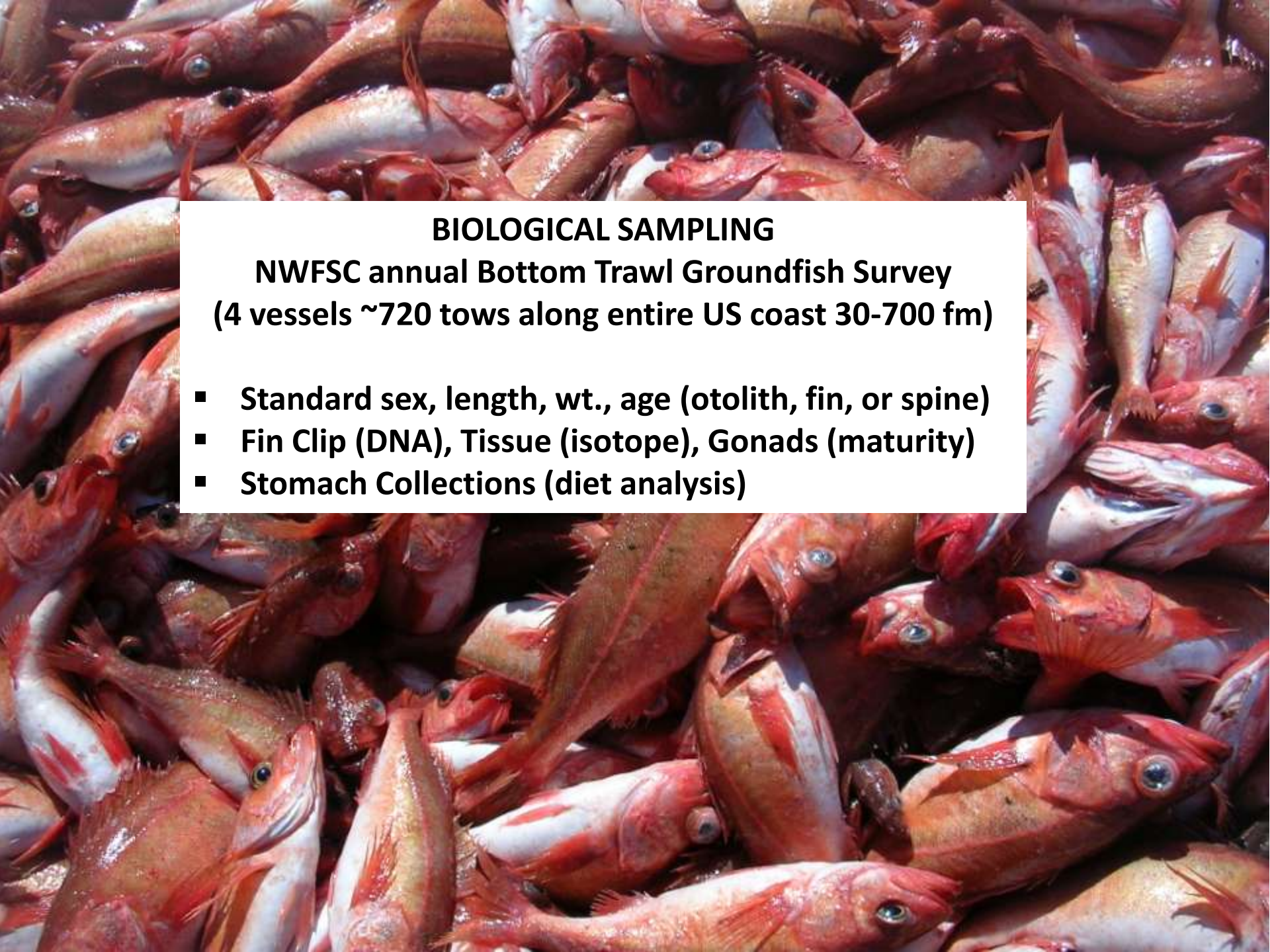


BIOLOGICAL SAMPLING

NWFSC annual Bottom Trawl Groundfish Survey

(4 vessels ~720 tows along entire US coast 30-700 fm)

- **Standard sex, length, wt., age (otolith, fin, or spine)**
- **Fin Clip (DNA), Tissue (isotope), Gonads (maturity)**
- **Stomach Collections (diet analysis)**

