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Young squid in the plankton of Prydz Bay, Antarctica

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Abstract: A collection of juvenile squid were caught with the Isaacs-Kidd midwater trawl (IKMT) and the Juday plankton net at 86 stations in Prydz Bay (60°–67°30'S, 60°–80°E) to a depth of 500 m but mostly at 0–200 m. Five species were identified, *Psychroteuthis glacialis, Alluroteuthis antarcticus, Brachioteuthis* sp. and the cranchiids *Galiteuthis glacialis* and *Mesonychoteuthis hamiltoni. P. glacialis* and the cranchiids were the most abundant species. Young *P. glacialis* (5–17 mm ML) were taken at depths of 5–200 m but concentrated in the upper 100 m whilst the cranchiids (5–35 mm ML) occurred over a wider vertical range (50–500 m). The regular occurrence of paralarvae and juveniles suggests that all the species reproduce in the Antarctic. Juvenile vertical distribution appears to differ between species with *P. glacialis* concentrated relatively near the surface, the cranchiids in the upper part of the Circumpolar Deep Water and *A. antarcticus* widely distributed to a depth of 900 m.

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Introduction

Paralarvae and juveniles of Antarctic squid have been reported on a number of occasions but until recently there have been few data on their ecology. During RRS *Discovery* Cruise 100 in 1979 a narrow sector of the Southern Ocean (15–30°E) was investigated and data on the juveniles of three species, *Alluroteuthis antarcticus, Mesonychoteuthis hamiltoni* and *Galiteuthis glacialis* were collected (Rodhouse 1988, Rodhouse & Clarke 1985, 1986). A small collection of young squids from the JARE-28 cruise of the RV *Shirase* (30–47°E) has also been described by Kubodera (1989).

During a series of Soviet oceanographic expeditions, macroplankton surveys in the region of Prydz Bay (60–80°E) caught a number of paralarval and juvenile squid. This extended the coverage of paralarval and juvenile squid collections in the Eastern Antarctic from 15 to 80°E.

Materials and methods

Young squid were collected during the austral summers (late December–March) of 1985–88 in the Prydz Bay region (60°–67°30'S, 60°–80°E). Specimens were taken at 86 stations (Fig. 1) with an Isaacs-Kidd midwater trawl (IKMT) with a mouth area of 6 m^2 and a Juday plankton net with a mouth area of 0.5 m^2. The 0–200 m and 0–500 m depth layers were sampled by the IKMT and the Juday net respectively. In 1985 and 1986 samples were collected by oblique or stepped-oblique hauls from the lower limit of the Deep Scattering Layer (DSL), at 50–80 m, to the surface or, when the DSL was absent, from 100 m to the surface. In 1987–88 layers 200–0 m and 100–0 m were sampled. Haul duration was 30 min; speed 3–4 knots. Additional specimens of adult squid were taken with a large pelagic trawl at 150–380 m.

Results

During the four cruises, 215 specimens were obtained representing five species: *Psychroteuthis glacialis* (Psychroteuthidae), *Alluroteuthis antarcticus* (Neoteuthidae), *Mesonychoteuthis hamiltoni* and *Galiteuthis glacialis* (Cranchiidae) and *Brachioteuthis* sp. (Brachioteuthidae). Juveniles of *P. glacialis* and *A. antarcticus* were readily identified as the diagnostic characters were clear in even the smallest specimens. The two cranchiid species were not separated at ML <20 mm so most specimens were assigned to an unidentified Cranchiidae category. Cranchiids >35 mm ML were all *G. glacialis* in which the posterior portion of the mantle is drawn out into a tail, small fins are visible and there are paired tubercles on each side of the nuchal mantle fusion.

Juvenile *P. glacialis* (5–10 mm ML) have an almost cylindrical mantle. The arms are subequal in length with a biserial sucker row. The longer tentacles have slightly expanded clubs, paired suckers and fixing pads along the stout stalk. The thin, transparent gladius has narrow dark coloured ridges on the rachis, visible through the skin on the dorsal side of the mantle. The digestive gland is large. Juvenile *A. antarcticus* differ from *P. glacialis* in that the mantle is sac-like with small, round subterminal fins. The head is large, the arms soft and thick, especially on the ventral side. The tentacles are shorter than the arms and the clubs are not formed. Suckers lie along the tentacles from the base and occupy the whole length. Juveniles of *P. glacialis* and *A. antarcticus* have generally similar body, arm and tentacle proportions to adults. Young cranchiids of the same size are morphologically distinct from the adult. They have much reduced fins and the branchial crown consists of tiny undeveloped arms and relatively long clubless tentacles.

