

Individual-level and Population-level Historical Prey Demand of San Francisco Estuary Striped Bass Using a Bioenergetics Model

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Study Objectives

- * Develop abundance estimates of sub-adult striped bass (Age 1 and Age 2)
- * Quantify consumption of prey by sub-adult and adult striped bass

Bioenergetics Model: Overview

- * A energy budget equation:

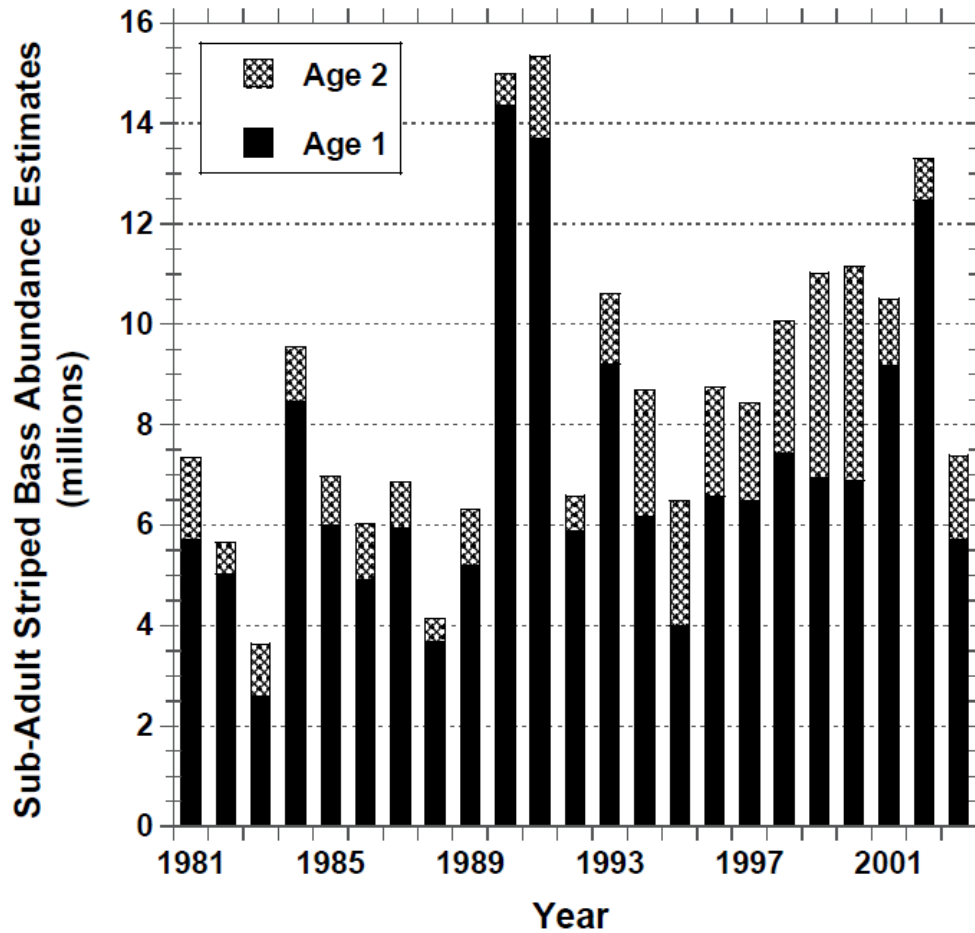
$$\textit{Growth} = \textit{Consumption} - \textit{Metabolism} - \textit{Excretion} - \textit{Egestion}$$

- * Requires species specific constants derived from laboratory studies
 - * Chesapeake Bay striped bass (Hartman *et al.* 1995)
- * Requires input data from field observations
 - * Water temperature, annual growth rates, diets, abundances

