Table S1. Summary of estimated acute thermal tolerance and assay temperatures that induce declines in mitochondrial parameters predicted to limit thermal tolerance.

		Mitochondrial parameter				
Species (tissue, acclimation temperature) and habitat climate	Estimated acute upper thermal tolerance limit (Assay type)	State III (Break point, or Max T_{assay})	Coupling ratio (RCR, ACR or P/O) ($T_{Decline}$)	Mito. membrane potential ($T_{Decline}$)	ATP synthesizing capacity ($T_{Decline}$)	ROS production (Respiratory state) ($T_{increase}$)
Alvinella pompejana (Gill, wild-caught) Hydrothermal vent Dahlhoff et al., 1991	55 °C (T_{lethal}, wild-caught)Ravaux et al., 2013	**48.6 °C** (ABT-CII)	NM	NM	NM	NM
Boreogadus saida (Heart fibre, 5 °C) Polar Leo et al., 2017	15.7 °C (CT_{max}, $T_{acclimation}$ = 3.5 °C)Drost et al., 2016	**3 °C** (plateau-CI, CII)	**6 °C** (coupling efficiency-CI, CII)see Gnaiger et al., 2015	NM	NM	NM
Bythograea thermydon (Hepatopancreas, wild-caught) Hydrothermal vent Dahlhoff et al., 1991	37.5 °C (T_{lethal}, wild-caught = 5 °C)Childress et al., 1982	**46.3 °C** (ABT-CII)	NM	NM	NM	NM
Chaenocephalus aceratus (Heart mito., 0 °C) Polar Urschel and O'Brien, 2009	13.9 °C (CT_{max}, $T_{acclimation}$ = 0 °C)Beers and Sidell, 2011	**28.7 °C** (ABT-CI)	**26 °C** (RCR-CI)	NM	NM	NM
Chionodraco rastrospinosus (Heart, mito., 0 °C) Polar Urschel and O'Brien, 2009	13.3 °C (CT_{max}, $T_{acclimation}$ = 0 °C)Beers and Sidell, 2011	**31.5 °C** (ABT-CI)	**26 °C** (RCR-CI)	NM	NM	NM
Drosophila simulans (Perm. whole animal, 24 °C) Tropical Pichaud et al., 2010	40.9 °C ($T_{knockdown}$, $T_{acclimation}$ = 27 °C) Overgaard et al., 2011	**24 °C** (decline)	**24 °C** (P/O)	NM	NM	NM
Fundulus heteroclitus heteroclitus (Heart fibre, 5 °C) Subtropical Chung et al., 2017	30.8 °C (CT_{max}, $T_{acclimation}$ = 2.3 °C) Fangue et al., 2006	ND (37 °C)	ND (RCR)	NM	NM	NM
Fundulus heteroclitus heteroclitus (Heart fibre, 15 °C) Subtropical Chung et al., 2018	34.9 °C (CT_{max}, $T_{acclimation}$ = 12.4 °C) Fangue et al., 2006	**33 °C** (plateau)	ND (RCR)	NM	NM	NM
Fundulus heteroclitus heteroclitus (Heart fibre, 33 °C) Subtropical Chung et al., 2018	42.5 °C (CT_{max}, $T_{acclimation}$ = 34 °C) Fangue et al., 2006	33 °C (plateau)	ND (RCR)	NM	NM	NM
Fundulus heteroclitus heteroclitus (Liver mito., 5 °C) Subtropical Chung et al., 2018	30.8 °C (CT_{max}, $T_{acclimation}$ = 2.3 °C) Fangue et al., 2006	33 °C (plateau)	33 °C (RCR)	NM	NM	NM
Fundulus heteroclitus heteroclitus (Liver mito., 15 °C) Subtropical Chung et al., 2018	34.9 °C (CT_{max}, $T_{acclimation}$ = 12.4 °C) Fangue et al., 2006	ND (37 °C)	**33 °C** (RCR)	NM	NM	NM
Fundulus heteroclitus heteroclitus (Liver mito., 25 °C) Subtropical Fangue et al., 2009	41.4 °C (CT_{max}, $T_{acclimation}$ = 26.5 °C) Fangue et al., 2006	30 °C (plateau)	30 °C (RCR)	NM	NM	NM
Fundulus heteroclitus heteroclitus (Liver mito., 33 °C) Subtropical Chung et al., 2018	42.5 °C (CT_{max}, $T_{acclimation}$ = 34 °C) Fangue et al., 2006	15 °C (plateau)	33 °C (RCR)	NM	NM	NM

