

# Measuring Cod Predation on Snow Crab in the Bering Sea

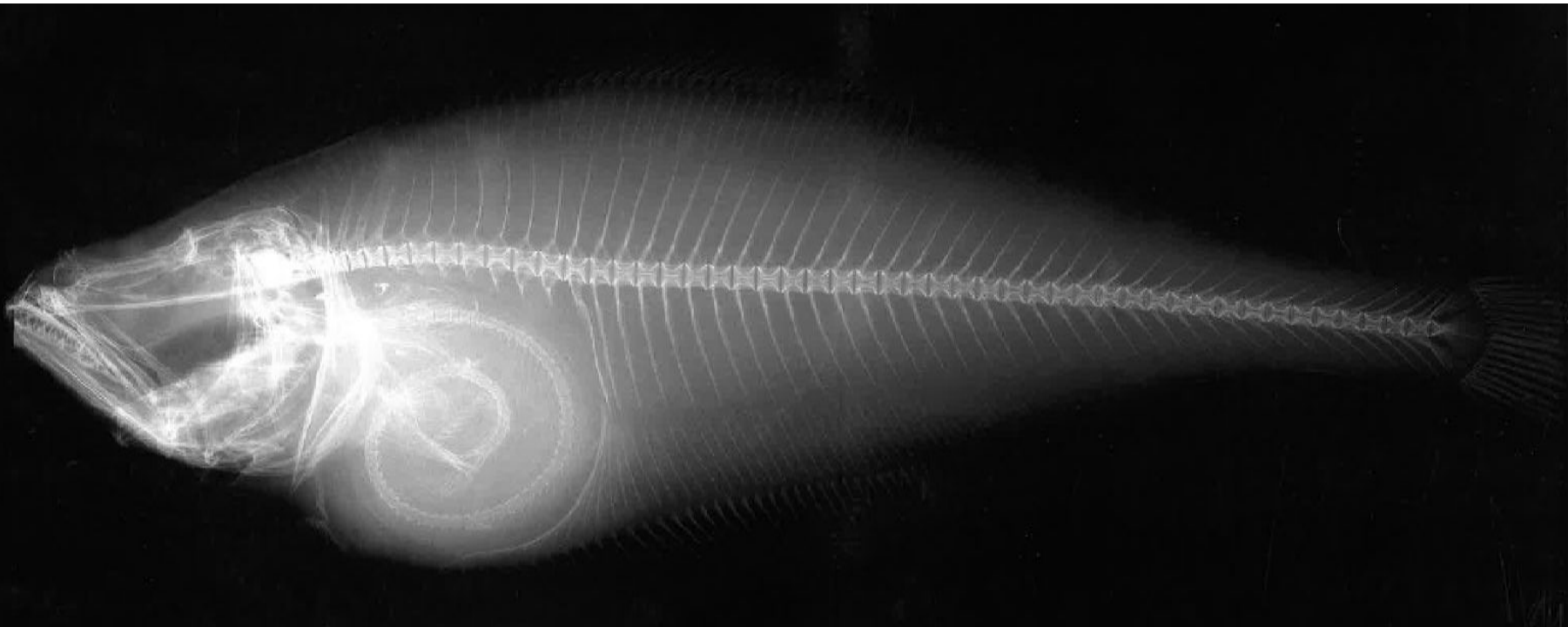


Kerim Aydin, Jonathan Reum, Geoff Lang, Rick Hibpshman, Jim Armstrong, Scott Hansen

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## Alaska Fisheries Science Center Groundfish Food Habits Program

- Recording the stomach contents of Alaskan groundfish by the Alaska Fisheries Science Center (AFSC) began in 1981.
- Systematic, standardized sampling for stomach content analysis began in 1985.
- Since then, the Groundfish Trophic Interactions Laboratory (a.k.a. the Food Habits Lab) has generally been staffed by 2 to 4 full time stomach content analysts.



Most stomach samples are collected during summer bottom trawl surveys (BTS) of the eastern Bering Sea, Gulf of Alaska, Aleutian Islands and other marine regions of Alaska.