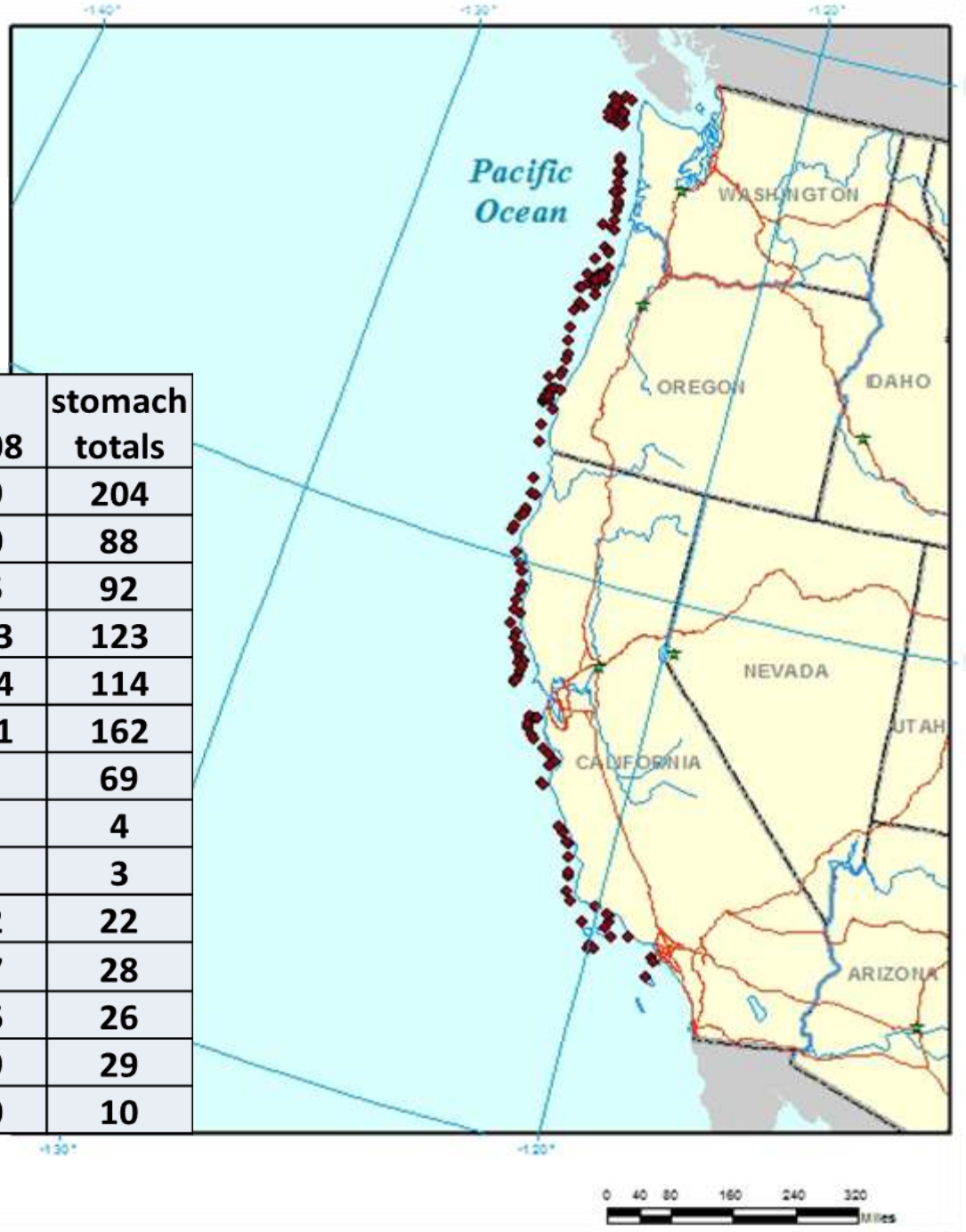
Stomach Collections

- Pacific Hake 2005 – 2010
- Sablefish 2005, 2008
- Rockfish 2005 – 2010
- Petrale, Sanddab 2006
- Hypoxia study

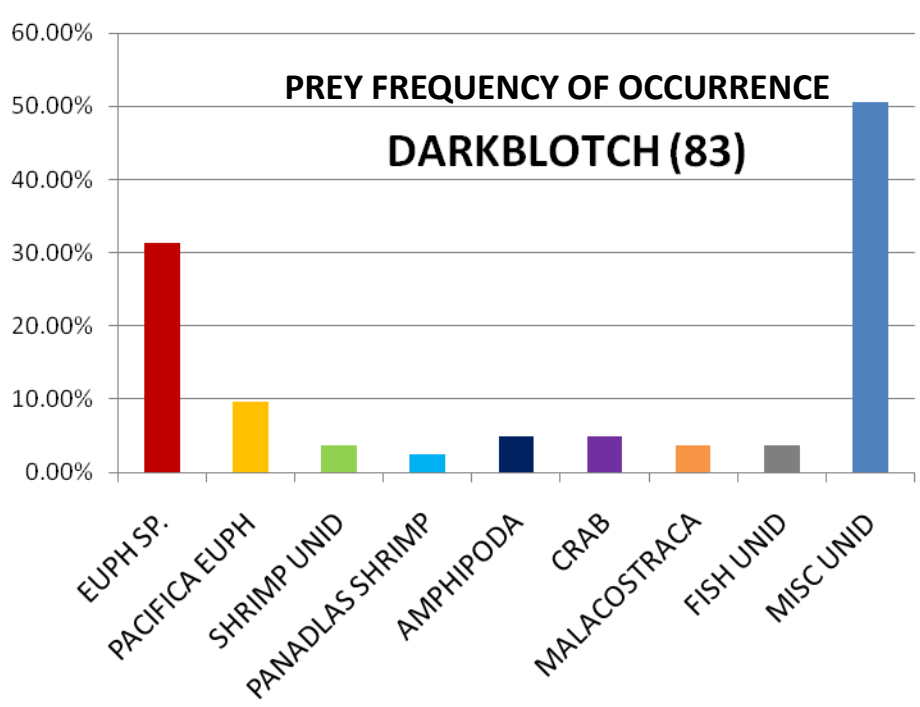
(English, Sanddab, Sculpin, Ratfish)

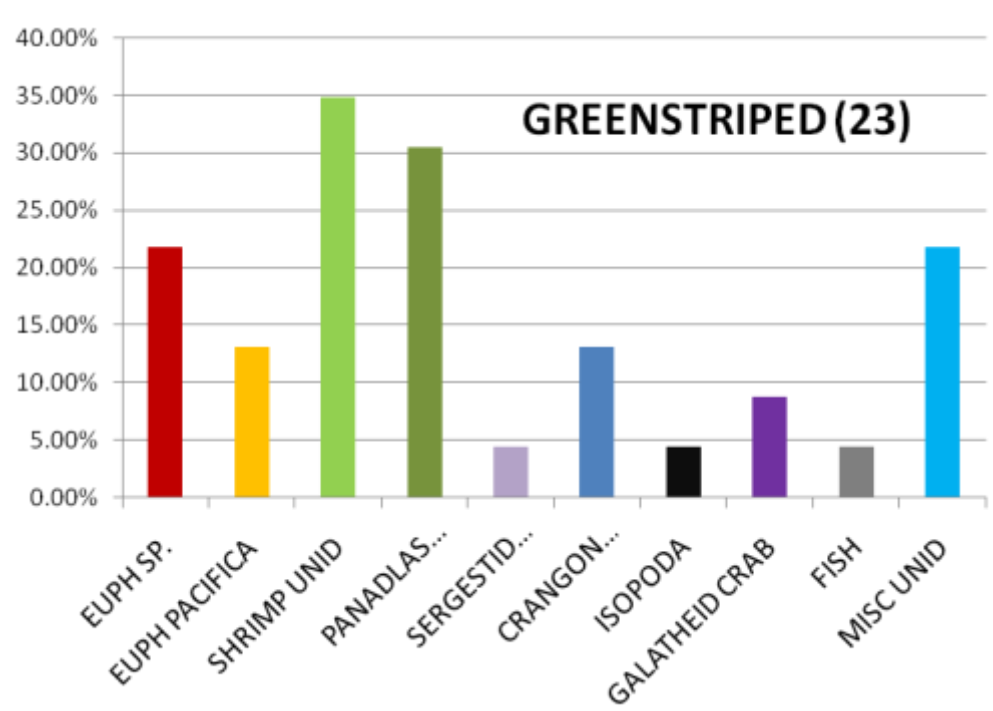
974 Rockfish Stomach Samples Collected from 2005 -2008

