

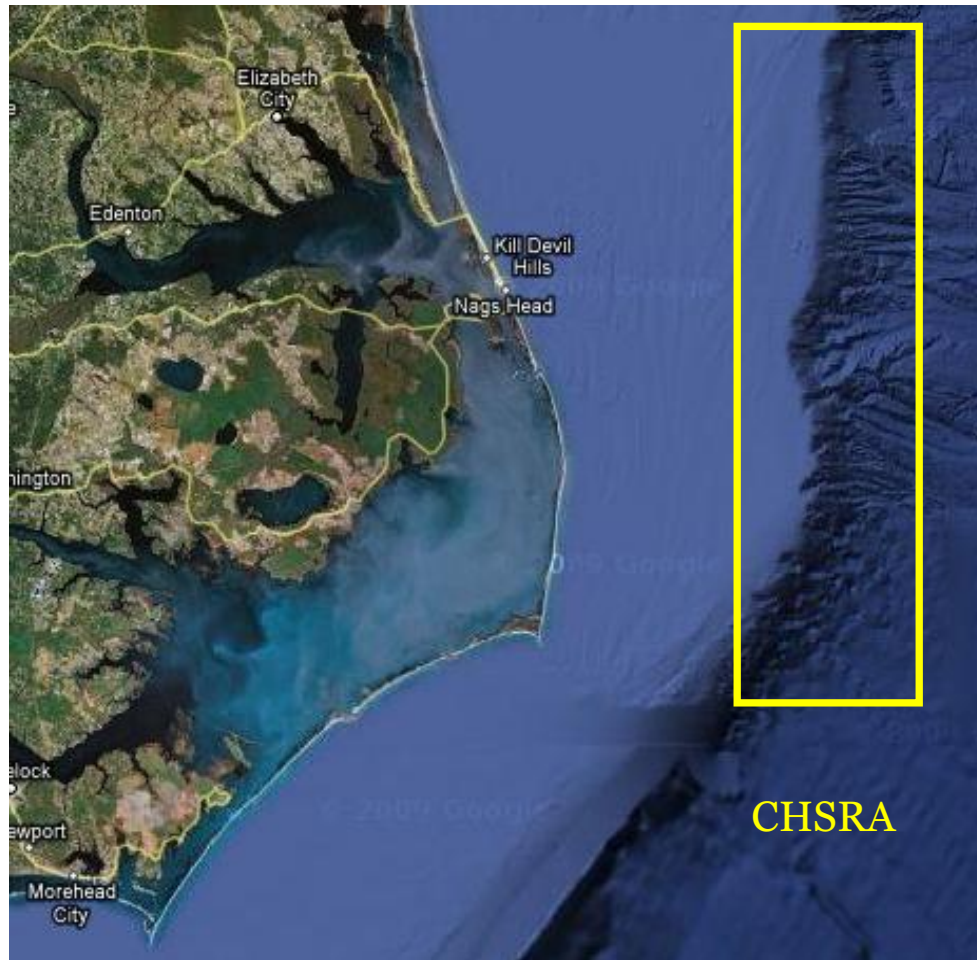
Stable isotope analysis of pilot whales



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Our focus



Background

Pilot whales interact with longline gear in two ways:

Depredation (loss or damage of catch)

Entanglement (death or injury of whales)



