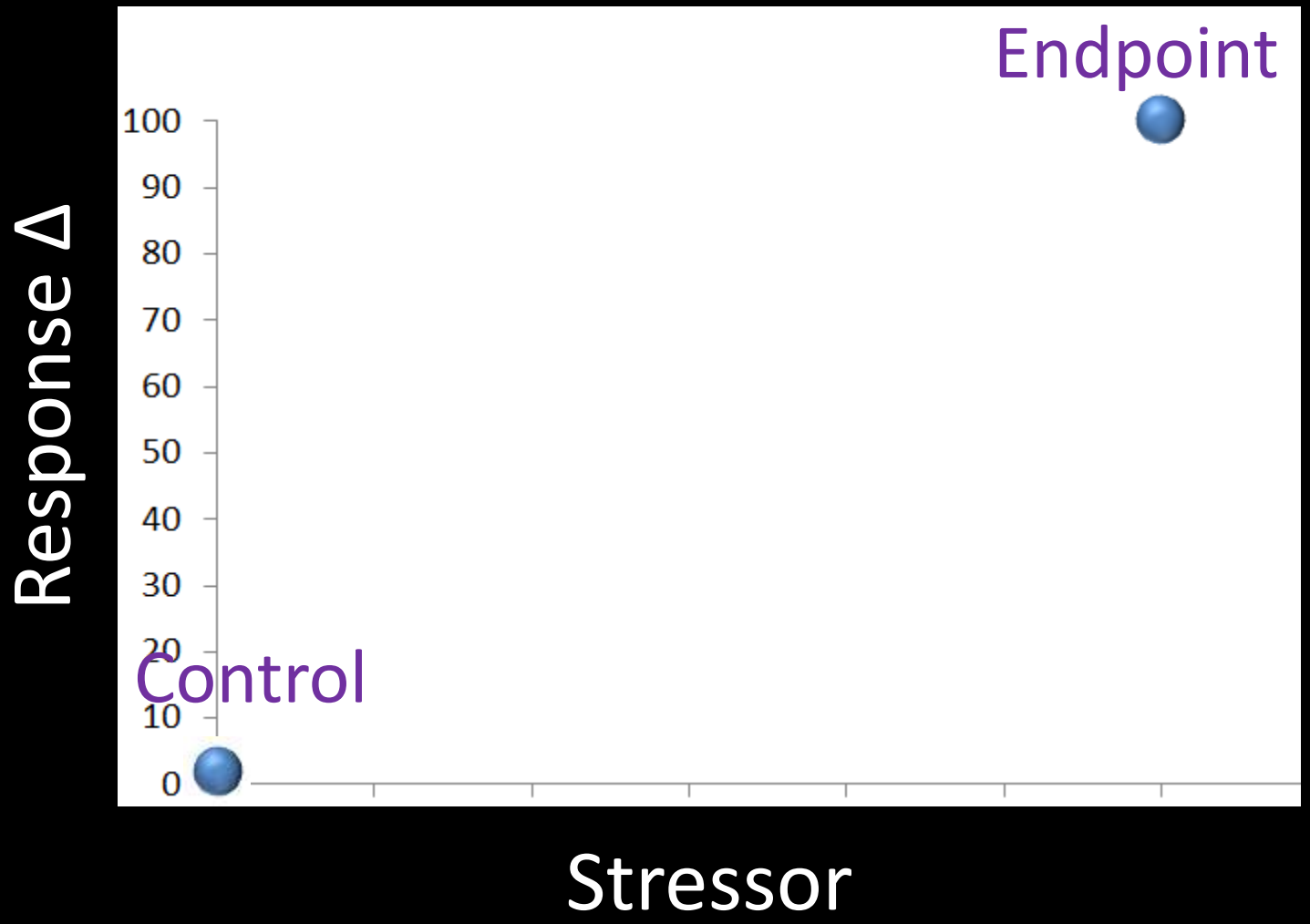
Organismal and Mechanistic Tolerance to Elevated Temperature in Delta Smelt.

Richard E Connon, Lisa M Komoroske, Matthias Hasenbein, Larry Brown, Joan Lindberg, Gonzalo Castillo and Nann A Fangue

Dose response curves and thresholds



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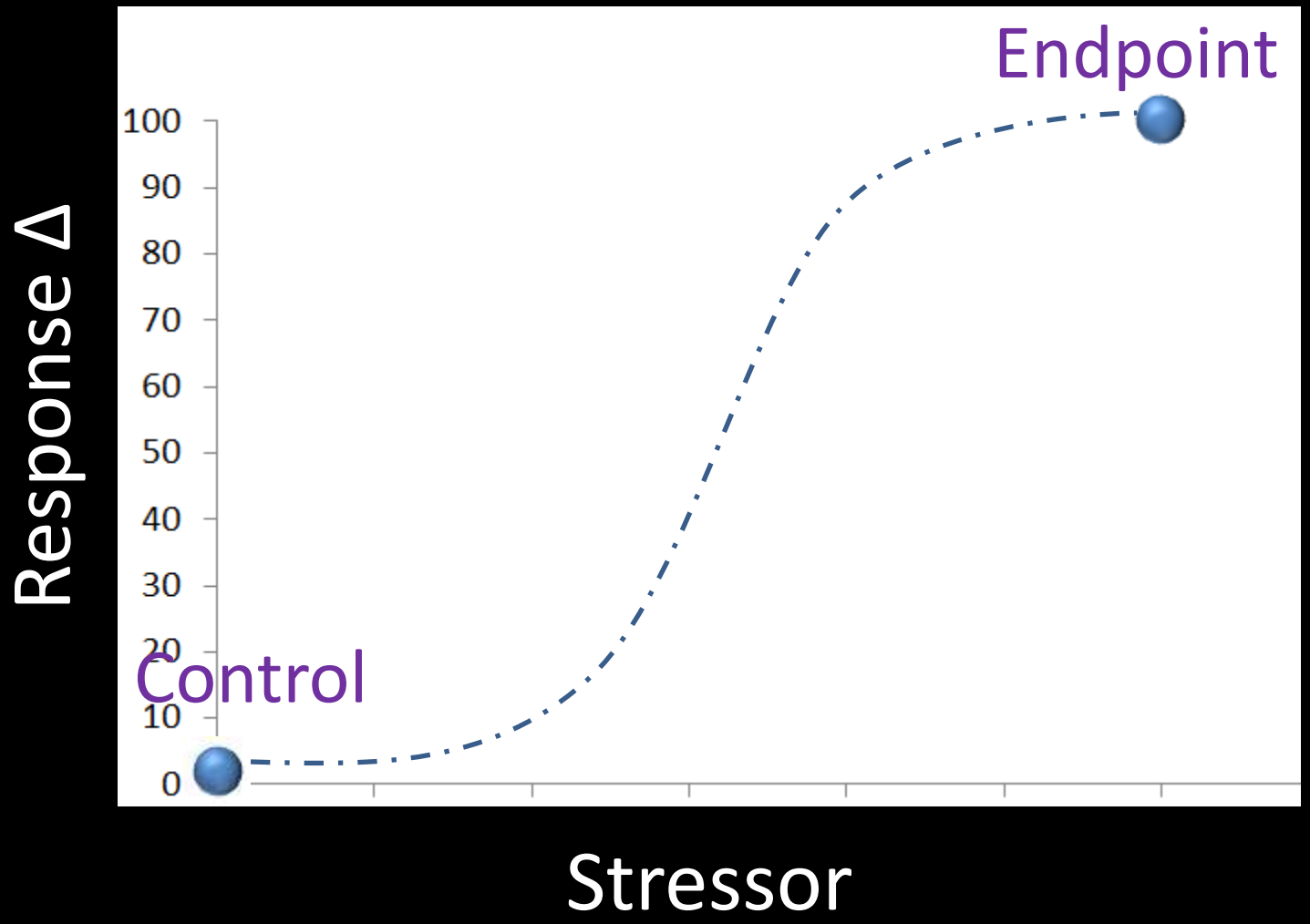