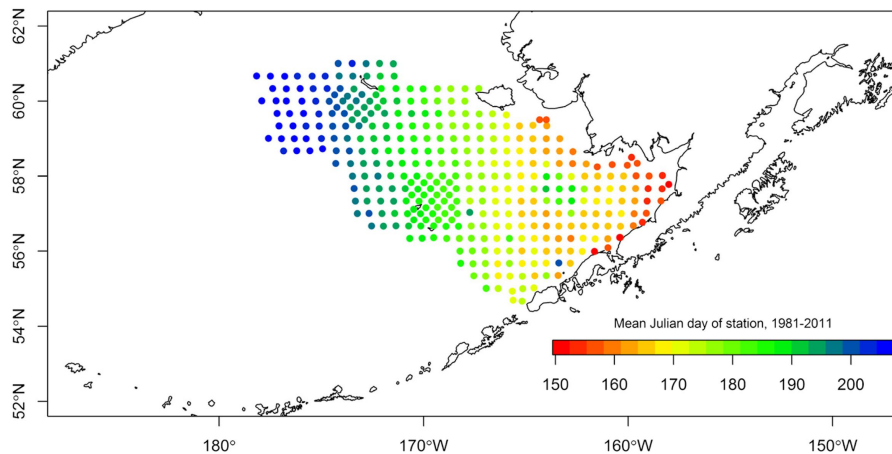
# Methods

Environ Biol Fish (2017) 100:443–470  
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## Quantifying food web interactions in the North Pacific – a data-based approach

Patricia A. Livingston · Kerim Aydin ·  
Troy W. Buckley · Geoffrey M. Lang · Mei-Sun Yang ·  
Bruce S. Miller

- Fish checked for signs of regurgitation.
- Scanned on board ship or returned to lab (frozen or formalin-preserved).
- Whole stomach weighed, prey by taxonomic category (resolution varies) measured by weight or volume estimation.
- Fish and crab prey measured (digestion permitting). Carapace width of Tanner and snow crab are measured to the nearest millimeter.