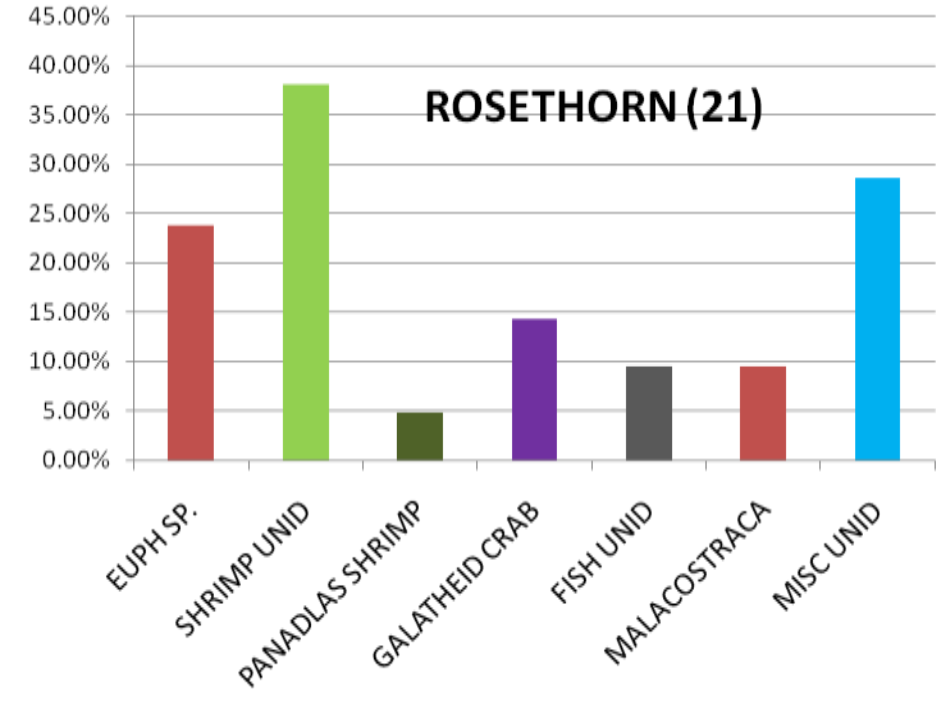
Rockfish Species	2005	2006	2007	2008	stomach totals
Chilipepper	88	25	12	79	204
Bocaccio	17	46	15	10	88
Canary		7		85	92
Yellowtail		10		113	123
POP				114	114
Darkblotch	1			161	162
Widow	43		17	9	69
Yelloweye				4	4
Cowcod				3	3
Rougheye				22	22
Greenstriped		1		27	28
Rosethorn				26	26
Sharpchin				29	29
Stripetail				10	10

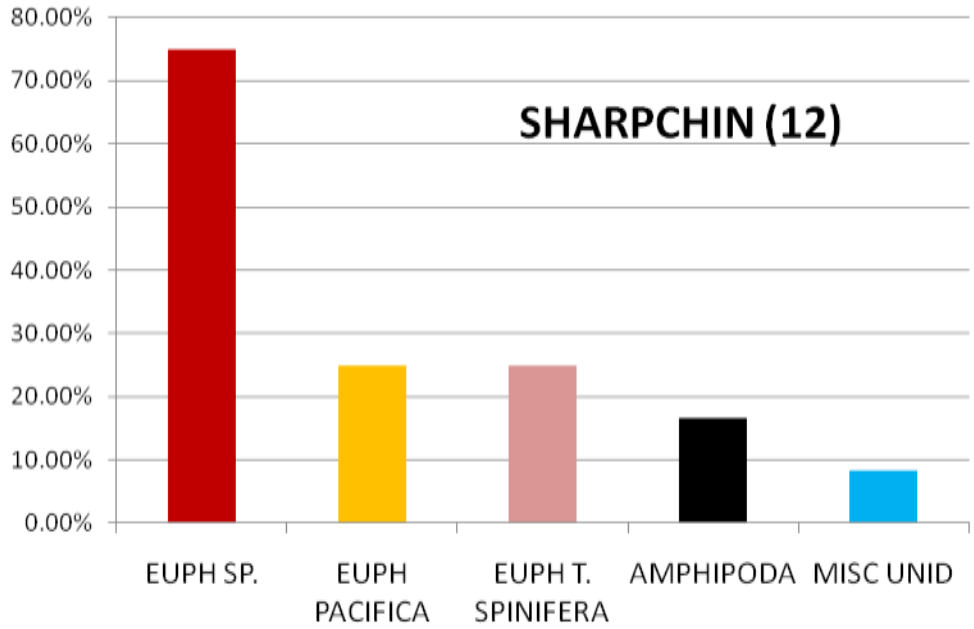


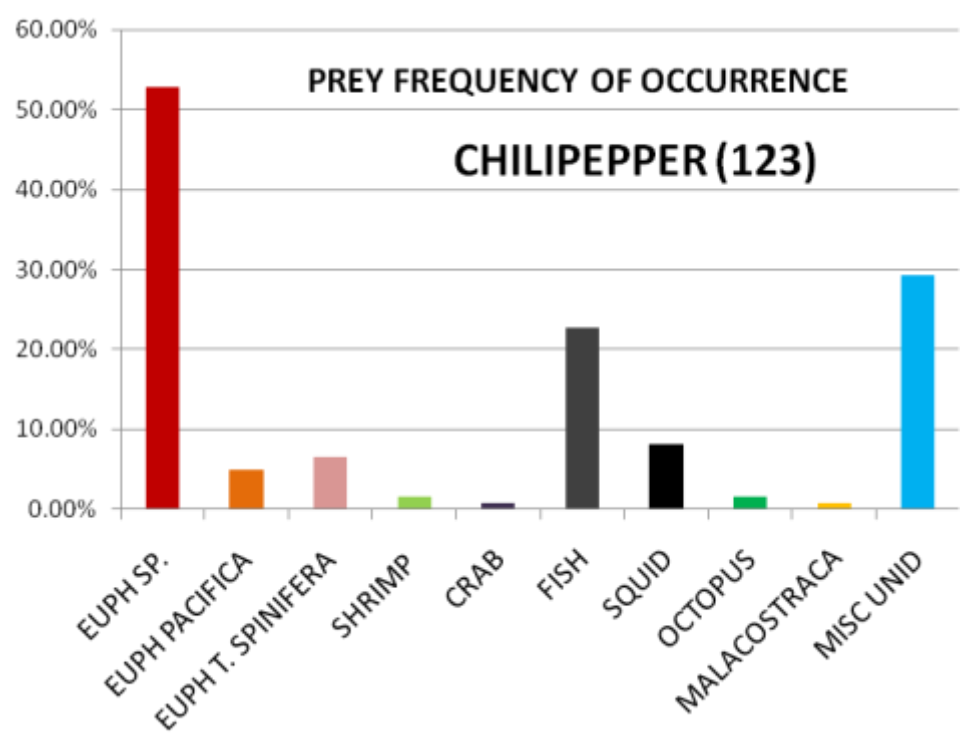

Collected at sea, stored
in Formalin (10%)
transferred to ETOH (70%)
for Analysis
FRAM D

