Conclusions:
The effect of temperature sensitivity and temperature variability varies depending on the size of food web community.

The risks of extinction of species in species-rich communities are higher as compared to species-poor communities.

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The response of ecosystems to an increasingly variable climate

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Reference : Deutsch, A. C., Tewksbury, J. J., Huey, B.R., Sheldon, S.K., Ghalambor, C. K., Haak, C. D., and Martin R.P., 2008. Impacts of climate warming on terrestrial ectotherms across latitude. PNAS 105 :18 6668-72.

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Background:

Ecological communities ranging from polar terrestrial to tropical marine environments are affected by climate change.

Rising temperature has increased the intensity and frequency of weather extremes due to which a large number of species are facing the risk of extinction.

Uneven distribution of temperature sensitive species and warming rate across the globe have highlighted the need for studies to predict the response of ecosystems to increasingly variable climate.

Aims:

To investigate how sensitivities of species to increasing temperature variability affect extinction risk.

To understand how connectance and species-richness affects community robustness with respect to increasing temperature variability.

Method:

✓Food web dynamics based on a generalized Rosenzweig-MacArthur model.

✓ Triangular shaped food webs with 6,12,18 and 24 species.

✓ Connectances with 0.07, 0.14, 0.21 and 0.28.

✓32 scenario,400 replicates per scenario.

✓The growth of a species was a function of temperature sensitivity and temperature standard deviation.

✓Figure 1& 2 illustrates how the model was constructed..

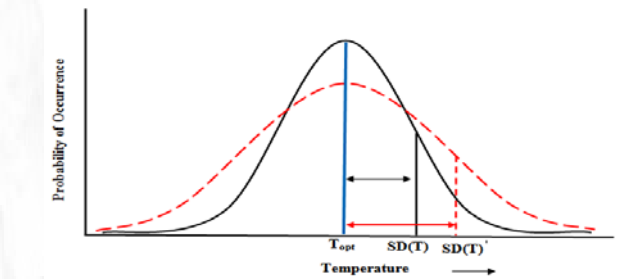


Fig 1: Normally distributed temperature time series was assumed. T_{opt} is the optimum temperature, SD(T) is the temperature standard deviation and SD(T)' is increased temperature

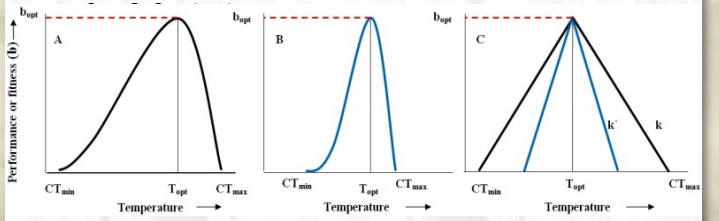


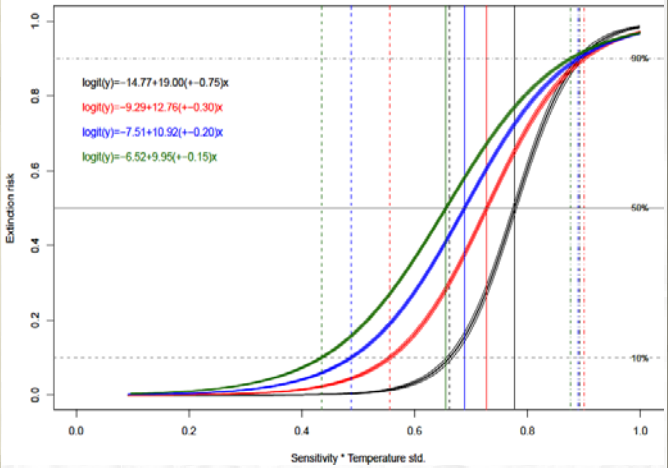
Fig 2:Panel A and B: Tolerance curve of temperate and tropical species respectively (Deutsch et al 2008). Panel C : symmetrical tolerance curve used to create model. Species with larger k are more sensitive to temperature deviation and vice versa. CT_{min} and CT_{max} is the minimum and maximum temperature respectively where fitness of a species is zero.

Results:

✓Extinction risk of species increased with temperature variability and temperature sensitivity.

✓Extinction risk of species increased with increasing food web size.

✓Rapid increased in extinction risk when temperature variability crossed a lower threshold, especially for species-poor food web.



Logistic regression curves with 95% confidence band [black, red, blue, green curve for 6, 12,18,24 species respectively] showing the risk of extinction as a function of the product of temperature sensitivity and temperature standard deviation. Formula denotes the linear regression equations. 10%, 50% and 90% extinction thresholds are also indicated in figure.