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Life history traits of rare Antarctic dragonfishes from the Weddell Sea

MARIO LA MESA[1], EMILIO RIGINELLA[2], FORTUNATA DONATO[1] and CARLOTTA MAZZOLDI[3]

[1]*CNR, Institute of Marine Sciences, Largo Fiera della Pesca 1, 60125 Ancona, Italy*
[2]*Zoological Station Anton Dohrn, Villa Comunale, 80121 Naples, Italy*
[3]*University of Padova, Department of Biology, Via U. Bassi 58/B, 35131 Padova, Italy*
m.lamesa@ismar.cnr.it

Abstract: The life history traits of bathydraconids, deep-living fishes distributed all around the Antarctic continent, are poorly known. In particular, very few data are available on the relatively rare genera *Akarotaxis* and *Bathydraco*. With the aim to fill this gap, sagittal otoliths and gonads were analysed to assess individual age and reproductive features of *Akarotaxis nudiceps* (Waite, 1916), *Bathydraco macrolepis* Boulenger 1907 and *Bathydraco marri* Norman, 1938 collected in the Weddell Sea. Based on the annual growth increment patterns, age estimates ranged between 6–11, 5–11 and 8–11 years for *A. nudiceps*, *B. macrolepis* and *B. marri*, respectively. Most of the gametogenetic processes could be described based on gonad histology for both sexes. Females shared the reproductive features commonly reported in notothenioids, such as group-synchronous ovary development and prolonged gametogenesis. Total fecundity estimates were comparable between the two species of *Bathydraco* (1500–2500 eggs/female), whereas that of *Akarotaxis* was one order of magnitude smaller (200–250 eggs/female). Consistently, the mean size of late vitellogenic oocytes showed an opposite trend, being 1.6–1.8 mm in *Bathydraco* and 2.2 mm in *Akarotaxis*.

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Introduction

The Antarctic dragonfishes (family Bathydraconidae) include small benthic species endemic to the Southern Ocean, occurring on the Antarctic continental shelf and slope, and around Antarctic and sub-Antarctic islands (Gon 1990). Among them, the genus *Bathydraco* is characterized by a single lateral line of tubular scales extending from opercle to at least the rear third of the body (Gon 1990). Based on a recent taxonomic revision (DeWitt 1985), it consists of five species: *B. antarcticus* Günther, 1878, *B. joannae* DeWitt, 1985, *B. macrolepis* Boulenger, 1907, *B. marri* Norman, 1938, and *B. scotiae* Dollo, 1906. Two other species of *Bathydraco*, *B. nudiceps* Waite, 1916 and *B. wohlschlagi* DeWitt and Tyler, 1960, were placed in synonymy and redescribed as *Akarotaxis nudiceps* (Waite, 1916), a monotypic genus with two lateral lines and other morphological characters different from *Bathydraco* (DeWitt & Hureau 1979). Cladistic analysis based on the skull morphology and skeletal characteristics of the pectoral and caudal fins suggested close relationships between *B. marri* and *B. joannae* and between *B. macrolepis* and *B. antarcticus*, respectively (Voskoboinikova 1999).

Compared to other notothenioids, *Akarotaxis* and *Bathydraco* are typically eurybathic and deep-living fishes, occurring between 230 and 2950 m depth (Eastman 2017). The geographical distributions of *B. antarcticus* and *B. joannae* are limited to sub-Antarctic waters, where they inhabit the slopes of the Scotia Sea Islands and the Kerguelen–Gaussberg Ridge. *Akarotaxis nudiceps*, *B. macrolepis* and *B. marri* are circum-Antarctic and occur on the Antarctic continental shelf and slope (Gon 1990). *Bathydraco scotiae* probably also has a circum-Antarctic distribution, but it has been found exclusively in deeper waters (2100–2950 m) than any other notothenioid (Eastman 2017). The biology of these species was unknown until recently due to their rare occurrence, generally restricted to deep waters (Gon 1990). More attention was devoted to their physiology, such as the morphology of brain and sense organs (Eastman & Lannoo 2003), and composition of antifreeze glycopeptides (Wöhrmann 1996).

Species composition and distribution of demersal fish fauna of the Weddell Sea is relatively well known, having been investigated during several expeditions of FS *Polarsirkel* and RV *Polarstern* during the 1980s (e.g. Kock *et al.* 1984, Ekau 1988, Schwarzbach 1988). Two main areas were surveyed by bottom trawling, off Vestkapp and in Gould Bay, in the eastern and southern Weddell Sea, respectively. *Bathydraco macrolepis* and *B. marri* were rarely caught, each representing < 2.0% of total catches of bathydraconids, whereas *A. nudiceps* accounted for *c.* 20% of total catches (Ekau 1988,