Supplementary Information Appendix

Rate dynamics of ectotherm responses to thermal stress

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Table S1. Heat Tolerance - Thermal death time parameters according to Rezende *et al.* 2014

Species	Class	Life stage	Habitat	CT_{max}	z	r^2	Response	Reference
Acanthemblemaria hancocki	Actinopterygii	adult	aquatic	36.63	0.39	0.335	Mixed	Mora & Maya 2006
Atta sexdens rubropulosa	Insecta	adult	terrestrial	53.29	2.17	0.417	Decrease	Ribeiro et al. 2012
Bathygobius soporator	Actinopterygii	adult	aquatic	39.27	0.08	0.056	No effect	Vinagre et al. 2014
Ceratitis capitata	Insecta	adult	terrestrial	42.05	0.36	0.801	Increase	Nyamunkondiwa & Terblanche 2010
Ceratitis rosa	Insecta	adult	terrestrial	40.26	0.78	0.976	Increase	Nyamunkondiwa & Terblanche 2010
Clupea harengus	Actinopterygii	larvae	aquatic	31.82	3.28	0.885	Decrease	Moyano et al. 2017
Cydia pomonella	Insecta	adult	terrestrial	38.41	2.30	0.808	Increase	Chidawanyika & Terblanche 2011
Cyrtobagous salviniae	Insecta	adult	aquatic	57.79	6.34	0.861	Decrease	Allen et al. 2012
Deuteraphorura one	Collembola	adult	terrestrial	43.35	3.35	0.852	Decrease	Allen et al. 2016
Deuteraphorura two	Collembola	adult	terrestrial	46.62	3.81	0.942	Decrease	Allen et al. 2016
Dicentrarchus labrax	Actinopterygii	larvae	aquatic	32.14	0.04	0.128	No effect	Moyano et al. 2017
Drosophila melanogaster	Insecta	adult	terrestrial	42.67	1.75	0.984	Decrease	Chown et al. 2009
Drosophila subobscura	Insecta	adult	terrestrial	42.17	3.13	na	Decrease	Castañeda et al 2015
Eurypanopeus abbreviatus	Malacostraca	adult	aquatic	37.42	0.81	1.000	Increase	Vinagre et al. 2014
Exosphaeroma antikraussi	Malacostraca	adult	aquatic	40.60	1.32	na	No effect	Faulkner et al. 2014
Exosphaeroma gigas	Malacostraca	adult	aquatic	34.95	2.12	0.819	Decrease	Faulkner et al. 2014
Exosphaeroma laeviusculum	Malacostraca	adult	aquatic	49.26	5.04	0.802	Decrease	Faulkner et al. 2014
Folsomia candida	Collembola	adult	terrestrial	45.37	3.49	0.852	Decrease	Allen et al. 2016
Glossina pallidipes	Insecta	adult	terrestrial	56.41	7.49	0.716	Decrease	Terblanche et al. 2007, 2008
Hippolyte obliquimanus	Malacostraca	adult	aquatic	34.66	0.06	0.980	No effect	Vinagre et al. 2014
Hyale grandicornis	Malacostraca	adult	aquatic	52.68	8.58	0.976	Decrease	Faulkner et al. 2014
Hyale hirtipalma	Malacostraca	adult	aquatic	34.90	3.05	0.977	Decrease	Faulkner et al. 2014
Hypogastrura assimilis	Collembola	adult	terrestrial	51.75	3.81	0.942	Decrease	Allen et al. 2016
Hypogastrura viatica	Collembola	adult	terrestrial	52.10	5.20	0.993	Decrease	Allen et al. 2016
Lepomis gibbosus	Actinopterygii	juvenile	aquatic	36.25	0.43	0.216	Decrease	Becker & Genoway 1979
Linepithema humile	Insecta	adult	terrestrial	54.58	5.90	0.981	Decrease	Jumbam et al. 2008; Chown et al. 2009
Menippe nodifrons	Malacostraca	adult	aquatic	38.71	0.32	0.629	Increase	Vinagre et al. 2014

Nylanderia fulva	Insecta	adult	terrestrial	56.04	7.82	1.000	Decrease	Bentley et al. 2016
Oncorhynchus kitsutch	Actinopterygii	juvenile	aquatic	30.75	1.13	0.939	Decrease	Becker & Genoway 1979
Oncorhynchus mykiss	Actinopterygii	juvenile	aquatic	27.84	0.24	0.478	No effect	Galbreath et al. 2004
Palaemon northropi	Malacostraca	adult	aquatic	40.10	0.33	0.363	Decrease	Vinagre et al. 2014
Parablennius marmoreus	Actinopterygii	adult	aquatic	37.10	0.56	0.997	Decrease	Vinagre et al. 2014
Pycnopsyche guttifer	Insecta	larvae	aquatic	38.25	3.26	0.669	Decrease	Houghton et al. 2014
Rutilus rutilus	Actinopterygii	adult	aquatic	31.58	0.17	0.026	No effect	Cocking 1956
Salmo salar	Actinopterygii	juvenile	aquatic	37.49	2.03	0.883	Decrease	Elliott & Elliott 1995
Salmo trutta	Actinopterygii	juvenile	aquatic	34.54	1.90	0.665	Decrease	Elliott & Elliott 1995; Galbreath et al. 2004
Salvelinus fontinalis	Actinopterygii	juvenile	aquatic	31.07	0.75	0.944	Decrease	Galbreath et al. 2004
Solenopsis invicta	Insecta	adult	terrestrial	62.57	8.66	0.996	Decrease	Bentley et al. 2016
Tenebrio molitor	Insecta	adult	terrestrial	42.54	0.19	0.031	Mixed	Allen et al. 2012
Thaumatotibia leucotreta	Insecta	adult	terrestrial	45.78	1.42	0.971	No effect	Terblanche et al. 2017
Thaumatotibia leucotreta	Insecta	larvae	terrestrial	64.87	8.86	0.908	Decrease	Terblanche et al. 2017
Xenylla humicola	Collembola	adult	terrestrial	50.62	4.32	0.981	Decrease	Allen et al. 2016

