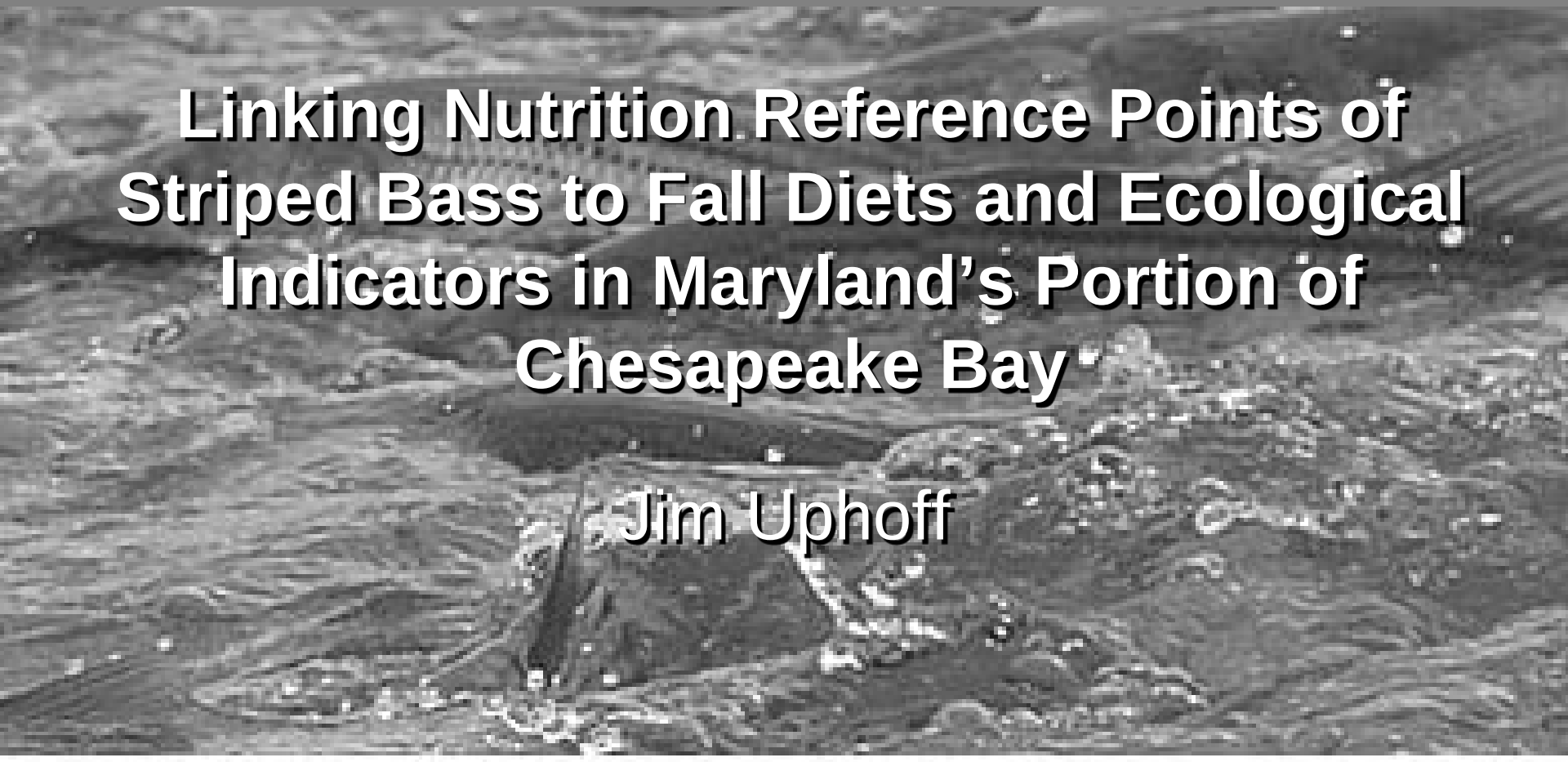


Linking Nutrition Reference Points of Striped Bass to Fall Diets and Ecological Indicators in Maryland's Portion of Chesapeake Bay

Jim Uphoff

Fisheries GIT, June 4, 2014

Acknowledgements

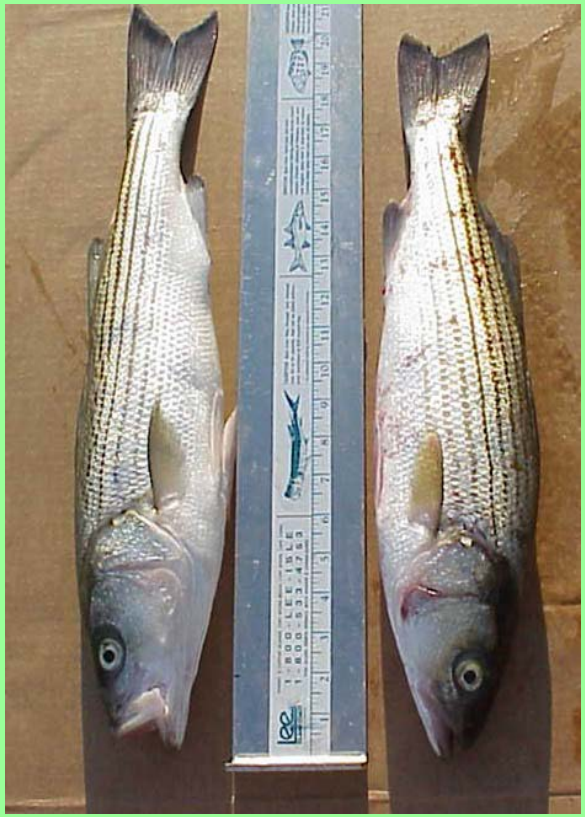
- John Jacobs, Reggie Harrell, Kyle Hartman, Howard Townsend -nutrition reference point development (NOAA, UM, WVU, NOAA)
- Jim Price (Chesapeake Bay Ecological Foundation or CBEF) – body fat and diet monitoring
- Mark Matsche & Kevin Rosemary MD Fisheries Fish and Wildlife Health Program (FWHP) – body fat monitoring data
- Lonnie Gonsalves (NOAA) – dissertation analyses (body fat time-series)
- Angela Giuliano - USFWS tagging analysis for in-Bay distribution (MD Fisheries)

Biological Reference Points for the Nutritional Status of Chesapeake Bay Striped Bass

Jacobs et al. 2013, N. American Journal of Fisheries Management

- **Find "best" ($, accurate, easy) nutritional status indicators relative to proximate analysis**

- **Provide targets and limits based on condition**



Lipids are the energy "currency" of fish

- **Nutrition reference points are based on lipids**

- **Target is a desired physiological state for reasonably healthy fish; most have fat, but not all**

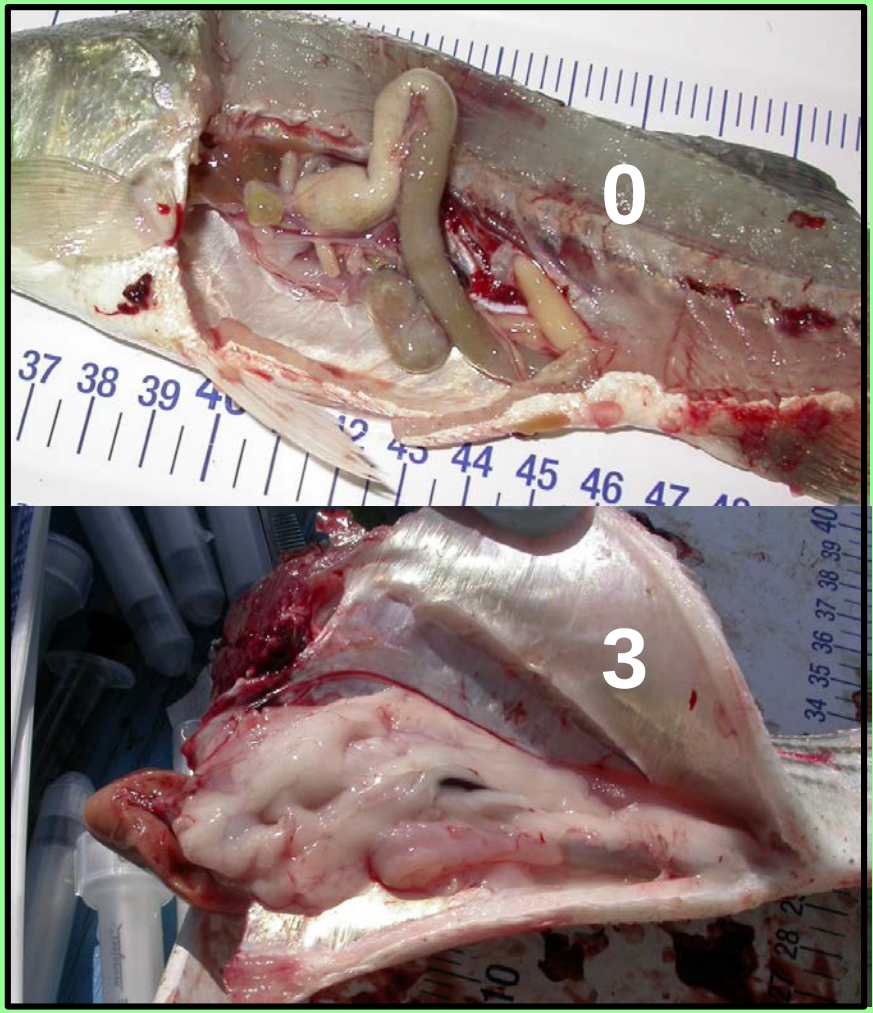
- **Threshold is a physiological state to be avoided; too few have fat; fish may be vulnerable to starvation, disease, lower reproduction, etc.**

Jacobs et al. Summary

- Water replaces lipid in striped bass – weight may not change much
- Fulton's K & relative weight = coarse predictors of lipid .
- Body fat index & moisture = strong indicators of lipid.

