WP 3.5
Fishery Production Potential on the Northeast Continental Shelf of the United States

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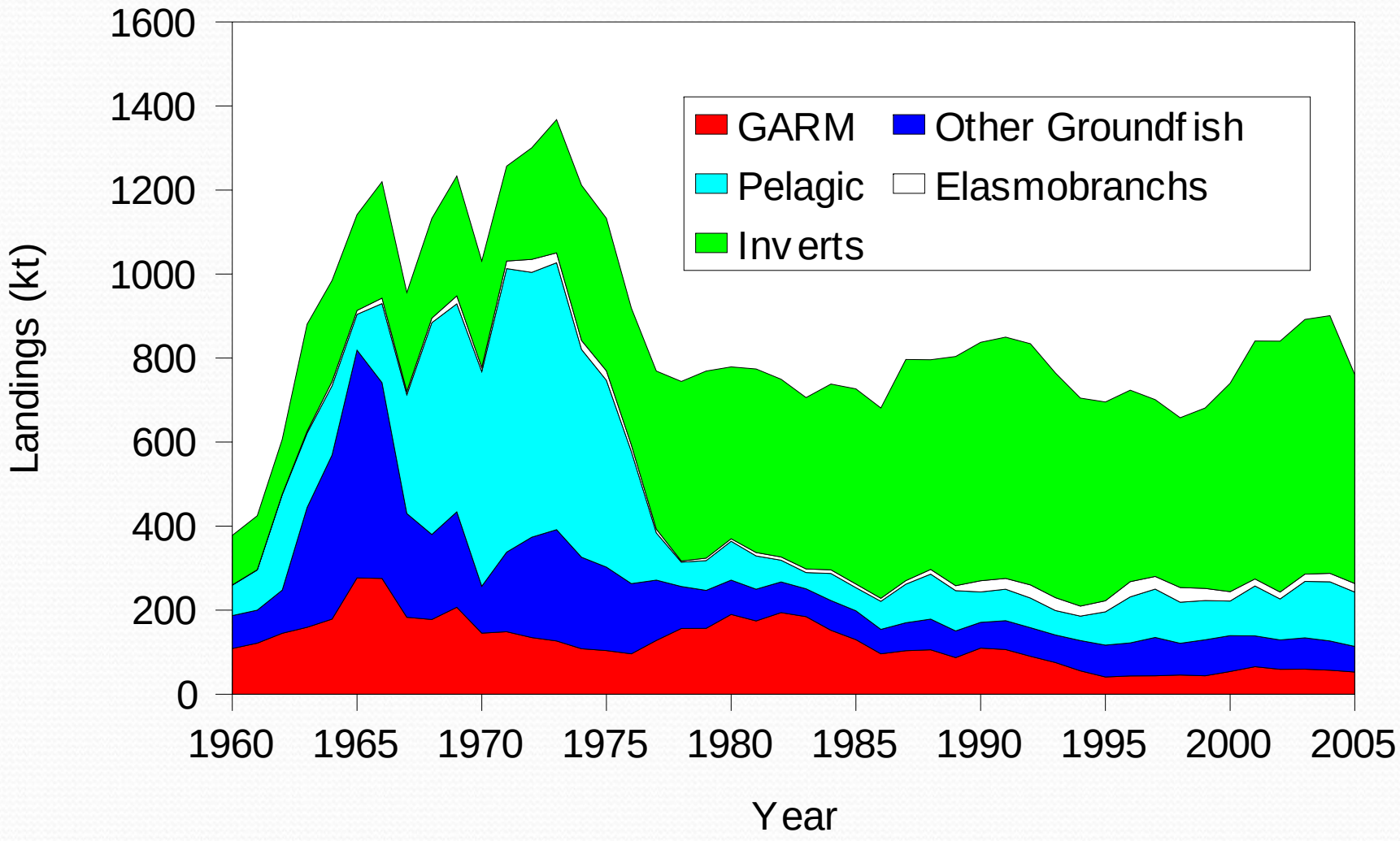
Objectives

Provide system-wide perspective on fishery production potential on the Northeast Continental Shelf including Benthic, Demersal, and Pelagic subsystems based on estimates of primary producton and energy transfer efficiencies.