CT_{max} - intercept of the curve

z - slope of the curve

r^2 - Variance explained by the linear semi-logarithmic model (na = have only two rates of temperature change, variance not calculated)

Response - Change in heat tolerance as time of exposure increases

Table S2. Cold Tolerance - Thermal death time parameters according to Rezende *et al.* 2014

Species	Class	Life stage	Habitat	CT_{min}	z'	r^2	Response	Reference
Ceratitis capitata	Insecta	adult	terrestrial	8.39	1.15	0.995	Increase	Nyamunkondiwa & Terblanche 2010
Ceratitis rosa	Insecta	adult	terrestrial	8.06	0.93	0.974	Increase	Nyamunkondiwa & Terblanche 2010
Cryptolestes ferrugineus	Insecta	adult	terrestrial	57.45	12.36	na	Increase	Jian et al. 2015
Cydia pomonella	Insecta	adult	terrestrial	2.44	0.70	1.000	No effect	Chidawanyika & Terblanche 2011
Cyrtobagous salviniae	Insecta	adult	aquatic	3.17	3.60	0.785	Decrease	Allen et al. 2012
Deuteraphorura one	Collembola	adult	terrestrial	-2.83	0.27	0.084	No effect	Allen et al. 2016
Deuteraphorura two	Collembola	adult	terrestrial	-2.29	0.92	0.956	Decrease	Allen et al. 2016
Drosophila melanogaster	Insecta	adult	terrestrial	7.58	0.56	0.754	Increase	Chown et al. 2009
Folsomia candida	Collembola	adult	terrestrial	-4.87	1.45	0.421	Decrease	Allen et al. 2016
Glossina pallidipes	Insecta	adult	terrestrial	-232.51	143.52	0.837	Decrease	Terblanche et al. 2007, 2008
Hypogastrura assimilis	Collembola	adult	terrestrial	0.79	1.31	0.993	Increase	Allen et al. 2016
Hypogastrura viatica	Collembola	adult	terrestrial	-0.90	2.46	0.912	Increase	Allen et al. 2016
Linepithema humile	Insecta	adult	terrestrial	-2.34	0.99	0.943	Decrease	Jumbam et al. 2008; Chown et al. 2009
Litopenaeus vannamei	Malacostraca	post larvae	aquatic	9.61	0.23	na	No effect	Kumlu et al. 2010
Locusta migratoria	Insecta	adult	terrestrial	-0.25	0.10	0.009	Mixed	Findsen et al. 2014
Nylanderia fulva	Insecta	adult	terrestrial	6.76	0.22	0.289	No effect	Bentley et al. 2016
Penaeus semisulcatus	Malacostraca	juvenile	aquatic	-3.79	4.03	0.973	Decrease	Kir & Kumlu 2008
Sitobion avenae	Insecta	adult	terrestrial	4.34	2.69	0.933	Increase	Powell and Bale 2006
Solenopsis invicta	Insecta	adult	terrestrial	2.91	0.56	0.814	No effect	Bentley et al. 2016
Tenebrio molitor	Insecta	adult	terrestrial	9.40	1.85	0.858	Increase	Allen et al. 2012
Thaumatotibia leucotreta	Insecta	adult	terrestrial	7.95	2.49	0.944	Increase	Terblanche et al. 2017
Thaumatotibia leucotreta	Insecta	larvae	terrestrial	-11.86	11.30	0.694	Decrease	Terblanche et al. 2017
Tribolium castaneum	Insecta	adult	terrestrial	6.00	0.00	na	No effect	Jian et al. 2015
Xenylla humicola	Collembola	adult	terrestrial	-7.30	1.13	0.380	Increase	Allen et al. 2016

CT_{min} - intercept of the curve

z' - slope of the curve

r^2 - Variance explained by the linear semi-logarithmic model (na = have only two rates of temperature change, variance not calculated)

Response - Change in cold tolerance as time of exposure increases

Table S3. *CTmax* models - Best models and the variance accounting for the statistical effects of the failure rate model according to Kingsolver & Umbanhowar, 2018