MD DNR FWHP Body Fat Index time-series starts in 1998

- Modified index of Goede and Barton (1990)
- 0- No observable visceral lipid
- 1 – up to 25% coverage
- 2 – 25 - 75% coverage
- 3 - >75% coverage
- Presence-absence worked well



Summary (continued)

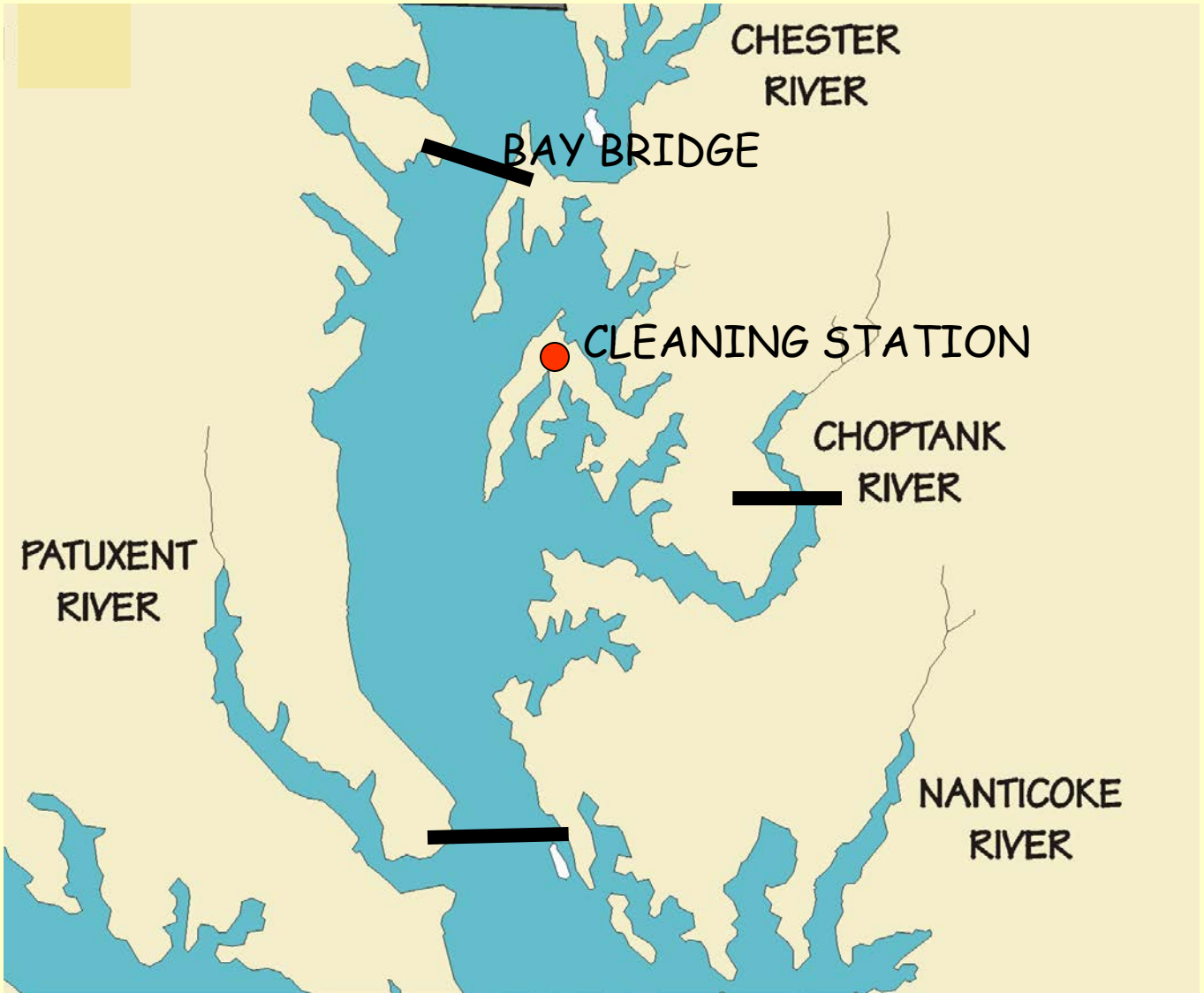
- Vulnerability indicators = 80% moisture or 0 body fat
- Reference condition based on 1990 sampling
- Target vulnerability of 25% of striped bass at 80% moisture or 30% with no observable body fat
- Threshold vulnerability =
  - % without fat that's clearly higher than target
  - 95% CI's don't overlap
  - 66% or more without fat

Examination of Chesapeake Bay Ecological Foundation Striped Bass health and diet data and DNR's Fish and Wildlife Health Program's health data

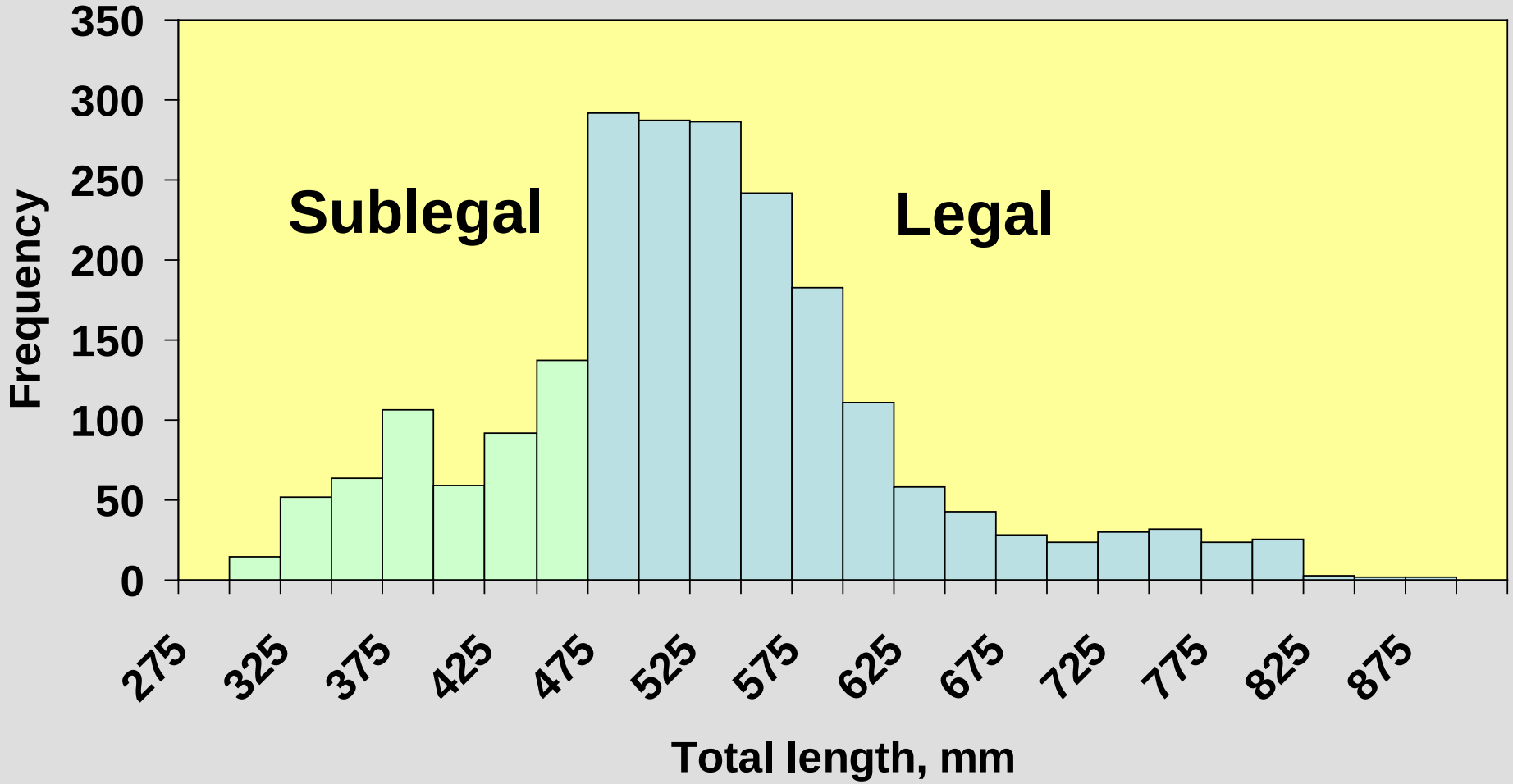
Summary of collections by Jim Price

- Collections year-round, 2006-2014
- Analysis: October – November, 2006-2012
  - Recommendation in Jacobs et al. (2013)
- Hook and line catches: mid-Bay cleaning station (legal fish) & collections under permit (sublegal & legal)
- N = 3,921
- Area accounts for 30-60% 1987-2007 USFWS tag returns in MD's part of Bay
- MD's part ~ 70% of Bay returns (Oct-Dec)

