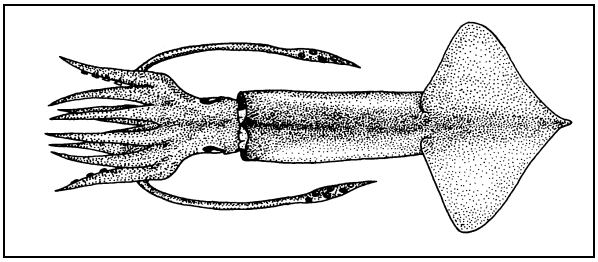

Fig. 1. Neon flying squid, *Ommastrephes bartrami.*

Neon Flying Squid

Background

Neon flying squid (Ommastrephes bartrami) are large oceanic squids found in the Pacific, Atlantic and Indian Oceans. In the North Pacific, they spawn in subtropical waters in the winter, and juveniles migrate northward to near the subarctic boundary to feed in the summer and fall. Flying squid generally aggregate near cold-water fronts when feeding near the surface at night and descend to depths greater than 300 metres during the day. Flying squid are distributed in or near British Columbia waters from July to September.

Neon flying squid were the target species of Asian driftnet fisheries in the North Pacific from the late 1970s until the early 1990s. Landings peaked in 1989 at approximately 357,000 t, and averaged 265,625 t annually between 1980 and 1990. Experimental fisheries using driftnets and automated jigging machines between 1979 and 1991 indicated that fishable aggregations of flying squid were available in or near B.C. waters in the late summer and fall.

This is one of a number of fisheries diversification initiatives underway in B.C.. Exploratory jig fishing for flying squid was undertaken in B.C. in 1996 via a partnership arrangement between industry and the federal and provincial governments. The objective of the agreement was to assess the feasibility of an automated jig fishery off the B.C. coast, both inside and outside of Canada's 200-mile fisheries conservation zone.

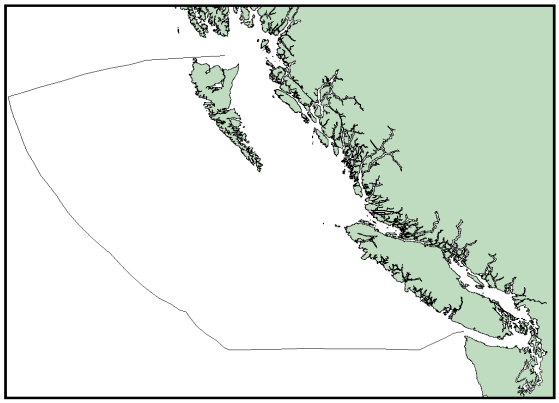

Fig. 2. Coastal British Columbia, showing the boundaries of Canada's Pacific Fishery Conservation Zone

Summary

- Neon flying squid are a highly migratory oceanic species that enter B.C. waters in the summer and fall.
- A pilot commercial fishery has explored the feasibility of an automated jig fishery since 1996.
- Catch has been lower than anticipated, and effort has been lower than initial expressions of interest by industry indicated.
- The fishery will continue as a pilot for the present.

Species Biology

Flying squid undergo a cyclic migration from spawning grounds in the Subtropical Pacific northward into productive Subarctic Boundary waters to feed and grow, followed by a southward migration of mature or maturing squid back in to Subtropical waters.

Flying squid live for approximately a year, during which growth is extremely rapid. Researchers have proposed varied combinations of spawning cohorts, and some suggest that the eastern and western North Pacific each have separate stocks. Females grow to 60 cm mantle length and 5.3 kg, while males are somewhat smaller.

Mating and spawning are separate acts. Males mature earlier in the season, and at a smaller size, than females. Males pass spermatophores to females, which are stored in the mantle cavity until the female ripens and spawns. Egg masses are likely spawned in midwater. Fecundity has been estimated at 350,000 to 3.6 million eggs per female, depending on size. Both males and females are thought to die soon after spawning. Larvae are pelagic and grow quickly during the northward migration.