Species	Class	Life stage	Habitat	Best Failure Rate Model	Variance	Response	Reference	Comments
Acanthemblemaria hancocki	Actinopterygii	adult	aquatic	Zero Exponential Threshold	0.436	Mixed	Mora & Maya 2006	
Atta sexdens rubropulosa	Insecta	adult	terrestrial	Exponential/Zero Exponential	0.460	Increase	Ribeiro et al. 2012	
Bathygobius soporator	Actinopterygii	adult	aquatic	Zero Power Threshold	0.053	No effect	Vinagre et al. 2014	Other good model fit: Exponential Threshold and Zero Exponential Threshold
Ceratitis capitata	Insecta	adult	terrestrial	Converse trend	na	Decrease	Nyamunkondiwa & Terblanche 2010	
Ceratitis rosa	Insecta	adult	terrestrial	Converse trend	na	Decrease	Nyamunkondiwa & Terblanche 2010	
Clupea harengus	Actinopterygii	larvae	aquatic	Exponential/Zero Exponential	0.312	Increase	Moyano et al. 2017	
Cydia pomonella	Insecta	adult	terrestrial	Converse trend	na	Decrease	Chidawanyika & Terblanche 2011	
Cyrtobagous salviniae	Insecta	adult	aquatic	Exponential/Zero Exponential	0.893	Increase	Allen et al. 2012	
Deuteraphorura one	Collembola	adult	terrestrial	Exponential/Zero Exponential	0.869	Increase	Allen et al. 2016	
Deuteraphorura two	Collembola	adult	terrestrial	Exponential/Zero Exponential	0.952	Increase	Allen et al. 2016	
Dicentrarchus labrax	Actinopterygii	larvae	aquatic	Exponential/Zero Exponential	0.125	No effect	Moyano et al. 2017	
Drosophila melanogaster	Insecta	adult	terrestrial	Zero Power Threshold	0.986	Increase	Chown et al. 2009	Other good model fit: Exponential Threshold and Zero Exponential Threshold
Drosophila subobscura	Insecta	adult	terrestrial	Only two rates of temp. change	na	Increase	Castañeda et al 2015	
Eurypanopeus abbreviatus	Malacostraca	adult	aquatic	Converse trend	na	Decrease	Vinagre et al. 2014	
Exosphaeroma antikraussi	Malacostraca	adult	aquatic	Only two rates of temp. change	na	No effect	Faulkner et al. 2014	
Exosphaeroma gigas	Malacostraca	adult	aquatic	Exponential/Zero Exponential	0.745	Increase	Faulkner et al. 2014	
Exosphaeroma laeviusculum	Malacostraca	adult	aquatic	Exponential/Zero Exponential	0.744	Increase	Faulkner et al. 2014	
Folsomia candida	Collembola	adult	terrestrial	Exponential/Zero Exponential	0.869	Increase	Allen et al. 2016	
Glossina pallidipes	Insecta	adult	terrestrial	Exponential Threshold	0.864	Increase	Terblanche et al. 2007, 2008	
Hippolyte obliquimanus	Malacostraca	adult	aquatic	Zero Power Threshold	0.981	No effect	Vinagre et al. 2014	Other good model fit: Exponential Threshold and Zero Exponential Threshold
Hyale grandicornis	Malacostraca	adult	aquatic	Zero Exponential	0.952	Increase	Faulkner et al. 2014	
Hyale hirtipalma	Malacostraca	adult	aquatic	Exponential/Zero Exponential	0.893	Increase	Faulkner et al. 2014	
Hypogastrura assimilis	Collembola	adult	terrestrial	Exponential/Zero Exponential	0.949	Increase	Allen et al. 2016	
Hypogastrura viatica	Collembola	adult	terrestrial	Exponential/Zero Exponential	0.994	Increase	Allen et al. 2016	
Lepomis gibbosus	Actinopterygii	juvenile	aquatic	Exponential/Zero Exponential	0.234	Increase	Becker & Genoway 1979	
Linepithema humile	Insecta	adult	terrestrial	Exponential/Zero Exponential	0.985	Increase	Jumbam et al. 2008; Chown et al. 2009	
Menippe nodifrons	Malacostraca	adult	aquatic	Converse trend	na	Decrease	Vinagre et al. 2014	
Nylanderia fulva	Insecta	adult	terrestrial	Exponential/Zero Exponential	0.999	Increase	Bentley et al. 2016	
Oncorhynchus kitsutch	Actinopterygii	juvenile	aquatic	Exponential/Zero Exponential	0.942	Increase	Becker & Genoway 1979	
Oncorhynchus mykiss	Actinopterygii	juvenile	aquatic	Exponential/Zero Exponential	0.762	No effect	Galbreath et al. 2004	
Palaemon northropi	Malacostraca	adult	aquatic	Exponential Threshold/Zero Exponential Threshold	0.381	Increase	Vinagre et al. 2014	Other good model fit: Zero Power Threshold
Parablennius marmoreus	Actinopterygii	adult	aquatic	Zero Power Threshold	0.997	Increase	Vinagre et al. 2014	Other good model fit: Exponential Threshold and Zero Exponential Threshold
Pycnopsyche guttifer	Insecta	larvae	aquatic	Exponential/Zero Exponential	0.723	Increase	Houghton et al. 2014	
Rutilus rutilus	Actinopterygii	adult	aquatic	Exponential/Zero Exponential	0.000	No effect	Cocking 1956	
Salmo salar	Actinopterygii	juvenile	aquatic	Exponential/Zero Exponential	0.628	Increase	Elliott & Elliott 1995	
Salmo trutta	Actinopterygii	juvenile	aquatic	Exponential/Zero Exponential	0.414	Increase	Elliott & Elliott 1995; Galbreath et al. 2004	
Salvelinus fontinalis	Actinopterygii	juvenile	aquatic	Exponential/Zero Exponential	0.626	Increase	Galbreath et al. 2004	
Solenopsis invicta	Insecta	adult	terrestrial	Exponential Threshold	0.999	Increase	Bentley et al. 2016	Other good model fit: Zero Exponential Threshold
Tenebrio molitor	Insecta	adult	terrestrial	Exponential/Zero Exponential	0.023	Mixed	Allen et al. 2012	
Thaumatotibia leucotreta	Insecta	adult	terrestrial	Zero Power Threshold	0.974	No effect	Terblanche et al. 2017	Other good model fit: Exponential Threshold and Zero Exponential Threshold