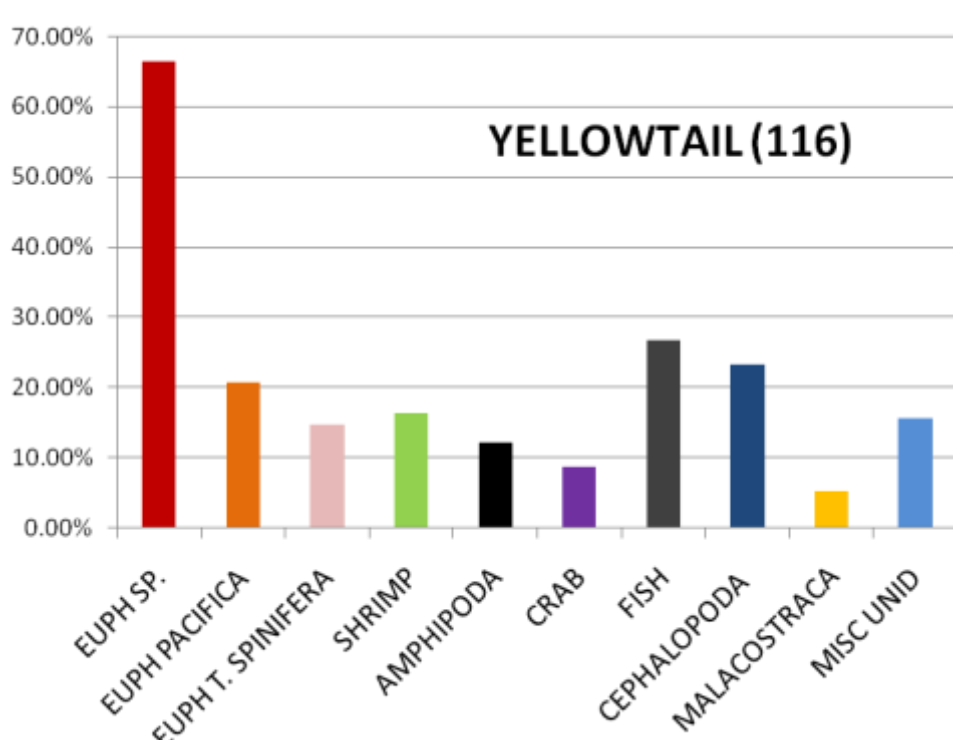

PREY FREQUENCY OF OCCURRENCE
DARKBLOTCH (83)
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
EUPH SP.
PACIFICA EUPH
SHRIMP UNID
PANADLAS SHRIMP
AMPHIPODA
CRAB
MALACOSTRACA
FISH UNID
MISC UNID

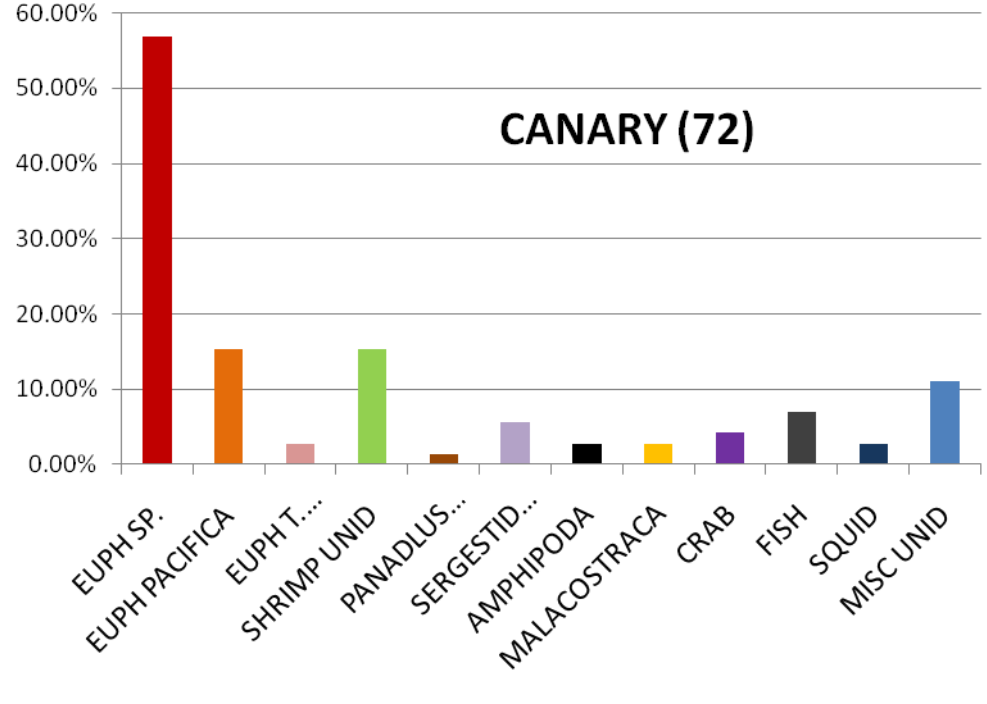

GREENSTRIPED (23)
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
EUPH SP.
EUPH PACIFICA
SHRIMP UNID
PANADLAS...
SERGESTID...
CRANGON...
ISOPODA
GALATHEID CRAB
FISH
MISC UNID