Neon flying squid eat small pelagic fish (such as myctophids and saury) and squid, including smaller individuals of the same species. In turn, flying squid serve as prey for swordfish, marlins, sharks, tunas, marine mammals and seabirds

The Fishery

Fishers attempt to locate shoals of squid using acoustic sounders and oceanographic patterns, primarily sea surface temperature. Fishing occurs primarily at night, when a powerful array of lights are used to attract squid to the fishing vessels. In recent years, continuous fishing resetting the gear at great depths during the day was attempted.

The fishery utilizes automated jigging machines developed for the Japanese fishery. Each machine has two lines, which are configured with a variable number of jigs and a large weight on the end. The machine lower the lines to a desired fishing depth, then retrieve them with a regular jigging motion. The squid are caught on the jigs, and are released from the gear as they are lifted aboard the vessel.

Squid are moved from the machines to a central processing area, where they are cleaned, separated into various products (mantles, wings and tentacles) and quickly frozen to ensure maximum quality. The refuse is frozen for sale as bait.

The experimental pilot fishery is managed under a total allowable catch of 1,500 t, approximately 1% of the long term average yield of the historic North Pacific fishery.

Fishers are given authority to fish under a scientific licence, and a licence to fish or tranship fish in waters other than Canadian fisheries waters. Eligible vessels must be equipped with automated jigging machinery, high-wattage lighting, and an at-sea processing and storage capacity, and be capable of high-seas trips of at least 3 weeks. Ten licences were approved in 1996, and this was increased to 21 in 1997 and 1998. Three other oceanic squid species were added to the pilot in 1997: the schoolmaster gonate squid (*Berryteuthis magister*); the 8-armed squid (*Gonatopsis borealis*); and the boreal clubhook squid (*Onychoteuthis borealijaponica*).

Catch and Effort

Relatively few licences were actively fished during the first 3 years of the pilot fishery. This is a reflection of many licence-eligible vessels continued involvement in traditional fishing opportunities, such as groundfish quotas and large Fraser River sockeye abundance in 1997. Catch rates increased in 1998, but no fishing occurred after Oct. 1, due to inclement weather.

Vessels participating in the pilot fishery report catch, effort, location, oceanographic, and weather information on harvest logbooks. Verified landings of various products (mantles, tentacles, wings) which are processed, packed and frozen at sea are converted to whole squid weights using conversion factors determined by observers.

Table 1. Season and participation in the 1996-98 pilot flying squid fishery.

Year	Season	# Vessels	Days Fished
1996	Jul 15-Oct 31	6	76
1997	May 12-Dec 31	4	19
1998	Aug 1-Dec 31	4	84

Effort is measured in jig-hours. Each double-spooled machine has two jigging lines, each usually equipped with 10 to 20 jigs per line. Thus, a vessel operating three machines rigged with 20 jigs per line for one hour expends 120 jig-hours of effort.

Table 2. Catch and effort in the 1996-98 pilot flying squid fishery.

Year	Total Effort (jig-hr)	Landings (t)
1996	180,418	7.4
1997	32,519	1.3
1998	67,315	63.0

Concerns arose during discussions of fishery development regarding potential bycatch of fish species, with particular concern surrounding salmonid bycatch, which was an issue in the high seas driftnet fishery. To date bycatch rates have been extremely low, consisting primarily of blue sharks (*Prionace glauca*) and pomfret (*Brama japonica*).

Resource Status

This is a new fishery, with little information available on stock size, biological characteristics or fisheries interactions. Current emphasis is on development of catch, effort, bycatch and biological data to monitor fishery performance, and develop methods to assess stock status and responses of stocks to fishing.

Outlook

The potential of this fishery remains unproven. Some fishers are beginning to recognize oceanic conditions and acoustic information that may be correlated with squid abundance. Experimentation with underwater lighting and daytime fishing in 1998 led to the highest production in the brief history of the fishery. Further development of these techniques and increased effort in the fishery will likely continue to increase production.

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