Area of Chesapeake Bay monitoring

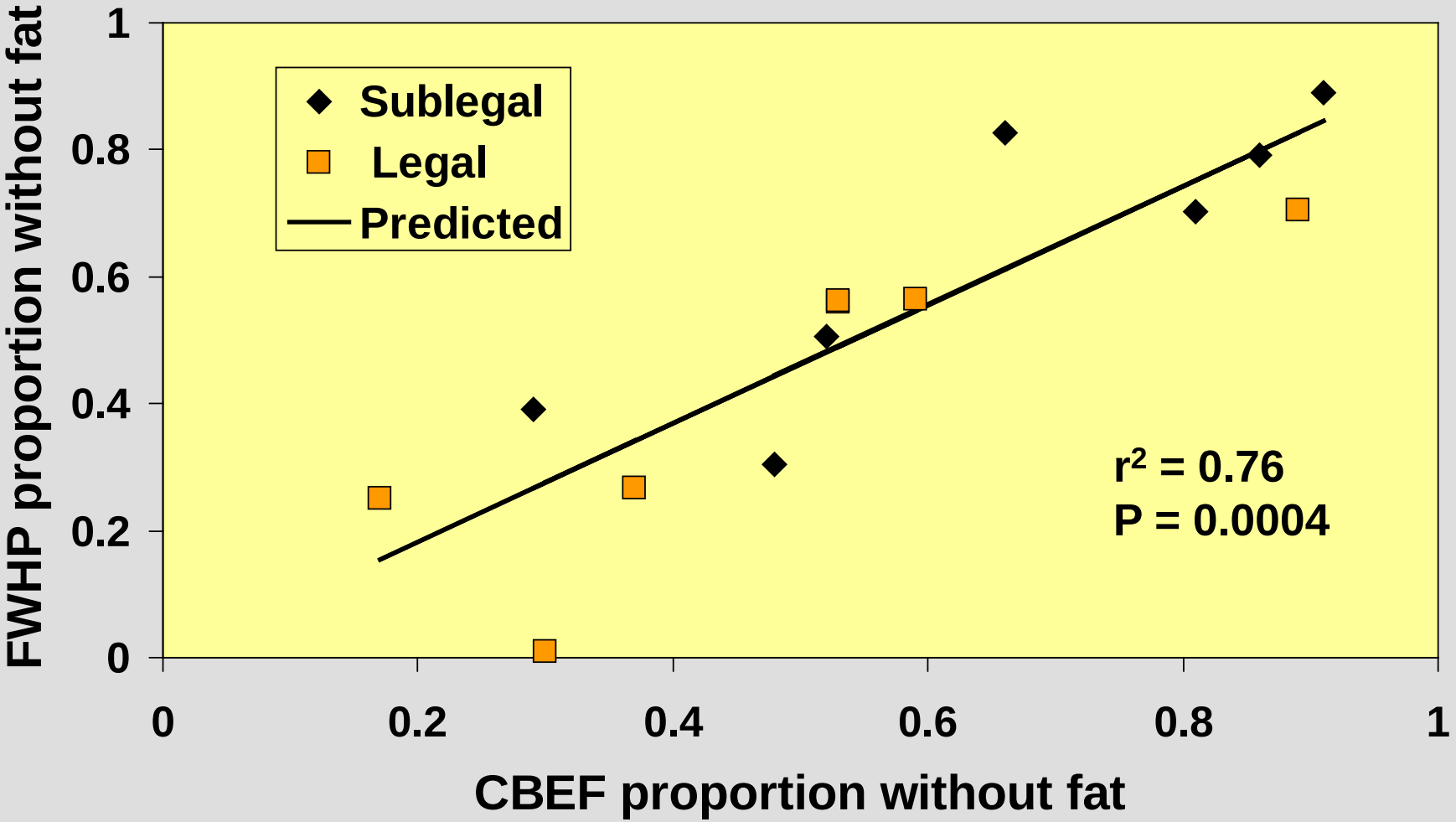


Length-frequency of Striped Bass included in analyses of 2006-2012 diets during October-November.

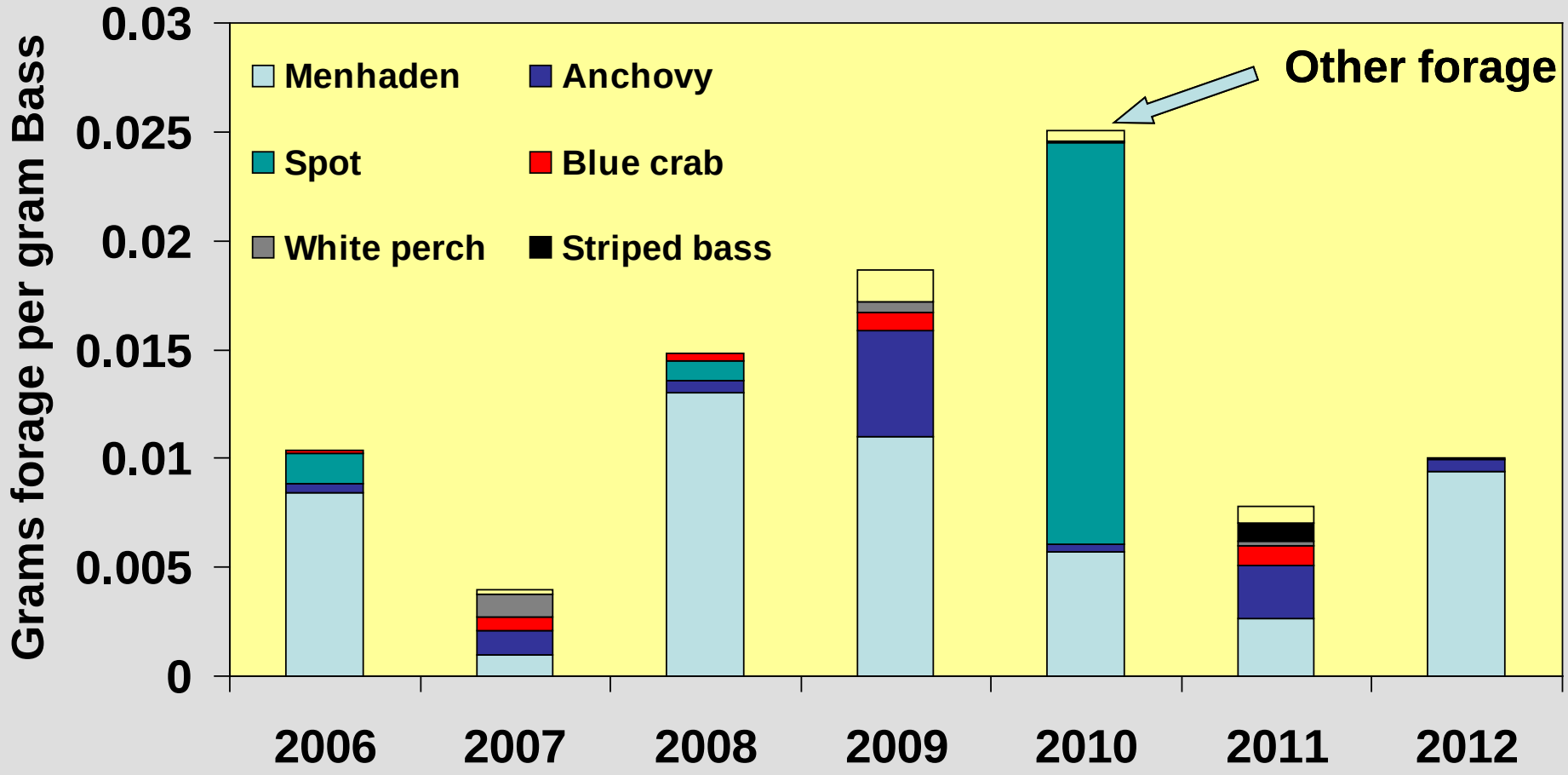


CBEF and FWHP proportions Striped Bass without body fat agree

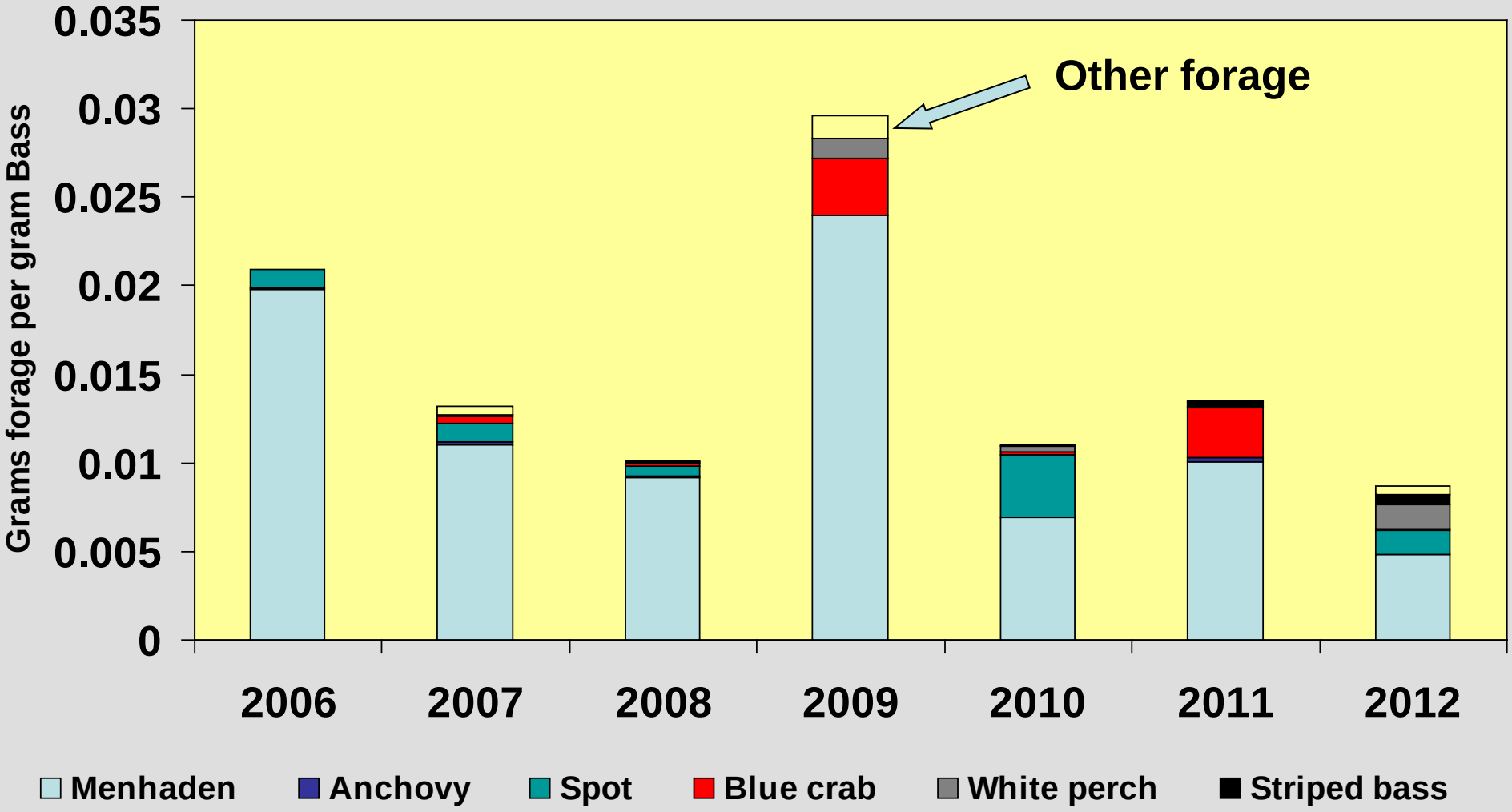
(same region, October-November, 2006-2012).