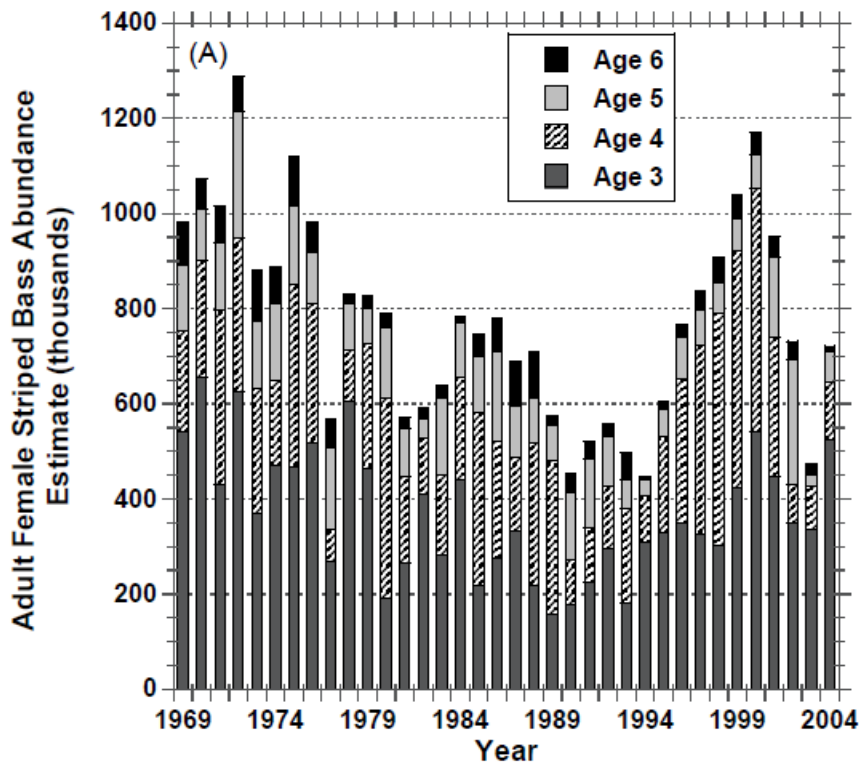
Striped Bass Abundance

- * Age 1 abundance:
 - * Observed Age 1-3 survival rates on hatchery fish 1981-1990
 - * Developed regression of survival to X_2 spring location to estimate 1991-2003 Age 1 abundances
- * Age 2 abundance:
 - * Mortality from Age 2-3 inferred from Age 3-4 total mortality minus harvest mortality
- * Age 3-7 abundance:
 - * DFG's mark-recapture database (1969 – 2004)