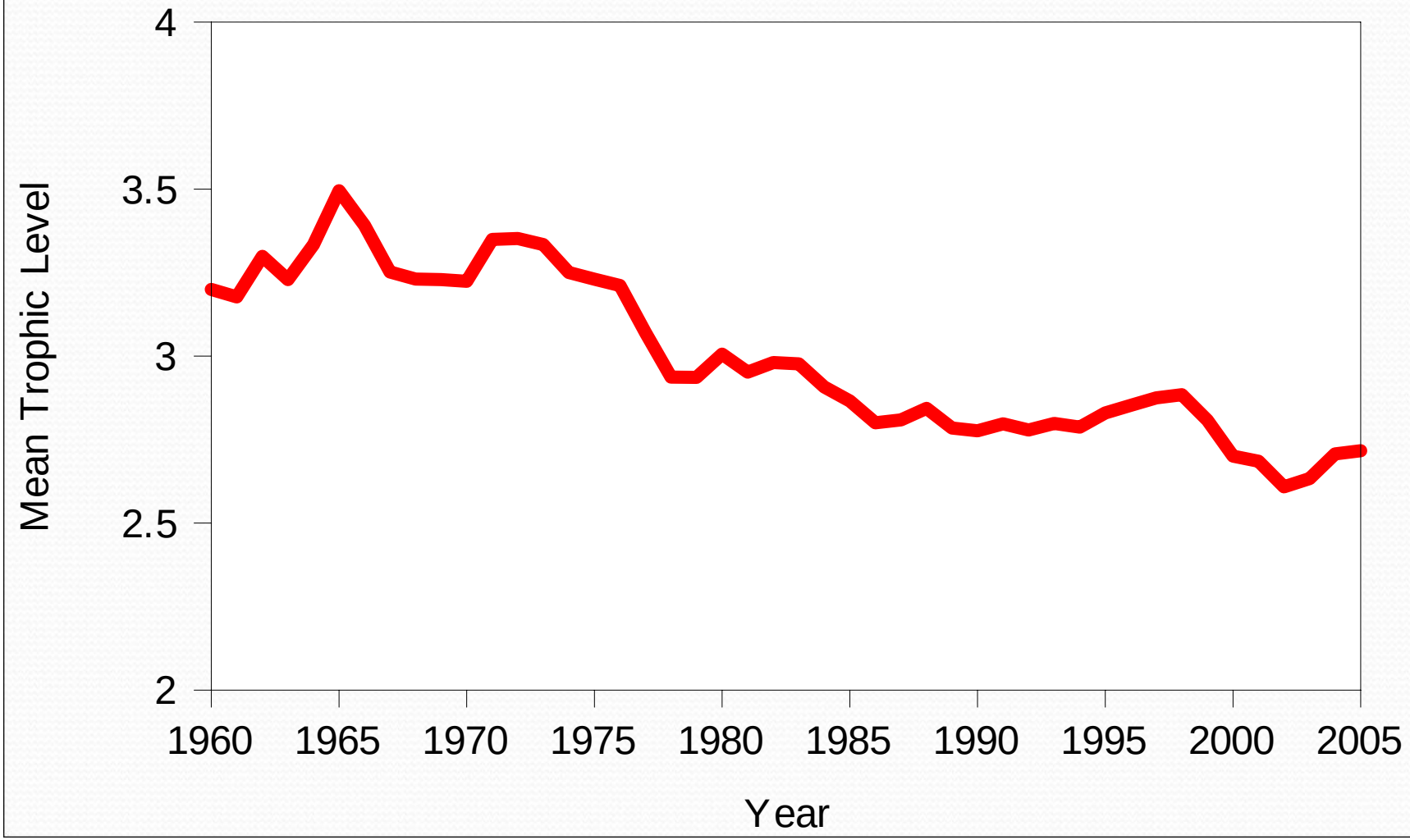
Some Previous Estimates of Fishery Production Potential for this System

- Edwards (1968): 1.8-2.2 million tons (for a “a highly organized, versatile, and efficient fishery paying due attention to the principles of good fishery management”
- Hennemuth (1970): 1.3 million tons
- Gulland (1970): 1.55 million tons
- Au (1973) 1.5-3.8 million tons

