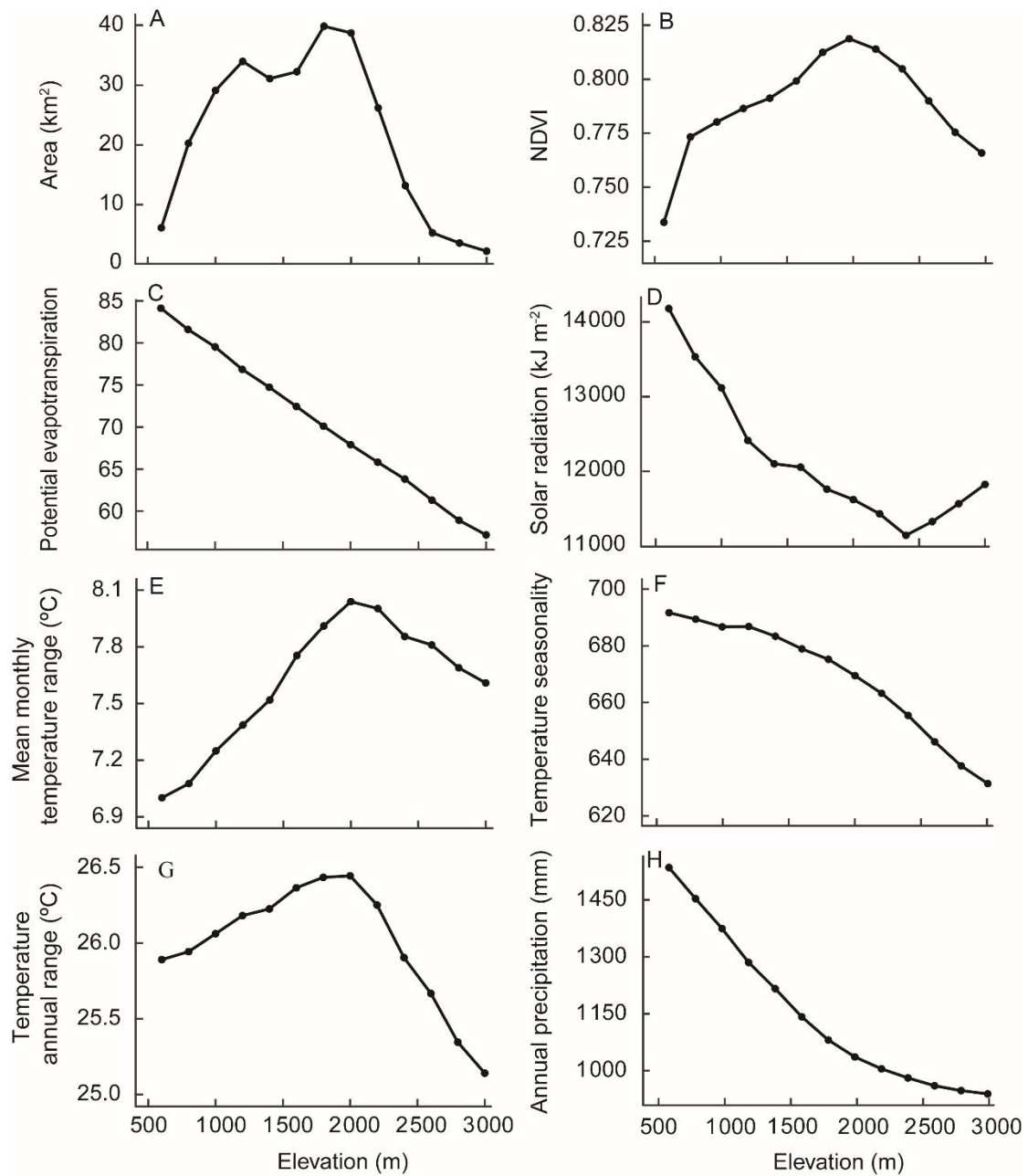
Wi is the importance value of each variable for model-averaging. Negative relationships are indicated by (-). SES, standardized effect size; NRI, the net relatedness index; NTI, the nearest taxon index; NDVI, normalized difference vegetation index.



Supplementary Figure S1. The functional dendrogram with coverage of 34 amphibian species on Mount Emei, southwestern China.



Supplementary Figure S2. Correlation relationships among temperature and precipitation variables from the Pearson's analysis, respectively. Positive correlations are displayed in blue and negative correlations in red. Color intensity and the size of the circle are proportional to the correlation coefficients. Details of these variables are presented in Table S6.



Supplementary Figure S3. Elevational patterns of (A) area, (B) normalized difference vegetation index (NDVI), (C) potential evapotranspiration, (D) solar radiation, (E) mean monthly temperature range, (F) temperature seasonality, (G) temperature annual range, (H) annual precipitation of 13 elevational bands on Mount Emei.