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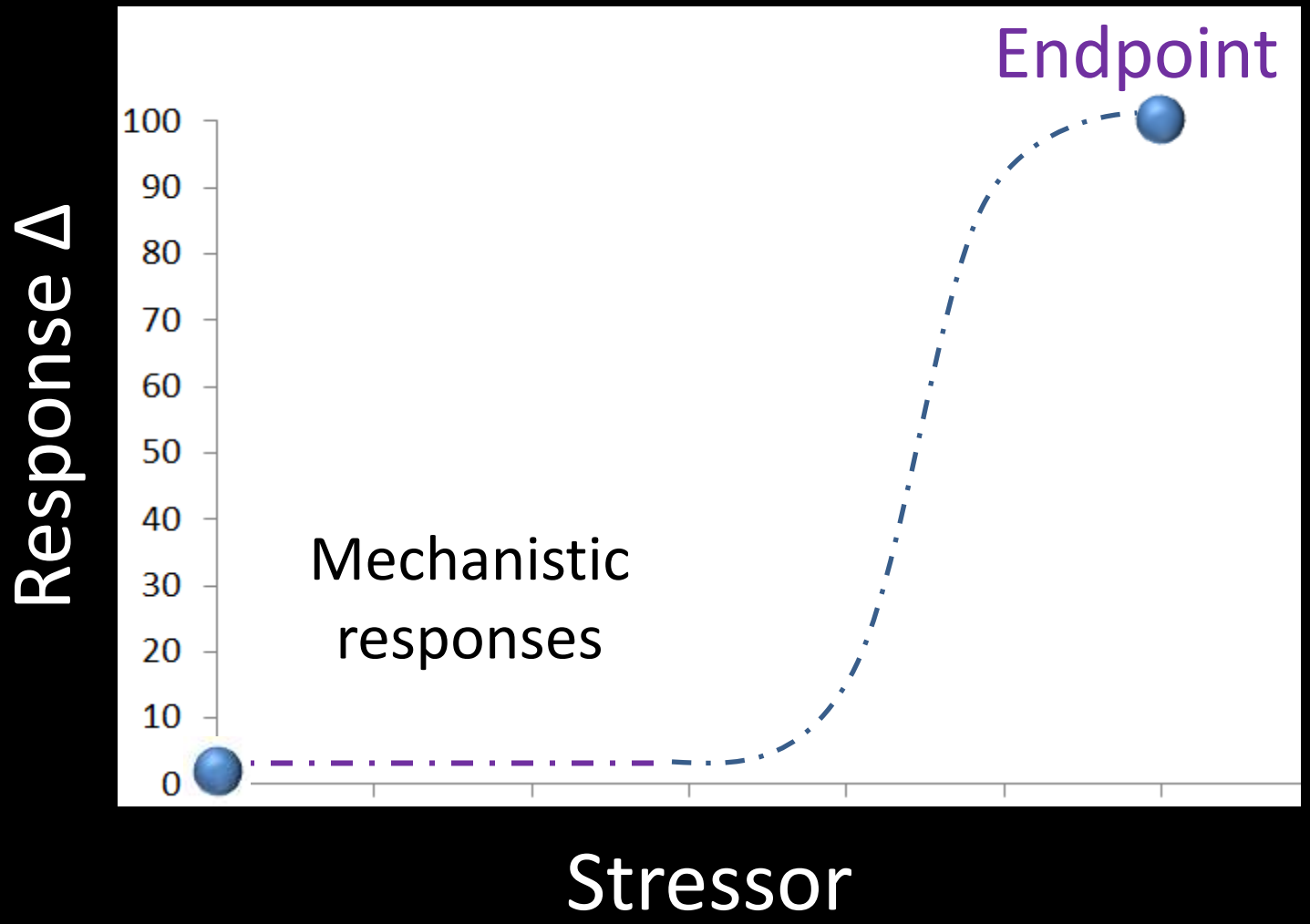

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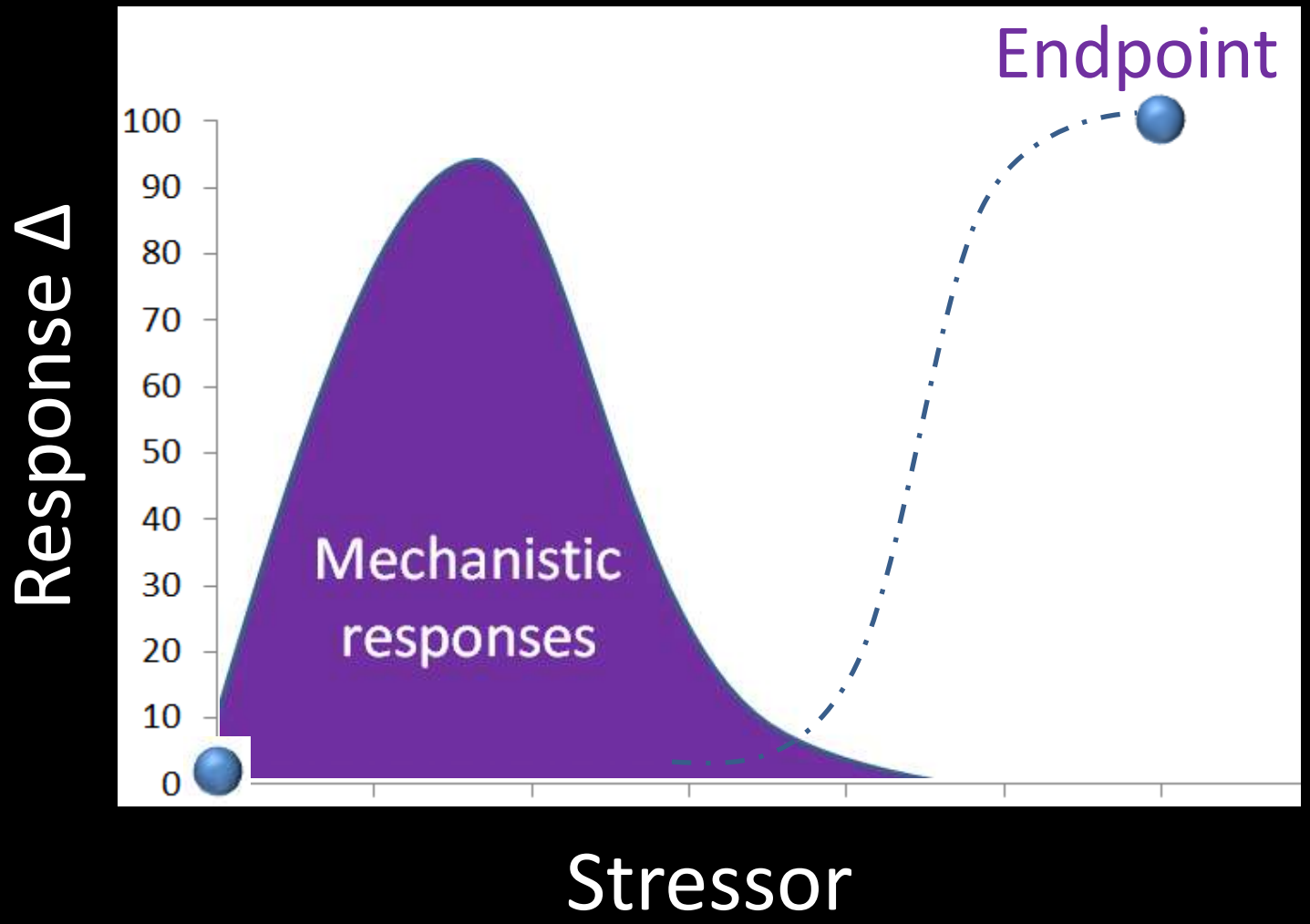