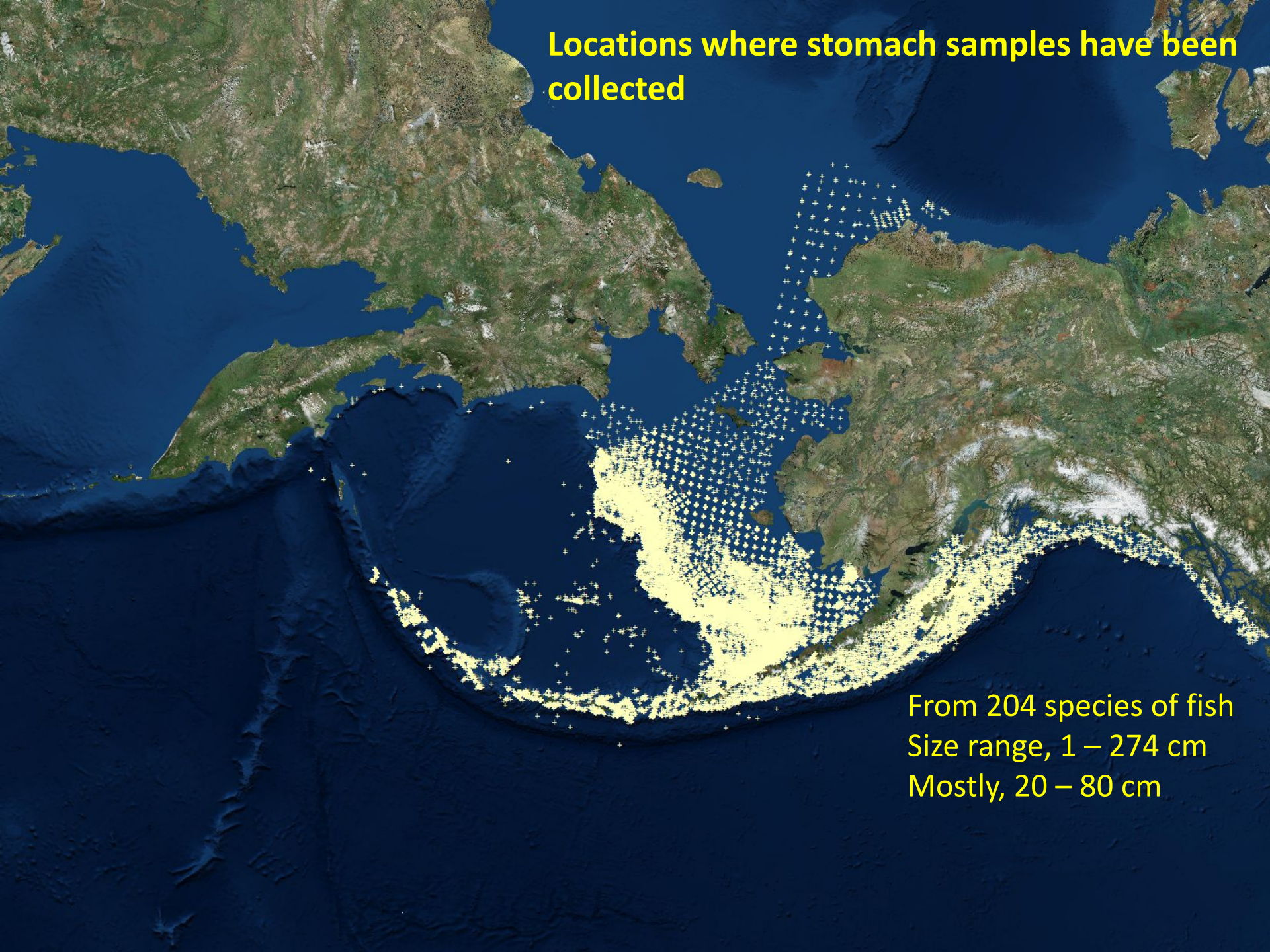


Stomach samples have also been collected by fisheries observers on large boats that allow for formalin storage, but there is a need to expand to broader coverage in time and space in partnership with fishers (current project)



