*Zootaxa* 2008: 1–22 (2009)
www.mapress.com/zootaxa/


**Article**

ISSN 1175-5326 (print edition)
**ZOOTAXA**
ISSN 1175-5334 (online edition)

# Genetic identification and color descriptions of early life-history stages of Belizean *Phaeoptyx* and *Astrapogon* (Teleostei: Apogonidae) with Comments on identification of adult *Phaeoptyx*

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## Abstract

*Phaeoptyx* and *Astrapogon* are represented in the Caribbean by six species (*P. conklini, P. pigmentaria, P. xenus, A. alutus, A. stellatus,* and *A. puncticulatus*). Species identification of larvae and juveniles is problematic because characters used to distinguish adults (e.g., patterns of pigmentation and numbers of gill rakers) are absent, incomplete, or difficult to discern in the young stages. Neighbor-joining trees derived from mitochondrial cytochrome oxidase 1 sequences (DNA Barcoding) were used to match early life stages and adults. Subsequent comparative analysis of preserved voucher specimens from which the DNA was extracted or digital color photographs of those specimens taken prior to preservation yielded sufficient information to separate all early life-history stages of Belizean *Phaeoptyx* and *Astrapogon* and provided additional information for field identification of adult *Phaeoptyx*. Patterns of chromatophores in fresh material, combined with patterns of melanophores, provide the easiest means of separating the life-history stages of *Phaeoptyx*. Larvae of *Astrapogon* species are morphologically very similar, and some differences in pigmentation detected among them may reflect different stages of development. Continued implementation of the DNA Barcoding methods and field protocol outlined herein should prove valuable in accurately identifying much more of the ichthyoplankton fauna of the Caribbean.

**Key words**: DNA Barcoding, fish larvae, chromatophores, Belize

## Introduction

To provide specific identifications of larvae of Caribbean reef fishes, we have been conducting field work for a number of years at the Smithsonian's research station at Carrie Bow Cay, Belize, a small coral-fringed island on the Belizean Barrier Reef ($16^0$48.5'N, $88^0$05'W). In recent years, we have augmented our protocol of rearing net-collected larvae through transformation (see Smith & Thacker 2000; Baldwin & Smith 2003) with matching larvae to adults through DNA Barcoding (Mitochondrial Cytochrome Oxidase 1 sequences). Among the identifications we have made genetically are early life stages of all species of the apogonid genera *Phaeoptyx* and *Astrapogon*, taxa that had previously presented identification problems. For *Phaeoptyx*, we had identified many more larval and juvenile morphotypes based on pigmentation than known species, and we did not know which features were significant for species identification. After matching the young stages to adults through DNA Barcoding, we were then able to go back to the voucher specimens and photographs of them and determine diagnostic characters for the young stages of all species.

The publication of *Early Stages of Atlantic Fishes* (Richards 2006) marked the most comprehensive effort to date to provide information for the identification of early stages of Western Central Atlantic fishes. The enormity of the subject matter, however, precluded detailed diagnoses and substantive comparative sections, useful information particularly for species for which early life stages have not already been described. Several

*Accepted by L. Rocha: 14 Jan. 2009; published: 11 Feb. 2009*