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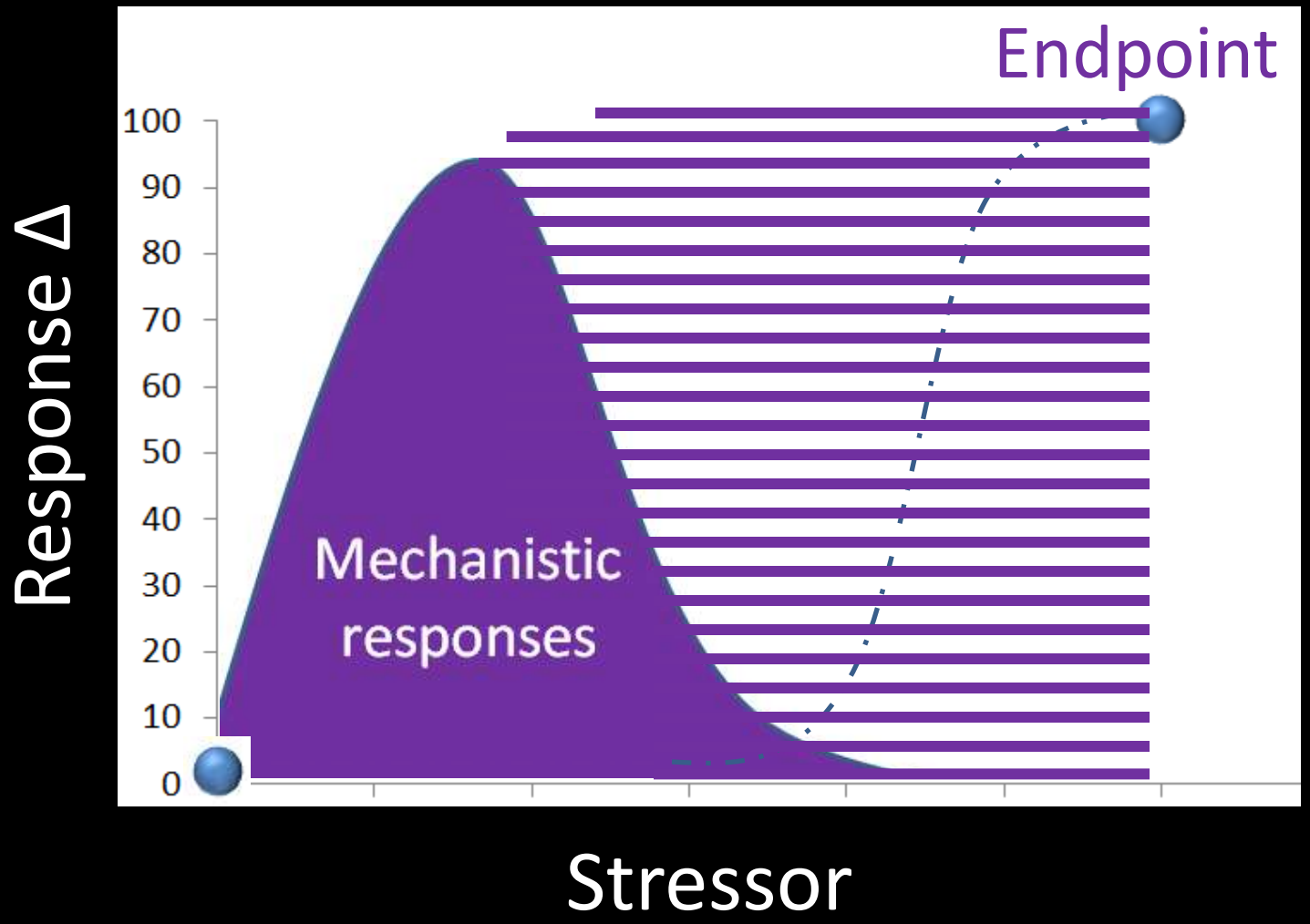

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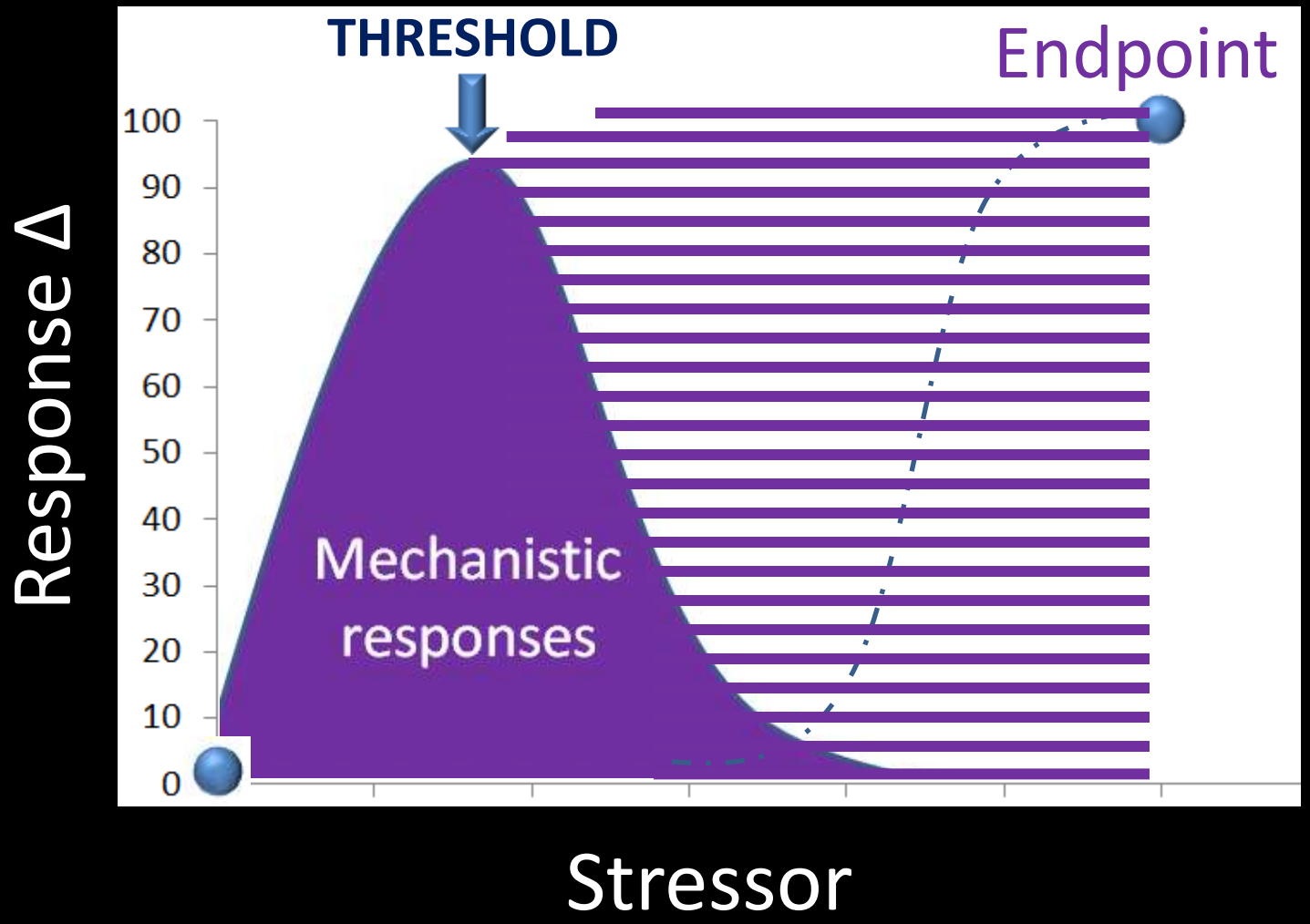

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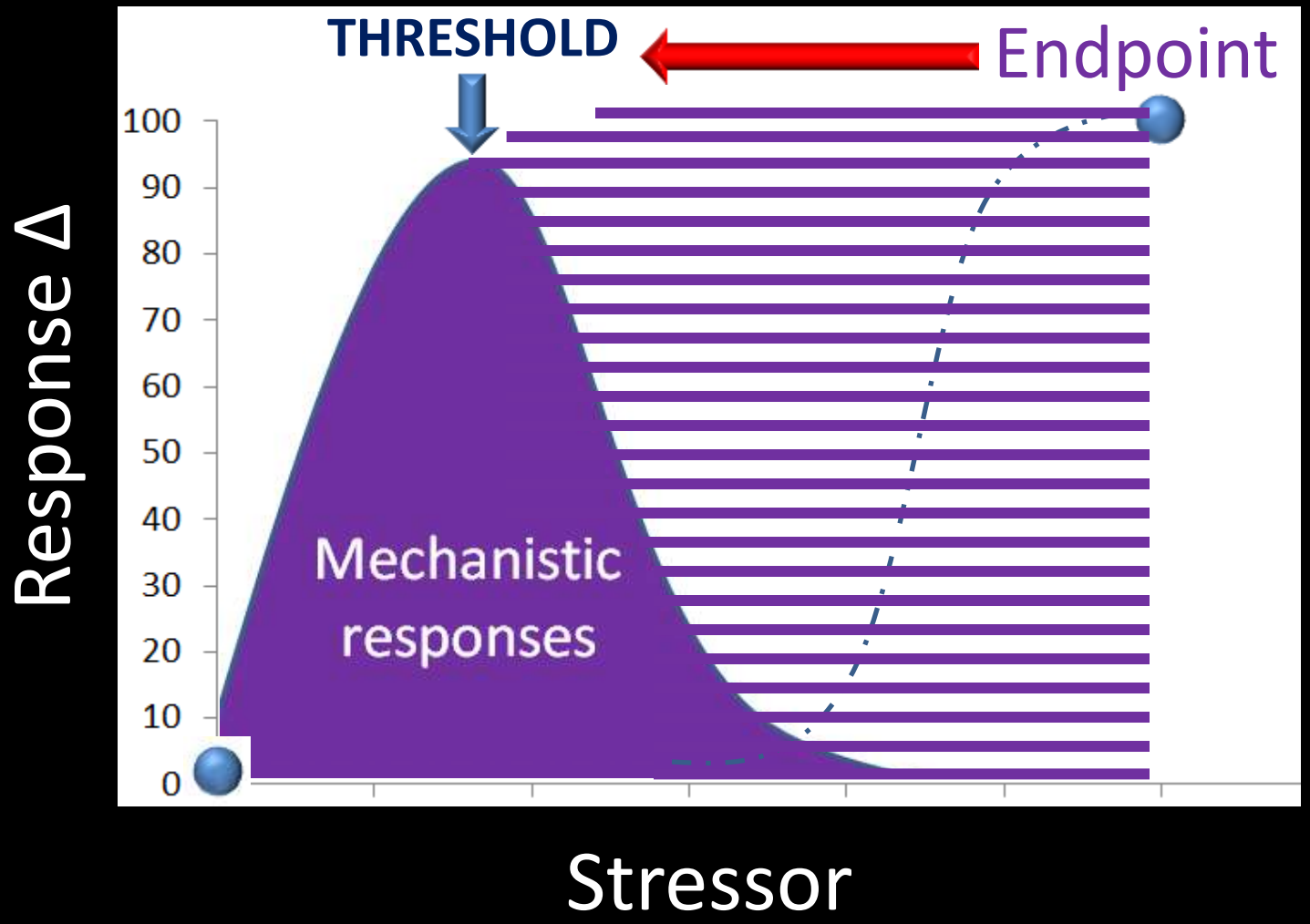