Depredation

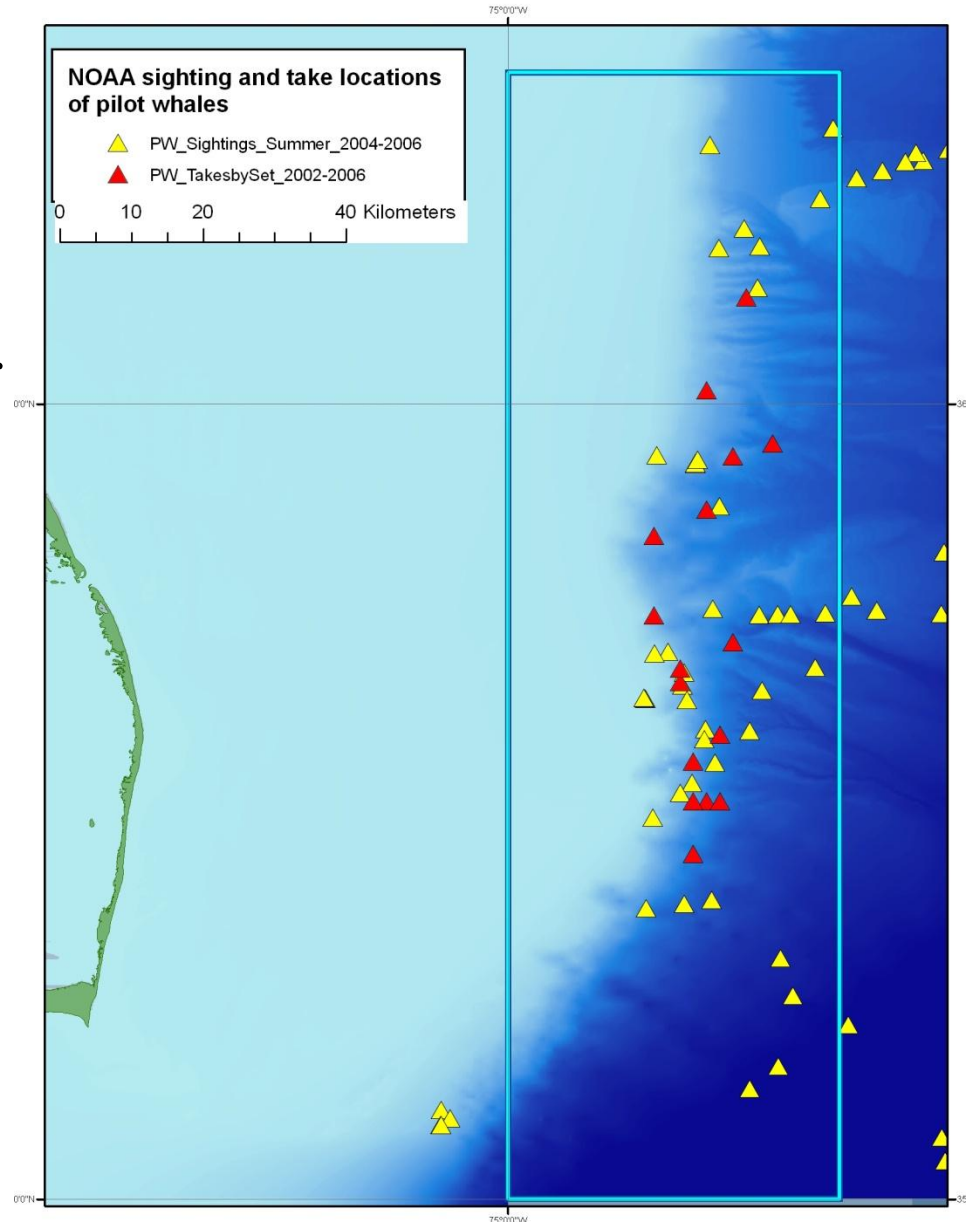


Depredation of tuna by
pilot whales

Entanglement

As a result of high numbers of takes:

- PLTRT convened in 2005
- CHSRA designated in 2009



Observed takes of pilot whales

Data courtesy of Lance Garrison, NMFS-SEFSC

Demographics



Healed scars of *past* entanglements

Class	# in Group	# Fishery interactions	% Fishery interactions
Adult female	16	5	31
Adult male	1	1	100
Subadult female	1	0	0
Subadult male	0	0	NA
Juvenile female	2	0	0
Juvenile male	3	2	66
Calf female	2	0	0
Calf male	2	1	50
TOTAL	27	9	33

Objectives

Identify depredation in pilot whales in the CHSRA
using stable isotope analysis



Stable isotopes

The isotopic value of animal tissue is the ratio of heavier to lighter isotopes in that tissue relative to a 'standard' material'