Juvenile squid were dominated by *P. glacialis* (83 specimens from 49 stations) and cranchiids (126 specimens from 49

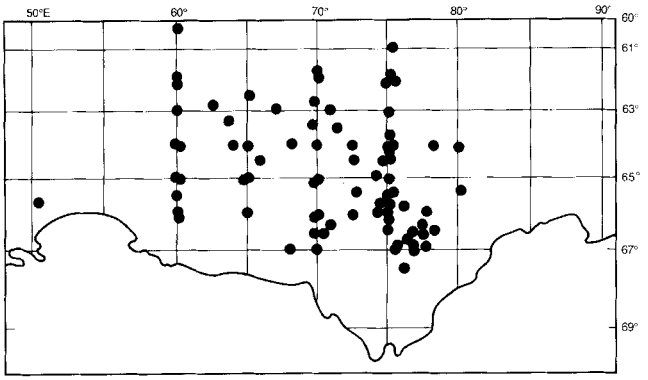

Fig. 1. Stations in Prydz Bay where paralarval and juvenile squid were caught during the austral summers of 1985-88.

stations). *A. antarcticus* was taken at only ten stations and *Brachioteuthis* sp. at two. Juveniles of *P. glacialis* occurred throughout the area from 60–67°S. The majority were caught by the IKMT during summer. The deepest haul to catch *P. glacialis* sampled a layer from 200–0 m. The shallowest was from 10–5 m. Most specimens were from hauls taken between the boundry of the DSL and the surface. In hauls sampling depths of 45 m and less the only species present was *P. glacialis*. The specimens all fell within a narrow size range, 5–17 mm ML. The smallest individuals (5–6 mm ML) and highest abundance was recorded between 62–64°S in the region of the Antarctic Divergence.

Cranchiids were collected from stations between 60–67°30'S with both the IKMT and Juday net at depths from 50–500 m. Larvae and juveniles were taken from greater depths than *P. glacialis*, mostly between 100–200 m. In five samples taken with the Juday net to 500 m, only small paralarval cranchiids of 4–10 mm ML were caught. Overall abundance of cranchiids was highest at southern stations (67°S) near the ice edge. The maximum number of specimens caught per 30 min haul was 14.

Juvenile *A. antarcticus* (14–45 mm ML) were caught with the IKMT in hauls from 80–0 m, 100–0 m and 200–0 m. Young *Brachioteuthis* sp. (28 and 70 mm ML) were taken with the IKMT from 80 m and 50 m. As well as juvenile squid, adult specimens of *P. glacialis, A. antarcticus* and *G. glacialis* were taken with a pelagic trawl at stations south of 66°S. On one occasion 83 specimens of *P. glacialis* (130–140 mm ML) were taken in a single haul.

Discussion

Macroplankton surveys of Prydz Bay from 1985–88 provide information on the juvenile cephalopods of the region. The data are not directly comparable with those obtained elswhere in Antarctica by the RRS *Discovery* cruise 100. That expedition investigated the region from 38°S with nine stations south of 60°S and sampled to a depth of 2500 m. Sampling of 100 m layers gave detailed data on the distribution of three Antarctic species (Rodhouse 1988, Rodhouse & Clarke 1985, 1986). The present study was entirely carried out south of 60°S but only the upper pelagic zone to a depth of 500 m was investigated.

The regular occurrence of the paralarvae and juveniles of *P. glacialis* and *A. antarcticus* in the summer plankton provided strong evidence that these species reproduce in the Antarctic in the seasonal pack ice zone. The data indicate that young cranchiids and *P. glacialis* are the predominant squid in the plankton. Two species of cranchiid occur in Antarctic waters, *Mesonychoteuthis hamiltoni* and *Galiteuthis glacialis* (Klumov & Yukhov 1975, McSweeny 1978, Rodhouse & Clarke 1985). *P. glacialis* is common in the diet of vertebrate predators in Antarctica (Offredo *et al.* 1985, Gales *et al.* 1990) and this is reflected by the presence of relatively large numbers of paralarvae and juveniles in the plankton.

The present study suggests that *P. glacialis* is most abundant in the upper 100 m layer. Rodhouse & Clarke (1985, 1986) suggest that young cranchiids are concentrated at 300–400 m in the upper part of the CDW and *A. antarcticus* is most abundant at 800–900 m (Rodhouse 1988). There appears to be spatial segregation of these species in the water column. It is possible that several species of Antarctic squid spawn and hatch in the upper CDW subsequently spreading up in the water column where feeding conditions are best for the early life stages.

Juvenile *P. glacialis* have been recorded widely in the Antarctic (Piatkowski 1987, Rodhouse 1989, Kubodera 1989) and the results of the present study appear to confirm that this is a circumpolar species that reproduces over a large area in the Antarctic. Frequent occurrence of juveniles in Prydz Bay suggests this is a regular breeding area and the narrow size range of specimens suggests a limited spawning season.

The number of juvenile squid in the plankton of Prydz Bay is comparable to numbers of pelagic Antarctic fishes such as *Bathylagus gracilis, Notolepis coatsi* and *Electrona antarctica* which occur in the upper 200 m. Large numbers are known to be present in the region (Nevinsky & Efremenko 1989) and it would appear that squid are equally abundant.

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