Conservation Physiology

Volume 2 • 2014

10.1093/conphys/cou008

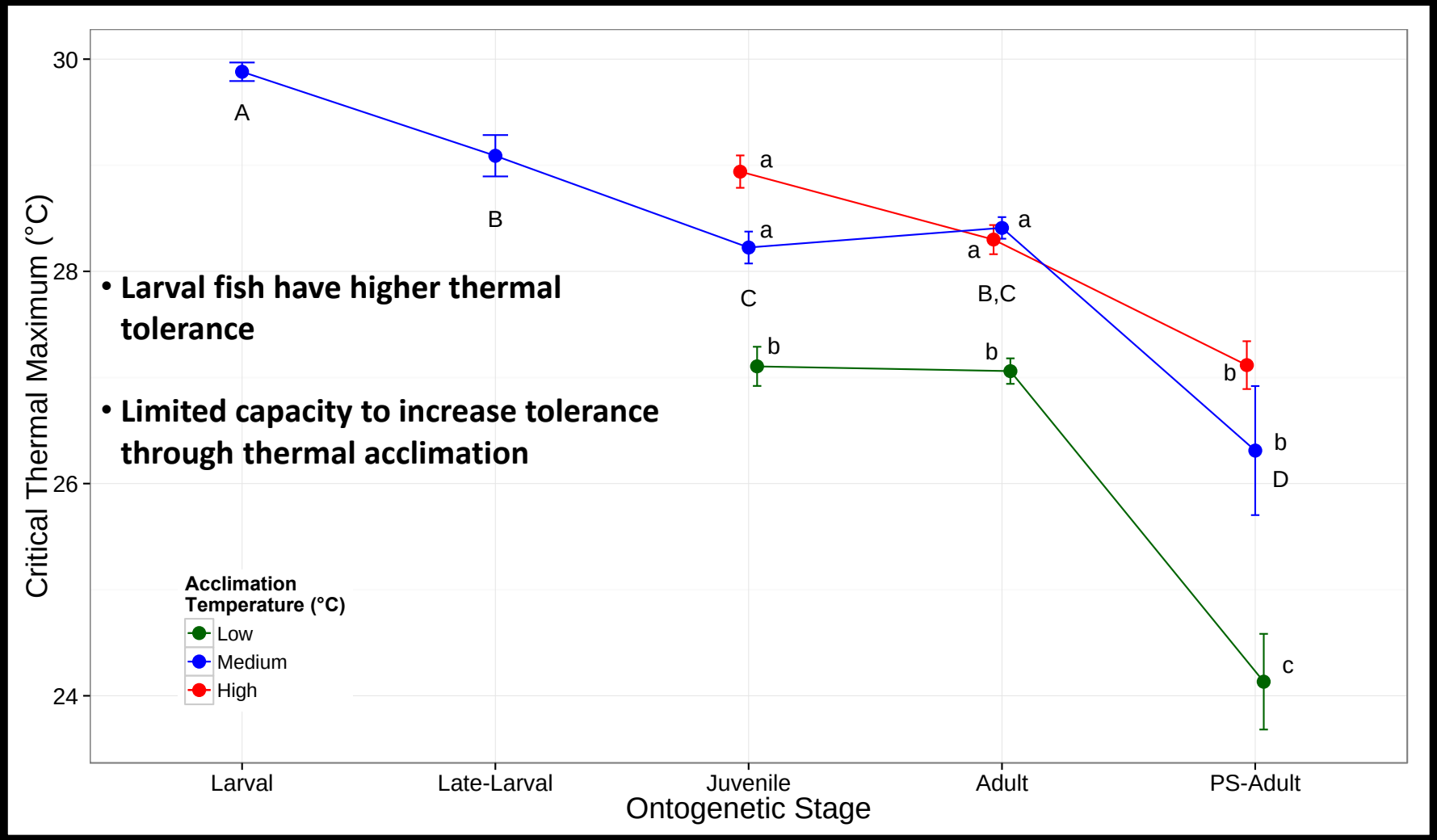
SEB Society for Experimental Biology

Research article

Ontogeny influences sensitivity to climate change stressors in an endangered fish

L. M. Komoroske[1], R. E. Connon[2], J. Lindberg[3], B. S. Cheng[4], G. Castillo[5], M. Hasenbein[2,6] and N. A. Fangue[1]*

Tolerance decreases among successive ontogenetic stages



- **Larval fish have higher thermal tolerance**
- **Limited capacity to increase tolerance through thermal acclimation**

Methods - *thermal tolerance & stress response*

A. Tolerance: Critical thermal maximum *(loss of equilibrium)*

Repeated with:

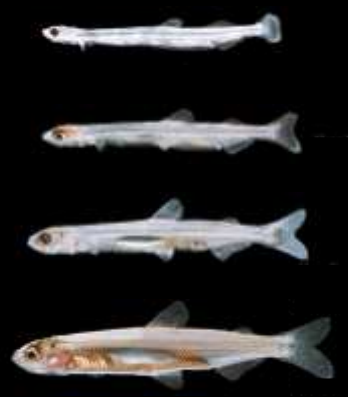
feeding larvae (~30dph)

post –larvae (~60dph)

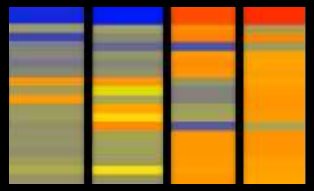
juvenile (~150dph)

adult (~230dph)