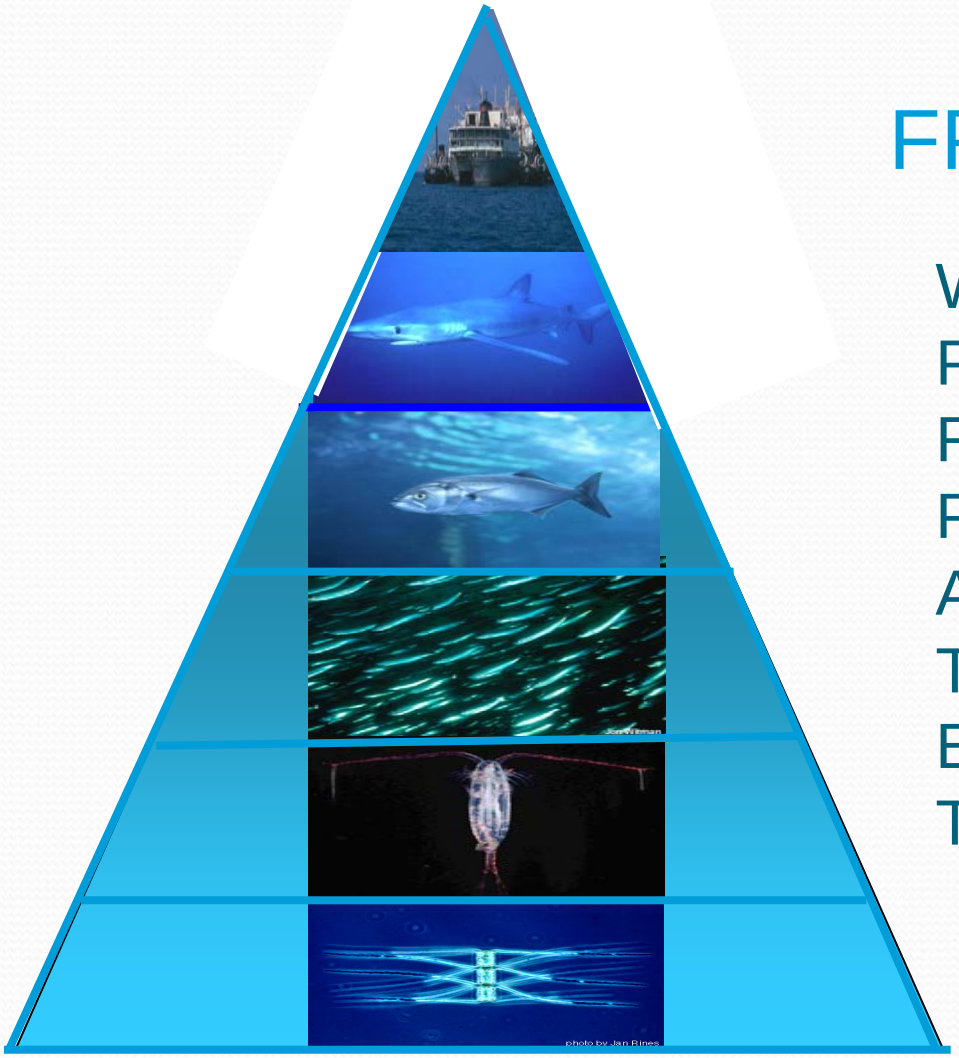
Landings NAFO Areas 5 & 6



Trends in Mean Trophic Level of Reported Landings

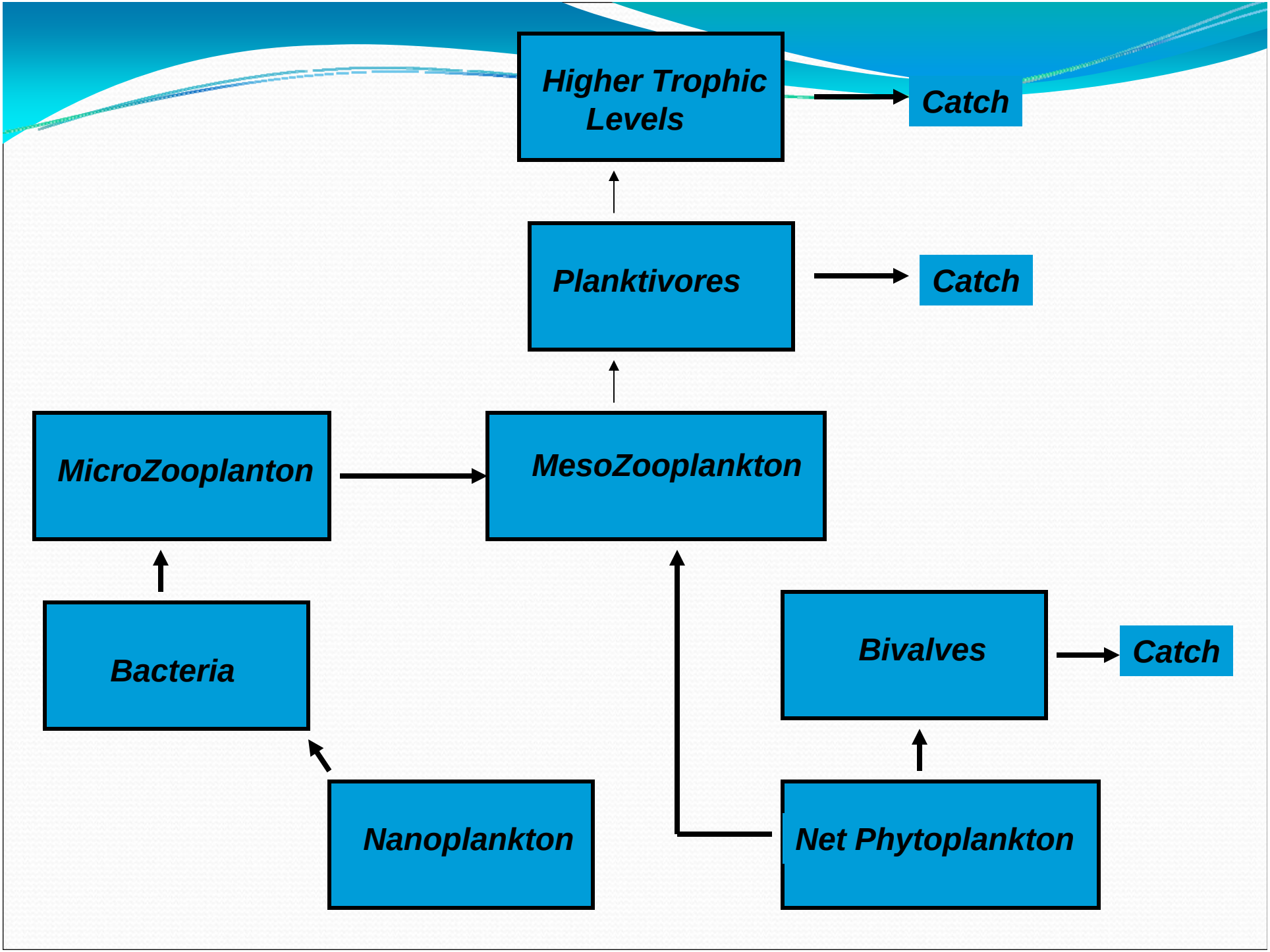


Estimate Fishery Production Potential and Primary Production Required to Sustain Fisheries

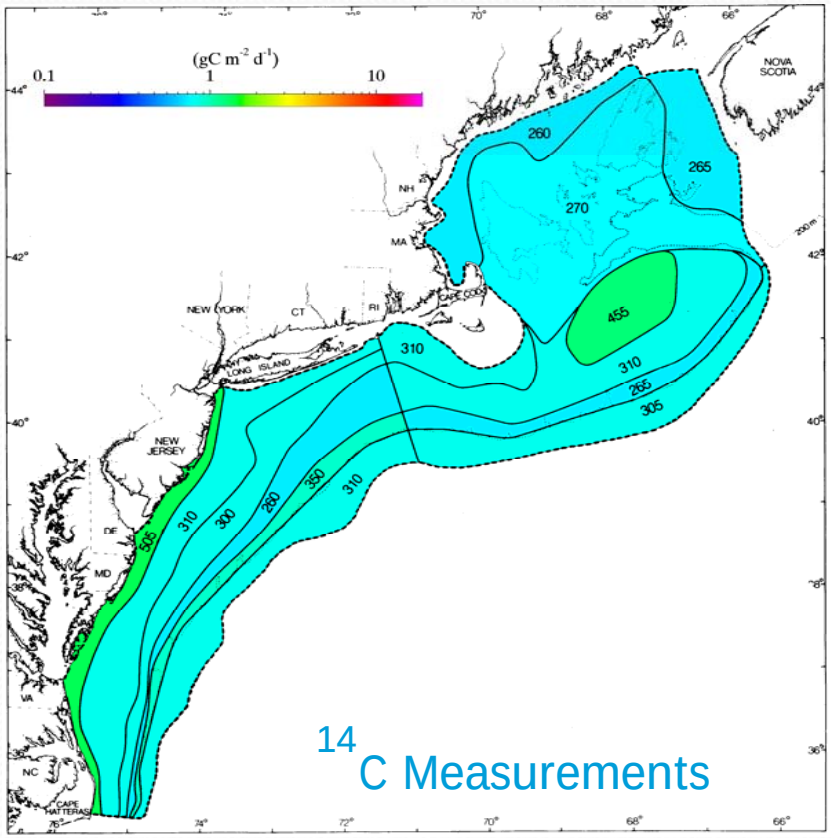