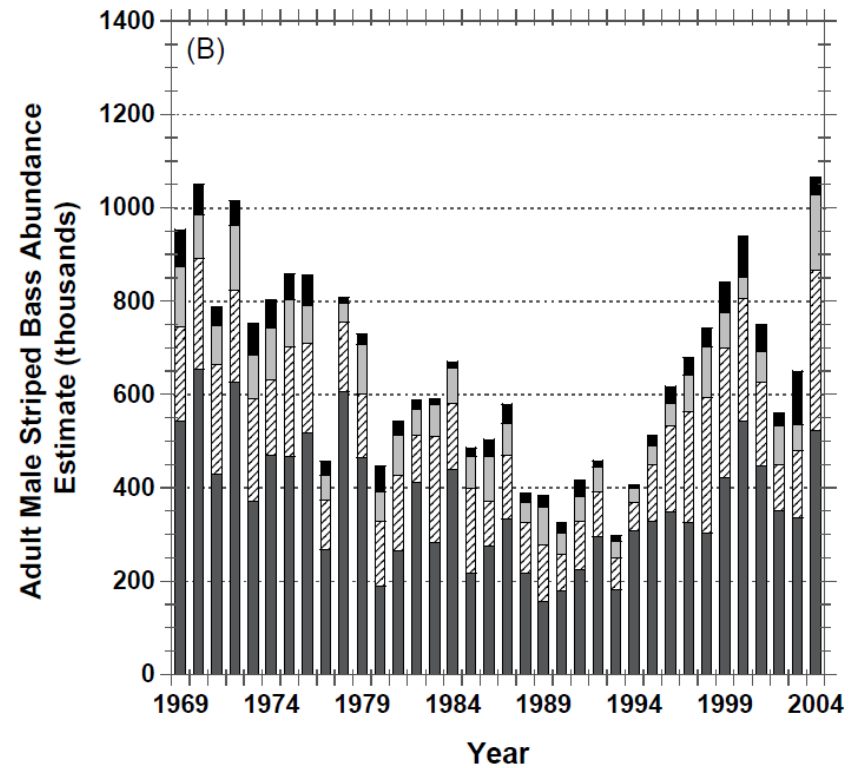
Sub-Adult Striped Bass Abundance



Adult Striped Bass Abundance

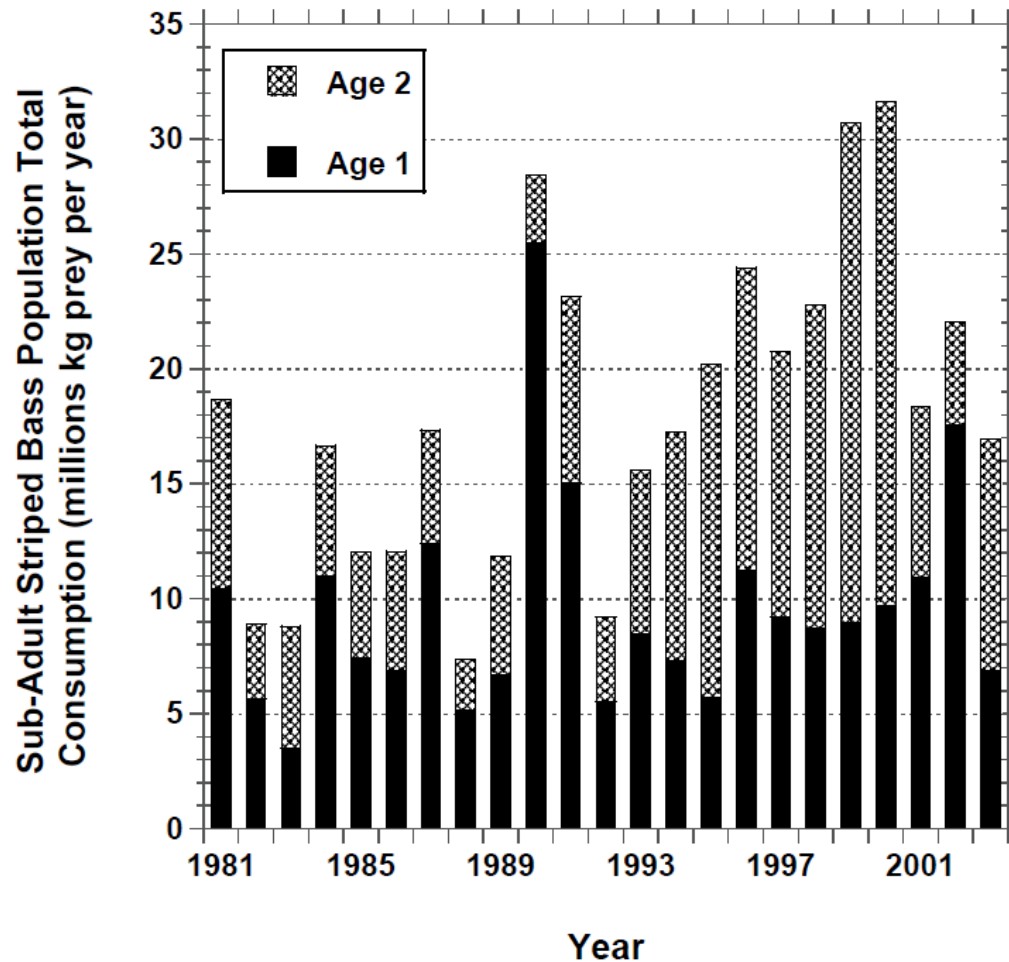


Females