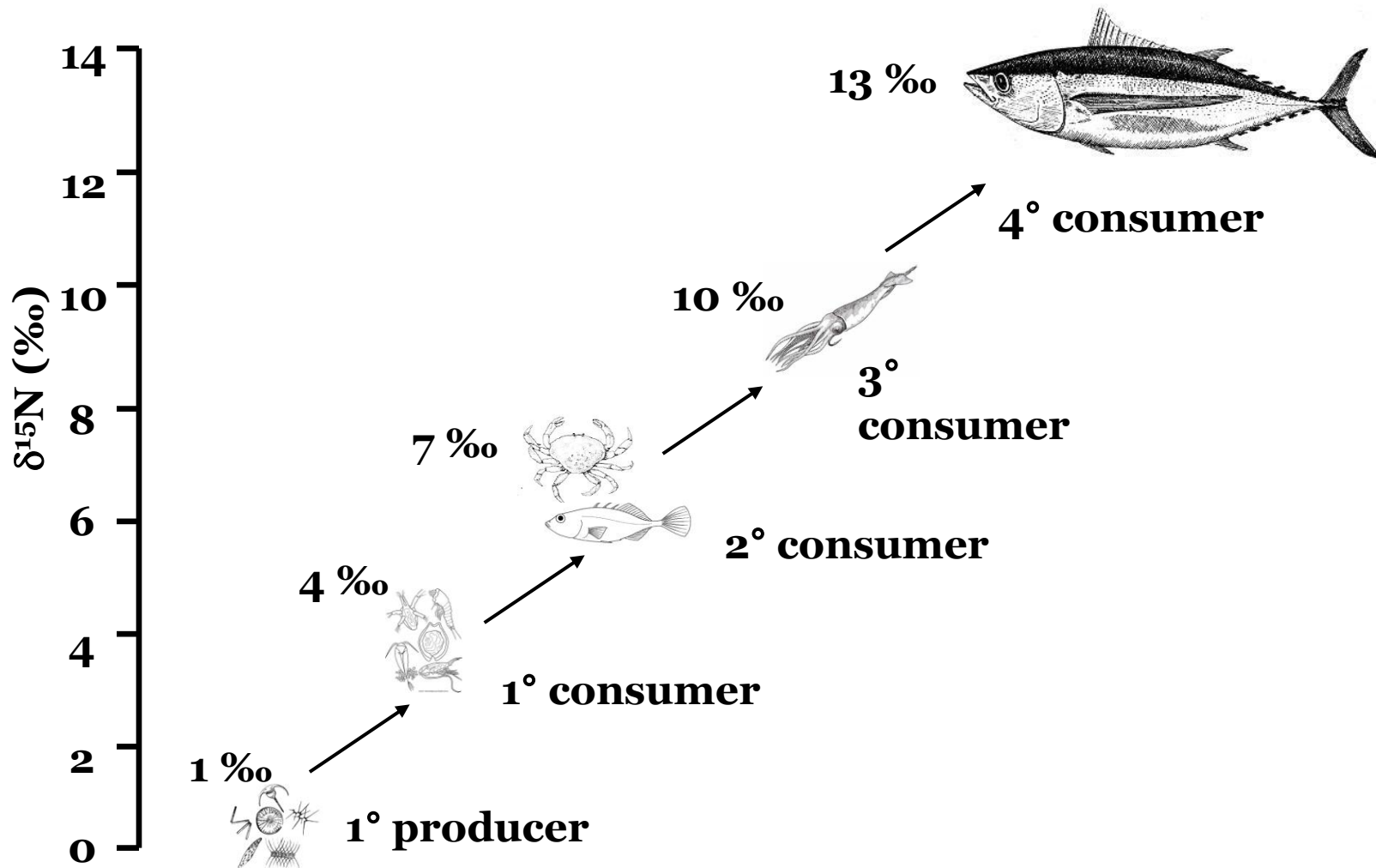
$$\delta^{\text{H}}\text{X} = [(R_{\text{sample}} / R_{\text{standard}} - 1)] * 1000$$