$$FP = R\ PP\ \tau_1 \tau_2^{(TL-2)}$$

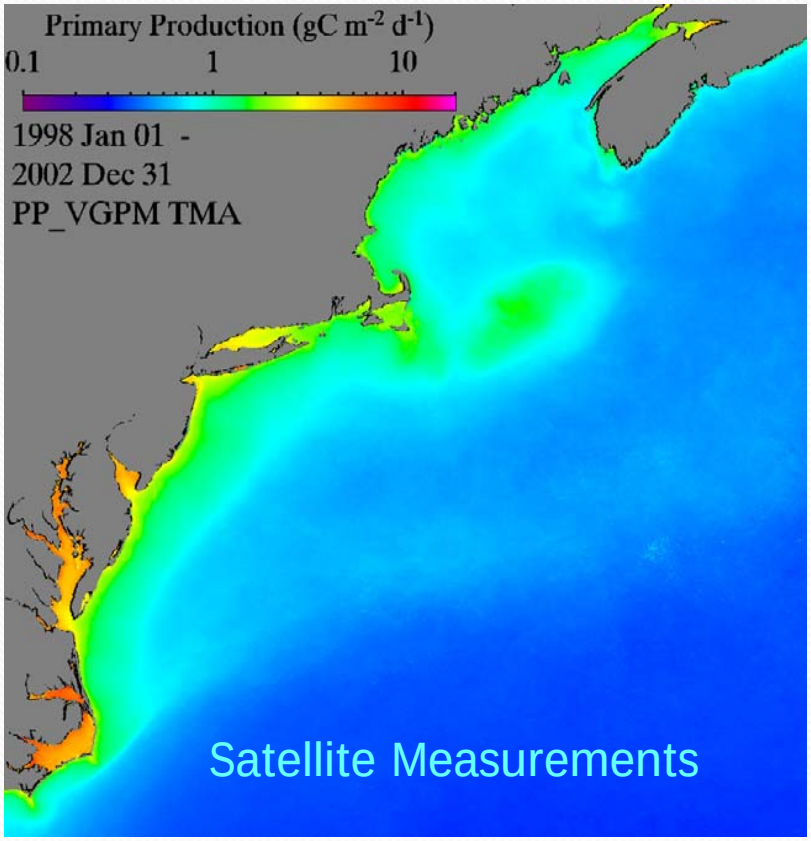
Where FP is Fishery Production Potential, R is a Retention Rate PP is Primary Production Available to Higher Trophic Levels, τ_i are Transfer Efficiencies and TL is the Mean Trophic Level of the Catch