Thaumatotibia leucotreta	Insecta	larvae	terrestrial	Zero Exponential Threshold	0.938	Increase	Terblanche et al. 2017	Other good model fit: Exponential Threshold and Zero Power Threshold
Xenylla humicola	Collembola	adult	terrestrial	Exponential/Zero Exponential	0.983	Increase	Allen et al. 2016	

Best Failure Rate Model - model with the lowest AICc (na = converse trend from the one expected by the model OR have only two rates of temperature change, variance not calculated)

Variance - Variance accounting for the statistical effects of the failure rate model (na = only two rates of temperature change, variance not calculated)

Response - Change in heat tolerance as ramping rate increases

Table S4. *CTmin* models - Best models and the variance accounting for the statistical effects of the failure rate model according to Kingsolver & Umbanhowar, 2018

Species	Class	Life stage	Habitat	Best Failure Rate Model	Variance	Response	Reference	Comments
Ceratitis capitata	Insecta	adult	terrestrial	Converse trend	na	Decrease	Nyamunkondiwa & Terblanche 2010	
Ceratitis rosa	Insecta	adult	terrestrial	Converse trend	na	Decrease	Nyamunkondiwa & Terblanche 2010	
Cryptolestes ferrugineus	Insecta	adult	terrestrial	Only two rates of temp. change	na	Decrease	Jian et al. 2015	
Cydia pomonella	Insecta	adult	terrestrial	Zero Power Threshold	0.999	No effect	Chidawanyika & Terblanche 2011	Other good model fit: Exponential Threshold and Zero Exponential Threshold
Cyrtobagous salviniae	Insecta	adult	aquatic	Exponential/Zero Exponential	0.823	Increase	Allen et al. 2012	
Deuteraphorura one	Collembola	adult	terrestrial	Exponential Threshold/Zero Exponential Threshold	0.096	No effect	Allen et al. 2016	Other good model fit: Zero Power Threshold
Deuteraphorura two	Collembola	adult	terrestrial	Zero Power Threshold	0.958	Increase	Allen et al. 2016	Other good model fit: Exponential Threshold and Zero Exponential Threshold
Drosophila melanogaster	Insecta	adult	terrestrial	Converse trend	na	Decrease	Chown et al. 2009	
Folsomia candida	Collembola	adult	terrestrial	Zero Power Threshold	0.469	Increase	Allen et al. 2016	Other good model fit: Exponential Threshold and Zero Exponential Threshold
Glossina pallidipes	Insecta	adult	terrestrial	Exponential Threshold	0.996	Increase	Terblanche et al. 2007, 2008	
Hypogastrura assimilis	Collembola	adult	terrestrial	Converse trend	na	Decrease	Allen et al. 2016	
Hypogastrura viatica	Collembola	adult	terrestrial	Converse trend	na	Decrease	Allen et al. 2016	
Linepithema humile	Insecta	adult	terrestrial	Exponential/Zero Exponential	0.945	Increase	Jumbam et al. 2008; Chown et al. 2009	
Litopenaeus vannamei	Malacostraca	post larvae	aquatic	Only two rates of temp. change	na	No effect	Kumlu et al. 2010	
Locusta migratoria	Insecta	adult	terrestrial	Exponential/Zero Exponential	0.014	Mixed	Findsen et al. 2014	
Nylanderia fulva	Insecta	adult	terrestrial	Exponential Threshold/Zero Exponential Threshold	0.296	No effect	Bentley et al. 2016	
Penaeus semisulcatus	Malacostraca	juvenile	aquatic	Zero Power Threshold	0.871	Increase	Kir & Kumlu 2008	Other good model fit: Exponential Threshold and Zero Exponential Threshold
Sitobion avenae	Insecta	adult	terrestrial	Converse trend	na	Decrease	Powell and Bale 2006	
Solenopsis invicta	Insecta	adult	terrestrial	Exponential Threshold	0.818	No effect	Bentley et al. 2016	Other good model fit: Zero Power Threshold
Tenebrio molitor	Insecta	adult	terrestrial	Converse trend	na	Decrease	Allen et al. 2012	
Thaumatotibia leucotreta	Insecta	adult	terrestrial	Converse trend	na	Increase	Terblanche et al. 2017	
Thaumatotibia leucotreta	Insecta	larvae	terrestrial	Exponential Threshold	0.917	Decrease	Terblanche et al. 2017	Other good model fit: Zero Exponential Threshold and Zero Power Threshold
Tribolium castaneum	Insecta	adult	terrestrial	Only two rates of temp. change	na	No effect	Jian et al. 2015	
Xenylla humicola	Collembola	adult	terrestrial	Zero Power Threshold	0.424	Increase	Allen et al. 2016	Other good model fit: Exponential Threshold and Zero Exponential Threshold

