
Spatial and seasonal distribution of the squid *Okutania anonycha* (Pearcy et Voss, 1963) (Cephalopoda: Gonatidae) in the northwestern Pacific Ocean and adjacent areas

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ABSTRACT. Spatial and seasonal distribution patterns, and size structure of the squid *Okutania anonycha* were studied in the northwestern Pacific Ocean and adjacent waters of the Bering Sea and Sea of Okhotsk, and a life-cycle scenario was suggested. This study used data collected during 11 research cruises of the TINRO-Centre during 1985-2004. Of 18,990 squid individuals caught in these cruises, 1861 individuals were analyzed. *O. anonycha* occurred in the trawl hauls in variable quantities throughout a year, and maximum catches of up to 2,800 individuals per hour trawling occurred in June. The dorsal mantle length ranged from 11 to 108 mm, and overall catches consisted of larval stages (16%), juveniles (54%) and feeding and maturing adults (30%). Monthly changes in size structure of the squid catches and analysis of modal class succession indicated that they might be associated with seasonal peaks of spawning. *O. anonycha* has a one year life cycle, and it appeared closely associated with the Western Subarctic Gyre, while adjacent waters of the Bering Sea and Sea of Okhotsk are peripheral areas of the species primarily oceanic range.

of the gonatid taxonomy using a genetic approach revealed a high rate of genetic divergence between the two nominal species of the genus *Berryteuthis* (*B. magister* and *B. anonychus*), argued the high taxonomic value of the conventional “generic” characters, and suggested that the smallfin gonate squid should be placed into a new genus, *Okutania* [Katugin, 2004]. The latest analysis of phylogenetic relationships among the Gonatidae based on mitochondrial DNA sequence data supports the idea of a strong genetic and evolutionary divergence between the two *Berryteuthis* spp. [Lindgren et al., 2004, Lindgren et al., in press].

O. anonycha is a relatively small species (maximum dorsal mantle length (DML), 150 mm), rather muscular, and “its distribution is of low-boreal distant-neritic type not truly oceanic” [Nesis, 1997]. Early studies suggested that the species dwells exclusively off the North American coast from California north to southeast Alaska [Nesis, 1973], and later this squid was considered a northeastern Pacific species distributed east of 160°E [Okutani et al., 1988, Nesis, 2003], with all records from the northwest Pacific Ocean attributable exclusively to the early life stages [Kubodera, Jefferts, 1984]. Our preliminary studies of the geographic distribution of *O. anonycha* revealed that, in fact, the species occurs through the boreal (primarily south boreal) zone of the North Pacific Ocean, partly including the Bering Sea and Sea of Okhotsk [Katugin et al., 2002; Katugin, Shevtsov, 2004]. Moreover, early juveniles of this species were once captured from the surface layer as far north in the Bering Sea as the Navarin region (60°50'N, 179°02'W). As for the vertical distribution of this species, it occurs primarily in the epipelagic zone [Nesis, 1997]; however, it has also occasionally been reported from great depths of 1000-1500 m [Anderson, 1978; Roper et al., 1984; Okutani et al., 1988]. The early life stages are widely distributed in the upper epipelagic zone over vast oceanic areas and in the south Bering Sea [Kubodera, Jefferts, 1984]. In the northeast Pacific Ocean, adults

Introduction

The minimal armhook, or the smallfin gonate squid *Okutania anonycha* (Pearcy et Voss, 1963) was first recognized as a new species from collections made in the northeast Pacific Ocean off the Oregon coast during 1960-1962, and described as a representative of the family Gonatidae under the name *Gonatus anonychus* [Pearcy, Voss, 1963]. Later studies on the systematics of the gonatid squids [Okutani, 1968; Nesis, 1971, 1973] suggested that this species should be placed in the genus *Berryteuthis* Naef, 1921, based upon the combination of three major character states: a radula with 7 teeth in transverse rows, the presence of tentacles in adults, and the absence of hooks on the tentacular club. Until recently, this species was mentioned under the name *Berryteuthis anonychus* (Pearcy et Voss, 1963) in most publications. However, a recent study