X: element

H: heavy isotope mass of that element,

R: ratio of the heavy isotope to the light isotope

Consumers enriched in ^{15}N over prey by $\sim 3 \text{ ‰}$



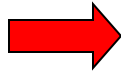
H(o): We predict an enrichment in $\delta^{15}\text{N}$ if pilot whales are feeding commonly on tuna from longlines rather than on squid

Tuna and squid samples



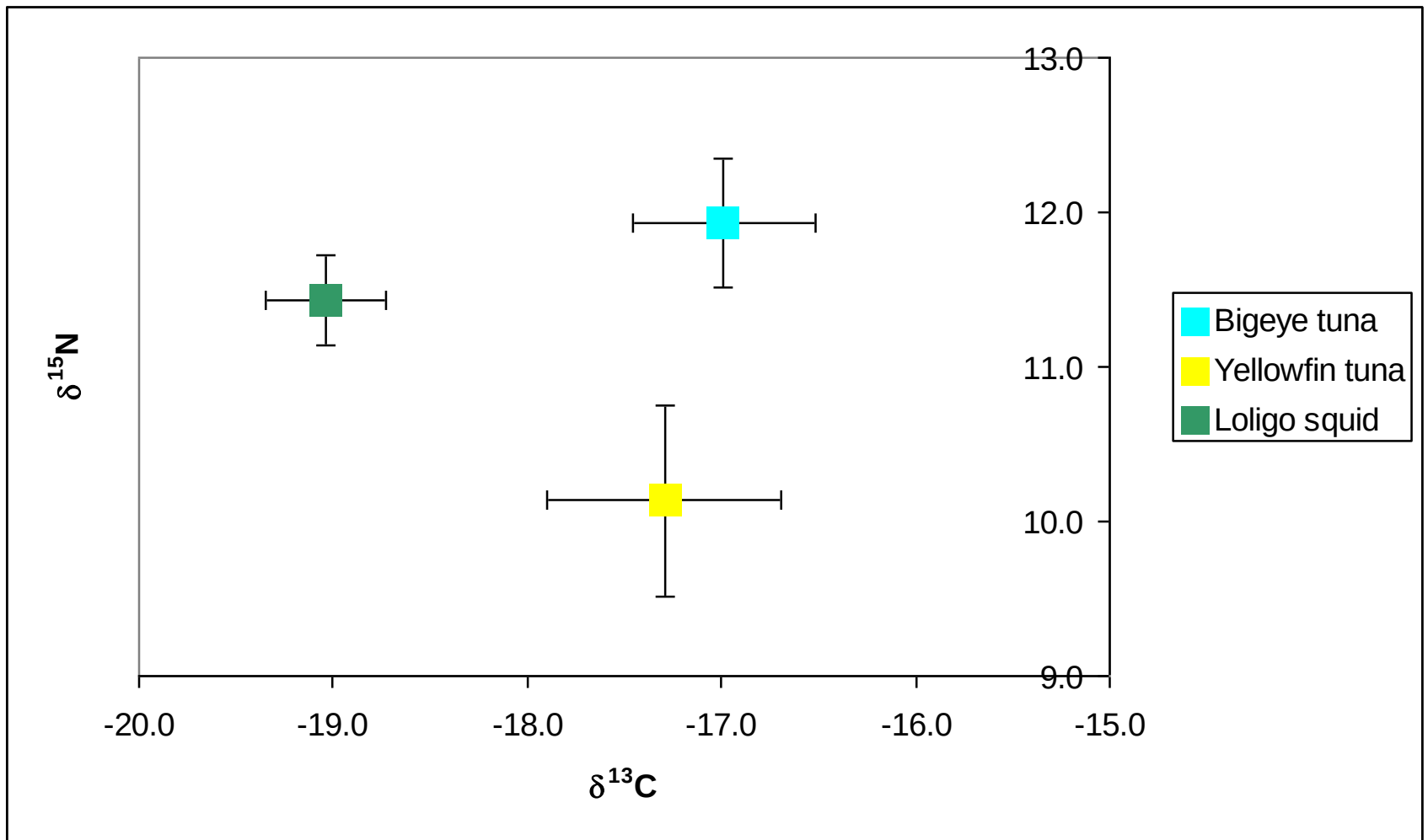
	Total	Analyzed
Bigeye tuna	69	30
Yellowfin tuna	77	30
Loligo squid	25 lbs	20