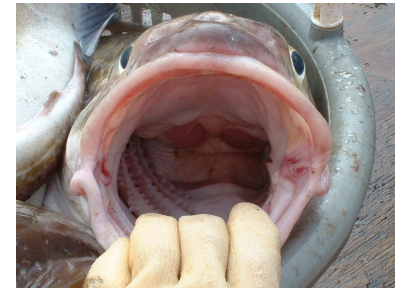


**Locations where stomach samples have been collected**



**From 204 species of fish  
Size range, 1 – 274 cm  
Mostly, 20 – 80 cm**

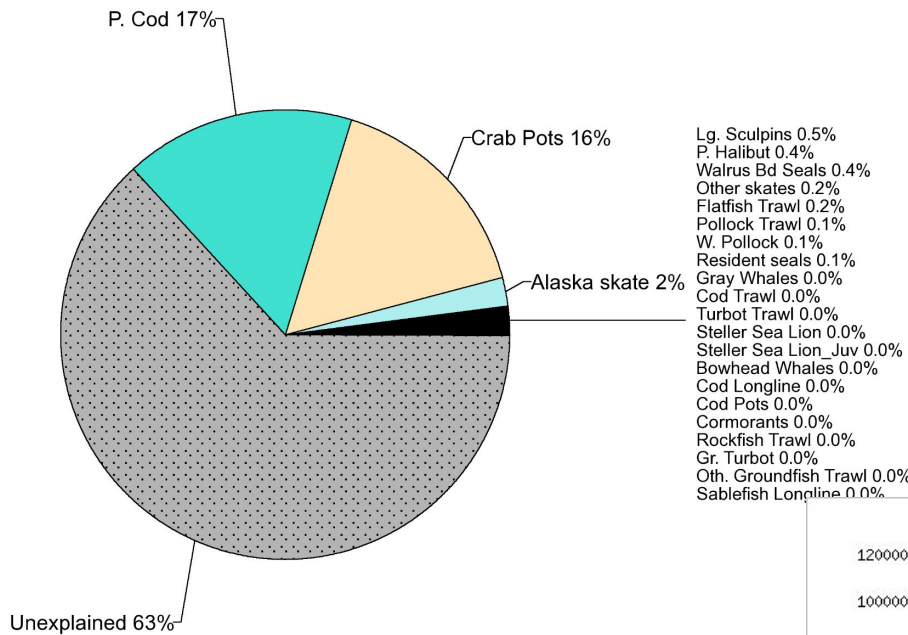
# Consumption of snow crab by cod



- 57,069 Pacific cod stomachs collected in EBS/NBS 1985-2022
- **Summer** bottom trawl survey samples only
- Estimate snow crab consumption of crab by:
  - BTS-estimated number of cod (length, stratum, year) \*
  - Temperature-adjusted daily ration (length, stratum, year) \*
  - % by weight of snow crab in cod stomachs (length, stratum, year)
- Examine size of snow crab prey

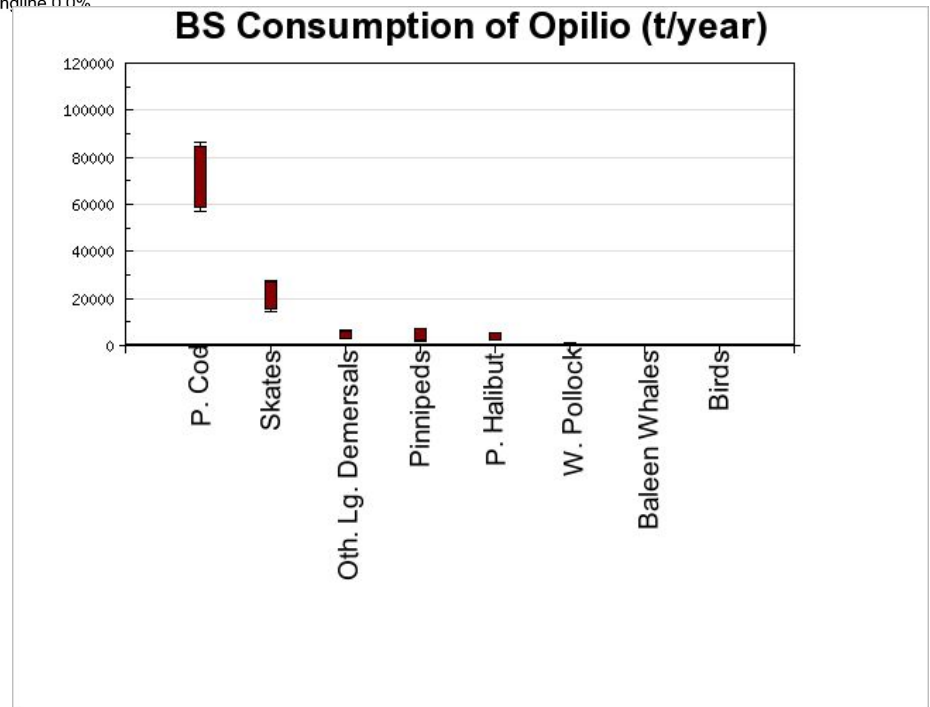


# BS Opilio mortality



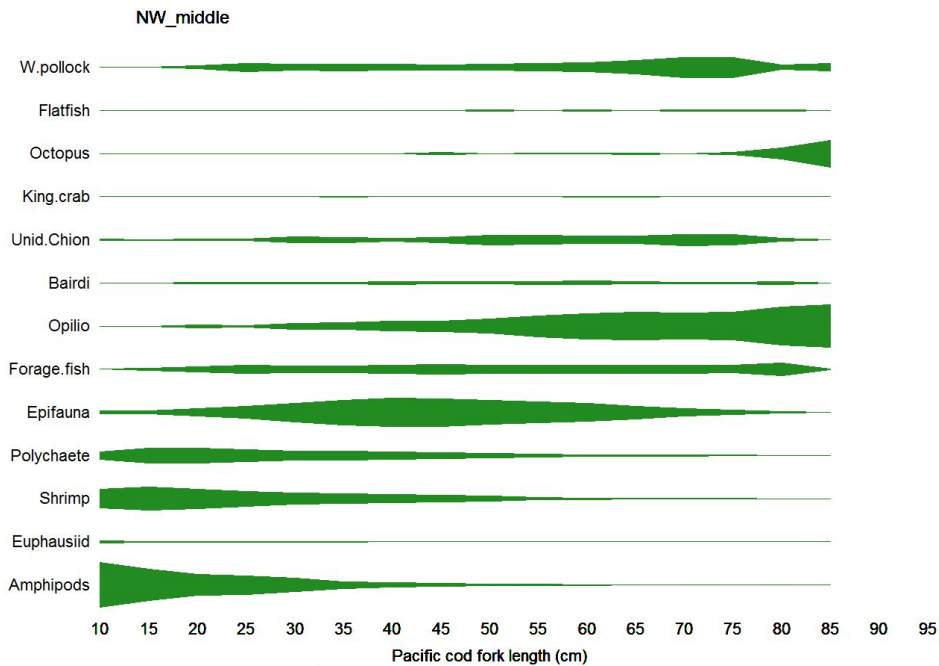
Opilio  $\geq$  50mm CW for this analysis