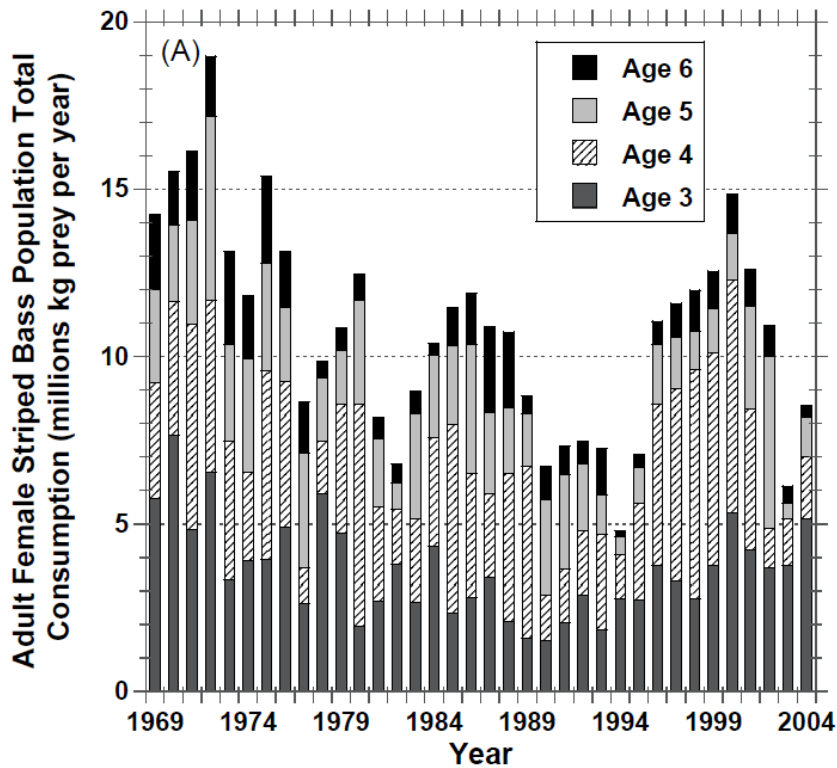


Males

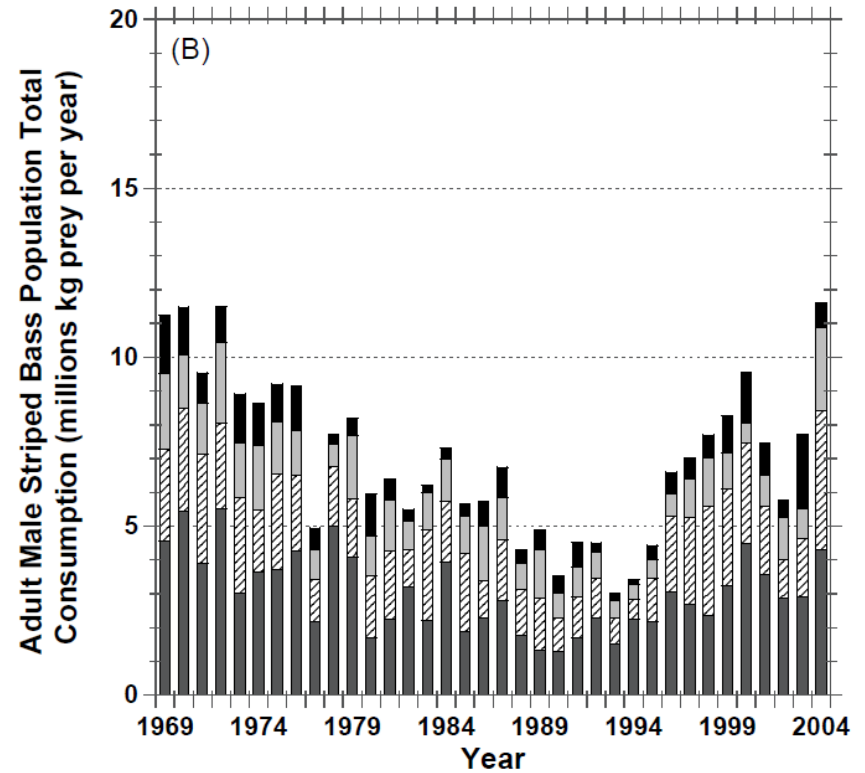
Sub-Adult Population Total Consumption



Adult Population Total Consumption

