DISTRIBUTION PATTERNS OF PELAGIC CEPHALOPODS THROUGH THE SUBARCTIC AND SUBTROPICAL FRONTAL ZONES IN THE CENTRAL NORTH PACIFIC

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ABSTRACT

Large scale fronts and associated frontal zones have profound effects on the distribution of pelagic oceanic animals. These oceanographic features create unique ecotones and are often identified as concentration sites for many organisms and barriers for others. Concentration of animals at these fronts give rise to localized regions where feeding aggregations abound and commercial fisheries have flourished.

In the North Pacific, the Subarctic and Subtropical Frontal Zones form boundaries that divide some of the large, "core" pelagic biogeographic provinces. Historically, biogeographic ranges of many micronektonic species including euphausiids, pteropods, heteropods, and chaetognaths as well as some commercial fish species have been shown to correspond with regions delimited by these large scale features. Results from recent trawl surveys that sampled across these frontal zones support previous suppositions that the distribution, abundance and assemblage patterns of many pelagic cephalopods are also strongly influenced by these physical features.

During August 1991, 3062 cephalopods representing 25 species were collected at sites along the 174.5° and 179.5° W meridians traversing the Subarctic Frontal Zone between the 37° and 46° N parallels. Another 634 individuals representing at least 36 species were taken in the Subtropical Frontal Zone region (between 21° and 31°N latitudes) during March-April 1992. Vertically migrating, micronektonic forms of the oegopsid squid families Enoploteuthidae, Gonatidae, Onychoteuthidae, Pyroteuthidae, Cranchiidae, and Chiroteuthidae were the most extensively sampled and displayed some

distributional response to large-scale frontal boundaries defined on near-synoptic time and space scales. Although several species shared common bounds at one extreme of their meridional range, few species exhibited mirrored distribution patterns. Therefore, a gradation of species was observed across oceanographic regimes as opposed to an abrupt change in faunal composition across frontal systems. The two most abundant species collected, *Abraliopsis felis* and *Pyroteuthis addolux*, also exhibited the broadest north-south distributions and had range limits associated with specific frontal boundaries. *Abraliopsis felis* displayed a range well into the Subarctic Domain to the north but catches diminished to the south and ended with the Subtropical Frontal Zone-subtropical water mass interface; *P. addolux* was taken throughout the Subtropical Domain but was not caught north of the "Subarctic Boundary".

Broad categorizations of "warm water" subtropic-tropic, "cold water" boreal subarctic and transitional endemics seem to best model the sampled fauna. The warm water species, such as *Abralia trigonura*, *Enoploteuthis higginsi*, *E. jonesi*, *E. reticulata*, *Onychoteuthis sp. C*, *Pterygioteuthis giardi* and *P. microlampas*, were captured throughout the Subtropical Domain and may have ranges extending farther south towards the equator but had northern limits defined by individual fronts within the Subtropical Frontal Zone. A complementary cold water species group includes species such as *Onychoteuthis borealijaponica*, *Galiteuthis phyllura*, *Gonaptopsis borealis*, and *Chiroteuthis calyx*, were taken throughout the Subarctic Domain and Subarctic Frontal Zone with southern range limits positioned somewhere within the mid-Transition Zone.

Recurrent group analysis was employed to examine species assemblage patterns. Results from the multivariate clustering routine supported the distribution patterns described above. Strong intergroup links between recurrent groups reflect the faunal gradation across oceanographic regimes; abrupt change in faunal composition across frontal systems would have resulted in the generation of more discrete recurrent groups. In the Subarctic series, the four recurrent groups form a broad subarctic-Transition Zone complex. Species that exhibited more extensive latitudinal distribution ranges tended to co-occur as did the cluster of species designated as Transition Zone endemics.