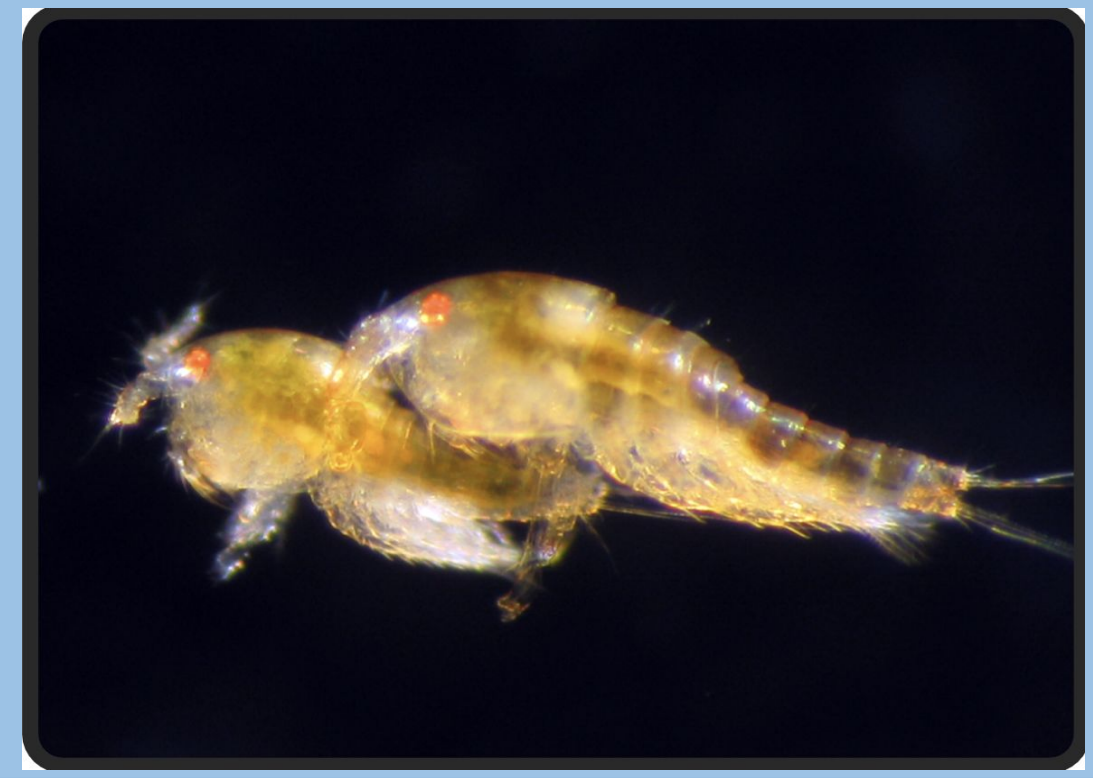




Effects of Gravid hypoxia exposure on Tigriopus californicus offspring

Aleksandra Krysiuk, Justice Lawson, Zoie Smith, Omar Sohaib
BIOL 255H, DR. Chris Willet and Lorrie He
UNC-Chapel Hill



Abstract

This study assessed the impact of early-life hypoxia on adult survival in Tigriopus californicus copepods from various California populations. Gravid copepods were split into hypoxic and normoxic groups. After the copepods matured, both groups faced hypoxic conditions in a second trial. Analysis revealed no enhanced hypoxia tolerance from early exposure, refuting the hypothesis of epigenetic influence. The findings contribute to understanding copepod resilience and ecosystem stability amid climate change.

Methods

Forty-eight copepods from four populations (San Diego, Santa Cruz, and two hybrids) were collected, with gravid females identified and separated into experimental and control groups. The experimental group was subjected to hypoxia using a nitrogen-filled box, while the control group remained in normoxic conditions. Both groups were later exposed to hypoxia, and nauplii survival was measured. The experiment also utilized temperature controls and statistical analysis (ANOVA) to evaluate the impact of population origin and treatment conditions on survival.

Figure 1: Hypoxia copepod box. A white clear tube supplies nitrogen into the box and is turned on and maintained at 2.5 psi in a controlled temperature environment.



