

A Quantitative Approach for Targeted Subsampling of Juvenile Fish for Diet Analysis

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Juvenile Walleye Pollock

Investigating the trophic ecology of juvenile fish species is an important component of the Alaska Fisheries Science Center Recruitment Processes Program in order to understand the influence of prey selectivity and availability on survival during early life. In order to standardize protocols for sampling juvenile Walleye Pollock for diet analyses, a procedure was developed to

optimize subsample size per station using prey curves, i.e., number of prey taxa vs. number of fish stomachs. The majority of published diet studies use prey curves post analysis which often shows inadequate sampling. Using historic diet data from 5 years and 3 habitats of juvenile Walleye Pollock from the central Bering Sea, projected prey curves and their confidence intervals are

created using the Chao2 estimator (defined in table below) from *EstimateS** software. The minimum number of fish to process in order to adequately describe the diet for each year and habitat is then determined from these prey curves and sampling effort is distributed accordingly. The following flowchart illustrates the step-by-step protocol needed to conduct this type of analysis.

How many fish
do I collect?

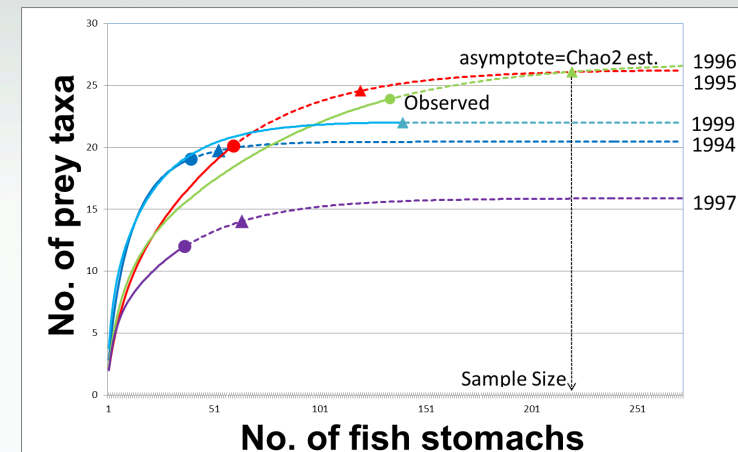
Prior to sampling

Historical diet data
(presence/absence)

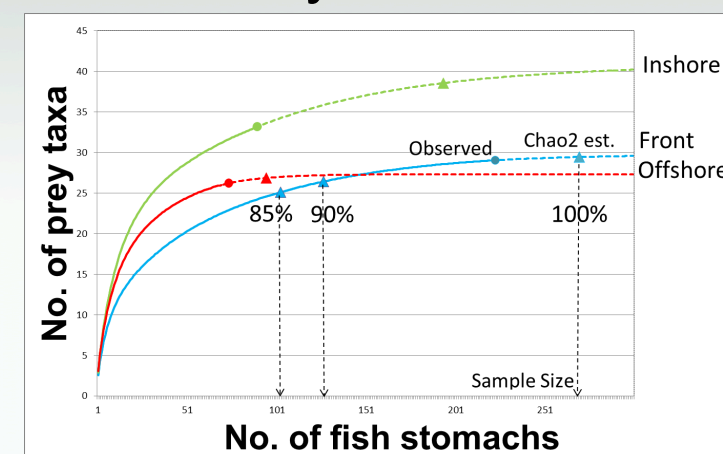
Predator stomachs	Prey taxa					
	A	B	C	D	E	
1	1	0	0	1	0	
2	0	0	0	0	1	
3	0	1	0	0	1	
4	1	0	1	0	0	

Start

Create prey curves by year...



or by habitat



From prey curve, tabulate # of fish stomachs on x axis associated with % of Chao2* estimator

	Criteria	Chao2 estimator*	No. of fish stomachs based on % of Chao2 estimator			No. of stations in survey
			85%	90%	100%	
Year	1994	19.73	23	28	53	6
	1995	24.59	67	79	121	10
	1996	26.13	104	127	222	8
	1997	13.95	36	43	63	3
	1999	22	34	44	132	4
Habitat	Inshore	38.54	86	109	194	10
	Front	29.43	102	129	267	15
	Offshore	26.84	39	49	94	6

*Chao2 estimator is the predicted asymptote where 100% prey taxa in assemblage are detected (Gotelli and Colwell, 2011)

From table, choose habitat with max no. of fish stomachs, multiply by no. of habitats in survey, divide by no. of stations in survey, add 25%.

Inshore
St. Paul Island, Alaska

Total fish = 3 * 267
Total stations = 10+15+6=31
Fish to sample per station = 3*267/31 + 25% = 32

Prior to processing

Determine hypothesis (temporal or spatial) and tabulate no. of stations where fish were caught (per year or habitat)

Choose no. of fish to process based on desired % taxa



For example, to capture 85% of prey taxa (from table), process:
Inshore: 86/10 = 8.6 (9)
Front: 102/15 = 6.8 (7)
Offshore: 39/6 = 6.5 (7)

Divide no. of fish to process by all stations where fish were collected to get subsample size (fish per station).

Offshore (39 fish)

Front (102 fish)

Inshore (86 fish)

St. Paul Island, Alaska

End

This analysis minimizes processing time while preserving data quality.

*Colwell, R.K., 2013. *EstimateS: Statistical estimation of species richness and shared species from samples*, Version 9. Persistent URL <oyrk,ickc,irg/estimates>

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How many fish
do I process?