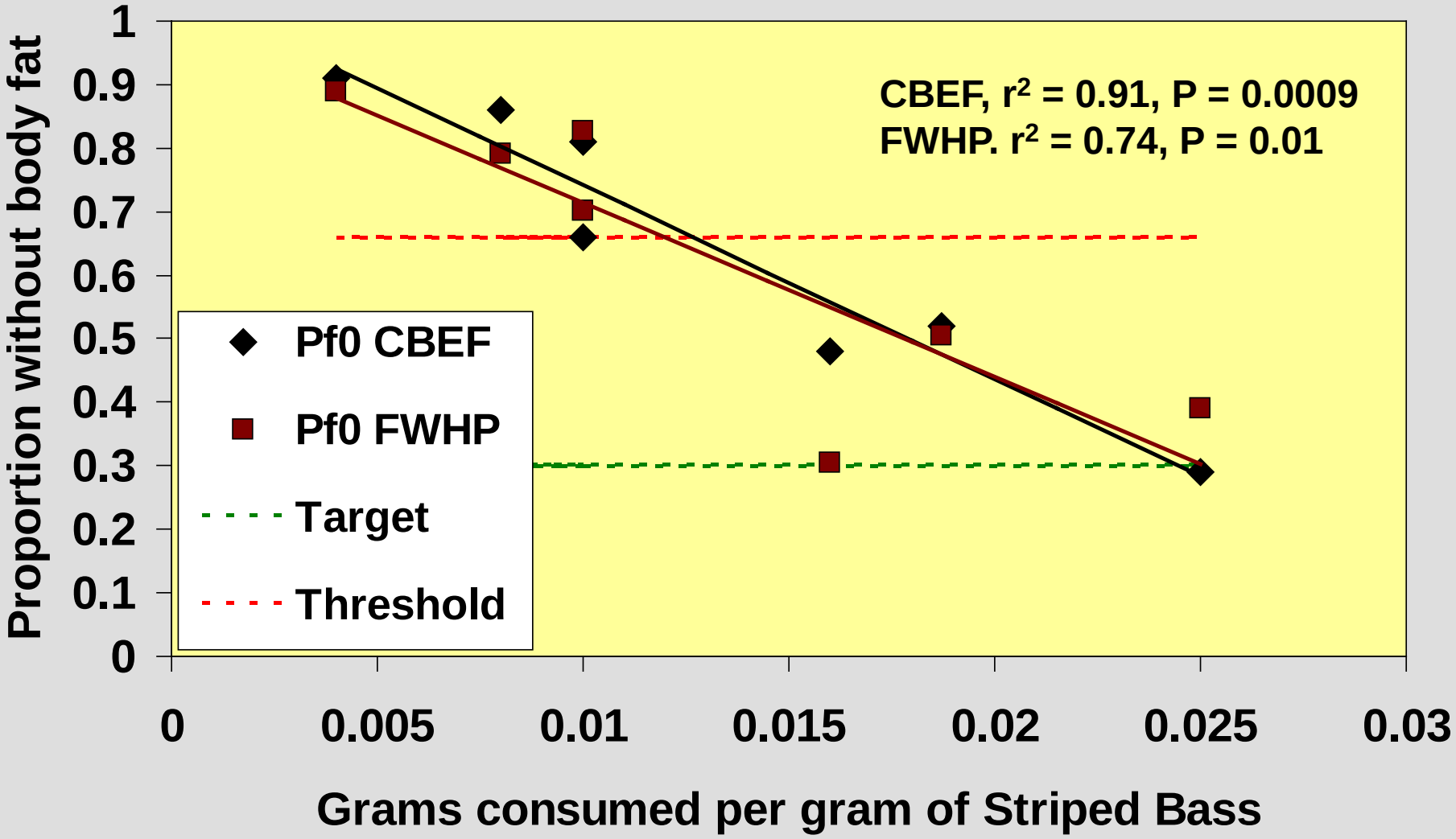
Weight of items consumed per gram of sublegal Striped Bass. Fall consumption dominated by YOY forage.



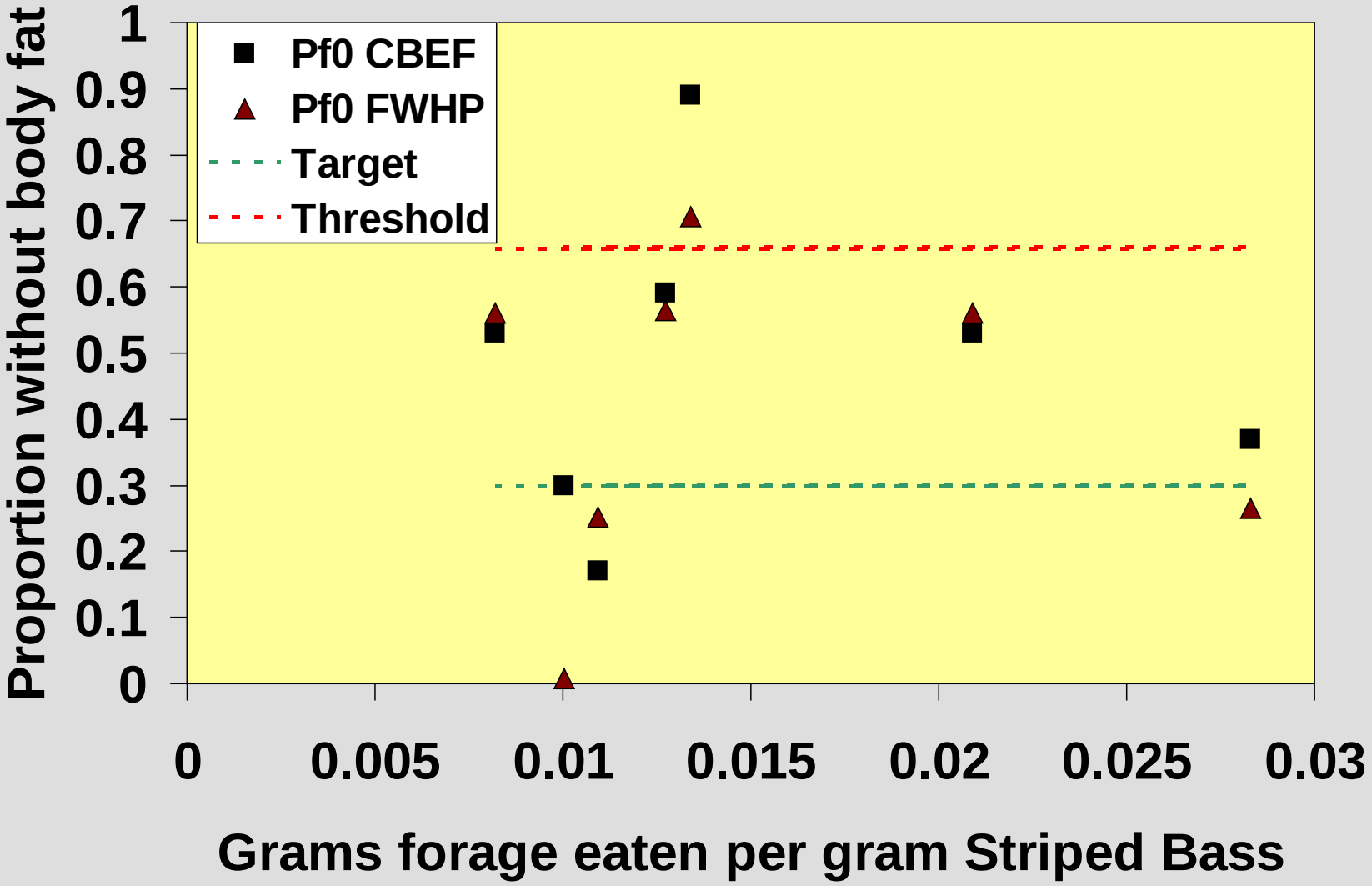
Weight of items consumed per gram of legal Striped Bass during October-November. Fall consumption dominated by YOY forage.