Results

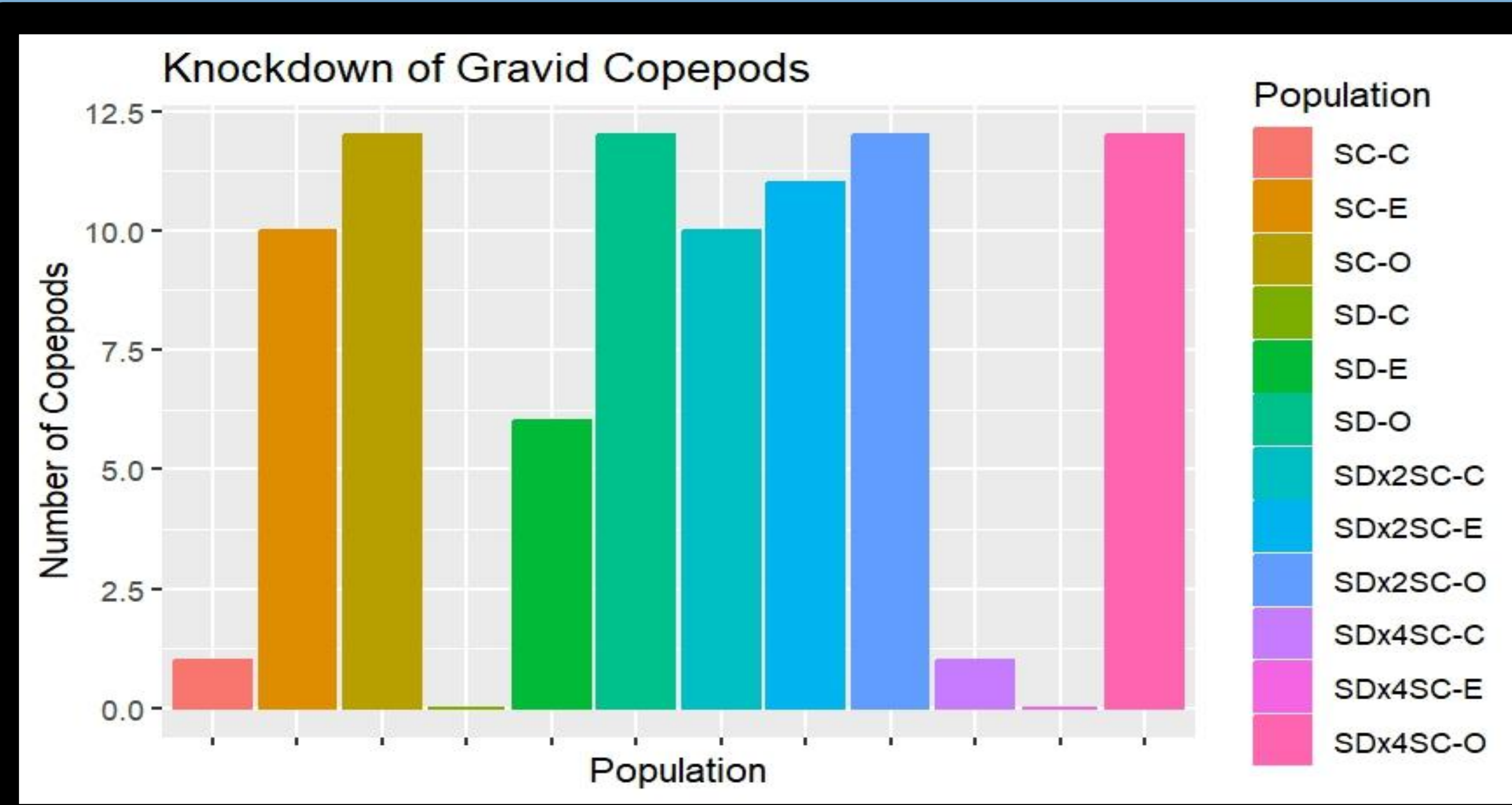


Figure 2: Primary Trial 1 and 2 of the Gravid copepods. This trial shows the number of knockdowns for both the hypoxic and control for primary trials 1 and 2 combined.