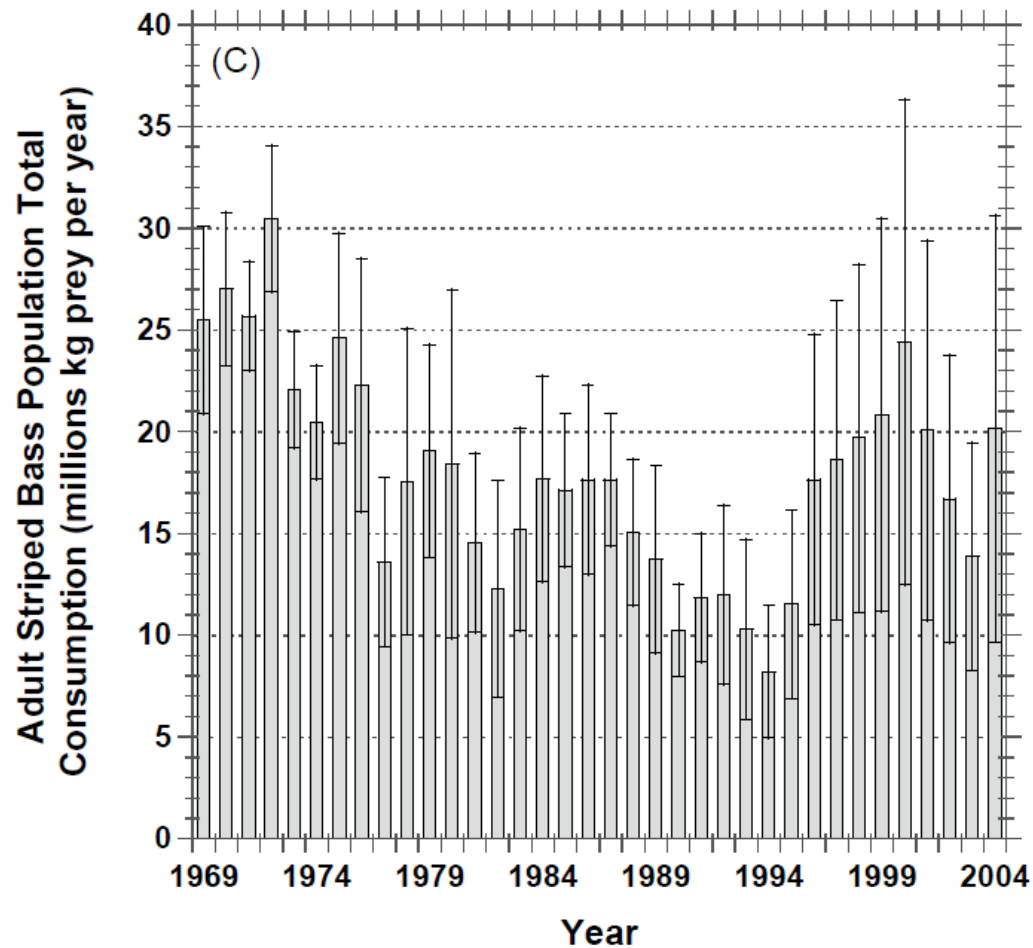


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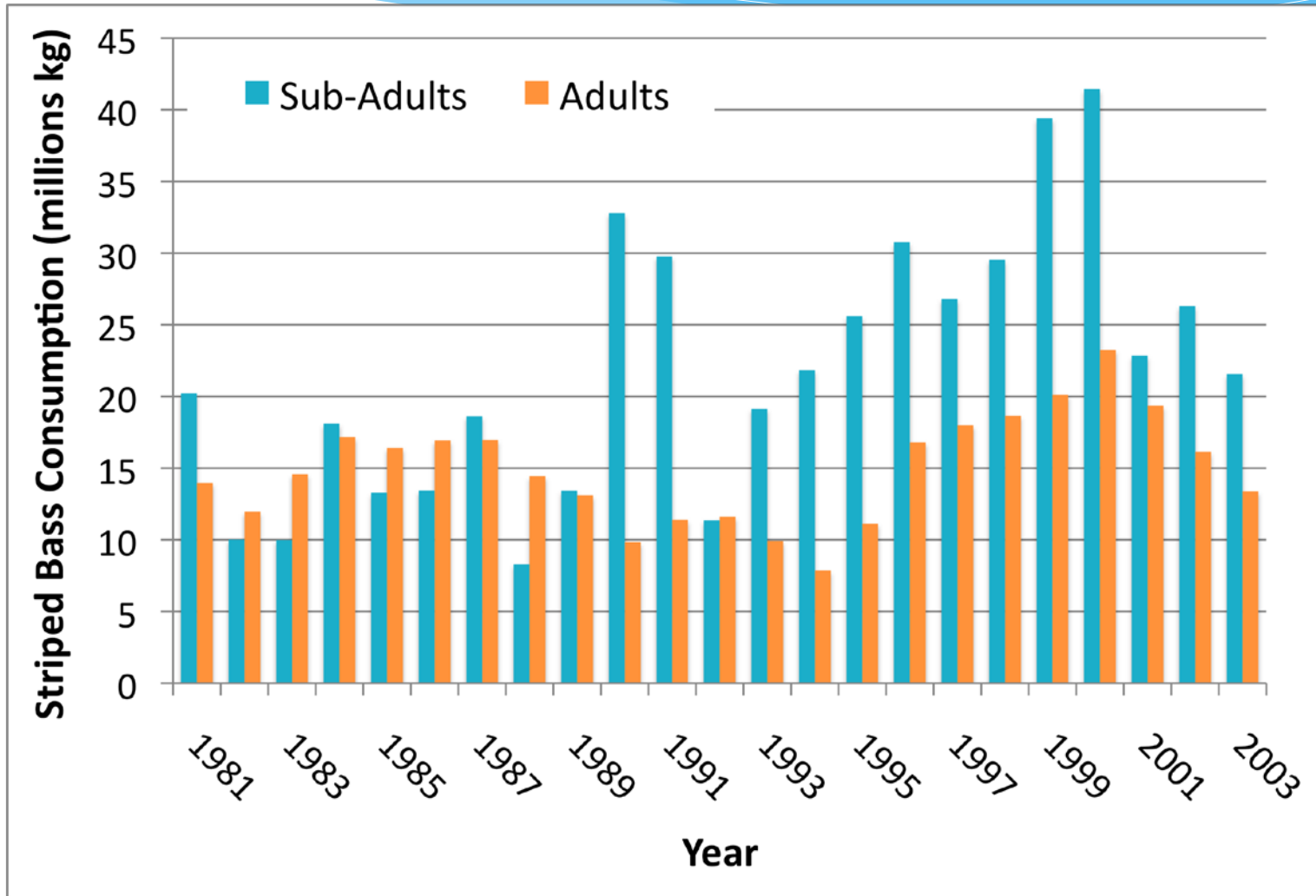