"Unexplained" is difference between best literature estimate of crab mortality (in 2007) and accounted mortality (fishing and predation)





%dlet by weight



Location matters -  
N versus S middle  
domains

100%

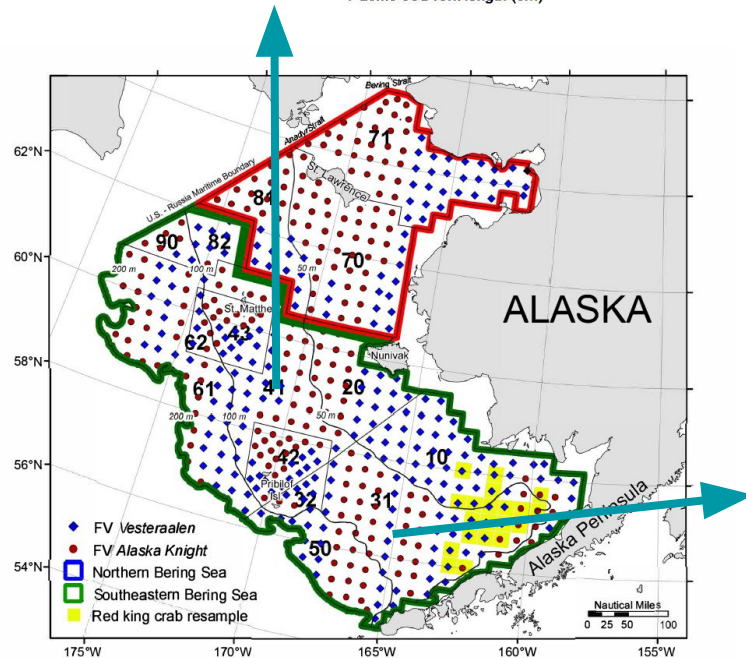