Legend: C- Control Group, E- Experimental Group, groups O-Original

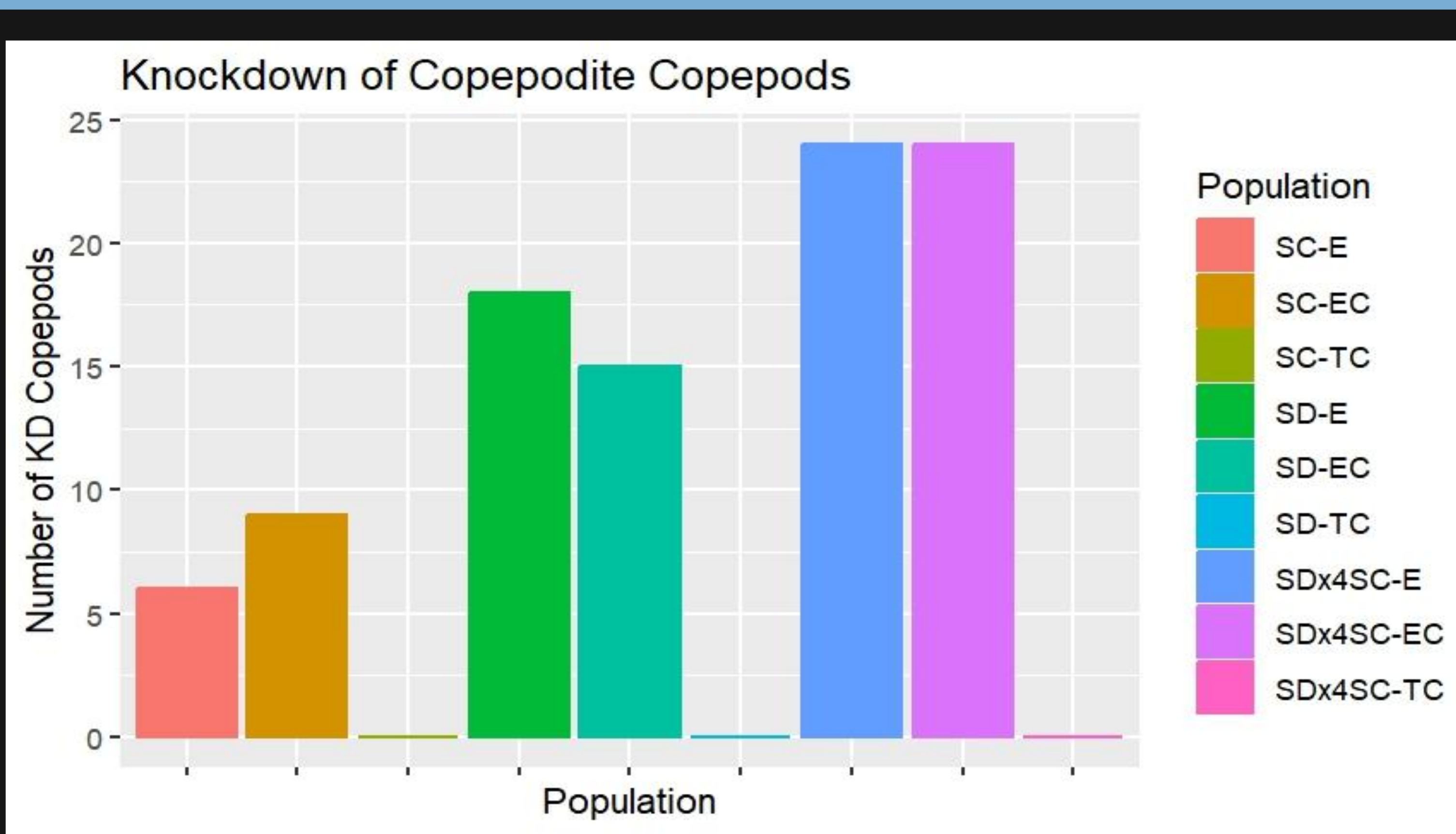


Figure 3: Secondary Trials 1 and 2 of the copepodites and adult copepods. This trial shows the number of knockdowns in each of the surviving populations for both hypoxic and control environments.

Legend: E- Experimental, EC-Experimental Control, TC- Total Control

Conclusions/ Future Goals

The study found no increase in hypoxia tolerance among copepods exposed to hypoxia in embryonic stages, rejecting the hypothesis that early hypoxia exposure improves adult survival under similar conditions. Interestingly, variations in hypoxia tolerance were noted among hybrid populations, suggesting genetic interactions may influence responses to low oxygen. The study faced limitations, including a small sample size and inadequate control of oxygen levels, potentially skewing results. Future research should expand the number of populations tested, improve environmental controls, and explore genetic factors to better understand copepod responses to hypoxia.

Acknowledgments

- University of North Carolina at Chapel Hill
- Chris Willet
- Lorrie He
- CURE Course Development Opportunities

Choi, Seo Yeol, et al. "Effects of Hypoxia on Benthic Eggs of Calanoid Copepods in the Southern Sea of Korea." *Frontiers*, Frontiers, 28 Feb. 2023, www.frontiersin.org/articles/10.3389/fmars.2023.1132851/full.

Deconinck, Aimee, and Christopher S Willett. "Hypoxia Tolerance, but Not Low Ph Tolerance, Is Associated with a Latitudinal Cline across Populations of Tigriopus Californicus." *PLoS One*, U.S. National Library of Medicine, 27 Oct. 2022, www.ncbi.nlm.nih.gov/pmc/articles/PMC9612455/.

Harada, Alice E, et al. "Variation in Thermal Tolerance and Its Relationship to Mitochondrial Function across Populations of Tigriopus Californicus." *Frontiers in Physiology*, U.S. National Library of Medicine, 15 Mar. 2019, www.ncbi.nlm.nih.gov/pmc/articles/PMC6429002.

Turner, J.T. (2004). "The importance of small planktonic copepods and their roles in pelagic marine food webs." *Zoological Studies*, 43(2), 255-266.