The Veliger 33(3):238–240 (July 2, 1990)

THE VELIGER


# Temporary Northern Range Extension of the Squid *Loligo opalescens* in Southeast Alaska

by

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*Abstract.* This note reports a temporary northern extension of the range of the California market squid, *Loligo opalescens* Berry, 1911, to 58°N in Southeast Alaska and suggests that water temperatures influence the northern limits of this neritic squid.

The reported range of *Loligo opalescens,* Berry, 1911, the only loliginid in the northeastern Pacific, is from Baja California (28°N) to southern Southeast Alaska (55°N) (BERNARD, 1970; HIXON, 1983). Although the main commercial harvest comes from California, small commercial fisheries exist in Baja California, Oregon, and Washington (ROPER *et al.,* 1984). Potentially, commercial stocks exist in British Columbia (BERNARD, 1980) and Southeast Alaska (STREET, 1983).

Reports of *Loligo opalescens* in Southeast Alaska are sparse. REID (1961) found *L. opalescens* in the stomachs of chinook (*Oncorhynchus tshawytscha* Walbaum, 1792) and coho (*O. kisutch* Walbaum, 1792) salmon from Southeast Alaska in 1957–1958. *Loligo opalescens* was not subsequently reported in Alaska until 1980, prompting exploratory fishing around Prince of Wales Island in 1982 (STREET, 1983). During 1982, *L. opalescens* was found in stomachs of troll-caught salmon off the west coasts of Baranof and Yakobi islands (KARINEN *et al.,* 1985; WING, 1985).

*Loligo opalescens* was collected north of latitude 55°N on several occasions from 1982 through 1984 during research projects of the Auke Bay Laboratory and from stomachs of salmon caught by participants of the Alaska Troll Logbook Program (Figure 1, Table 1). The collections from Yakobi Island (58°N) are the most northerly records for this species; the trawl catch west of the Myriad Islands (57°N) is the most northerly evidence of schooling; and the collection of egg capsules at Rowan Bay (56°N) is the most northerly observation of spawning.

The trawl catch of *Loligo opalescens* from west of the Myriad Islands is of interest because the number of specimens captured (>230) indicates that the sample was from a large school. These squid were classified as mature or immature (Table 2), based on the presence or absence of eggs or sperm (FIELDS, 1965); ca. 94% of the females had maturing ovaries and 61% of the males had spermatophores. Mantle lengths (ML) averaged 78.4 mm and 83.7 mm for males and females, respectively. These squid were captured at 126 m and at a bottom water temperature of 6.9°C.

*Loligo opalescens* spawns at water temperatures from 7°C (BERNARD, 1980) to 16°C (FIELDS, 1965). Water temperatures above 7°C occur in the southern portion of Southeast Alaska from March to December, with maximum temperatures of 13–16°C occurring in July and August (WILLIAMSON, 1965; JONES, 1978). Spawning is sporadic from December through September in British Columbia (BERNARD, 1980). Although *L. opalescens* spawns regularly in Barkley Sound (SHIMEK *et al.,* 1984), spawning may not occur annually at other British Columbia locations

Table 1

*Loligo opalescens* collected north of latitude 55° from 1982 through 1984.

| Collection number* | Collection data | | | |
|---|---|---|---|---|
| | Samples | Date | Southeast Alaska location | Method, depth |
| | | *Live captures* | | |
| AB 82-20 | 335 egg capsules | 21 July 1982 | Rowan Bay, Kuiu Island 56°39.4'N, 134°15.5'W | Scuba diving, 12–15 m |
| AB 83-21 | 2 juveniles (57 & 87 mm ML)** | 4 Aug. 1983 | Port Conclusion, Baranof Island 56°15.8'N, 134°39.8'W | Trawl, 18–37 m on hard bottom |
| AB 84-54 NMML 454 | 230+ specimens (57–116 mm ML) (27 specimens are at AB, 63 at NMML; rest discarded) | 4 May 1984 | West of Myriad Islands 57°33.6'N, 136°22.3'W | Trawl, 126 m on hard bottom |
| AB 84-71 | 1 male (86 mm ML) | 17 July 1984 | Lisianski Inlet, east side Yakobi Island, 58°0.6'N, 136°28'W | Purse seine, 0–45 m |
| AB 84-72 | 1 juvenile (57 mm ML) | 18 July 1984 | Herbert Graves Island 57°41'N, 136°11'W | Purse seine, 0–45 m |
| | | *Stomach contents* | | |
| AB 83-47 | 2 juveniles (21 & 22 mm ML) | 10 Apr. 1982 | Whale Bay, Baranof Island 56°36.3'N, 135°2.5'W | Chinook salmon stomach |
| AB 83-48 | 1 adult (89 mm ML) | 14 Apr. 1982 | Whale Bay, Baranof Island 56°36.3'N, 135°2.5'W | Chinook salmon stomach |
| AB 83-49 | 1 adult (93 mm ML) | 18 Aug. 1982 | Surge Bay, Yakobi Island 57°59.7'N, 136°33.1'W | Coho salmon stomach |
| AB 83-50 | 1 adult (81 mm ML) | 1 July 1983 | Hoktaheen, Yakobi Island 58°4.4'N, 136°33.0'W | Chinook salmon stomach |

* Collections held at the Auke Bay Laboratory, Auke Bay, Alaska (AB) or the National Marine Mammal Laboratory, Seattle, Washington (NMML).