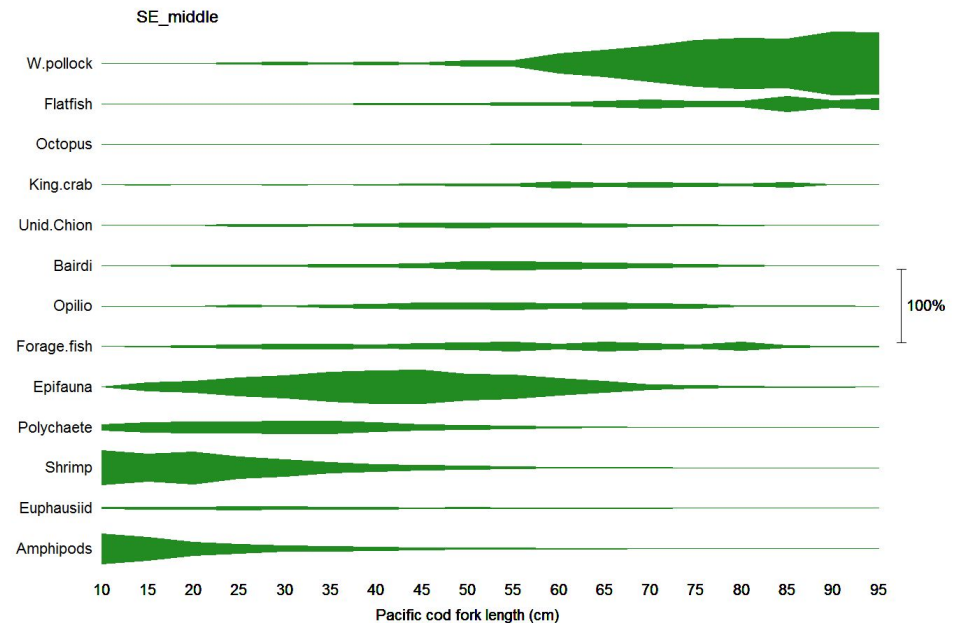
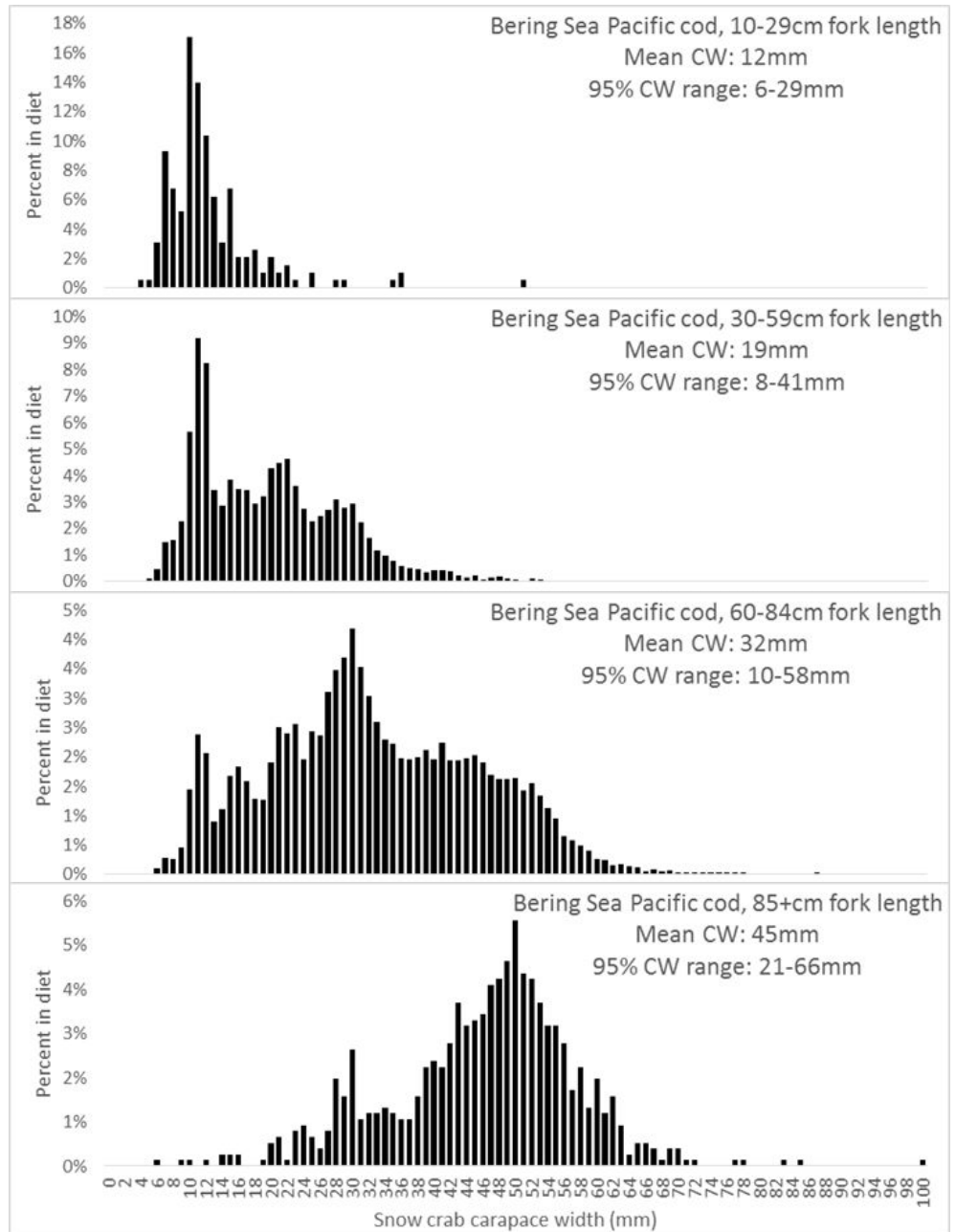


Figure 2. -- Sampled survey stations by vessel and the stratification scheme used for data analysis of the 2017 eastern and northern Bering Sea continental shelf bottom trawl surveys.