Processing samples



Mass spectrometer with GC, autosampler, Conflo interface and GC combustion/thermochemical interface

Tuna and squid results



Pilot whale samples

Collected with crossbows

Sampled distinct individuals

Genetics and stable isotopes



Pilot whale samples

Date	Source	#	Preservation
January-05	Stranding	24	Frozen
May-05	Stranding	1	Frozen
September-06	CHSRA research cruise	6	DMSO
May-07	CHSRA research cruise	27	DMSO
August-07	CHSRA research cruise	17	DMSO
May-08	CHSRA research cruise	10	Frozen and DMSO
July-08	Stranding	1	Frozen
February-10	Stranding	1	Frozen
July-10	CHSRA research cruise	6	Frozen
September-10	CHSRA research cruise	1	Frozen

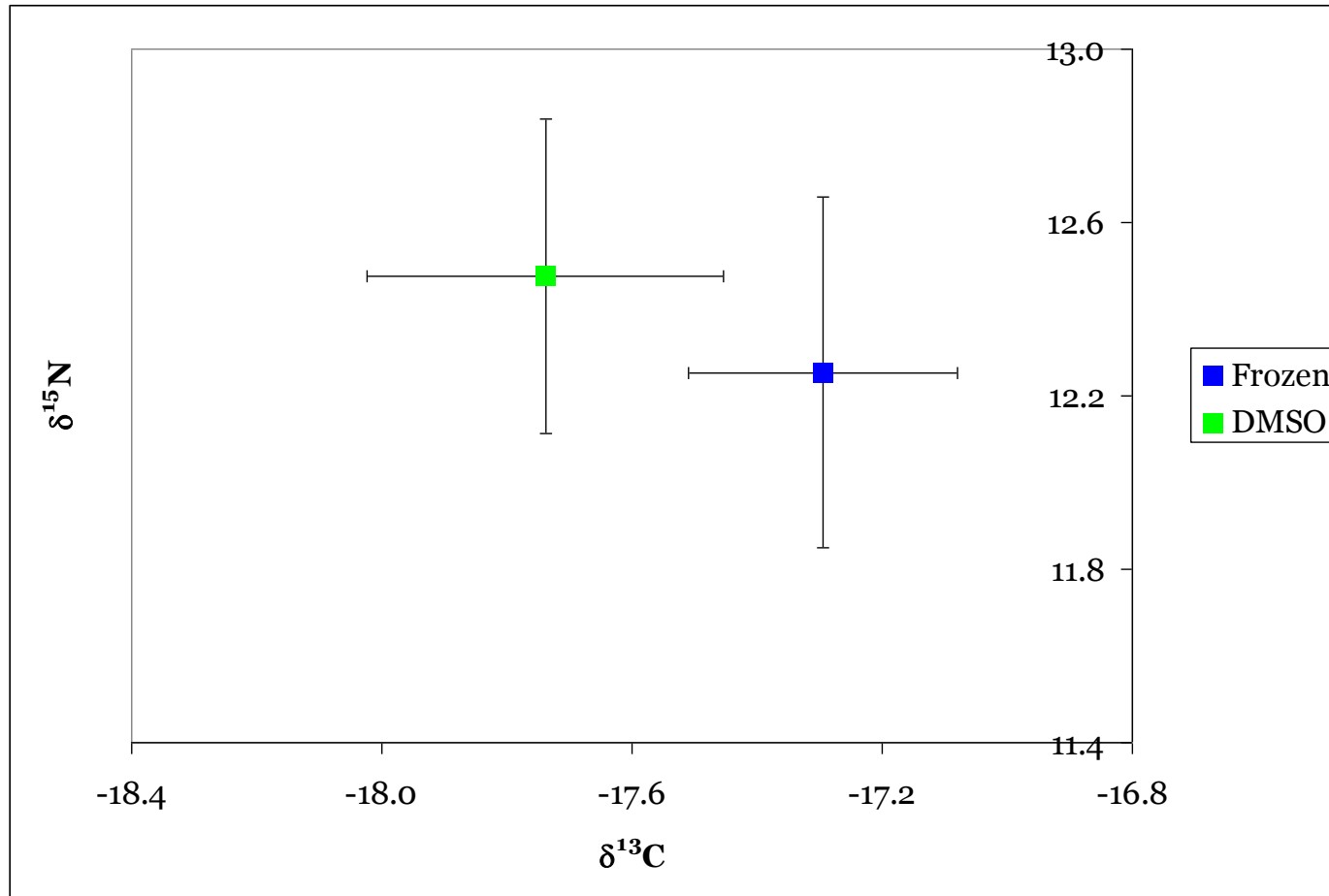
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Pilot whale samples