Males

Adult Population Total Consumption



Striped Bass Total Consumption



Bioenergetics Consumption Modeling Summary

- * Possible recent shift in striped bass predator-prey relationship
 - * Adult individual consumption decreased
 - * Age 2 individual consumption increased
 - * Age 1 individual consumption unchanged
- * Population consumption increased (1990 -2001)
 - * Larger population of adult and age 2 striped bass
- * Sub-adult population consumption similar to adult population consumption

Bioenergetics Consumption Modeling Key Assumptions

- * Consumption estimates inclusive of oceangoing striped bass
- * Abundance estimates
- * No intra-annual mortality
- * Relatively static diets

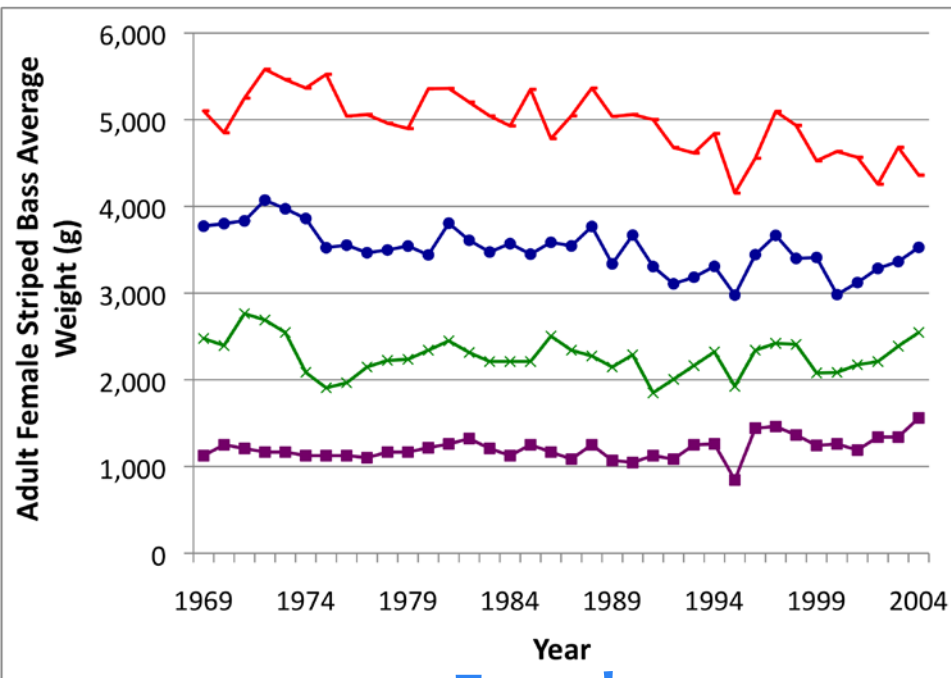
Acknowledgements

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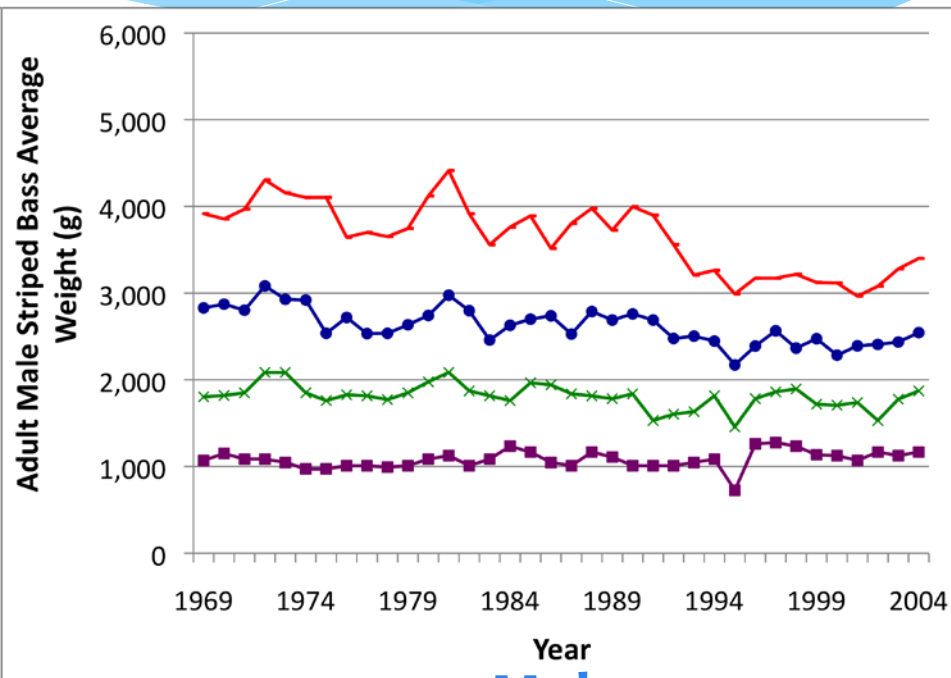
Questions