%dlet by weight



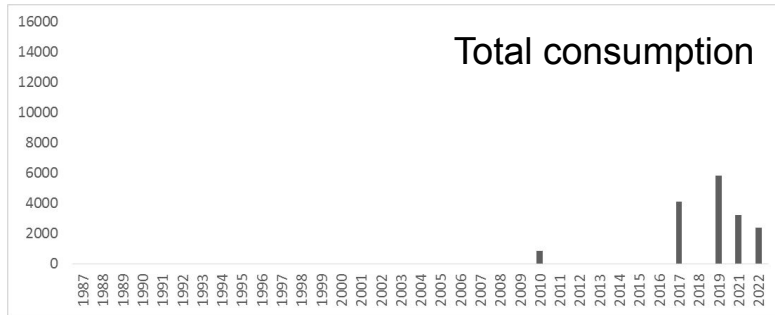
# Snow Crab prey carapace width by predator size (P. cod)



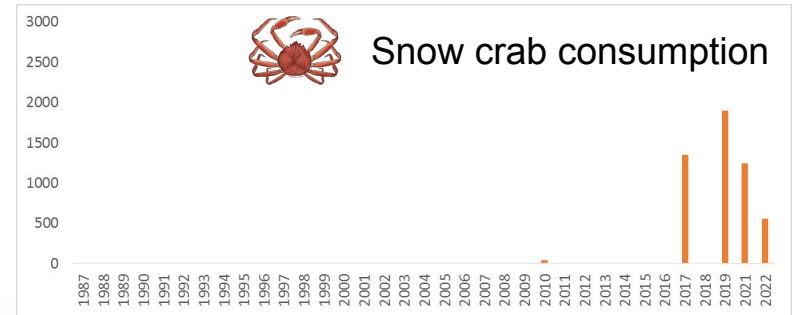


# Design-based **SUMMER** estimate (daily consumption rate)

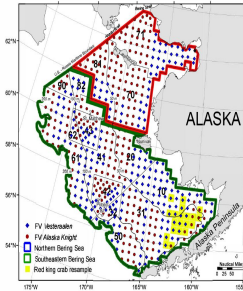
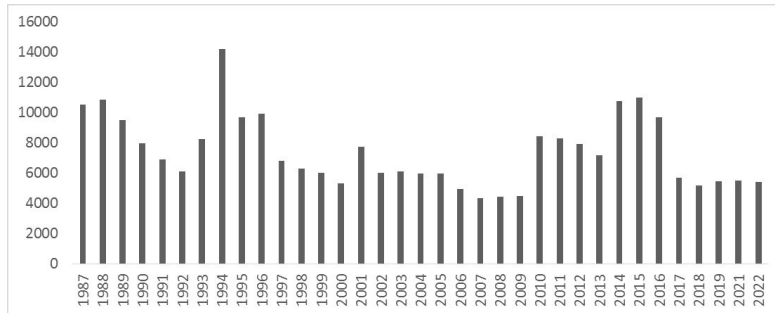
## Pacific cod - summer consumption (t/day) measured from bottom-trawl survey data