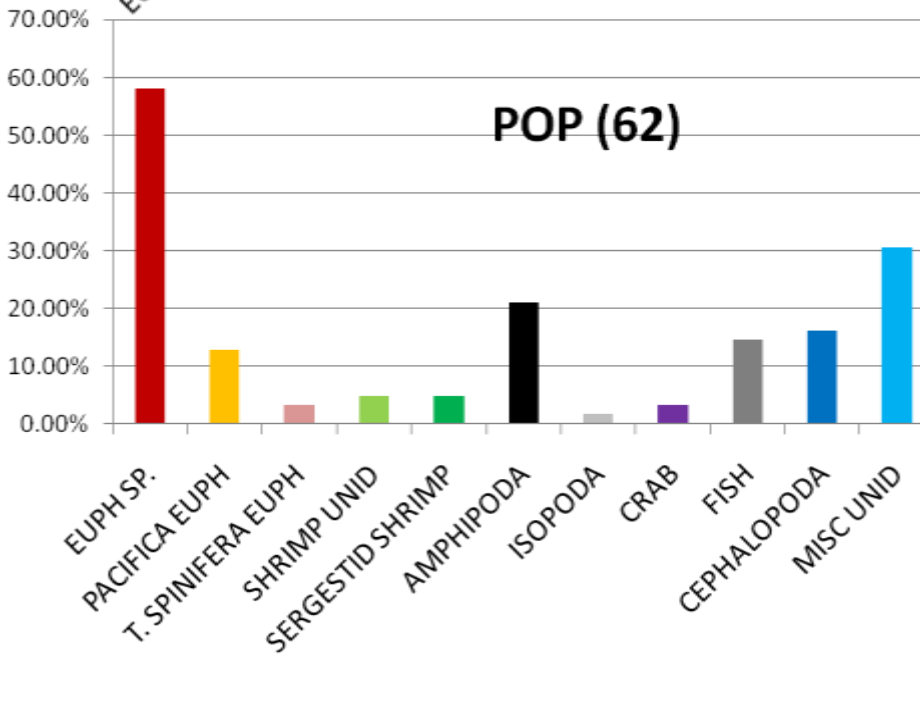

ROSETHORN (21)
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
EUPH SP.
SHRIMP UNID
PANADLAS SHRIMP
GALATHEID CRAB
FISH UNID
MALACOSTRACA
MISC UNID

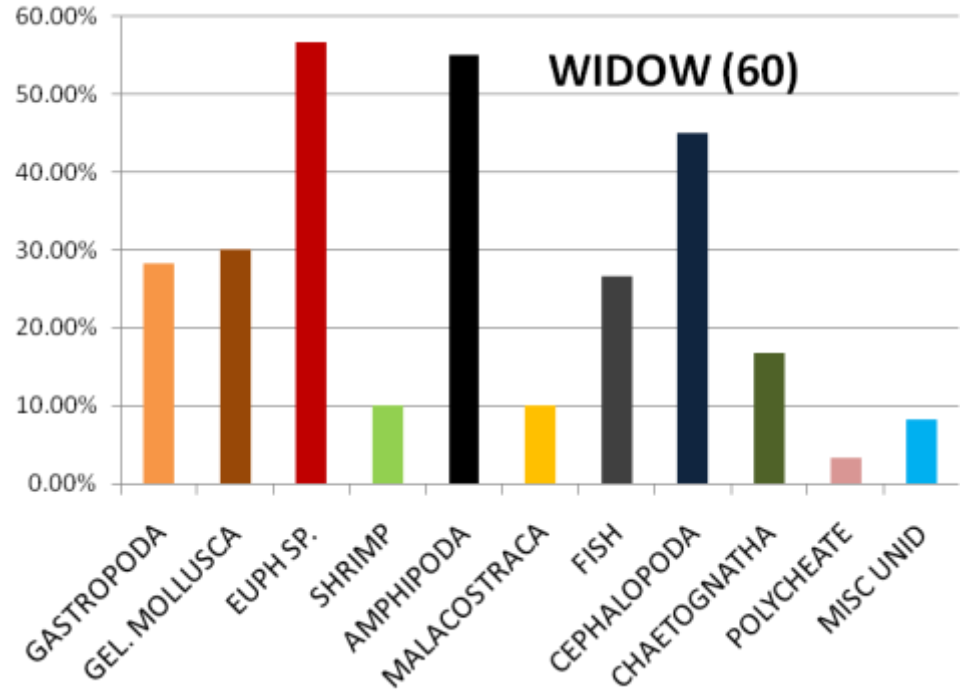

SHARPCHIN (12)
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
EUPH SP.
EUPH PACIFICA
EUPH T. SPINIFERA
AMPHIPODA
MISC UNID

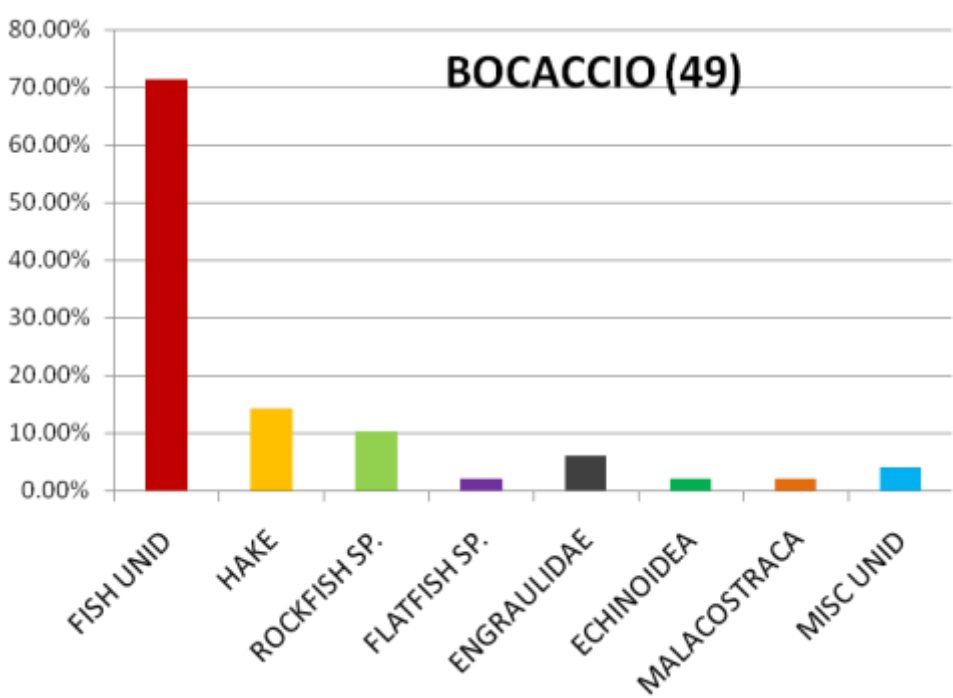

PREY FREQUENCY OF OCCURRENCE
CHILIPEPPER (123)
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
EUPH SP.
EUPH PACIFICA
EUPH T. SPINIFERA
SHRIMP
CRAB
FISH
SQUID
OCTOPUS
MALACOSTRACA
MISC UNID