Best Failure Rate Model - model with the lowest AICc (na = converse trend from the one expected by the model OR have only two rates of temperature change, variance not calculated)

Variance - Variance accounting for the statistical effects of the failure rate model (na = only two rates of temperature change, variance not calculated)

Response - Change in cold tolerance as ramping rate increases

Table S5

Outcome of Phylogenetic Generalised Least Squares (PGLS) analyses showing change in the sensitivity to temperature change (z and z') with the type of response observed to the increased time of exposure to high (z) and low (z') stressful temperatures, habitat and climate.

Response (z)	Estimate	s.e.	t	P
Decrease	3.369	0.725	4.654	**<0.0001**
Increase	-3.038	0.971	-3.128	**0.003**
Mixed	-3.013	1.403	-2.148	**0.038**
No Effect	-2.435	0.900	-2.706	**0.010**
$F_{(3,36)} = 5.905$, $p = 0.002194$, $R^2 = 0.33$, $_{ML}\lambda = 0.26$				
Response (z')	Estimate	s.e.	t	P
Decrease	2.198	0.407	5.398	**<0.0001**
Increase	-0.688	0.519	-1.326	0.204
Mixed	-2.098	0.997	-2.104	0.052
No Effect	-1.868	0.551	-3.389	**0.004**
$F_{(3,16)} = 4.60$, $p = 0.01667$, $R^2 = 0.46$, $_{ML}\lambda = 0.00$				
Habitat (z)	Estimate	s.e.	t	P
Aquatic	1.913	0.577	3.315	**0.002**
Terrestrial	1.671	0.849	1.968	0.056
$F_{(1,38)} = 3.873$, $p = 0.05639$, $R^2 = 0.09$, $_{ML}\lambda = 0.05$				
Habitat (z')	Estimate	s.e.	t	P
Aquatic	2.620	0.580	4.520	**0.0003**
Terrestrial	-1.603	0.629	-2.550	**0.020**
$F_{(1,18)} = 6.5$, $p = 0.02012$, $R^2 = 0.22$, $_{ML}\lambda = 0.00$				
Climate (z)	Estimate	s.e.	t	P
Polar	2.896	1.383	2.094	**0.043**

Sub-tropical	-0.357	1.889	-0.189	0.851
Temperate	-0.645	1.124	-0.574	0.569
Tropical	-0.367	1.253	-0.293	0.771
$F_{(3,36)} = 0.118$, $p = 0.949$, $R^2 = 0.0098$, $_{ML}\lambda = 0.40$				

Climate (z')	Estimate	s.e.	t	P
Polar	1.795	0.839	2.140	**0.048**
Sub-tropical	-0.680	1.186	-0.573	0.574
Temperate	-0.470	0.897	-0.524	0.607
Tropical	-1.405	1.186	-1.185	0.253
$F_{(3,16)} = 0.518$, $p = 0.6757$, $R^2 = 0.0886$, $_{ML}\lambda = 0.00$				

Table S6

Result of GLM testing the effects of rate of time to failure, body length and interaction on CT_{max} of juvenile and adult fish: CT_{max} ~ $\log_{10}$(FailTime) * $\log_{10}$(Body Length)

CT_{max}	Estimate	s.e.	t	P
CT_{max} (Intercept)	65.019	10.219	6.362	<0.0001
$\log_{10}$(Time to failure)	-6.488	3.413	-1.901	0.063
$\log_{10}$(Body Length)	-14.604	5.360	-2.724	**0.009**
$\log_{10}$(Time to failure) * $\log_{10}$(Body Length)	2.451	1.763	1.390	0.170

Table S7

Result of GLM testing the effects of rate of time to failure, body length and interaction on CT_{max} of crustaceans, insects, and springtails combined: CT_{max} ~ $\log_{10}$ (FailTime) * $\log_{10}$(Body Length)

CT_{max}	Estimate	s.e.	t	P
CT_{max} (Intercept)	60.086	4.825	12.452	<0.0001
$\log_{10}$(Time to failure)	-8.355	2.219	-3.766	**0.0003**
$\log_{10}$(Body Length)	-10.331	4.669	-2.213	**0.029**
$\log_{10}$(Time to failure) * $\log_{10}$(Body Length)	2.916	2.083	1.400	0.165

GLM models of time and body size interaction were run separately for fish and all the other taxa to avoid sampling bias in our analysis, since fish was the only taxonomic group in our dataset with body length above 31mm (Figure S3). CT_{max} variation among fish species was not a consequence of interaction between time and body length, even after excluding fish larvae from the dataset (Table S6). Likewise, CT_{max} variation among species from other taxonomic groups combined was not a consequence of interaction between time and body length (Table S7).

