

ACUTE VS. DEVELOPMENTAL ACCLIMATION SHAPES PARENTAL AND GRANDPARENTAL EFFECTS OF OCEAN WARMING ON MARINE STICKLEBACKS

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Transgenerational plasticity (TGP) can buffer populations against rapid environmental change, yet little is known about the underlying mechanisms or how long these effects persist. We tested for adaptive TGP in response to simulated ocean warming across parental and grandparental generations of marine sticklebacks, and investigated mitochondrial respiration capacity (MRC) as a potential mechanism underlying growth responses. Acute exposure to elevated temperature during reproductive conditioning led to strong maternal TGP benefits on F1 offspring growth, with a matching pattern for MRC, providing an intuitive mechanistic basis for maternal acclimation persisting into adulthood. Developmental acclimation to elevated temperature, however, led to negative maternal effects on F2 offspring growth and no detectable maternal effects on MRC. But, maternal grandmother TGP benefits were still present for both growth and MRC, perhaps resulting from epigenetic marks on mitochondrial genes acquired during acute exposure. In summary, both parental and grandparental TGP will play a role in mediating some of the impacts of climate change, but the mechanisms underlying offspring phenotype plasticity may differ depending on whether mothers experience acute or developmental acclimation.