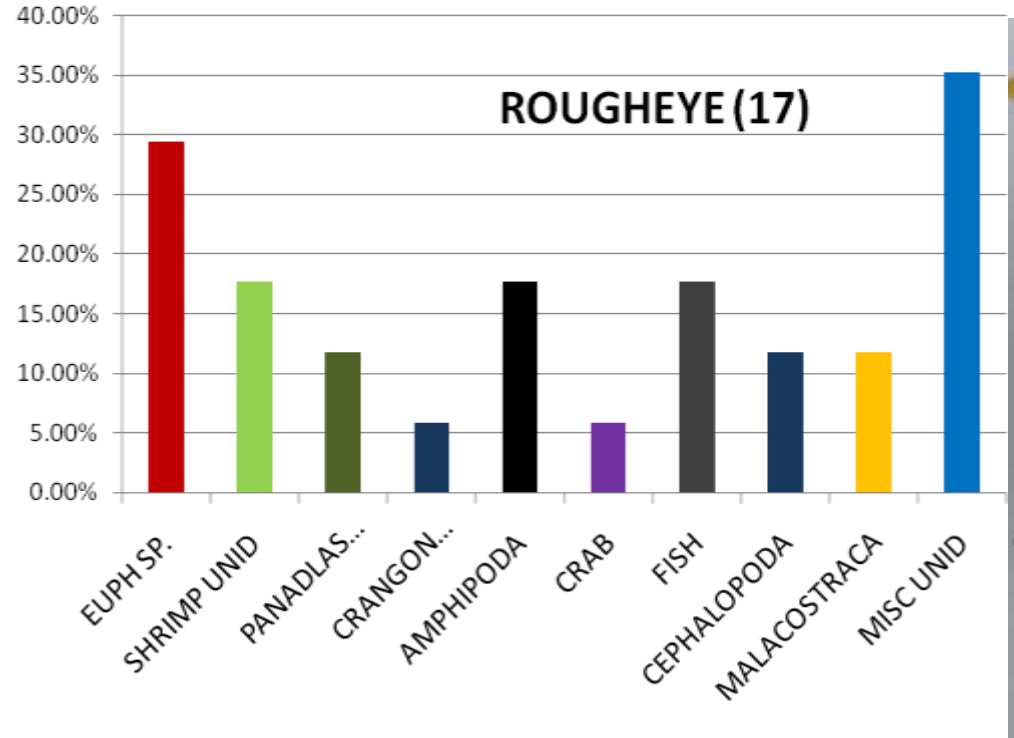

YELLOWTAIL (116)
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
EUPH SP.
EUPH PACIFICA
EUPH T. SPINIFERA
SHRIMP
AMPHIPODA
CRAB
FISH
CEPHALOPODA
MALACOSTRACA
MISC UNID


CANARY (72)
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
EUPH SP.
EUPH PACIFICA
EUPH T....
SHRIMP UNID
PANADLUS...
SERGESTID...
AMPHIPODA
MALACOSTRACA
CRAB
FISH
SQUID
MISC UNID


POP (62)
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
EUPH SP.
PACIFICA EUPH
T. SPINIFERA EUPH
SHRIMP UNID
SERGESTID SHRIMP
AMPHIPODA
ISOPODA
CRAB
FISH
CEPHALOPODA
MISC UNID


WIDOW (60)
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
GASTROPODA
GEL. MOLLUSCA
EUPH SP.
SHRIMP
AMPHIPODA
MALACOSTRACA
FISH
CEPHALOPODA
CHAETOGNATHA
POLYCHEATE
MISC UNID


BOCACCIO (49)
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
FISH UNID
HAKE
ROCKFISH SP.
FLATFISH SP.
ENGRAULIDAE
ECHINOIDEA
MALACOSTRACA
MISC UNID


ROUGHEYE (17)
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
EUPH SP.
SHRIMP UNID
PANADLAS...
CRANGON...
AMPHIPODA
CRAB
FISH
CEPHALOPODA
MALACOSTRACA
MISC UNID


2008 NWFSC/FRAM
FOOD HABITS SAMPLE #
2006
STOMACH or MUSCLE TISSUE

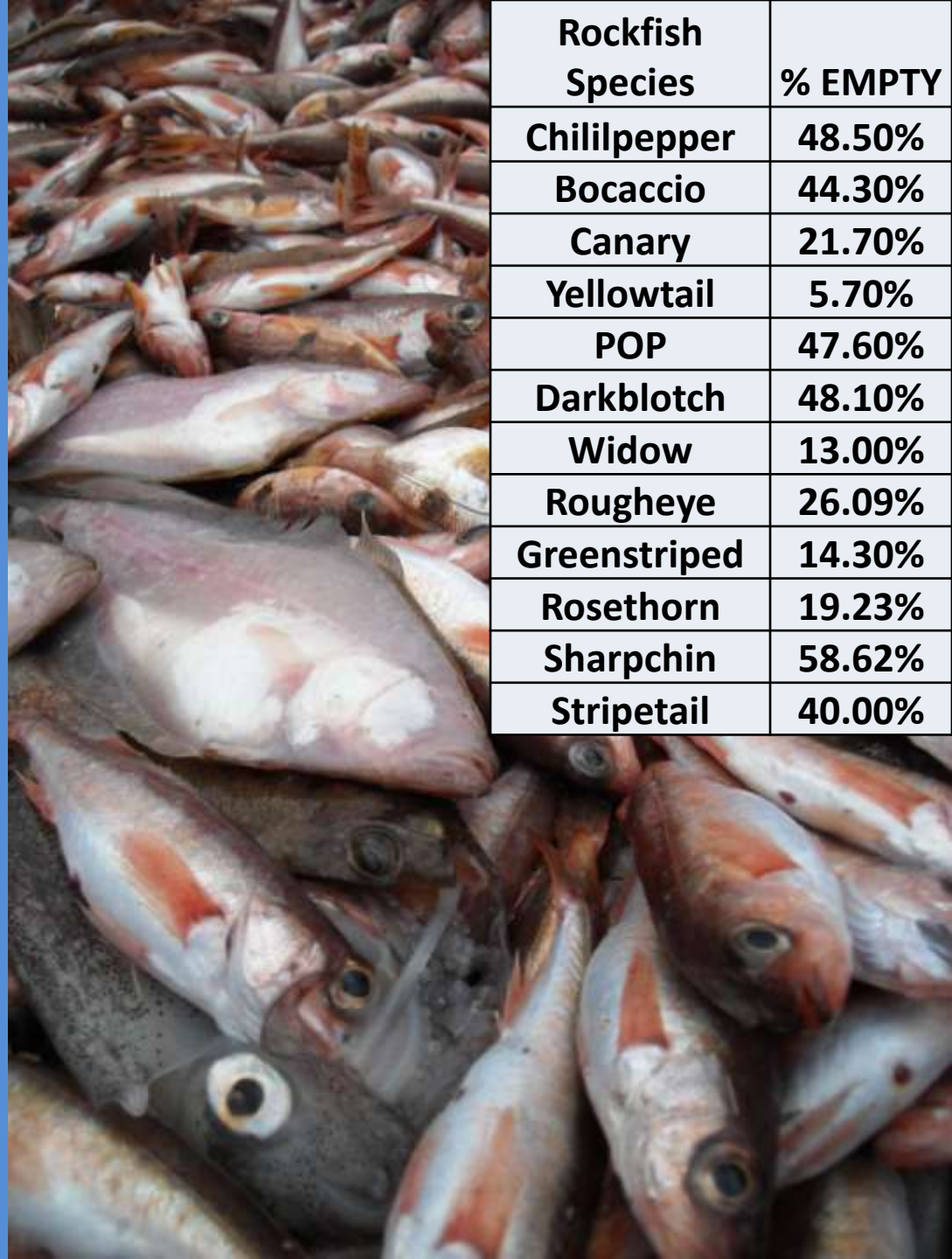
PROBLEMS:

