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Identification of the larval and juvenile stages of the Cubera Snapper, *Lutjanus cyanopterus*, using DNA barcoding

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Abstract

The larvae and newly-settled juveniles of the Cubera Snapper, *Lutjanus cyanopterus*, are identified by DNA barcoding. Four larvae and three small juveniles of *L. cyanopterus* were detected among a large collection of pelagic larvae and a smaller collection of settled juveniles from the Caribbean coast of Panama. The mtDNA COI barcode sequences from the larvae and juveniles were virtually identical to sequences from adults sampled from the spawning aggregation in St. Thomas, USVI. Barcode sequences for the eleven regional species of *Lutjanus* species (*sensu lato*) were obtained and they exhibited deep interspecific divergences that allowed for efficient discrimination among the western Atlantic snapper species. The nearest neighbor species, the Mutton Snapper *L. analis*, was more than 11% divergent from *L. cyanopterus*. Cubera Snapper larvae are characterized by prominent melanophores along the outer spinous-dorsal-fin membranes and along the outer third of the longer pelvic-fin membranes. They are morphologically distinct from the late-stage larvae of the other regional snappers by their relatively wider caudal peduncle and their relative dorsal-spine lengths. Juveniles retain the black outer portion of the dorsal and pelvic-fin membranes and have a smaller body-depth than other regional snapper juveniles. The size at settlement is about 18 mm SL, relatively large for lutjanids. Daily otolith increments from *L. cyanopterus* larvae and juveniles indicate a pelagic larval duration of about 29 days with back-calculated spawning and settlement dates around the new moon. Although smaller adult Cubera Snappers can appear very similar to the Gray Snapper, *L. griseus*, the larvae and juveniles are quite different. In this case, the early life history stages reflect the deep genetic divergence between the two species while the adult forms converge in appearance.

Key words: snapper, Cubera, Lutjanidae, *Lutjanus*, *cyanopterus*, larvae, juvenile, identification, DNA barcoding, BOLD, fish, phylogenetics, pelagic larval duration, PLD, pargo, gray, *griseus*, Caribbean, western Atlantic, otoliths

Introduction

There are at least ten species of snappers in the genus *Lutjanus* in the western Atlantic and, as one of the dominant predators on and around reefs, they are an important component of the tropical marine fauna and support major fisheries in the region (Allen 1985). Their early life history stages can be difficult to identify since most species share meristics and overlap in morphometrics. In such circumstances, DNA barcodes are especially helpful (Packer *et al.* 2009), particularly when rare and common species coexist and share a similar appearance, a frequent problem in larval identification for many fish taxa. To facilitate DNA barcode identification of fishes, regional working groups are coalescing under the Fish Barcode of Life (FISH-BOL) initiative (e.g. Swartz *et al.* 2008), which seeks to establish a barcode reference sequence library for all fishes

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