Growth–survival paradigm in early life stages of fish:

theory, advance, synthesis, and future

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Growth and survival are tightly coupled in early life stages of fish. Larger and/or faster growing individuals (or populations) are more likely to survive than smaller and/or slower growing conspecifics. This “growth–survival” paradigm was given much attention in studies on recruitment dynamics of fish. However, predicting year-class strength from early growth dynamics has revealed difficult. Moreover, there have been contradictory results between field and laboratory studies and among different ecosystems, taxonomic groups, and study groups. We believe that a synthesis of the recent literature is needed. Here we present our ideas and perspectives on the “growth–survival” paradigm through synoptic reviews from Japan–Canada collaboration workshops. First, we summarize the theoretical framework of the current paradigm and its functional mechanisms (theory). Second, we review recent advances in studies on the paradigm (advance). Subsequently, we challenge a synthesis of results from field, laboratory, and modeling studies across systems and taxa (synthesis). In particular, a conceptual framework is proposed to potentially reconcile contradictory results. This conceptual framework comprises non-linear larval growth–survival relationships for three functional mechanisms under predation pressure from three predator types in an optimal foraging context. Finally, we propose recommendations for the direction of future studies (future).