Higher Trophic Levels
Catch
Planktivores
Catch
MicroZooplanton
MesoZooplankton
Bacteria
Bivalves
Catch
Nanoplankton
Net Phytoplankton

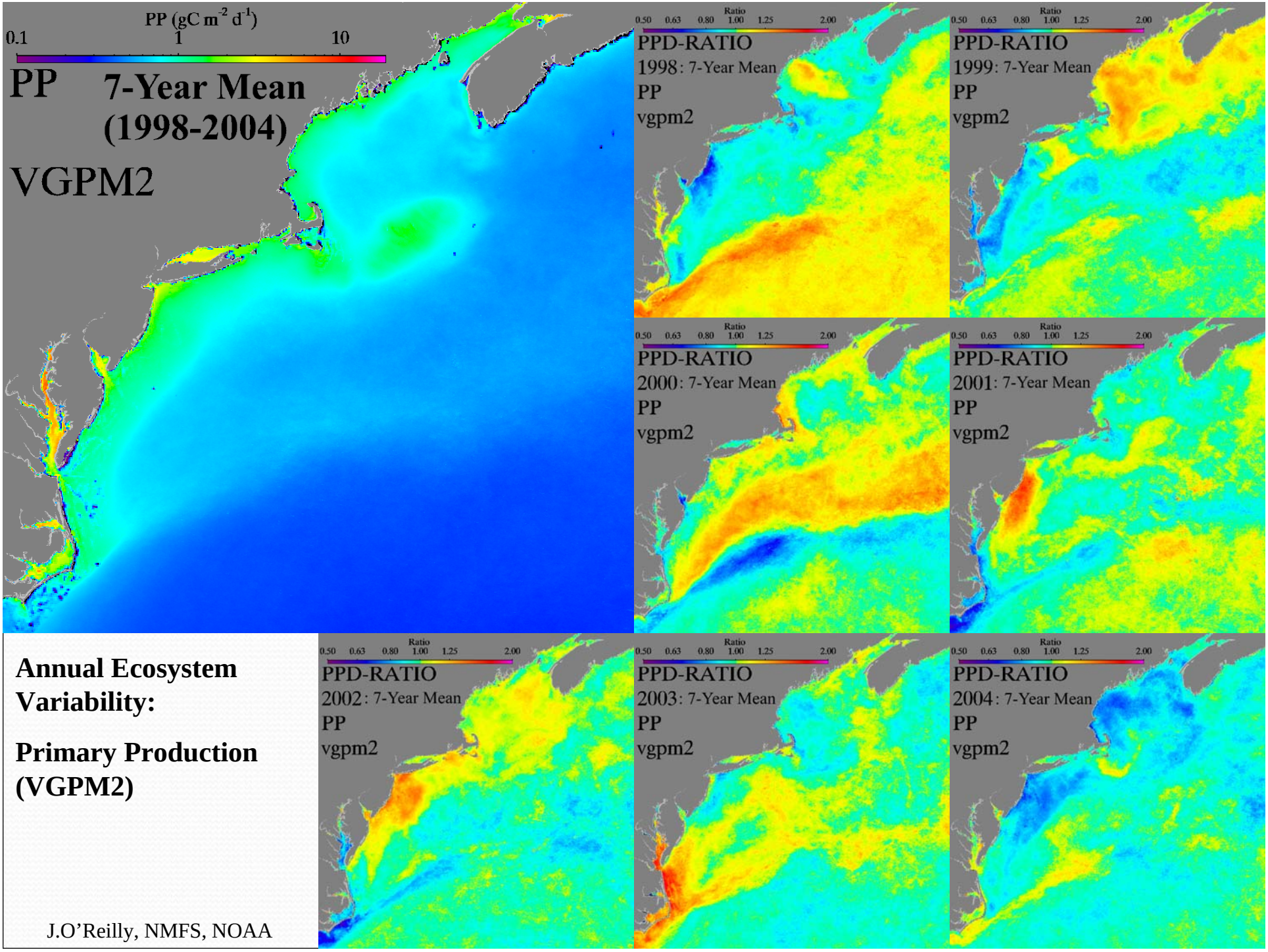
Primary Production
Northeast Continental Shelf