- Often a high % of empty or nearly empty stomachs due to barotrauma or regurgitation
- Difficulty in identifying digested prey

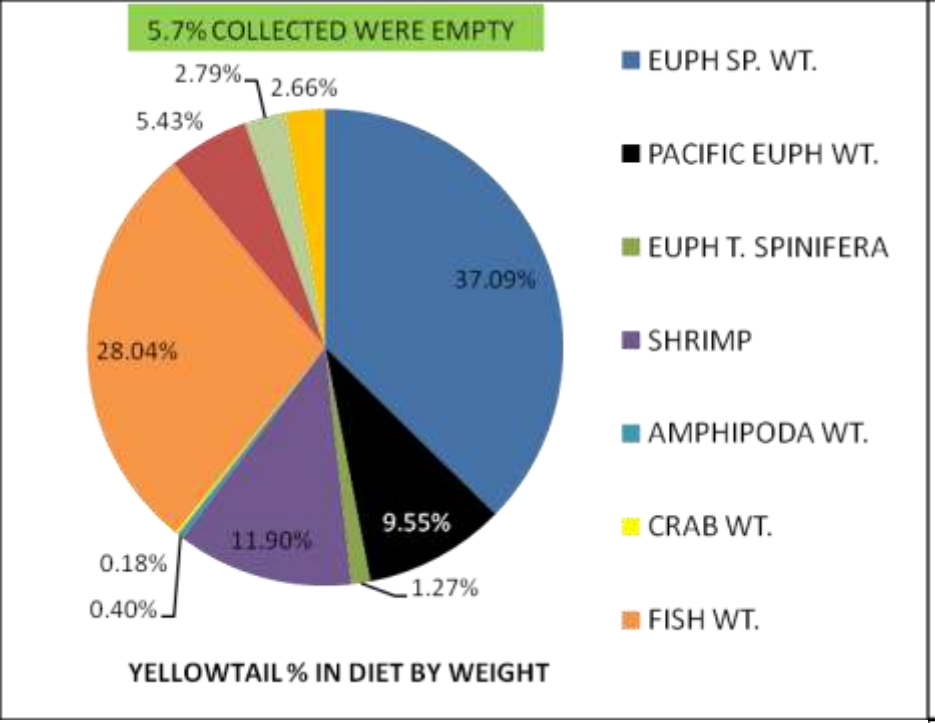
This leads to the questions:
Are the majority of useable stomachs only from fish with a small amount in their gut? Or have they regurgitated prior to being landed.

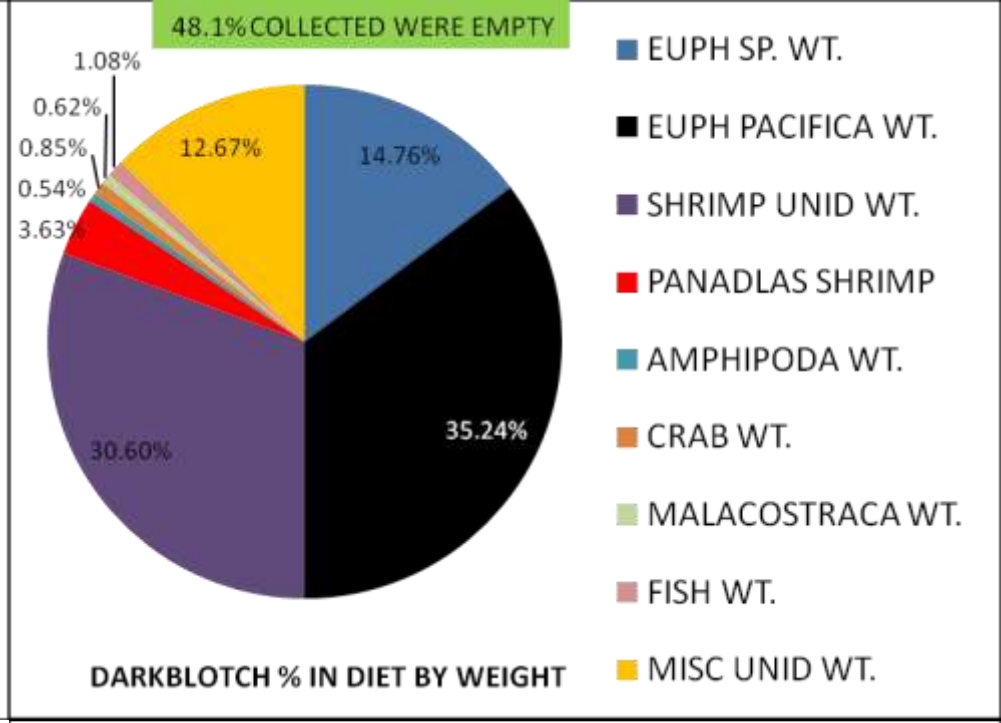
Also, is the total % wt. of prey in their stomachs a biased estimate, considering the large # of empty or stomachs with a trace amount? Am I only seeing what didn't get tossed?