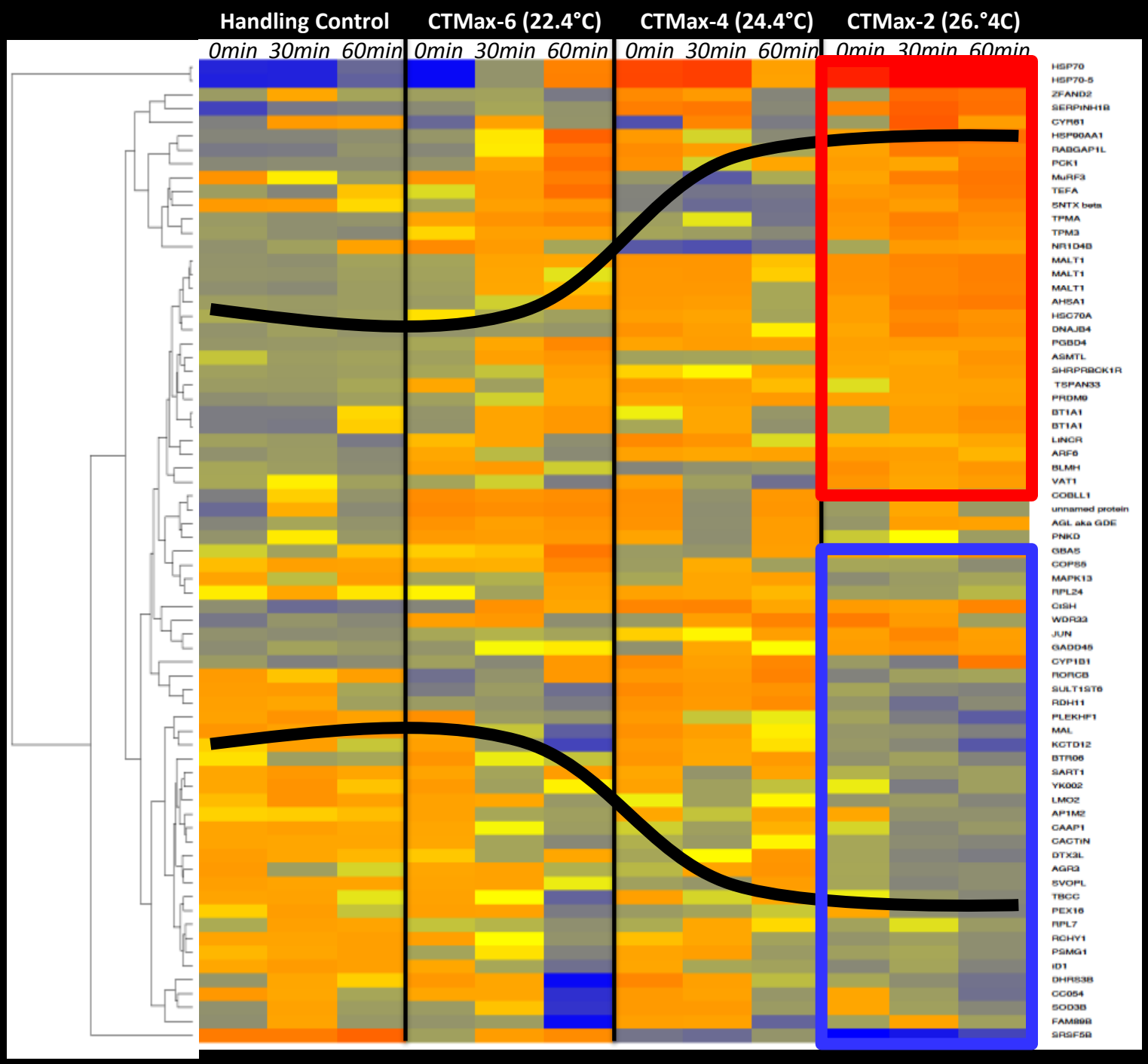
post-spawning adults (>300dph)

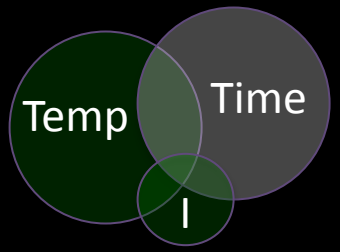


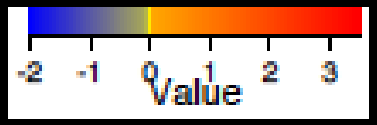
B. Physiological stress response: RNA-Seq, microarrays & qPCR



