**Title:** ANTHROPOGENIC ADAPTATION IN TOXIC WATERS: LESSONS FROM KILLIFISH (*Fundulus*)

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**Abstract**:

The world is changing at a pace that makes us reevaluate the capabilities of the evolutionary process. As industrial development continues to increase and as we improve analytical environmental chemistry methods, we have observed a growing number of contaminated environments. This increasing pressure from chronically released and persistent contaminants has amplified the importance of evolutionary toxicology. In this chapter, we aim to convey the principles of this relatively young field through a review of evolutionary adaptation in Atlantic and Gulf killifish (*Fundulus* *heteroclitus*, and *F. grandis*). Killifish have been widely studied with regard to evolutionary toxicology and anthropogenic adaptation. In the past 20 years, researchers have identified multiple populations of both *F. heteroclitus* and *F. grandis*, which have adapted to resist high levels of various classes of industrial contaminants, including polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and polychlorinated dibenzo-*p*-dioxins and furans (PCDD/Fs). Heritability of resistance has been confirmed, with offspring showing similar capacity to resist the cardiovascular teratogenesis associated with early life stage exposures to dioxin-like compounds (DLCs). As more populations have been discovered and studied, different aspects of the acquired resistance have been revealed, but also unique attributes of the independently adapted populations have been identified. Populations adapted to PAHs exhibit high resistance to many classes of contaminants, while populations adapted to PCB contamination, are only partially resistant to PAHs. PAH adapted populations of *F. heteroclitus* and PCB adapted populations of *F. grandis* are more tolerant to oxidative stress, while PCB adapted populations of *F. heteroclitus* are more sensitive. Even proximal adapted populations in *F. grandis* differ in their levels of cross-resistance to pesticides. These are only some of the ways in which populations of *Fundulus* with phenotypically similar genetic adaptations, create a much more varied and intricate story to be explored in evolutionary toxicology. Here we summarize the field of evolutionary toxicology through a case study of anthropogenic adaptation in *Fundulus*, including its environmental and evolutionary relevance.