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Observed Decline in Size-at-Age



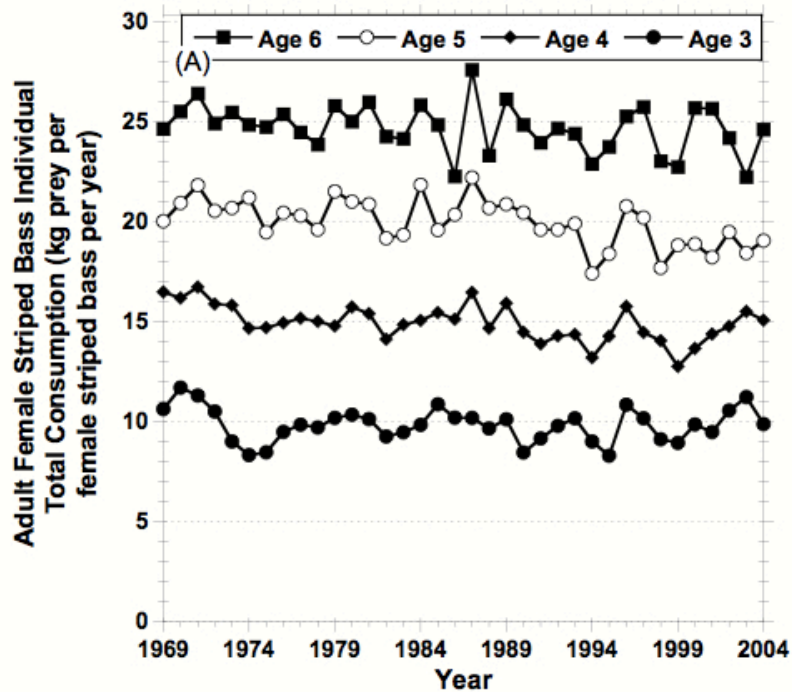
Females



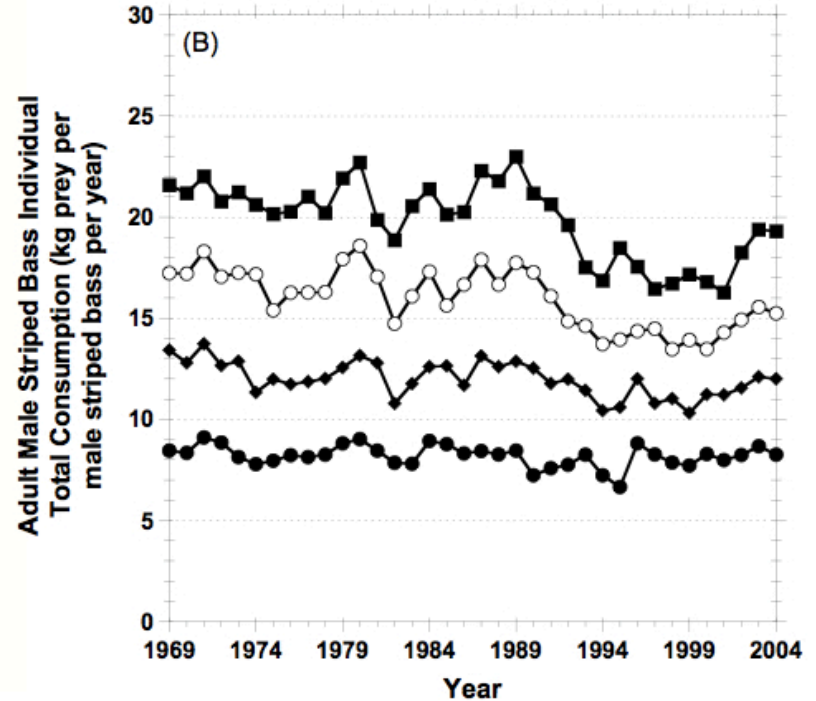
Males

■ Age 3 ✕ Age 4 ● Age 5 — Age 6