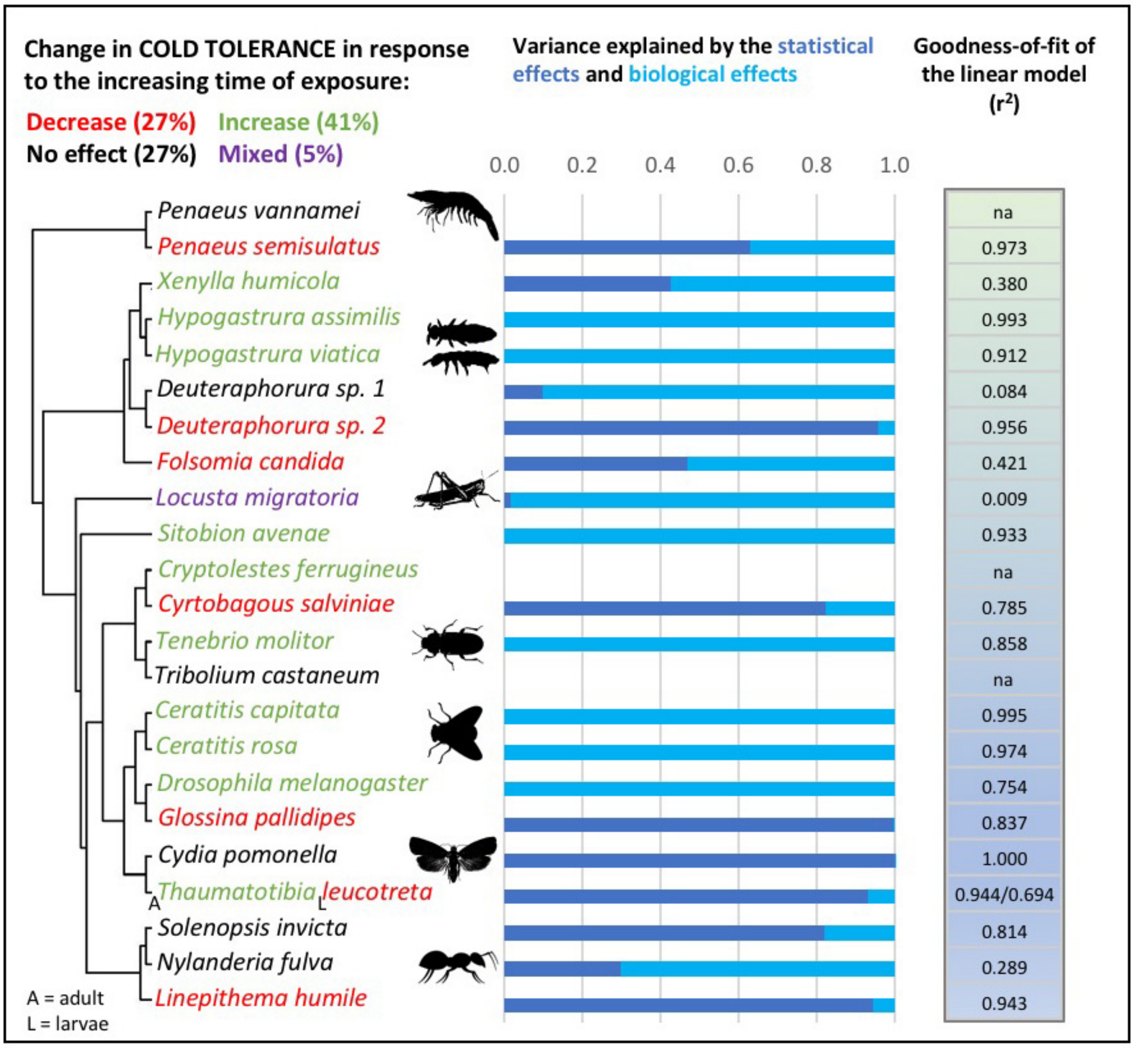

Figure S1. Phylogeny of 41 species of ectotherms used in the CT_{max} analysis and their response patterns describing the change in heat tolerance with the increasing exposure time (i.e. slower ramping rates). Variance explained by the statistical (dark blue) and biological (light blue) effects using a failure rate model [1] and goodness-of-fit of the thermal landscape model [2].