^{14}C Measurements



Satellite Measurements

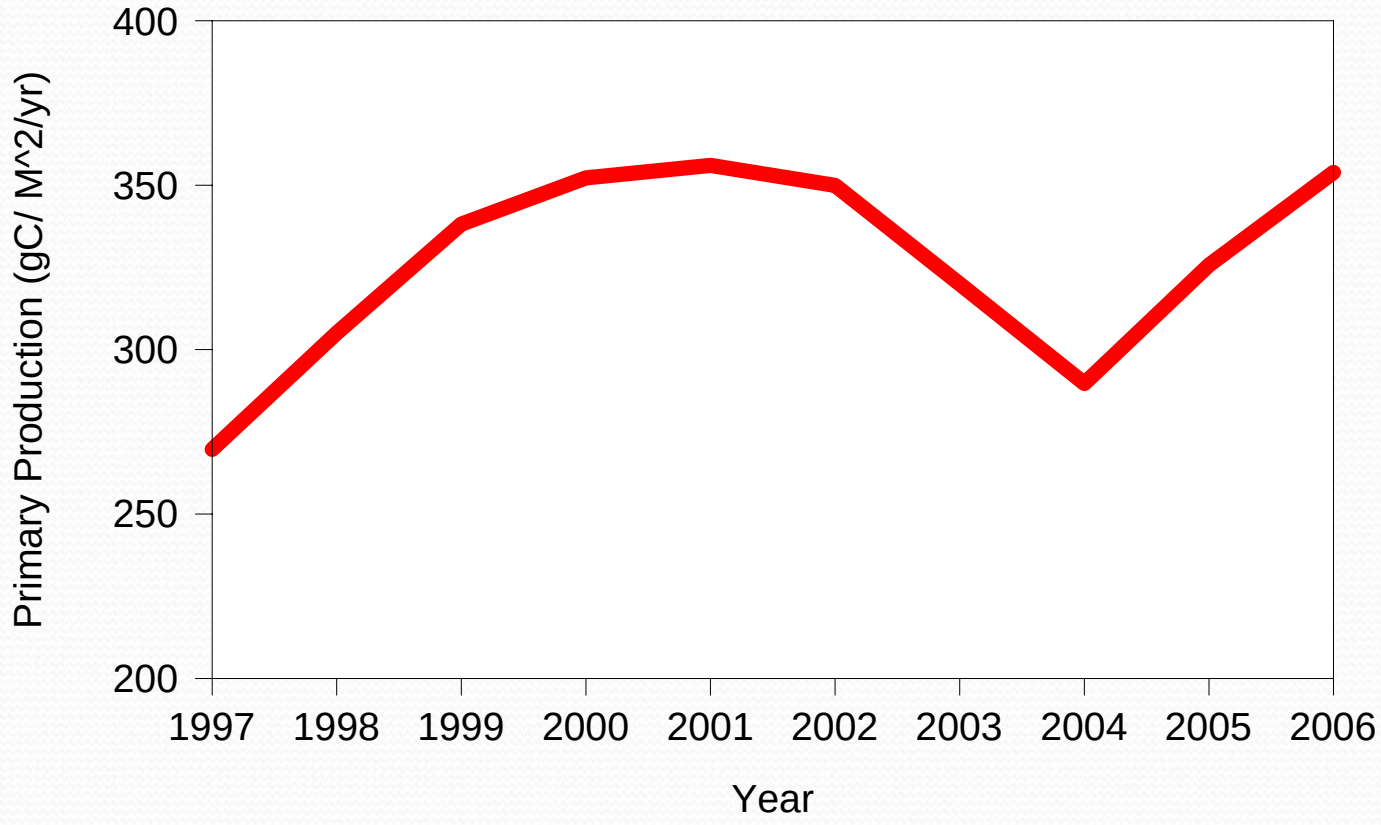


Annual Ecosystem Variability:

