



# Determining the life history strategy of the cryptobenthic reef gobies *Coryphopterus hyalinus* and *C. personatus*

Nicolette S. Beeken\*, Jason D. Selwyn, J. Derek Hogan

Fish Conservation Lab, Department of Life Sciences, Texas A&M University-Corpus Christi, Corpus Christi, Texas 78412, USA

**ABSTRACT:** Understanding the life history strategy of species can clarify their functional role, and contribution to the productivity and resilience of an ecosystem. We use otolith microstructure analysis to study the life history of 2 widespread and abundant Caribbean reef fishes, genetically identified here as the glass goby *Coryphopterus hyalinus* and masked goby *C. personatus*. Our analysis reveals that these species exhibit an extreme life history relative to other vertebrates due to their short lifespan, small adult body size, early maturity, and continuous growth in body length throughout reproductive age. We find that pelagic larval duration (PLD) varies widely, and average larval growth influences PLD where faster-growing larvae have shorter PLDs. We show that average daily growth substantially decreases during the settlement transition to reef habitat, approximately coinciding with reproductive maturity. Continuous somatic growth throughout reproductive age can serve to support greater fecundity in older, larger-bodied females and enhance survivorship. Several features of the ecology (i.e. broad depth range, planktivorous diet) and life history (i.e. small adult body size, quick generational turnover, short lifespan) of *C. hyalinus* and *C. personatus* indicate that they play a key trophic role in transferring nutrients from pelagic plankton to Caribbean reef predators and the reef benthos. Our analyses highlight why life history traits related to survival, reproduction, and population dynamics can enhance our understanding of ecosystem-scale processes and functioning on coral reefs.

**KEY WORDS:** Life history · Functional ecology · Coral reef fish · Lifespan · Body size · Conservation biology · Cryptobenthic · Otolith microstructure

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## 1. INTRODUCTION

Variable extrinsic mortality directly influences age at maturity and lifespan of terrestrial vertebrates where higher mortality rates result in earlier maturation and shorter lifespans (Ricklefs 2010). For fishes, high extrinsic mortality is expected to select for small adult body size, short lifespan, and short generation time (Winemiller 2005). Fishes of the smallest size classes that inhabit benthic reef habitats are collectively known as cryptobenthic reef fishes, and they constitute a significant portion of reef fish biodiversity

and biomass production (Brandl et al. 2018). Field, mesocosm, and otolith studies indicate that cryptobenthic reef fishes, such as gobies, experience high predation mortality on coral reefs (Hernaman & Munday 2005b, Depczynski & Bellwood 2006, Goatley & Bellwood 2016, Goatley et al. 2017). Understanding the life history strategy of species can clarify their functional role, and contribution to the productivity and resilience of an ecosystem (Winemiller 2005).

The glass goby *Coryphopterus hyalinus* (Böhlke & Robins 1962) and masked goby *C. personatus* (Jordan & Thompson 1905) are both abundant and widespread

\*Corresponding author: nsb125@gmail.com