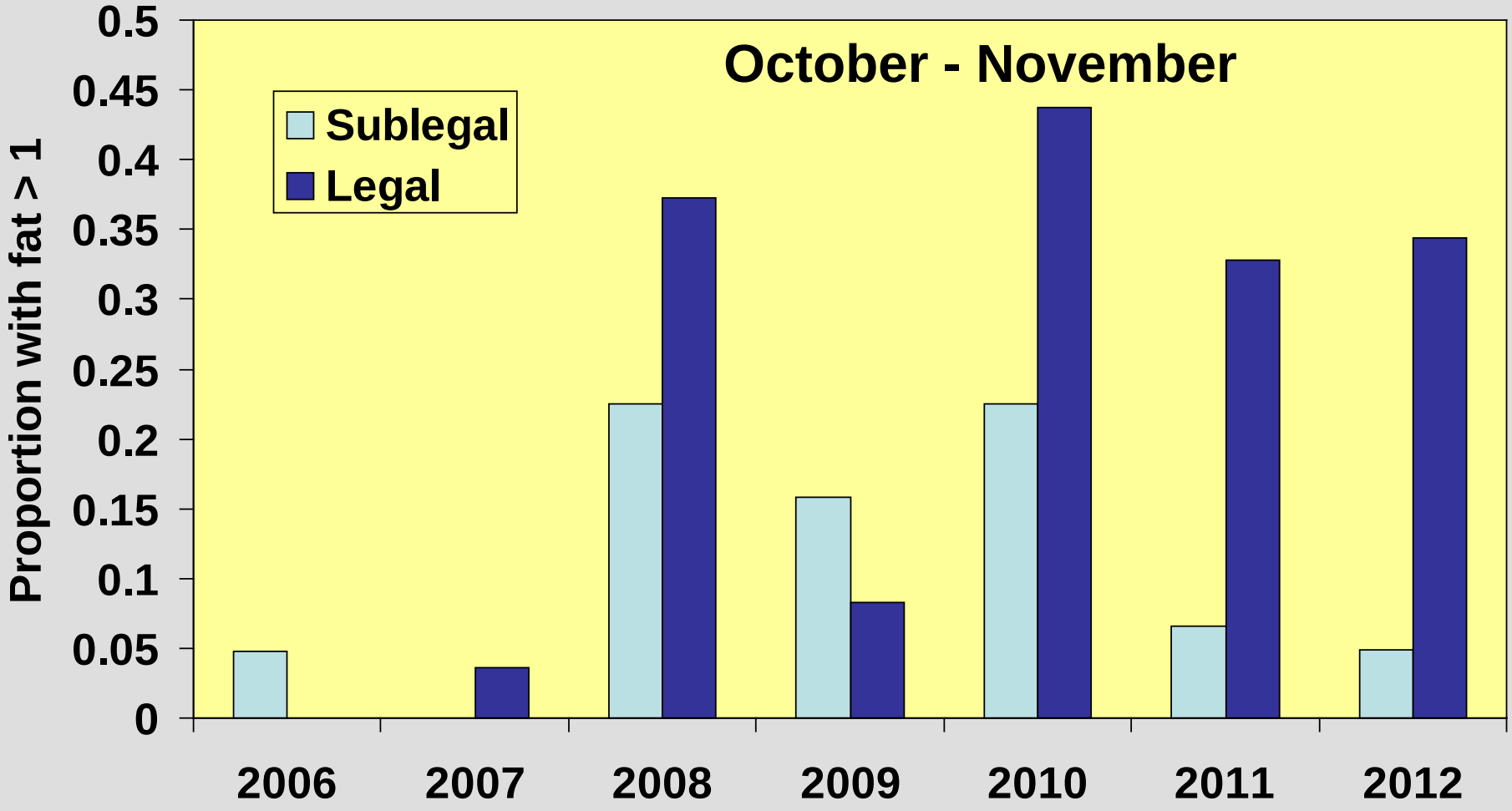
Sublegal Striped Bass condition was related to October-November consumption



Legal Striped Bass condition was not related to October-November consumption



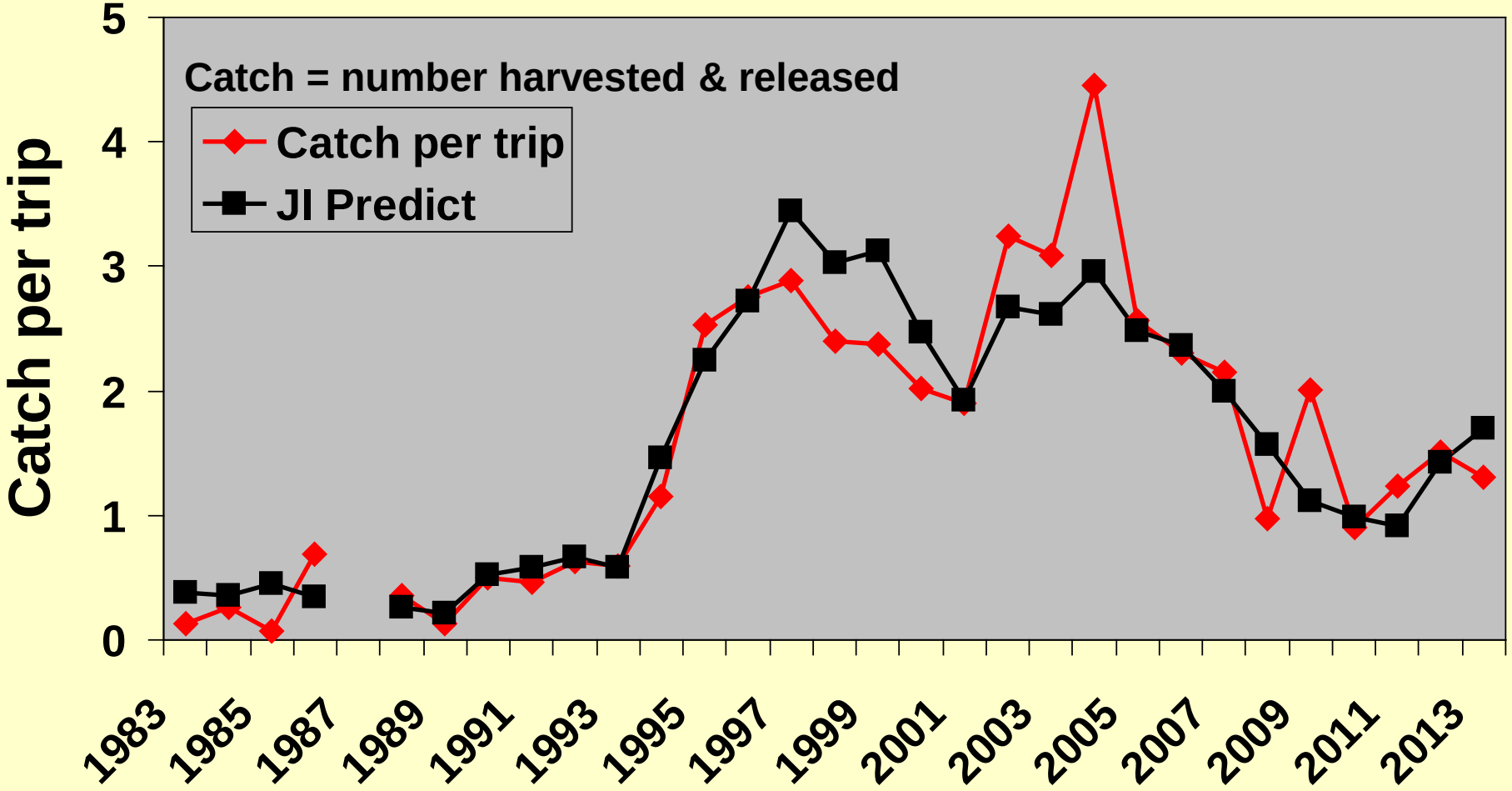
Proportion of fish in FWHP monitoring with “high” body fat scores (> 1). Some fish in some years were in better shape. Previous feeding may be important for legal fish.