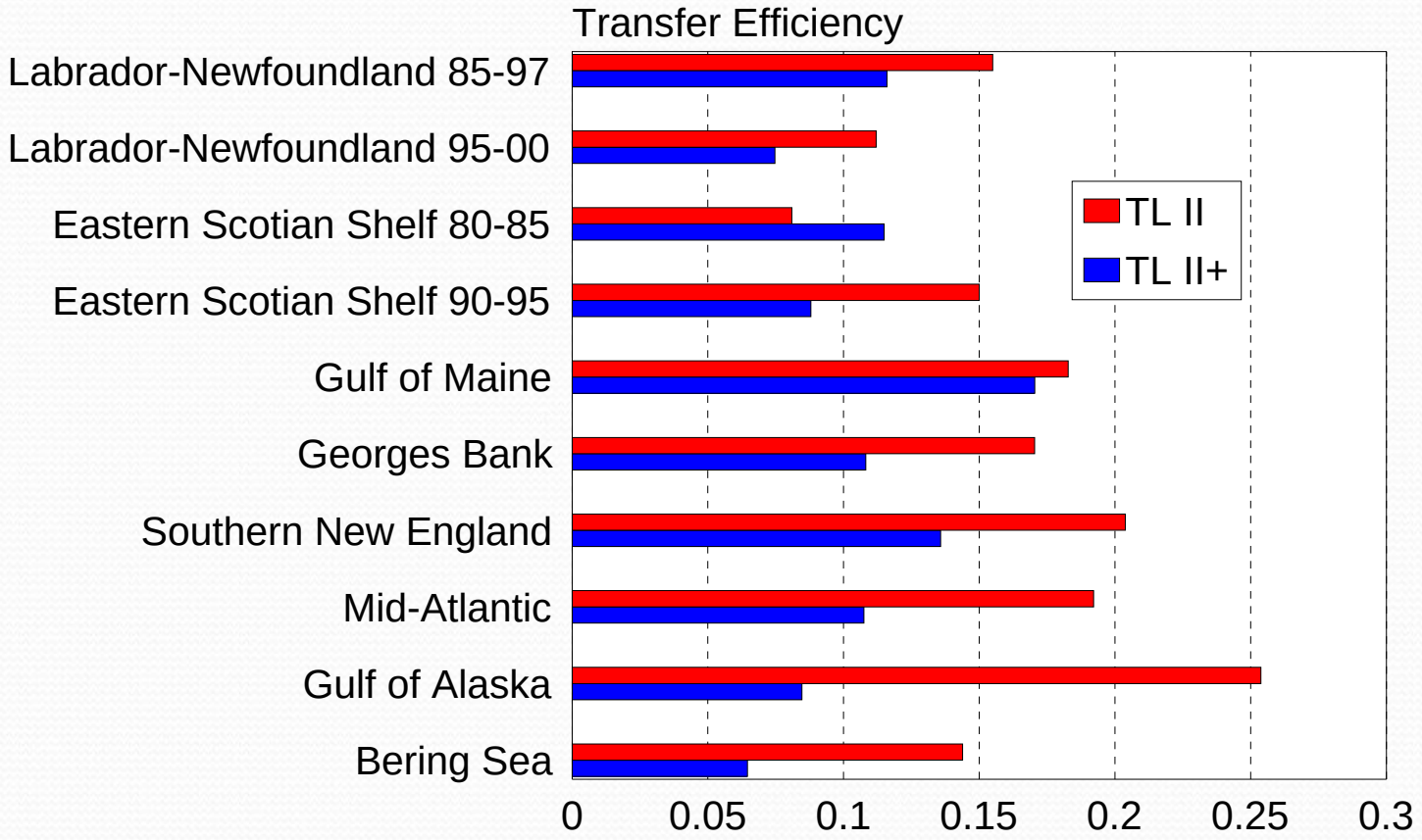
Primary Production (VGPM2)

J.O'Reilly, NMFS, NOAA

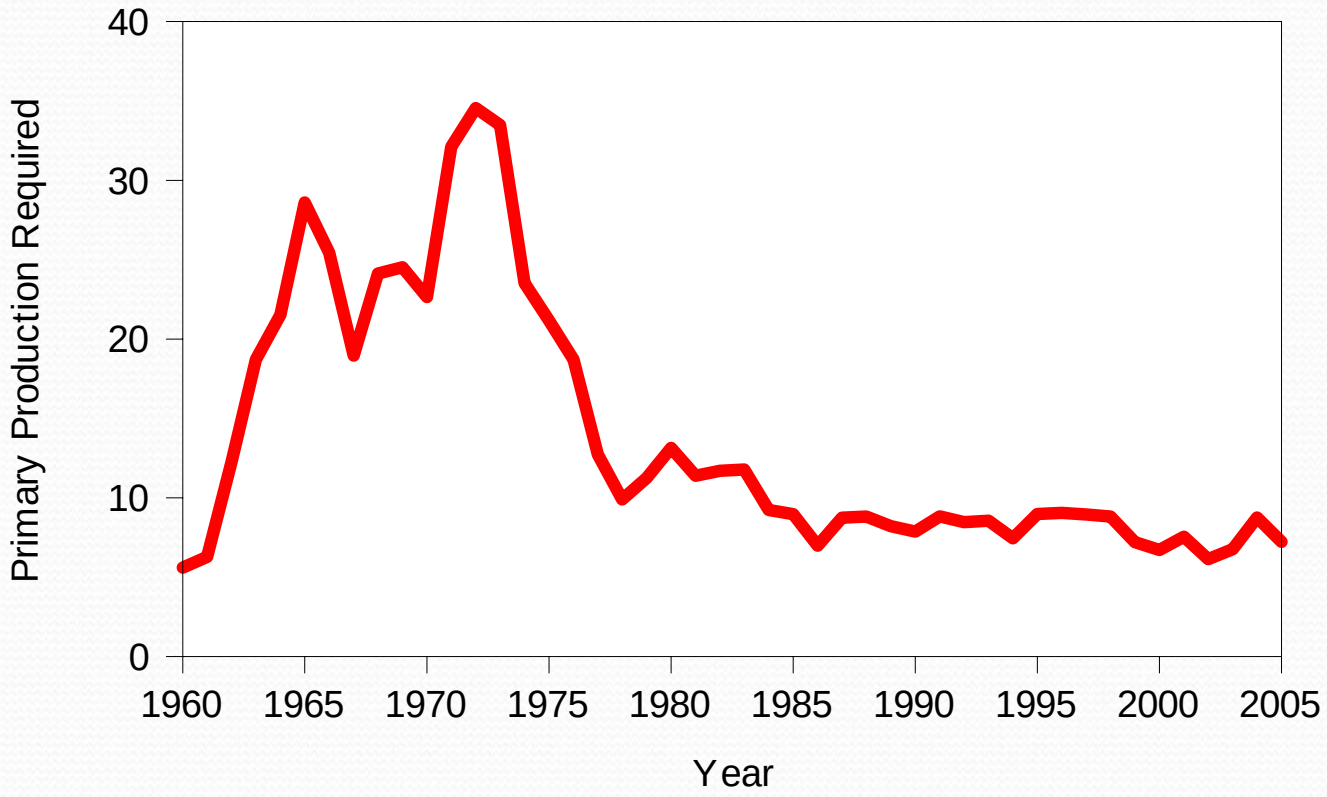
Satellite-Derived Primary Production Estimates



