
Distribution and biology of the Japanese common squid (*Todarodes pacificus*) in the Pacific Ocean off the Kuril Islands and eastern Kamchatka in summer

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ABSTRACT. Two size groups comprised stocks of the Japanese common squid (*Todarodes pacificus*) migrating in the Pacific Ocean off the Kuril Islands and eastern Kamchatka in June-September 2004. Small-sized squid were juveniles while large-sized animals were adults. Juveniles occurred in June-July, and had a mean dorsal mantle length (DML) of 76 mm. Mean DML of adult squid increased northeastward from 156 mm in June to 174 mm in July off the Kuril Islands, and 239 mm in September off eastern Kamchatka. In autumn, one individual was caught as far north as 55°N, which is the northernmost point of the species occurrence reported so far, and another one to the east of the Commander Islands, in the Bering Sea (Near Strait). All adult animals were immature and were intensively preying, mainly upon fish (primarily, Myctophidae), to a lesser extent crustaceans (primarily, Euphausiacea), and occasionally cephalopods (identified as conspecific juveniles). Our findings suggested that under certain conditions, particularly, in years of intensification of the Kuroshio Current and at high stock abundance, schools of the Japanese common squid may be widely distributed in the northwestern Pacific Ocean, and may even migrate as far to the north as the area adjacent to the Commander Islands during forage migrations.

rates as far north as the Tatar Strait in the Japan Sea, approximately up to the latitude 51°30'N [Suzuki, 1974; Shevtsov, Mokrin, 1998], up to offshore areas of western Kamchatka (54°20'N, 151°30'E) in the Okhotsk Sea (our data), and up to southern Kamchatka in the Pacific Ocean [Okutani, 1995]. In the Pacific Ocean, the species was reported from as far east as approximately 165°E, and as far north as approximately 52°N [Mokrin, Khen, 2004]. Information that the Japanese common squid occurred off the coast of Canada [Zuev, Nesis, 1971; Roper et al., 1984] seems rather doubtful, and needs confirmation.

T. pacificus is harvested commercially almost throughout the entire distribution range, and the total annual catch of this species peaked at about 700,000 metric tons in 1968 [Murata, 1989; Sakurai et al., 2002]. Pacific Ocean regions off Hokkaido and the Kuril Chain are the northernmost areas of the squid distribution, where during years of high stock abundance the species may occur in rather dense (and even commercial) aggregations [Nakata, 1993; Shevtsov et al., 2004]. This region is the northernmost portion of the species range in the Pacific Ocean, and it includes a zone of intensive interaction between warm Kuroshio and cold Oyashio currents. Here, individuals from the winter-spawning group or cohort forage and grow before migrating back to southern natal areas to reproduce [Araya, 1967; Okutani, 1983; Murata, 1990]. This squid is a neritic-oceanic dweller of the subtropical origin [Okutani, 1983]. It implies that oceanographic conditions may affect and even govern the squid migration routes and spatial distribution patterns (and hence, squid abundance and commercial yield in a particular area), and may limit the species geographic range.

The main objective of this study was to reveal how far north *T. pacificus* migrates in the Pacific Ocean during summer feeding migrations. In order to achieve this general goal, we considered spatial distribution and selected biological traits (size, maturity and foraging activity) of *T. pacificus* captured

Introduction

The Japanese flying or Japanese common squid (*Todarodes pacificus* Steenstrup, 1880) is a low boreal subtropical epipelagic species belonging to the oceanic teuthid family Ommastrephidae [Nesis, 1982, 1985; Okutani, 1983, 1995]. The species is distributed in subtropical and temperate waters in the northwestern Pacific Ocean, including the northwestern Philippine, northern South China, East China, Yellow, Japan (East), and southern and even central Okhotsk seas, and in the oceanic and coastal areas off Japan and the Kuril Islands [Shevtsov, 1978; Nesis, 1982; Roper et al., 1984; Okutani, 1995; Mokrin, Khen, 2004]. In summer, *T. pacificus* mig-