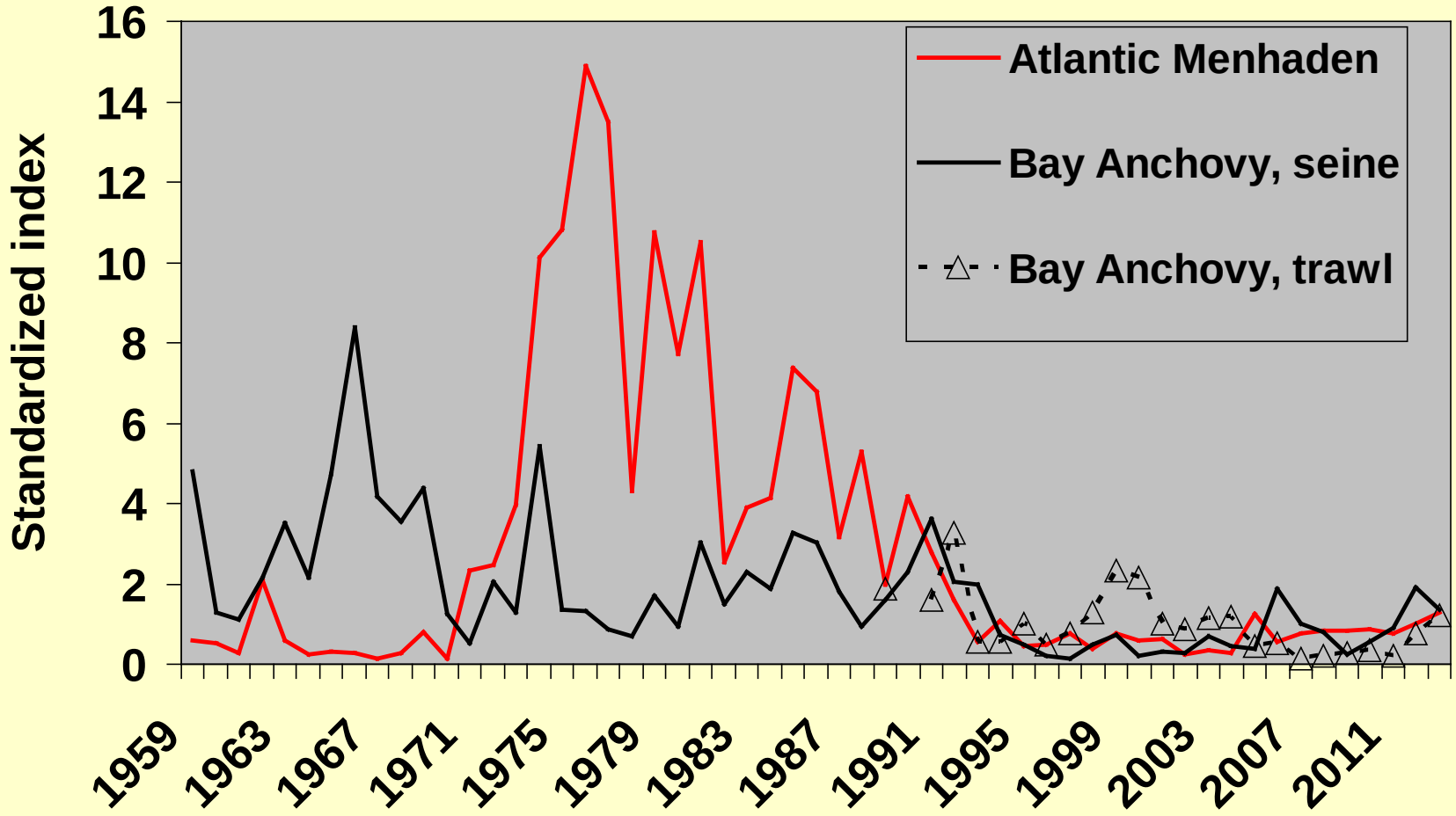
Ecological indicators - MD

1. Resident bass relative abundance index
2. Major forage indices.
    1. Seine survey (Bass nursery areas)
    2. Blue Crab trawl survey (mostly lower MD Bay)
    3. Winter dredge Blue Crab survey
3. Attack success ~ (forage index / bass index)
4. Sublegal Striped Bass relative survival (Spring gill net indices of age 3 or age 4 males / relevant JI)
5. ASMFC survival estimates for 18-28 inch Striped Bass in Bay from tag-based M
6. Proportion bass without body fat

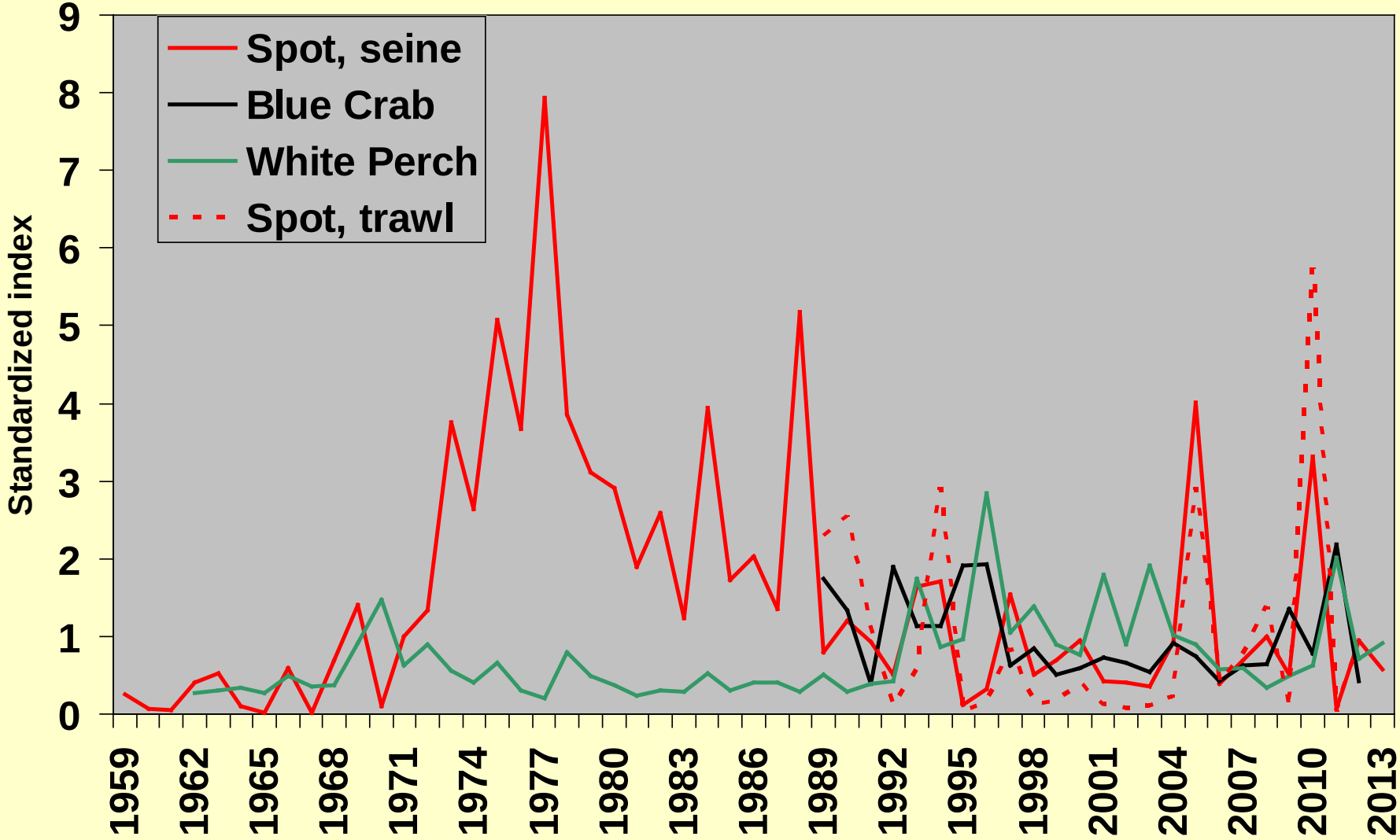
Resident Striped Bass index in MD's portion of Bay (Sept-Oct MD MRIP catch per private boat trip) and prediction from MD JI's 1-4 years prior.



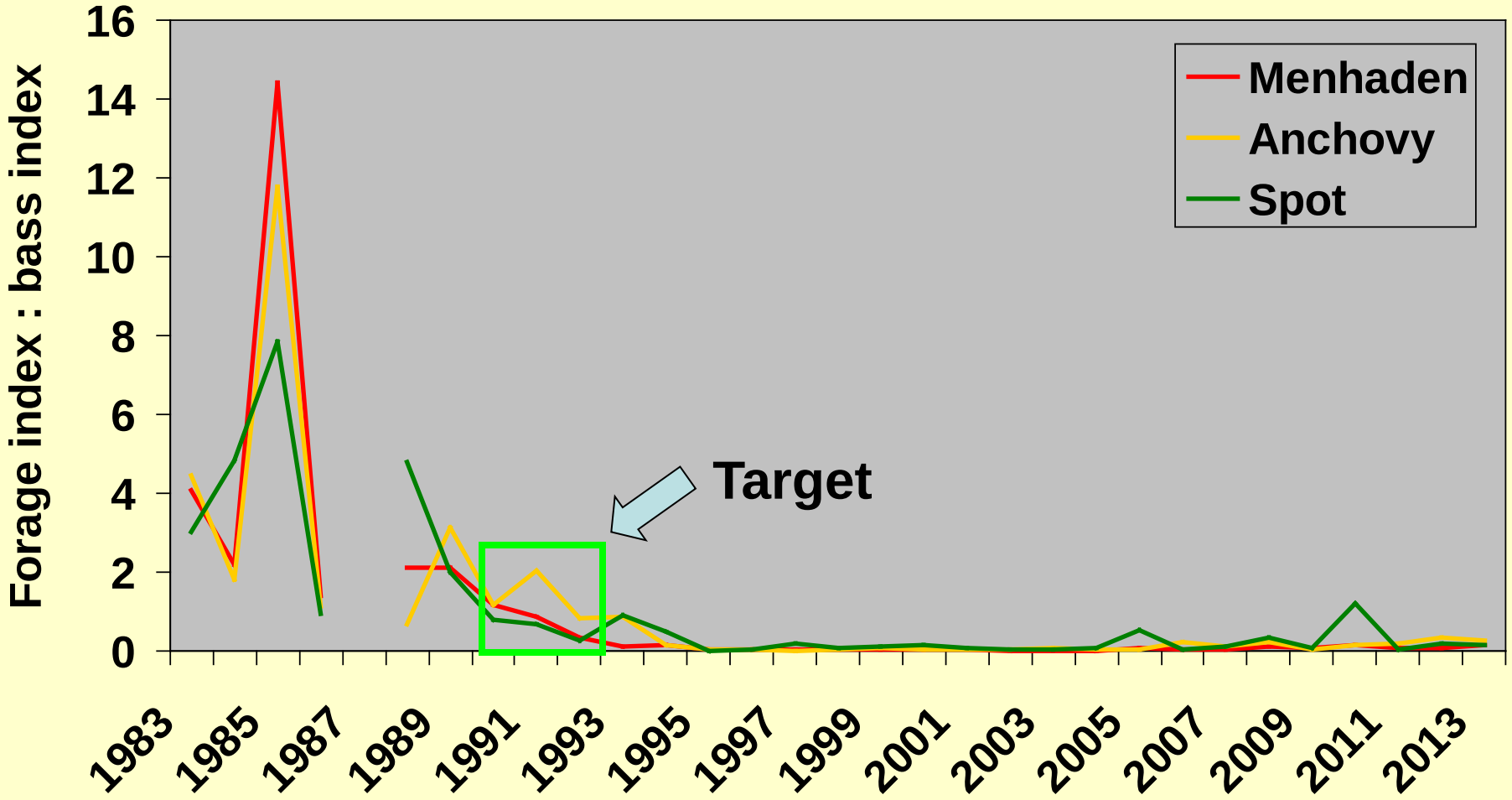
Trends in major pelagic prey of Striped Bass in Maryland surveys. Indices were standardized to their 1989-2012 means.