** ML = dorsal mantle length.

(FIELDS, 1965). Frequency of spawning in southern Southeast Alaska is unknown.

The two periods during which *Loligo opalescens* has been documented in Southeast Alaska are associated with warmer than average waters: REID (1961) reported squids, including *L. opalescens,* as common in stomach contents (1.3–13.8%) of troll-caught chinook salmon during the strong 1957–1958 El Niño, and STREET (1983) collected *L. opalescens* in southern Southeast Alaska from 1980 to 1982 following a warming trend that began in 1970 (ROYER, 1985). The presence of *L. opalescens* as far north as Cross Sound in northern Southeast Alaska during 1983 and 1984 probably resulted from a combination of the 1982–1983 El Niño and the long-term warming trend. The possibility that this warming trend resulted in an overall increase in abundance of *L. opalescens* is consistent with observations in central California where successive warm years resulted in increased harvest (MCINNIS & BROENKOW, 1979). Increased landings in Washington also occur during or following a strong El Niño (SHOENER & FLUHARTY, 1985). During the 1982–1983 El Niño, squid from the more southerly areas may have established small spawning populations along the coast from southern Baranof Island to Cross Sound. Although the specimens collected in 1984 from the Myriad Islands were in spawning condition, no specimens of *L. opalescens* have been collected during subsequent zooplankton and demersal fish surveys in the same general area. It appears, therefore, that permanent populations were not established.

Table 2

Sex, maturity, and size of *Loligo opalescens* collected west of the Myriad Islands, Southeast Alaska, 4 May 1984. Measurements made before preservation.

| Sex and maturity | Mean dorsal mantle length (mm) | Number measured ($n$ = 202) |
|---|---|---|
| Females | 83.7 | 109 |
| Mature | 84.4 | 102 |
| Immature | 73.7 | 7 |
| Males | 78.4 | 93 |
| Mature | 82.0 | 57 |
| Immature | 72.6 | 36 |

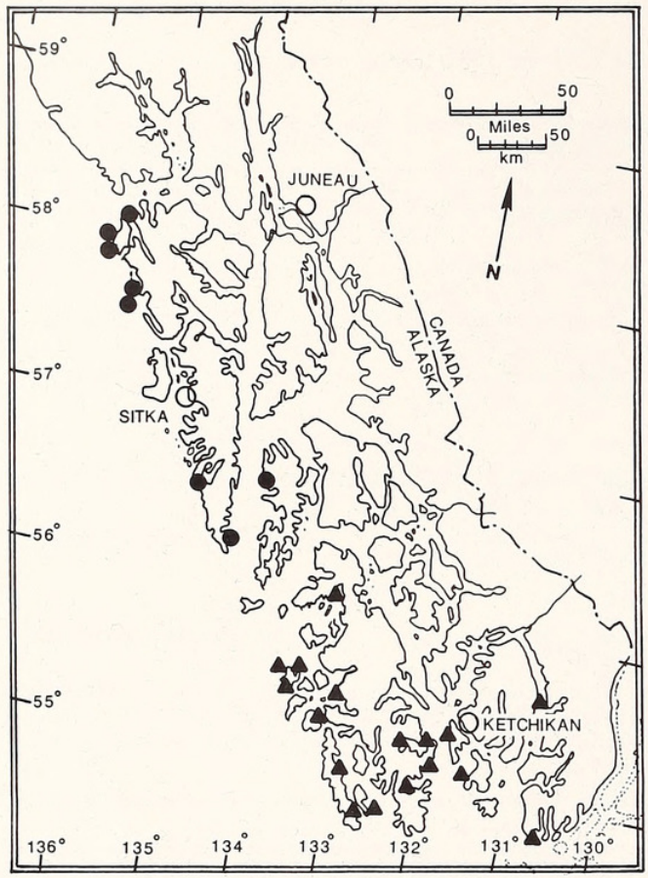


Figure 1

Capture localities of *Loligo opalescens* (closed circles) in northern Southeast Alaska and localities of observations (triangles) reported by STREET (1983) in southern Southeast Alaska.

## ACKNOWLEDGMENTS

We thank Mr. Clifford Fiscus, Dr. Katharine Jefferts, and Ms. Sara Maupin for confirming the identification of the specimens from the Myriad Islands and for sorting and storing them at the National Marine Mammal Laboratory. We thank Mr. Richard Haight for release of the sample and data.

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