Chemical Clues: stable isotopes and tuna.

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Structure-associated Hawaiian Food Webs

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Focus

Trophic Shift – CTP and WTP

Isotopic differences in tuna tissues – CTP, WTP, ETP

Starvation Issues – CTP, WTP
**δ^{13}C Values:**
Source Information

“you are what you swim in”

**δ^{15}N Values:** Trophic Information

“you are what you eat + 3 ‰”

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Fry et al. 1978

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Fig. 1. δ^{13}C values of plants and grasshoppers at a West Texas study site. Values are expressed as ‰ (see text for explanation).

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Courtesy of Dr. R. Doucett (NAU)
Central Tropical Pacific
BET vs. YFT

\[ \delta^{15}N \text{ (‰)} \]

\[ \delta^{13}C \text{ (‰)} \]

> 46cm BET
> 46cm YFT
< 42 cm YFT
Central Tropical Pacific

Fork Length (cm) vs. δ¹⁵N (‰)

- Liver
- WMT

Data points scatter across the graph, showing the relationship between fork length and δ¹⁵N values for liver and WMT samples.
Central Tropical Pacific
Tissue Types from Juvenile Tuna

\[ \delta^{15}N \text{ (‰)} \]

\[ \delta^{13}C \text{ (‰)} \]
STARVATION “SIGNAL”?  
(Hobson et al. 1993)
STARVATION “SIGNAL”?
(Hobson et al. 1993)

WTP Epipelagic Predators

Silky Shark

δ¹⁵N (‰)
δ¹³C (%)

Dolphinfish  ▲  Skipjack tuna  ▶  Yellowfin tuna

Starvation?
Conclusions

- Trophic shift due to change in diet.
- Initial results indicate a starvation signal
- Differences between liver and white muscle might be a proxy for migration and diet changes.

Future Directions

- Tuna Tank: Feeding trials to examine tissue turnover rates and starvation signals in tuna.
- Characterize regional isotope values at base of the foodweb by sampling barnacles on FADs.
- Utilize mercury as an additional trophic indicator in tuna
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