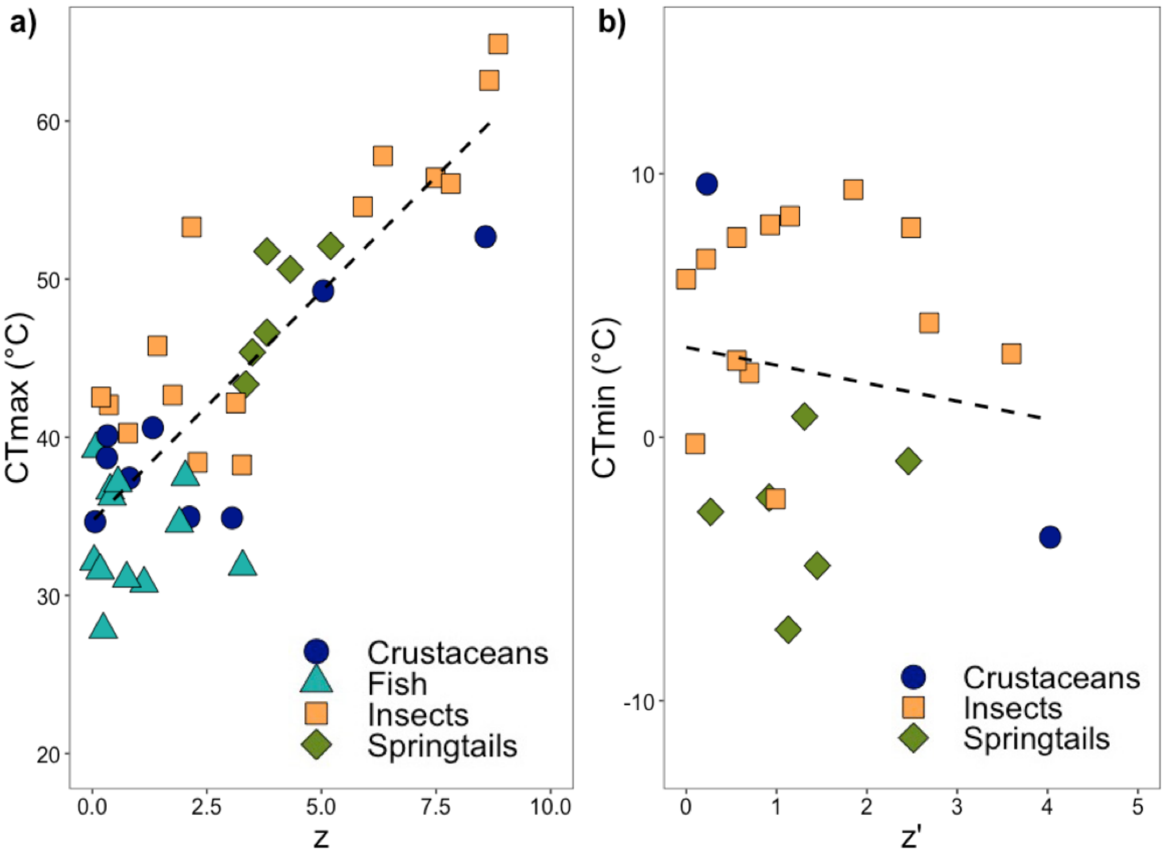

Figure S2. a) The association between parameters CT_{max} and z for 41 species of ectotherms b) The association between parameters CT_{min} and z' for 21 species of ectotherms. CT_{max} (CT_{min}) and *z* (*z'*) correspond to intercept and slope of log-linear model of CTLs against a logarithm of time for each species [2].

