The trophic ecology of two oceanic squids in Hawaiian waters

Presentation Outline

- Introduction
  - Background on squids
  - Methodology
- Study objectives
- Results
- Future analyses
- Conclusions
Background on squids

Migrates 20-50N

Zone of Overlapping Distributions

Non-migrator tropics to 25N

< 38cm

< 76cm

Hawaii
Why study the trophic ecology of these squids?

- Every large pelagic predator feeds on ommastrephids
- feed heavily on mesopelagic fishes and squids
- collapse of major finfish fisheries
Methodology

“Trophic position refers to how many energy transfers that have occurred between the basal resource (photons or detritus) and the species or trophic group in question.” Persson et al. (1996)

- Stomach contents
  - species identification
  - labor intensive/arbitrary trophic levels
- Stable isotopes
  - $\delta^{13}C \approx 1\%$ enrichment/trophic level
  - $\delta^{15}N \approx 3.4\%$ enrichment/trophic level
  - physiological basis for trophic level
  - interpretation
Objectives of this study

- Determine trophic positions of both squid species
- Determine interactions of both squid species
  - predator/prey
  - competition
  - resource partitioning
- Examine the isotopic signals from different tissues, and look for possible historical signals
What I have so far

Stomach contents -

Plot of major otolith constituents of two squid species

Myctophidae

Unidentified

Gonostomatidae

Melamphaeidae

Sternoptychidae

Evermannellidae

Fish family

% of total otoliths

Plot of five major myctophid species

red squid

purple squid

Myctophid species
What I have so far

Stable isotopes -

Increasing category size vs $\delta^{15}$N

- Filtered material
- Zooplankton
- Ob paralarvae
- Ob juveniles
- So adults
- Ob adults
- Tuna
What I have so far

Stable isotopes -

\[ R^2 = 0.9329 \]

\[ R^2 = 0.9431 \]

\[ R^2 = 0.7655 \]

**O. bartramii** $\delta^{15}$N vs mantle length

- Paralarvae
- Males
- Females
- Juveniles
- 1999
- 2000
- 1998
What I have so far

Stable isotopes

Plot of Bigeye and Yellowfin lengths vs $\delta^{15}\text{N}$
Where to go now?

- Regressions of otoliths/beaks vs fish/squid
- Comparisons of stomach contents findings with stable isotope results of individual outliers
- Stable isotopes of different tissues
- Isotopic analyses of prey items
- Historical signals in secreted structures
Hypotheses/Results to Date

- Red and purple squid are not competing for food resources, resource partitioning seems to occur
- Red squid seem to be more generalist feeders while the purple squid appears to specialize
- The red squid feeds at a higher trophic level than the purple squid
- Red squid seem to have reached a trophic plateau at higher mantle lengths.