Fundulus heteroclitus heteroclitus (Perm. brain, 5 °C) Subtropical Chung et al., 2017	30.8 °C (CT_{max}, $T_{acclimation}$ = 2.3 °C) Fangue et al., 2006	33 °C (plateau)	ND (RCR)	NM	NM	NM
Fundulus heteroclitus heteroclitus (Perm. brain, 15 °C) Subtropical Chung et al., 2017	34.9 °C (CT_{max}, $T_{acclimation}$ = 12.4 °C) Fangue et al., 2006	**33 °C** (plateau)	ND (RCR)	NM	NM	NM
Fundulus heteroclitus heteroclitus (Perm. brain, 33 °C) Subtropical Chung et al., 2017	42.5 °C (CT_{max}, $T_{acclimation}$ = 34 °C) Fangue et al., 2006	33 °C (plateau)	ND (RCR)	NM	NM	NM
Fundulus heteroclitus macrolepidotus (Heart fibre, 5 °C) Temperate Chung et al., 2017	28.6 °C (CT_{max}, $T_{acclimation}$ = 2.3 °C) Fangue et al., 2006	ND (37 °C)	ND (RCR)	NM	NM	NM
Fundulus heteroclitus macrolepidotus (Heart fibre, 15 °C) Temperate Chung et al., 2018	33.6 °C (CT_{max}, $T_{acclimation}$ = 12.4 °C) Fangue et al., 2006	**33 °C** (plateau)	ND (RCR)	NM	NM	NM
Fundulus heteroclitus macrolepidotus (Heart fibre, 33 °C) Temperate Chung et al., 2018	41.3 °C (CT_{max}, $T_{acclimation}$ = 34 °C) Fangue et al., 2006	ND (37 °C)	ND (RCR)	NM	NM	NM
Fundulus heteroclitus macrolepidotus (Liver mito., 5 °C) Temperate Chung et al., 2018	28.6 °C (CT_{max}, $T_{acclimation}$ = 2.3 °C) Fangue et al., 2006	33 °C (plateau)	33 °C (RCR)	33 °C (State III-CI) Chung and Schulte, 2015	NM	33 °C (State IV-CII) Chung and Schulte, 2015
Fundulus heteroclitus macrolepidotus (Liver mito., 15 °C) Temperate Chung et al., 2018	33.6 °C (CT_{max}, $T_{acclimation}$ = 12.4 °C) Fangue et al., 2006	**33 °C** (plateau)	**33 °C** (RCR)	33 °C (State III-CI) Chung and Schulte, 2015	NM	33 °C (State IV-CII) Chung and Schulte, 2015
Fundulus heteroclitus macrolepidotus (Liver mito., 25 °C) Temperate Fangue et al., 2009	40.4 °C (CT_{max}, $T_{acclimation}$ = 26.5 °C) Fangue et al., 2006	30 °C, (plateau)	35 °C (RCR)	NM	NM	NM
Fundulus heteroclitus macrolepidotus (Liver mito., 33 °C) Temperate Chung et al., 2018	41.3 °C (CT_{max}, $T_{acclimation}$ = 34 °C) Fangue et al., 2006	33 °C (plateau)	33 °C (RCR)	33 °C (State III-CI) Chung and Schulte, 2015	NM	33 °C (State IV-CII) Chung and Schulte, 2015
Fundulus heteroclitus macrolepidotus (Perm. brain, 5 °C) Temperate Chung et al., 2017	28.6 °C (CT_{max}, $T_{acclimation}$ = 2.3 °C) Fangue et al., 2006	ND (37 °C)	ND (RCR)	NM	NM	NM
Fundulus heteroclitus macrolepidotus (Perm. brain, 15 °C) Temperate Chung et al., 2017	33.6 °C (CT_{max}, $T_{acclimation}$ = 12.4 °C) Fangue et al., 2006	**33 °C** (plateau)	ND (RCR)	NM	NM	NM
Fundulus heteroclitus macrolepidotus (Perm. brain, 33 °C) Temperate Chung et al., 2017	41.3 °C (CT_{max}, $T_{acclimation}$ = 34 °C) Fangue et al., 2006	33 °C (plateau)	ND (RCR)	NM	NM	NM
Gadus morhua (Heart fibre, 5 °C) Subpolar Leo et al., 2017	21.4 °C (CT_{max}, $T_{acclimation}$ = 8 °C) Norin et al., 2019	**12 °C** (plateau-CI, CII)	ND (coupling efficiency-CI, CII) see Gnaiger et al., 2015	NM	NM	NM
Gobionotothen gibberifrons (Heart mito., 0 °C) Polar Urschel and O'Brien, 2009	15.4 °C (CT_{max}, $T_{acclimation}$ = 0 °C) Beers and Sidell, 2011	**31.4 °C** (ABT-CI)	**26 °C** (RCR-CI)	NM	NM	NM