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Pilot whale samples - Frozen vs. DMSO

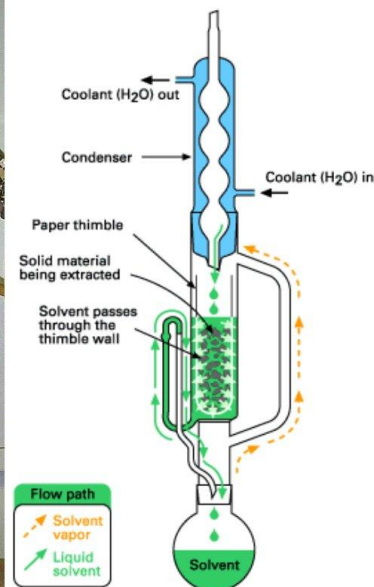
N= 10 matched samples



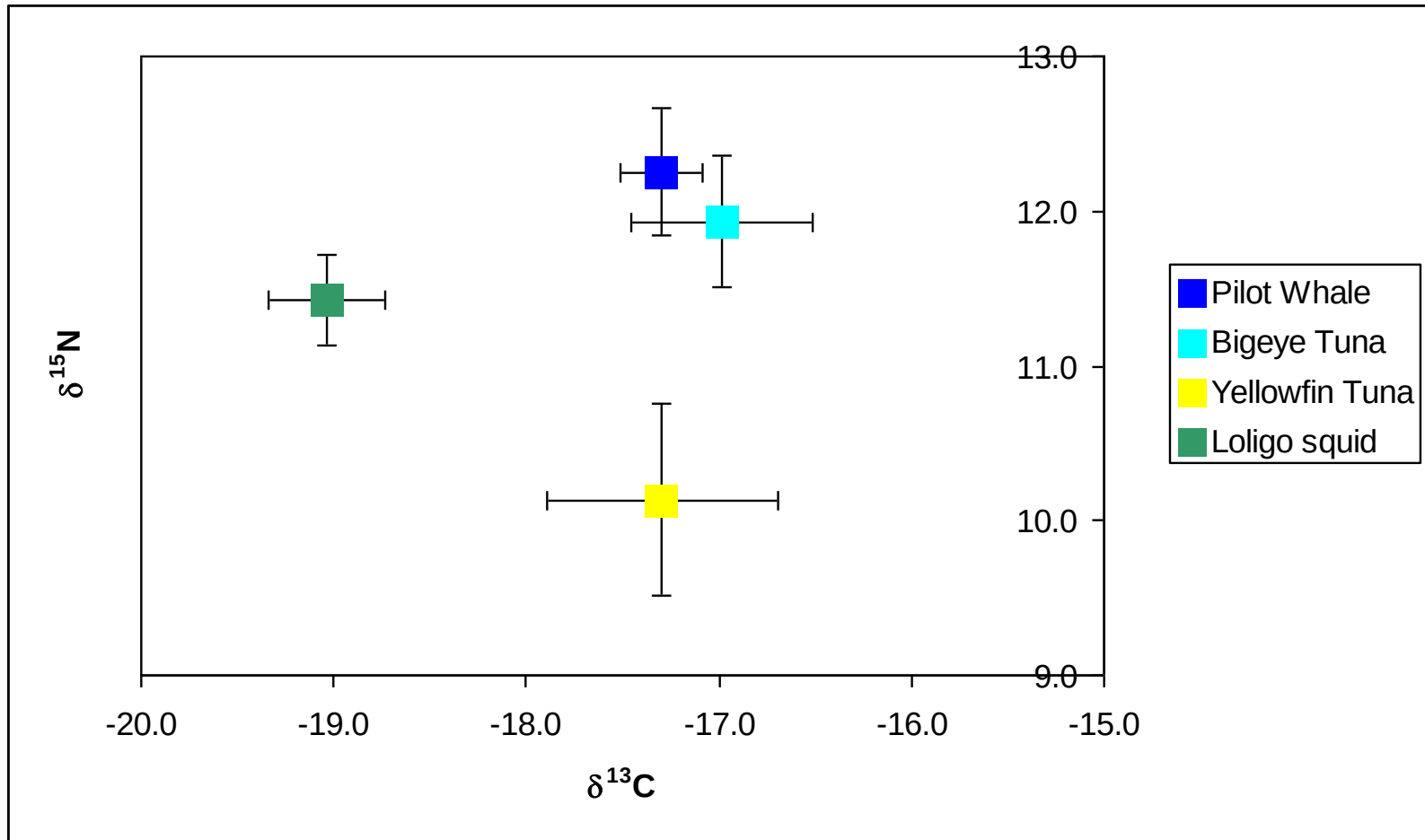
$\delta^{13}\text{C}$ $p = 0.002$

$\delta^{15}\text{N}$ $p = 0.07$

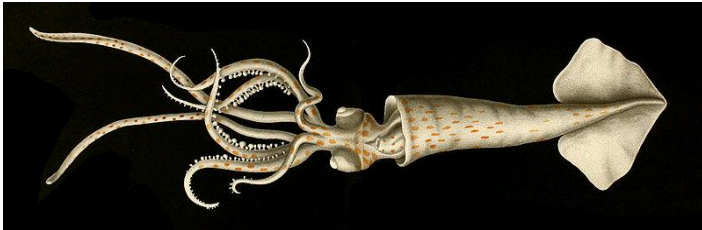
Lipid extraction



Preliminary results: Pilot whale-tuna-squid



Pilot whale diet



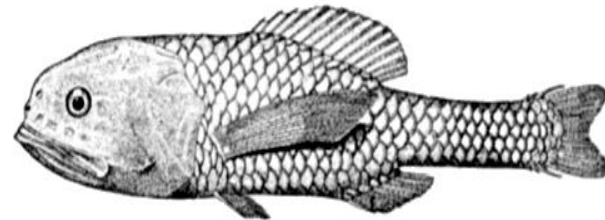
Common arm squid (*Brachoteuthis riisei*)



Reverse jewell squid (*Histioteuthis reversa*)



Cranch squid (*Taonius pavo*)



Bean's bigscale (*Scopelogadus Beanii*)

Accomplishments to date



Collected many samples from pilot whales in the CHSRA and targeted fish species in the pelagic longline fishery

Determined importance of standardized methodology:

- Preservation method

- Lipid extraction of samples

Defined clear isotopic signatures of potential prey

Future Work



Lipid extract tuna and pilot whale samples

Conduct stable isotope analyses

Examine isotopic signatures of pilot whales with evidence of fishery interactions

Explore demographic and seasonal differences

Determine residency of sampled pilot whales

Collect samples from additional potential prey species

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Willie Etheridge

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