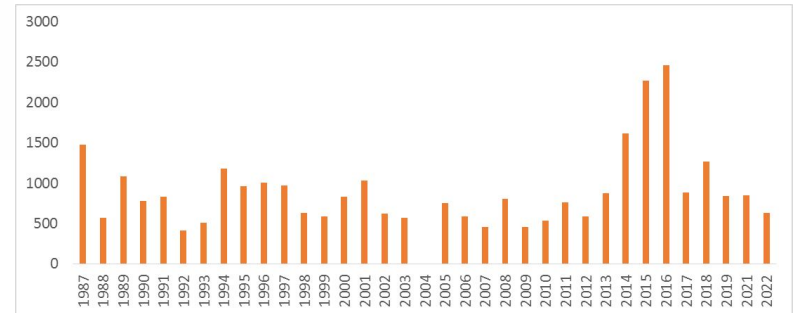
NBS



Snow crab consumption



EBS



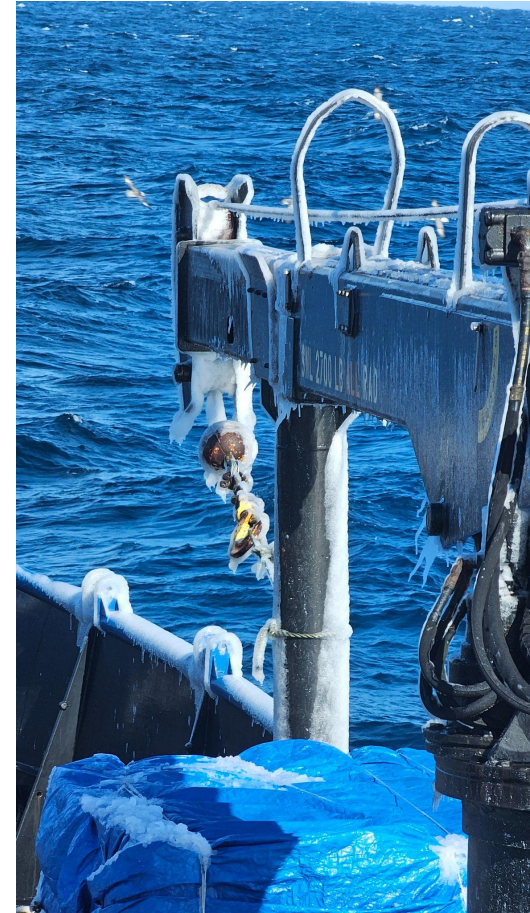
Total:  
Snow crab:

2022 NBS consumption 50% of 2019 peak, EBS consumption stable  
2022 NBS consumption 25% of 2019 peak, EBS slightly lower than 2019  
(2023 numbers available June 2024)





# Current pilot project







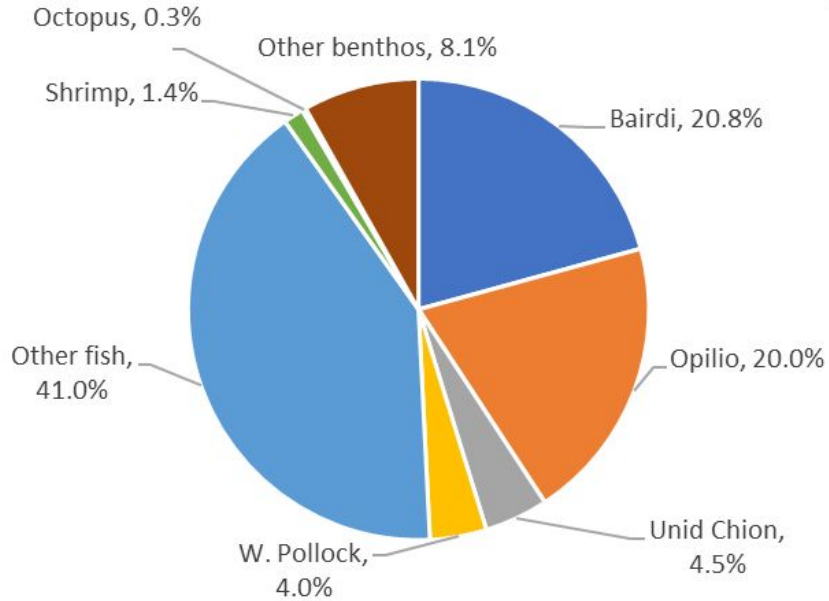
# Current pilot project





# Current pilot project

26 Pacific cod sampled



Crab Carapace Width (mm)	Bairdi	Opilio
10	1	
20	6	5
30	9	
40	9	4
50		2
60		
70		1