Haliotis corrugata (Hepatopancreas, 20 °C) Mediterranean Dahlhoff and Somero, 1993	32.0 °C (CT_{max}, $T_{acclimation}$ = 19 °C) Diaz et al., 2006	**44.1 °C** (ABT-CII)	NM	NM	NM	NM
Haliotis fulgens (Hepatopancreas, 20 °C) Mediterranean Dahlhoff and Somero, 1993	33.6 °C (CT_{max}, $T_{acclimation}$ = 19 °C) Diaz et al., 2006	**40.6 °C** (ABT-CII)	NM	NM	NM	NM
Haliotis rufescens (Hepatopancreas, 12 °C) Mediterranean Dahlhoff and Somero, 1993	27.5 °C (CT_{max}, $T_{acclimation}$ = 17 °C) Diaz et al., 2000	**34.0 °C** (ABT-CII)	NM	NM	NM	NM
Lepidonotothen nudifrons (Liver mito., 0 °C) Polar Hardewig et al., 1999	8 to 11 °C (T_{lethal}), 15.06 °C (CT_{max}) Bilyk and DeVries, 2011	ND (18°C-CI)	**9 °C** (RCR-CI), ND (P/O-CII)	NM	NM	NM
Manduca sexta (Whole animal mito., 27 °C) Tropical Martinez et al., 2017	44.7 °C (CT_{max}, $T_{acclimation}$ = 28 °C) Kingsolver et al., 2016	**34 °C** (plateau-CI, CII)	**34 °C** (RCR-CI, CII)	NM	NM	NM
Mya arenaria (Mantle mito., 10 °C) Temperate Abele et al., 2002	31.3 °C (T_{lethal}, $T_{acclimation}$ = 10 °C) Compton et al., 2007	**15 °C** (ABT)	ND (RCR), 15 °C (P/O)	NM	NM	15 °C (State IV-CI, State III-CI)
Notolabrus celidotus (Heart fibre, 18 °C) Temperate Iftikar and Hickey, 2013	27.5 °C ($T_{heart\ failure}$)	ND (32.5 °C-CI)	25 °C (RCR-CI), 27.5 °C (P/O-CI, CII)	NM	27.5 °C	32.5 °C (State III-CI)
Notothenia coriiceps (Liver mito. 1 °C) Polar Mark et al., 2012	16.17 °C (CT_{max}, $T_{acclimation}$ = −1.5 °C) Bilyk and DeVries, 2011	**9 °C** (ABT-CI)	ND (RCR-CI)	6 °C (State II-CI)	NM	NM
Notothenia rossii (Liver mito. 1°C) Polar Mark et al., 2012	16.16 °C (CT_{max}, $T_{acclimation}$ = −1.5 °C) Bilyk and DeVries, 2011	**6 °C** (ABT-CI)	ND (RCR-CI)	9 °C (State II-CI)	NM	NM
Oreochromis mossambicus (Liver mito., 28 °C) Tropical Weinstein and Somero, 1998	42.22 °C (CT_{max}) King and Sardella, 2017	**43.5 °C** (ABT-CI, CII)	**35 °C** (ACR-CI, CII)	NM	NM	NM
Pachycara brachycephalum (Liver mito., 5 °C) Polar Lannig et al., 2005	17.15 °C (CT_{max}, $T_{acclimation}$ = 4 °C) Bilyk and DeVries, 2011	ND (20 °C)	20 °C (RCR)	NM	NM	NM
Pachycara brachycephalum (Liver, 0 °C) Polar Lannig et al., 2005	14.54 °C (CT_{max}) Bilyk and DeVries, 2011	ND (20 °C)	**20 °C** (RCR)	NM	NM	NM
Romaleon antennarius (Hepatopancreas, wild-caught) Temperate Dahlhoff et al., 1991	31.5 °C (CTmax, $T_{accliamtion}$ = 15 °C) Padilla-Ramírez et al., 2015	**31.0 °C** (ABT-CII)	NM	NM	NM	NM
Salvelinus alpinus (Heart mito., 10 °C) Polar Christen et al., 2018	23 °C (CT_{max})	**15 °C** (plateau)	NM	NM	NM	25 °C (State III-CI, CII)
Sebastes mystinus (Liver mito., 13 °C) Mediterranean Weinstein and Somero, 1998	22.5 °C (T_{lethal}, $T_{acclimation}$= 12 °C) TENERA Environemtnal Services, 1988	**39.5 °C** (ABT-CI, CII)	**20 °C** (ACR-CI, CII)	NM	NM	NM
Trematomus bernachchii (Liver mito., -1.86 °C) Polar Weinstein and Somero, 1998	13.62 °C (CT_{max}) Bilyk and DeVries, 2011	**20.3 °C** (ABT-CI, CII)	**18 °C** (ACR-CI, CII)	NM	NM	NM

Trematomus bernachchii (Liver mito., 4 °C) Polar Weinstein and Somero, 1998	15.02 °C (CT_{max}) Bilyk and DeVries, 2011	22.3 °C (ABT-CI, CII)	18 °C (ACR-CI, CII)	NM	NM	NM

ND: No clear acute temperature breakpoint detected, NM: Not measured, ABT: Arrhenius breakpoint temperature, plateau: no increase in function with increasing acute temperature, CI or CII following a mitochondrial parameter indicates the ETS complex being provided substrate, $T_{decline}$ – Acute temperature where a decline in mitochondrial function is observed, a range of acute temperatures is provided in instances where the exact $T_{decline}$ is ambiguous. Bold and underlined mitochondrial parameters are data that met the criteria for inclusion in Figure 2 – see section "Do mitochondria set organismal thermal limits?".

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