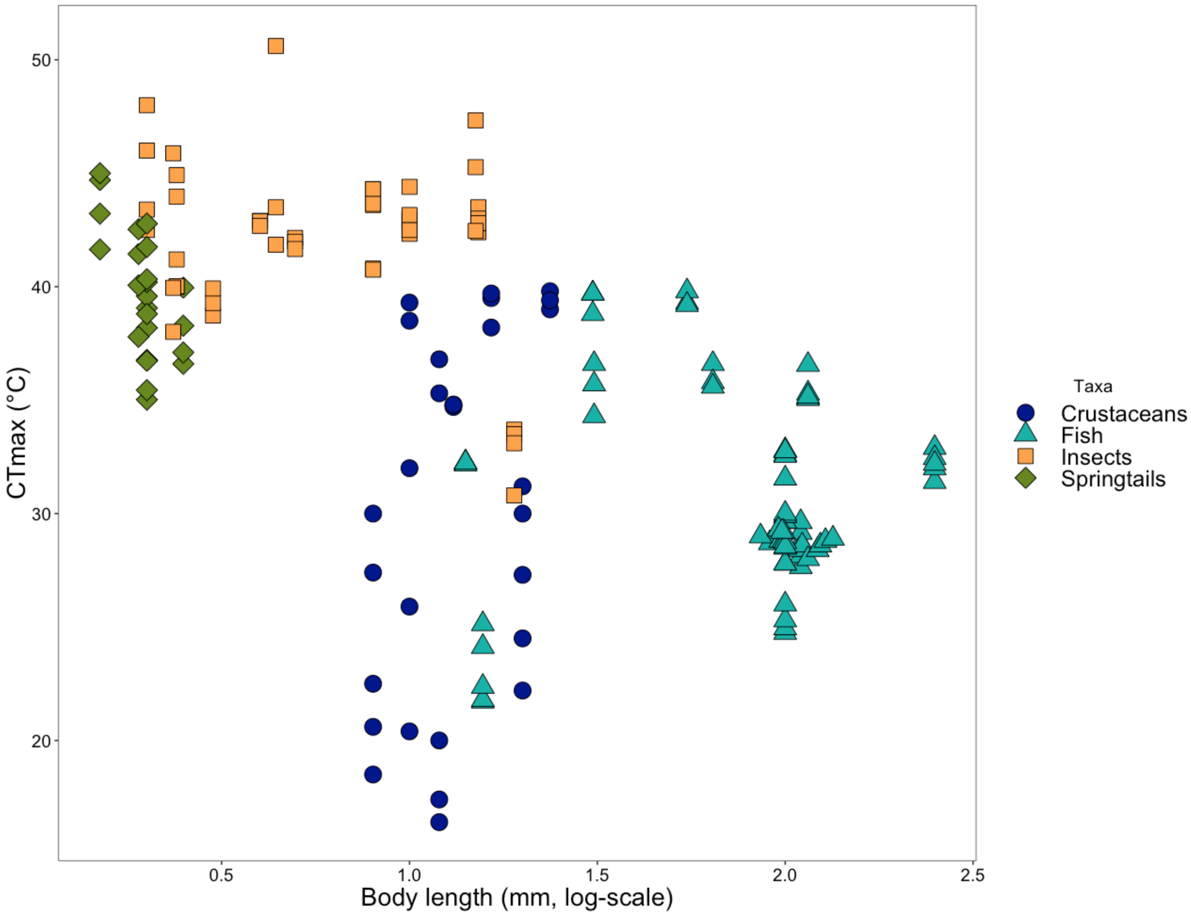

Figure S3. Relationship between body length (mm) and CT_{max} of 38 species of ectotherms

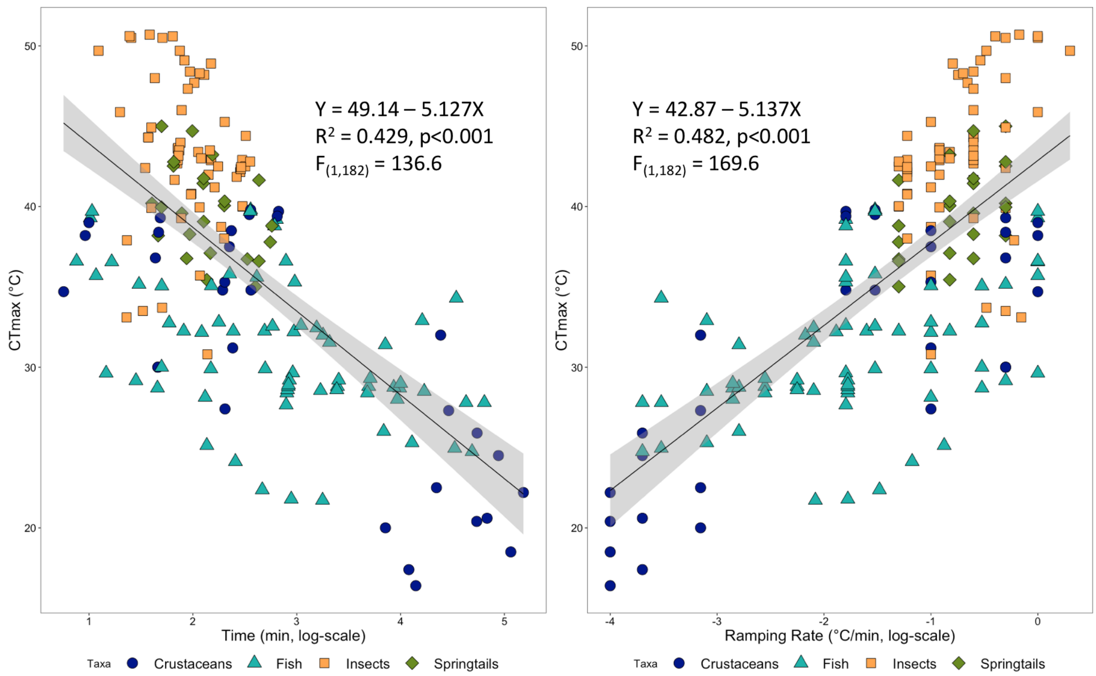

Figure S4. Left panel shows the overall time-temperature relationship. Right panel shows the overall rate-temperature relationship. The outcomes of the study are similar.

References

1. Kingsolver JG, Umbanhowar J. 2018 The analysis and interpretation of critical temperatures. *J. Exp. Biol.* **221** (doi:10.1242/jeb.167858)

2. Rezende EL, Castañeda LE, Santos M. 2014 Tolerance landscapes in thermal ecology. *Funct. Ecol.* **28**, 799–809. (doi:10.1111/1365-2435.12268)