Fish photos Rene Reyes, USBR





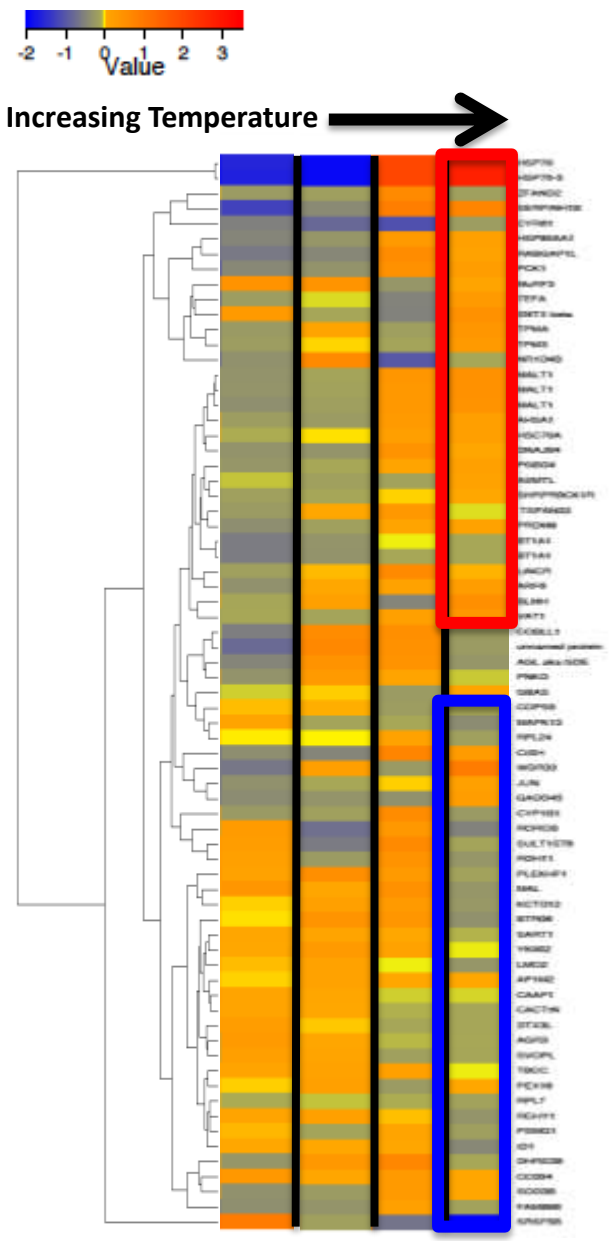


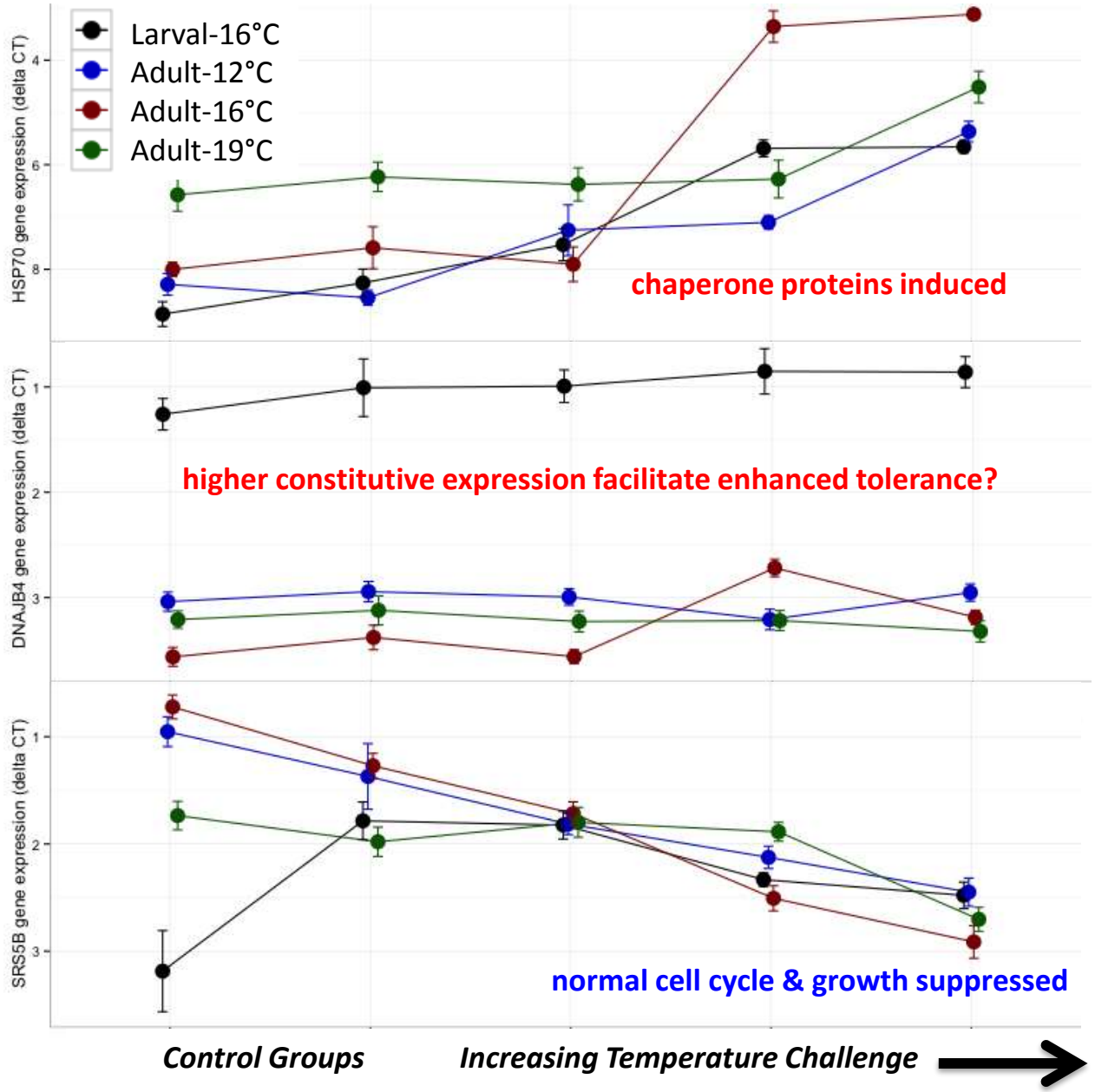
Adults acclimated to 16°C

Komoroske et al. in prep

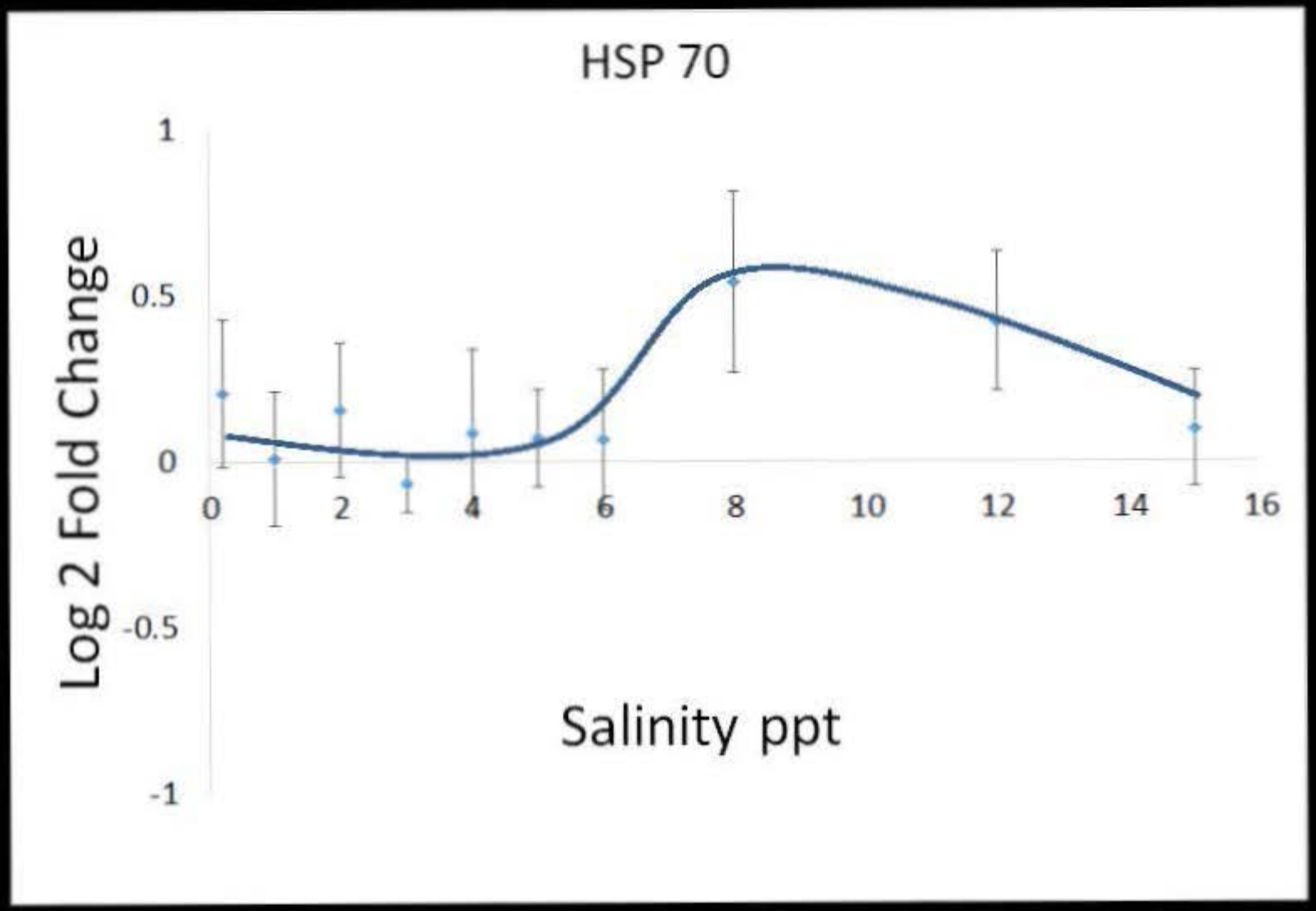
Physiological stress response

CTMax-6 CTMax-4 CTMax-2





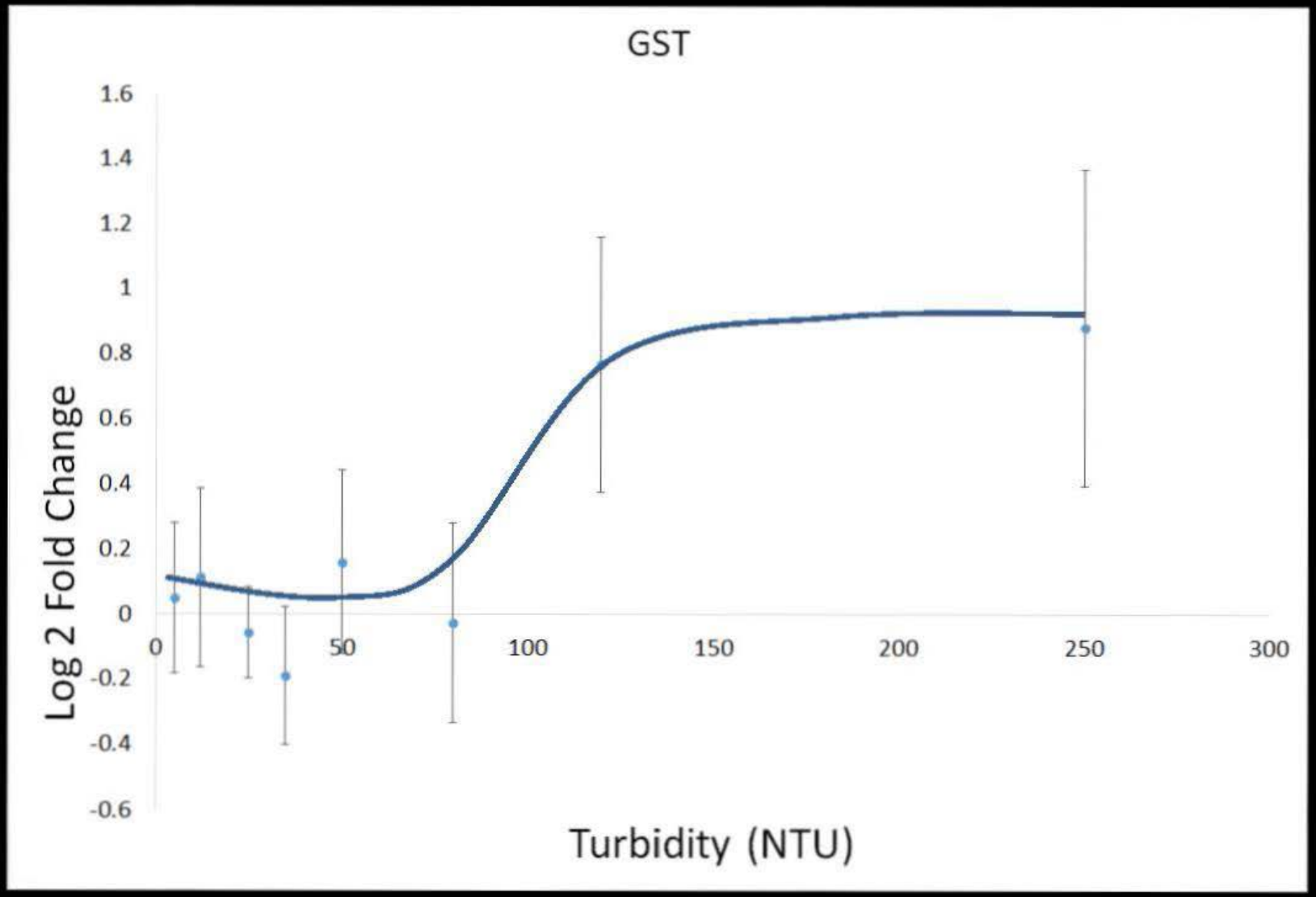
Salinity



Larval Delta Smelt

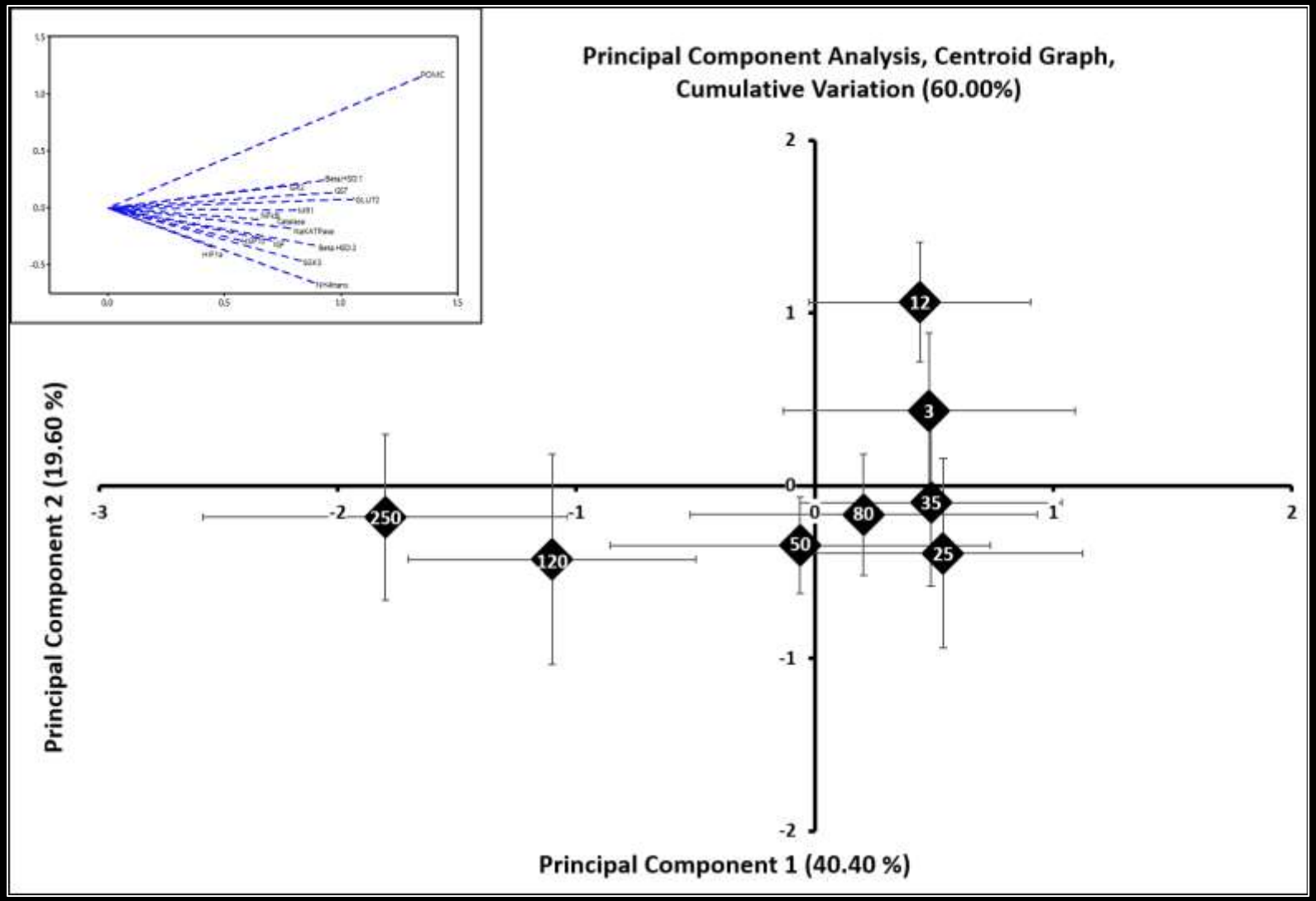
Hasenbein et al.
in prep

Turbidity



Larval Delta Smelt

Hasenbein et al. in prep



POSTER: Stress Response to Turbidity and Salinity utilizing Feeding Performance, Biochemical, and Molecular Biomarkers in Delta Smelt (*Hypomesus transpacificus*)

Matthias Hasenbein*, UC Davis

Summary and Conclusions

- Thermal mechanistic thresholds -2˚C or -4˚C below CTmax - Loss of Equilibrium
- Fitness Cost? Down regulation in other functions
- Larval DS have higher mechanistic thermal tolerance than juveniles>adults
- Larval salinity tolerance is seemingly lower than juveniles>adults
- Mechanistically determined optimal turbidity range between 12 and 80 NTU

What does this mean?

Other than temperature, salinity and turbidity

- Multiple stressors
- Stressor interactions
- Contaminants
- Disease
- Feeding ability
- Flow
- Habitat

Acknowledgments

- FCCL, Fangue and Connon Labs, UC Davis
- Funding sources:
  - Delta Stewardship Council (#201015533)
  - Bureau of Reclamation Grant (#R12AP20018)
  - State and Federal Contractors Water Agency (#201301957)