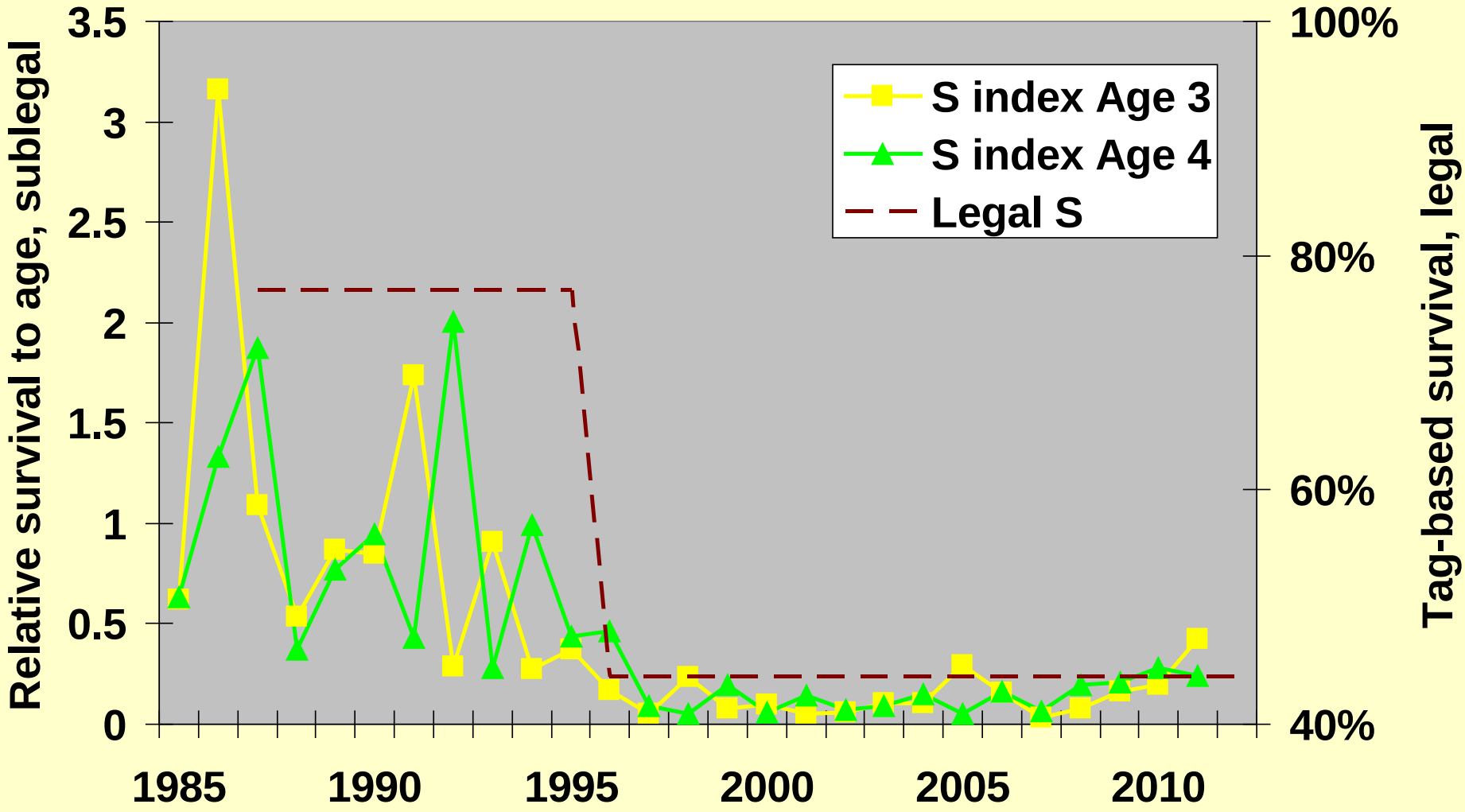
Trends in major benthic prey of Striped Bass in Maryland surveys. Indices were standardized to their 1989-2012 means.



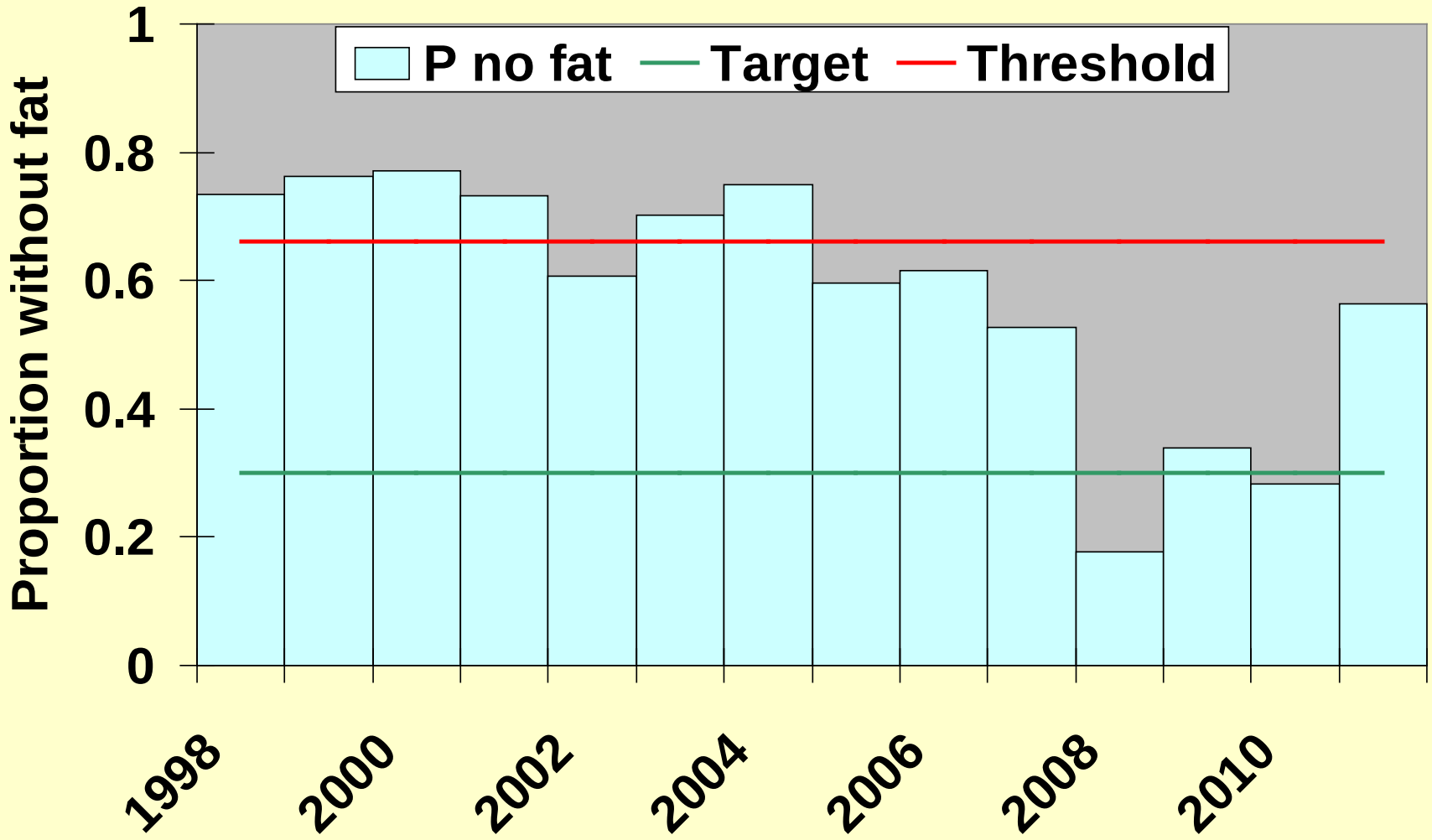
Indices of relative attack success



Trends in relative survival of sublegal male Striped Bass and survival from tag M estimate (ASMFC) of legal Striped Bass in MD's portion of Chesapeake Bay