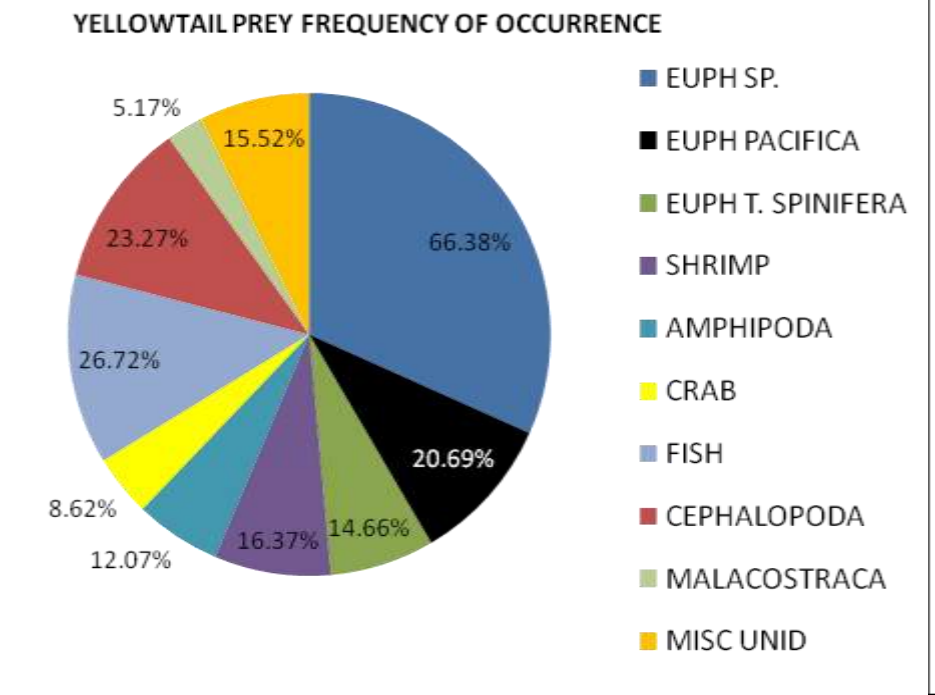
Our survey samples during daylight, while the rockfish are on the seafloor. Are our samples biased towards benthic prey vs. pelagic prey. The stable isotope tropic comparison may show different.

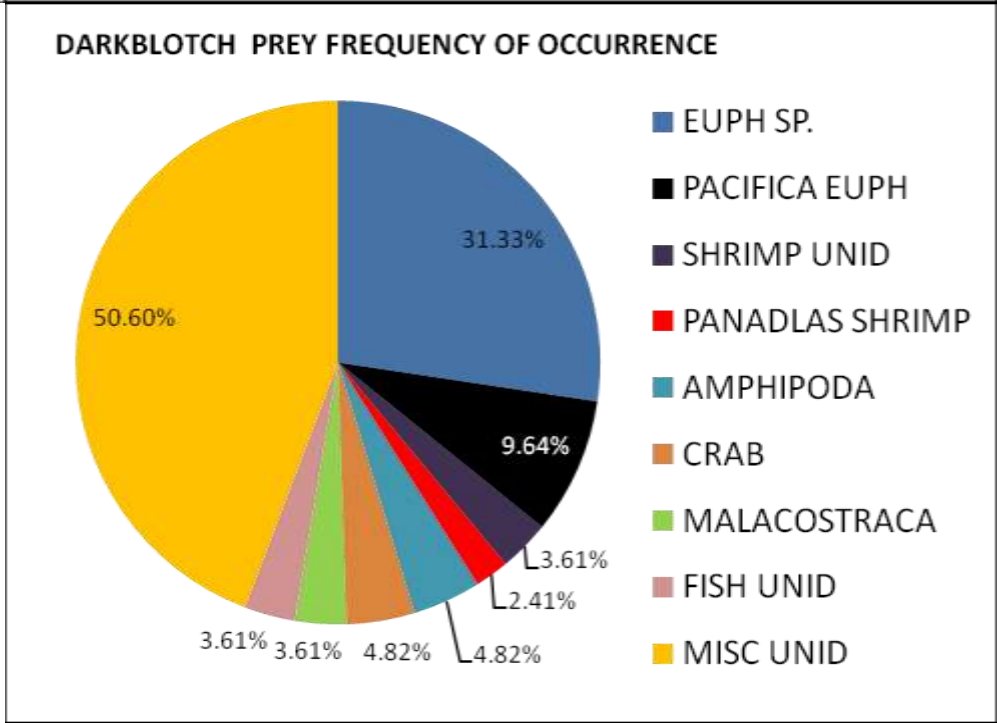


Rockfish Species	% EMPTY
Chililpepper	48.50%
Bocaccio	44.30%
Canary	21.70%
Yellowtail	5.70%
POP	47.60%
Darkblotch	48.10%
Widow	13.00%
Rougheye	26.09%
Greenstriped	14.30%
Rosethorn	19.23%
Sharpchin	58.62%
Stripetail	40.00%


5.7% COLLECTED WERE EMPTY
37.09%
9.55%
1.27%
11.90%
0.18%
0.40%
28.04%
5.43%
2.79%
2.66%
EUPH SP. WT.
PACIFIC EUPH WT.
EUPH T. SPINIFERA
SHRIMP
AMPHIPODA WT.
CRAB WT.
FISH WT.
YELLOWTAIL % IN DIET BY WEIGHT


48.1% COLLECTED WERE EMPTY
14.76%
35.24%
30.60%
3.63%
0.54%
0.85%
0.62%
1.08%
12.67%
EUPH SP. WT.
EUPH PACIFICA WT.
SHRIMP UNID WT.
PANADLAS SHRIMP
AMPHIPODA WT.
CRAB WT.
MALACOSTRACA WT.
FISH WT.
MISC UNID WT.
DARKBLOTCH % IN DIET BY WEIGHT


YELLOWTAIL PREY FREQUENCY OF OCCURRENCE
66.38%
20.69%
14.66%
16.37%
12.07%
8.62%
26.72%
23.27%
5.17%
15.52%
EUPH SP.
EUPH PACIFICA
EUPH T. SPINIFERA
SHRIMP
AMPHIPODA
CRAB
FISH
CEPHALOPODA
MALACOSTRACA
MISC UNID


DARKBLOTCH PREY FREQUENCY OF OCCURRENCE
31.33%
9.64%
3.61%
2.41%
4.82%
4.82%
3.61%
3.61%
50.60%
EUPH SP.
PACIFICA EUPH
SHRIMP UNID
PANADLAS SHRIMP
AMPHIPODA
CRAB
MALACOSTRACA
FISH UNID
MISC UNID

WHAT'S NEXT:

- Finish up 2009 -2010 stomach collections (another 491 samples)
- Look for trends/differences in terms of % of prey wt. in diet vs. freq. of occurrence in diet
- Update Rockfish diet composition in conjunction with stable isotope research to look at tropic relationships and trends in isotopic signatures of several rockfish species.
- Continue looking at Sablefish and Pacific Sanddab diet compositions.
- Parasite prevalence work in Pacific Hake and Rockfish.