DELTA STEWARDSHIP COUNCIL

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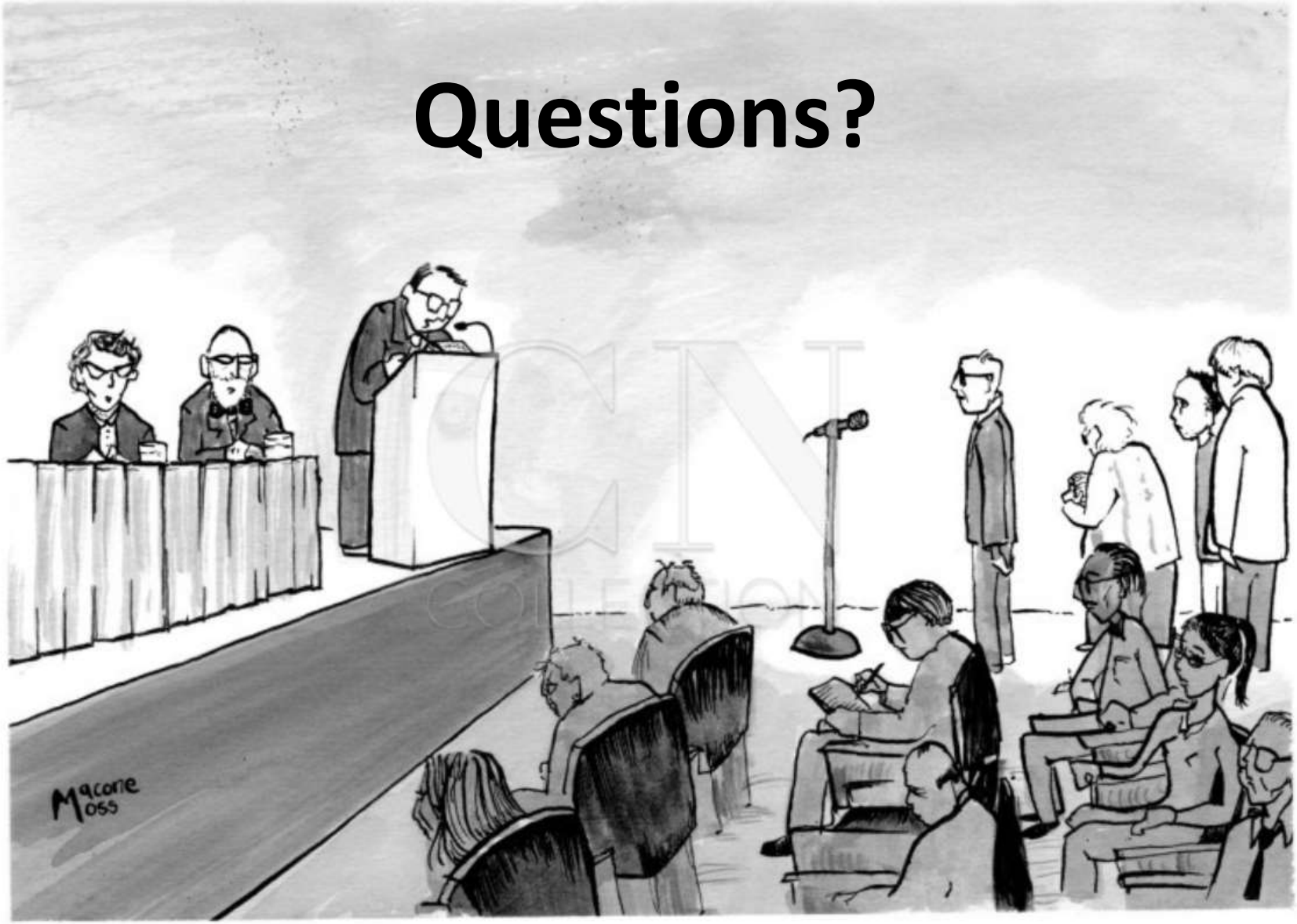
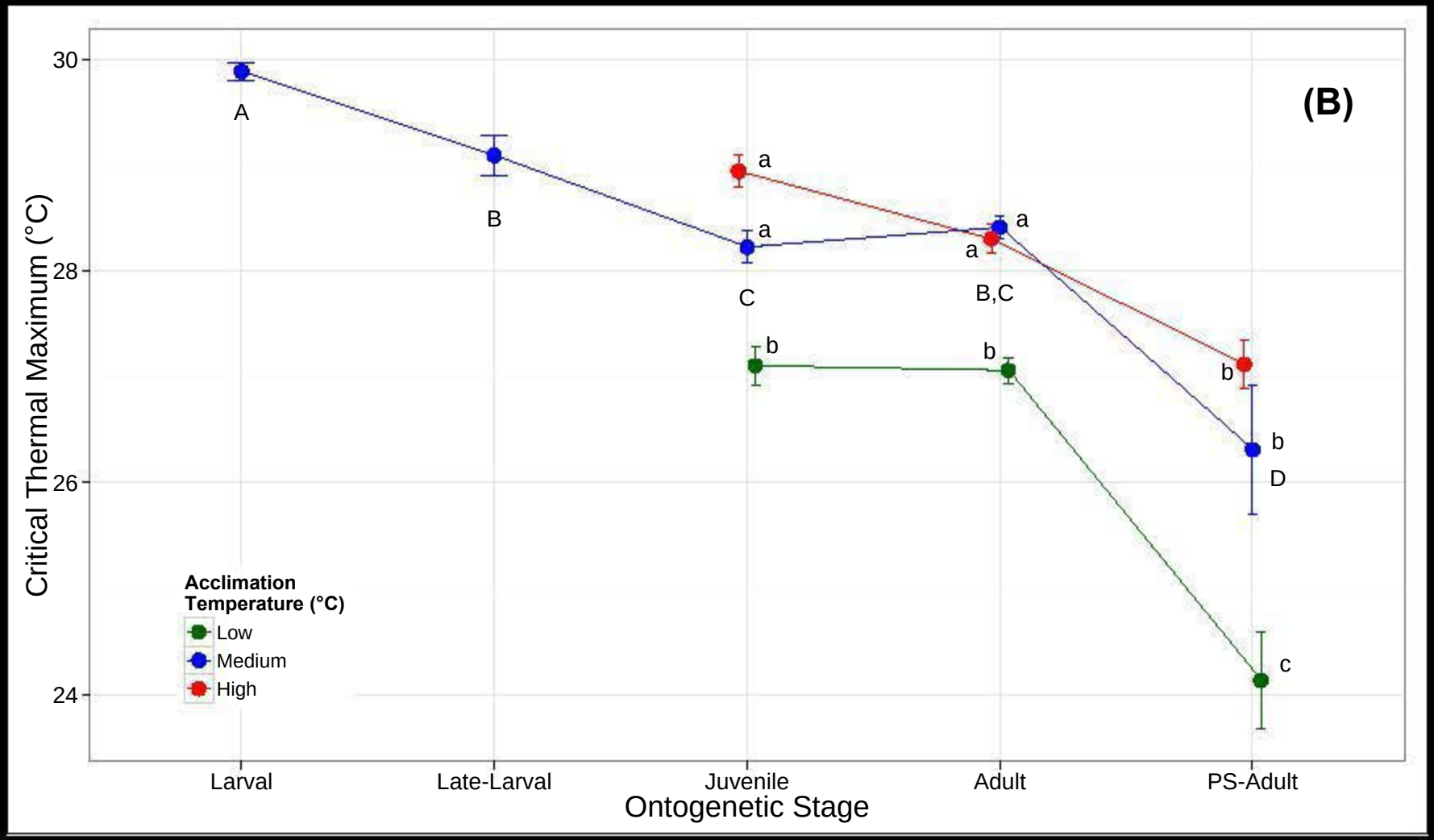
SFCWA
State & Federal Contractors Water Agency

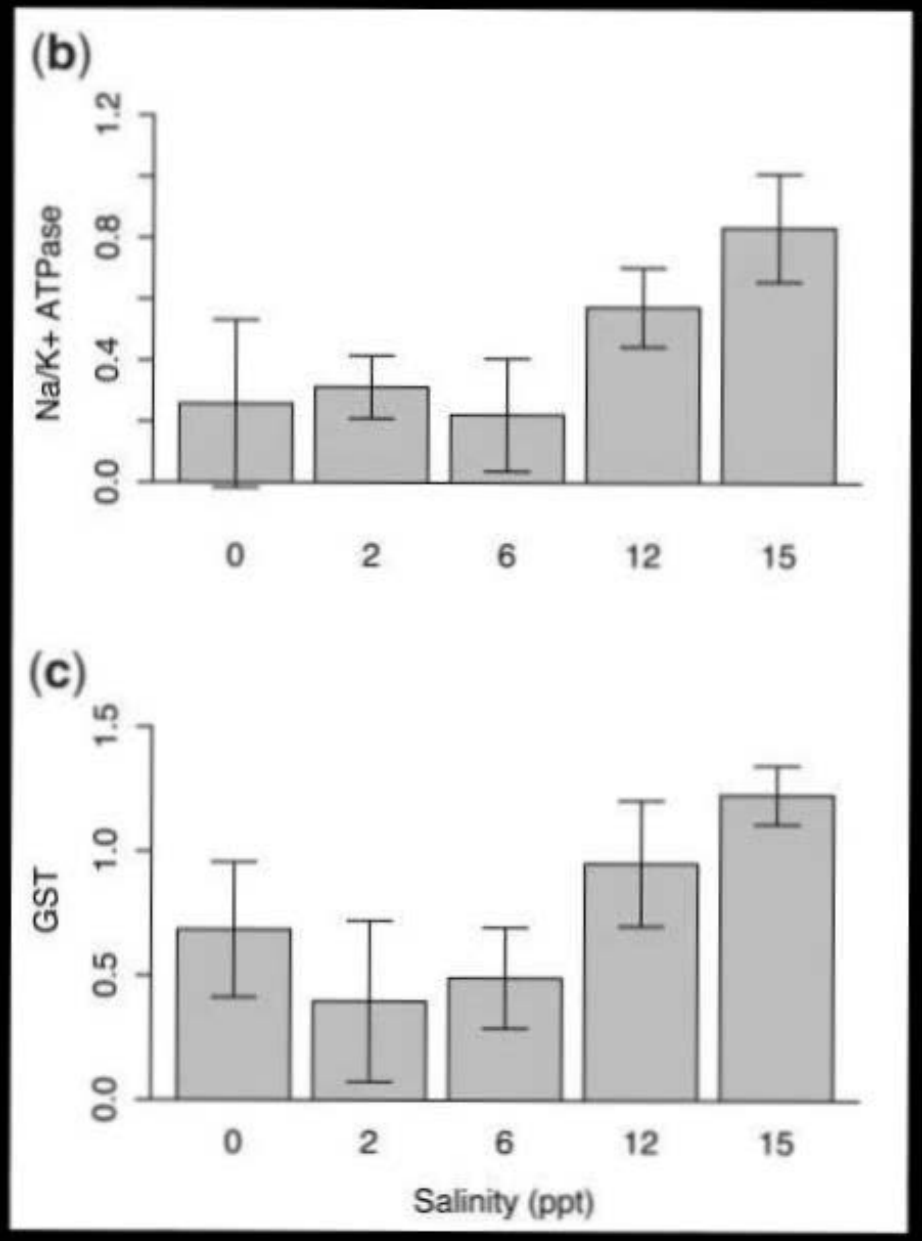
Questions?



"We'd now like to open the floor to shorter speeches disguised as questions."

Tolerance decreases among successive ontogenetic stages




(b)
Na/K+ ATPase
0.0
0.4
0.8
1.2
0
2
6
12
15
(c)
GST
0.0
0.5
1.0
1.5
0
2
6
12
15
Salinity (ppt)