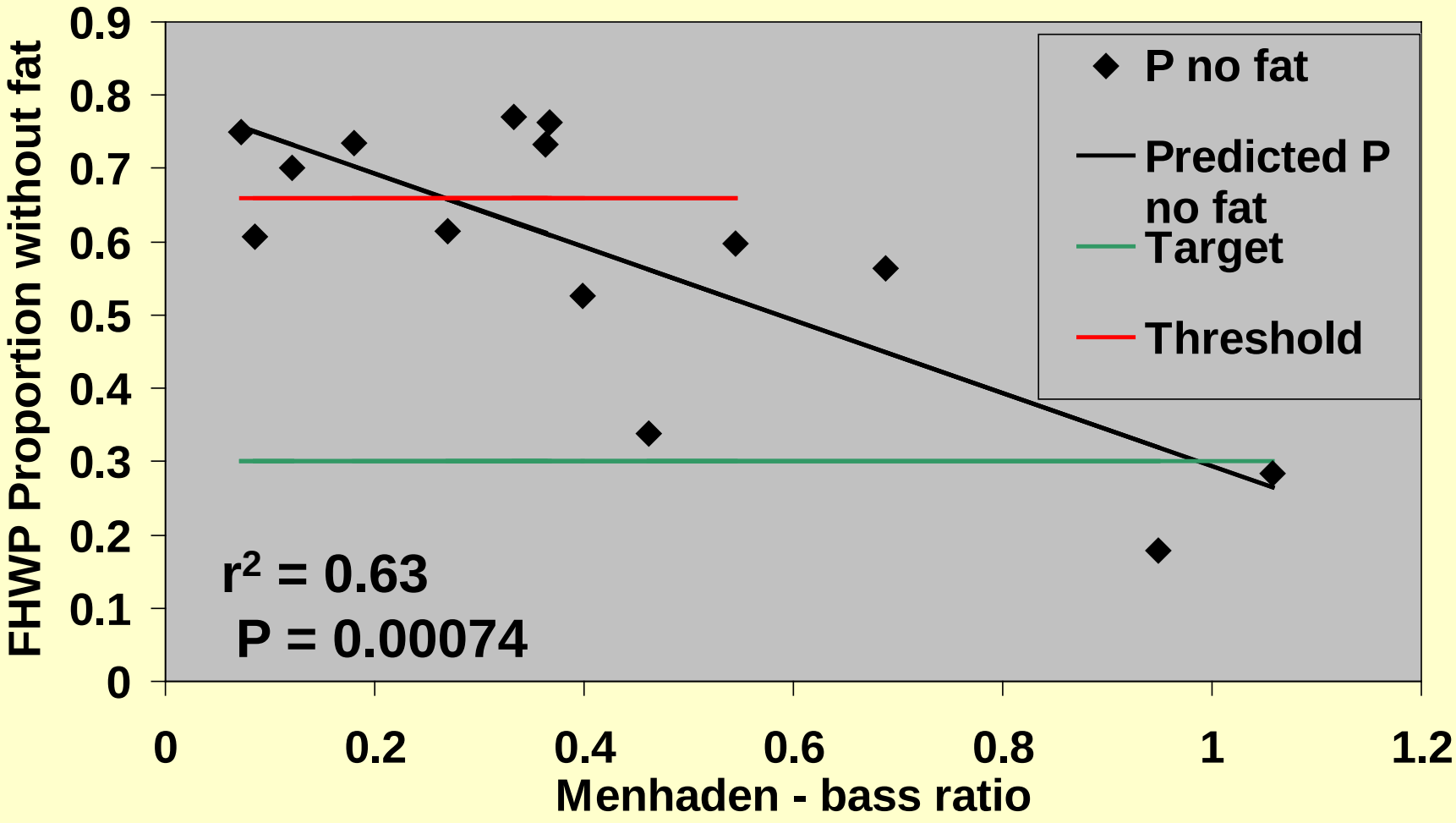


FWHP proportion without body fat (sublegal, fall, baywide, MD).



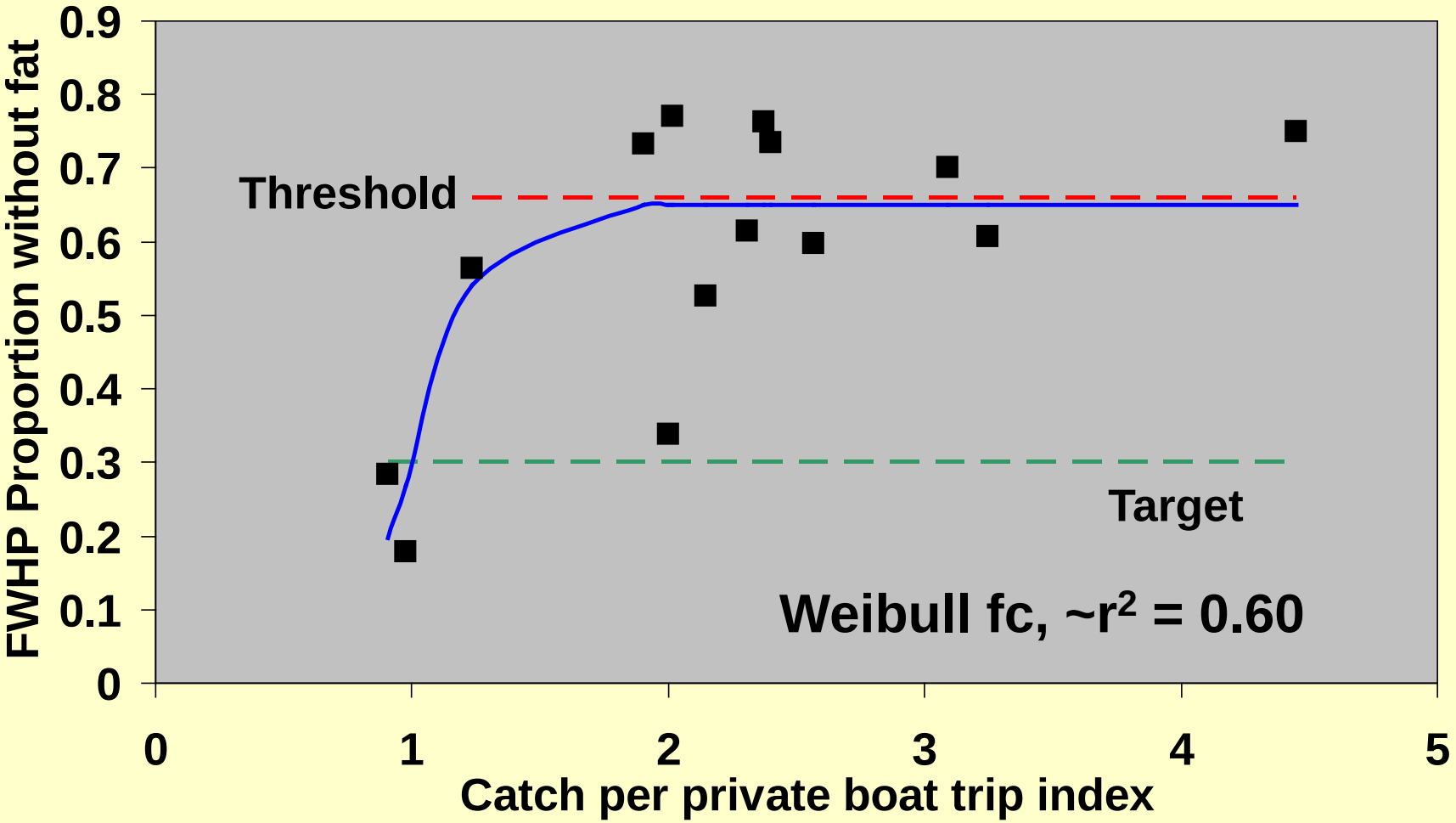
Sublegal bass body fat in target region during 1998-2012 when menhaden & bass ratio > 1. Target reached due to decrease in bass.

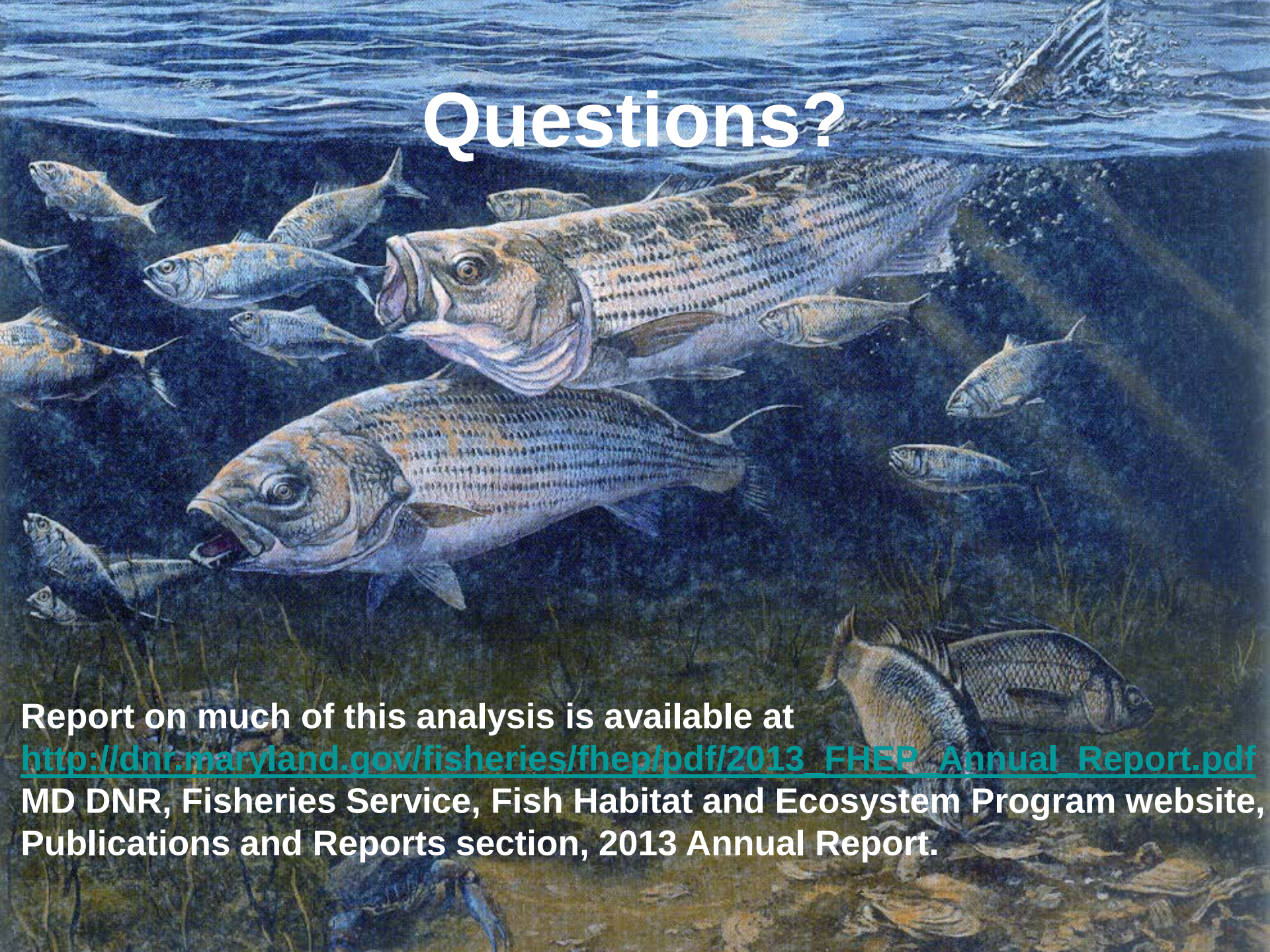
1998-2011 data.



Sublegal bass body fat in target region when bass index is low.

1998-2011 data





Questions?

Report on much of this analysis is available at
http://dnr.maryland.gov/fisheries/fhep/pdf/2013_FHEP_Annual_Report.pdf
MD DNR, Fisheries Service, Fish Habitat and Ecosystem Program website, Publications and Reports section, 2013 Annual Report.