Adult Individual Total Consumption

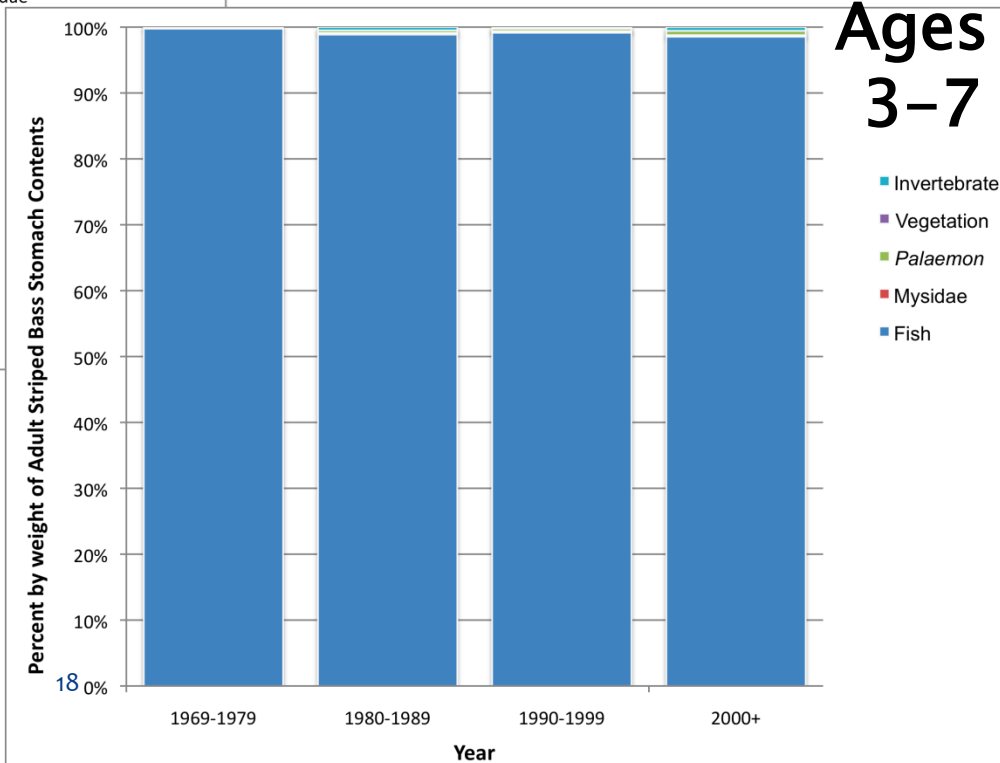
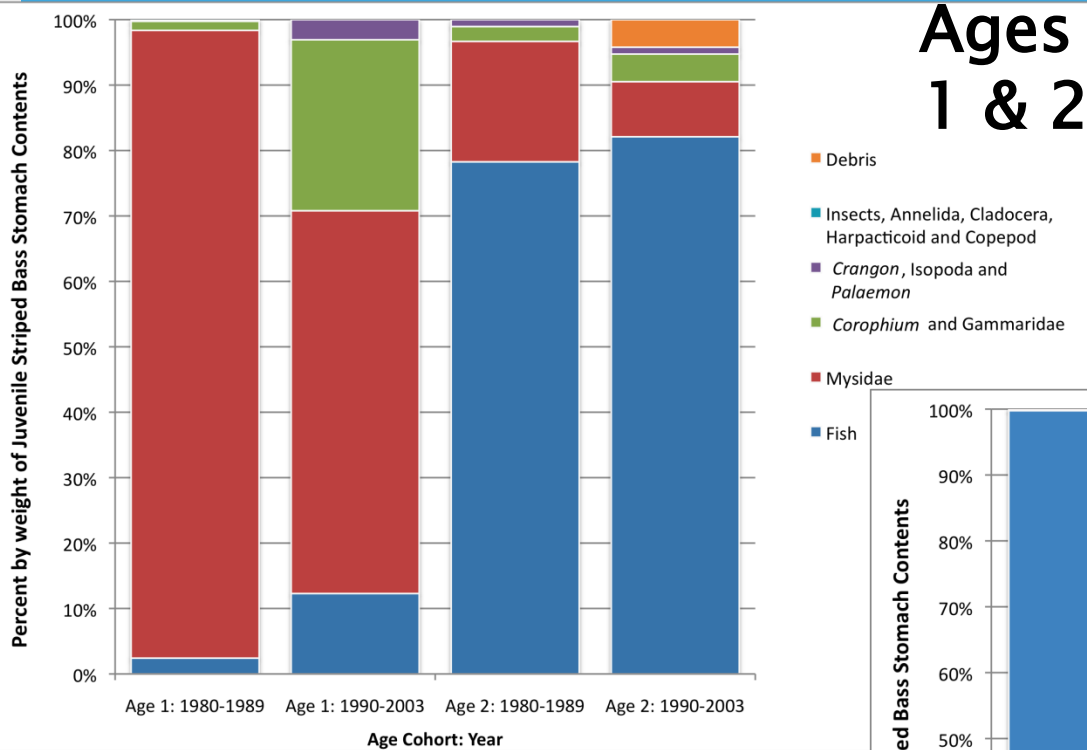


Females



Males

Striped Bass Diet Proportions



Sub-Adult Individual and Population Consumption of Prey Fish