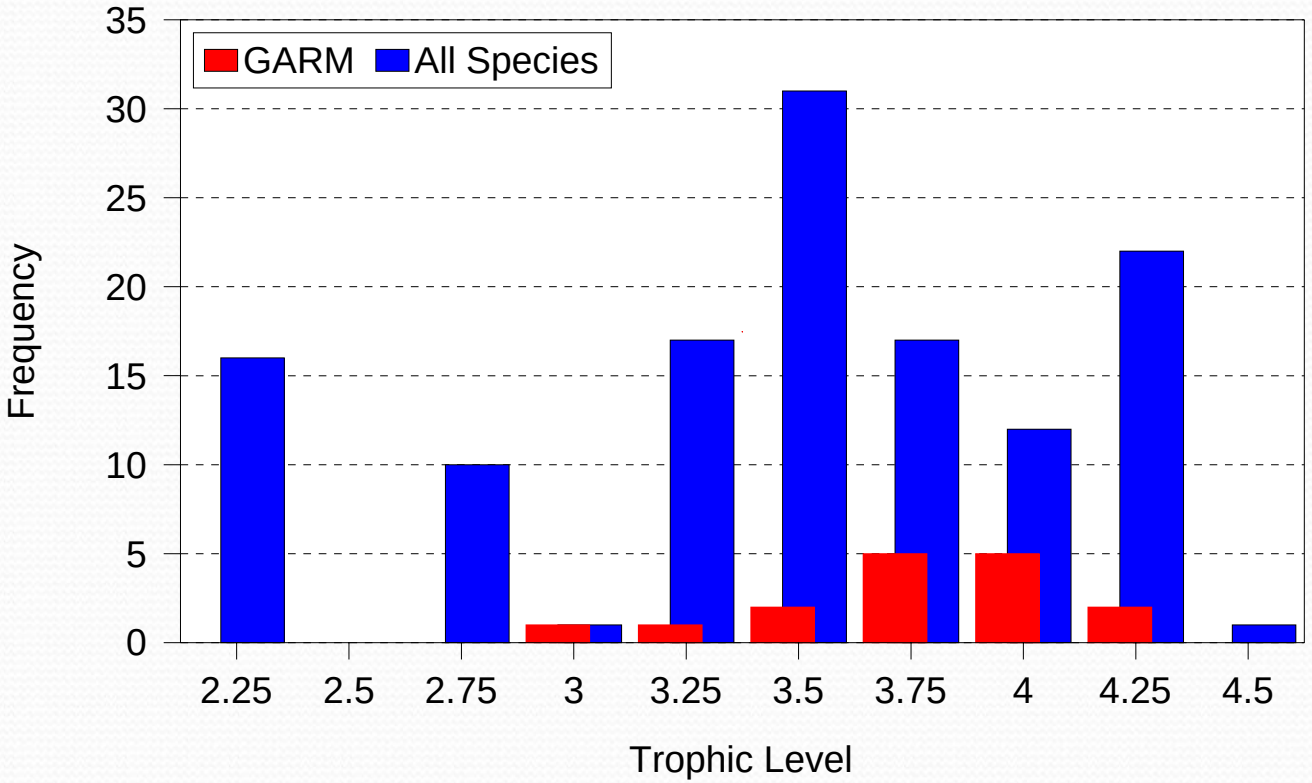
Estimated Transfer Efficiencies



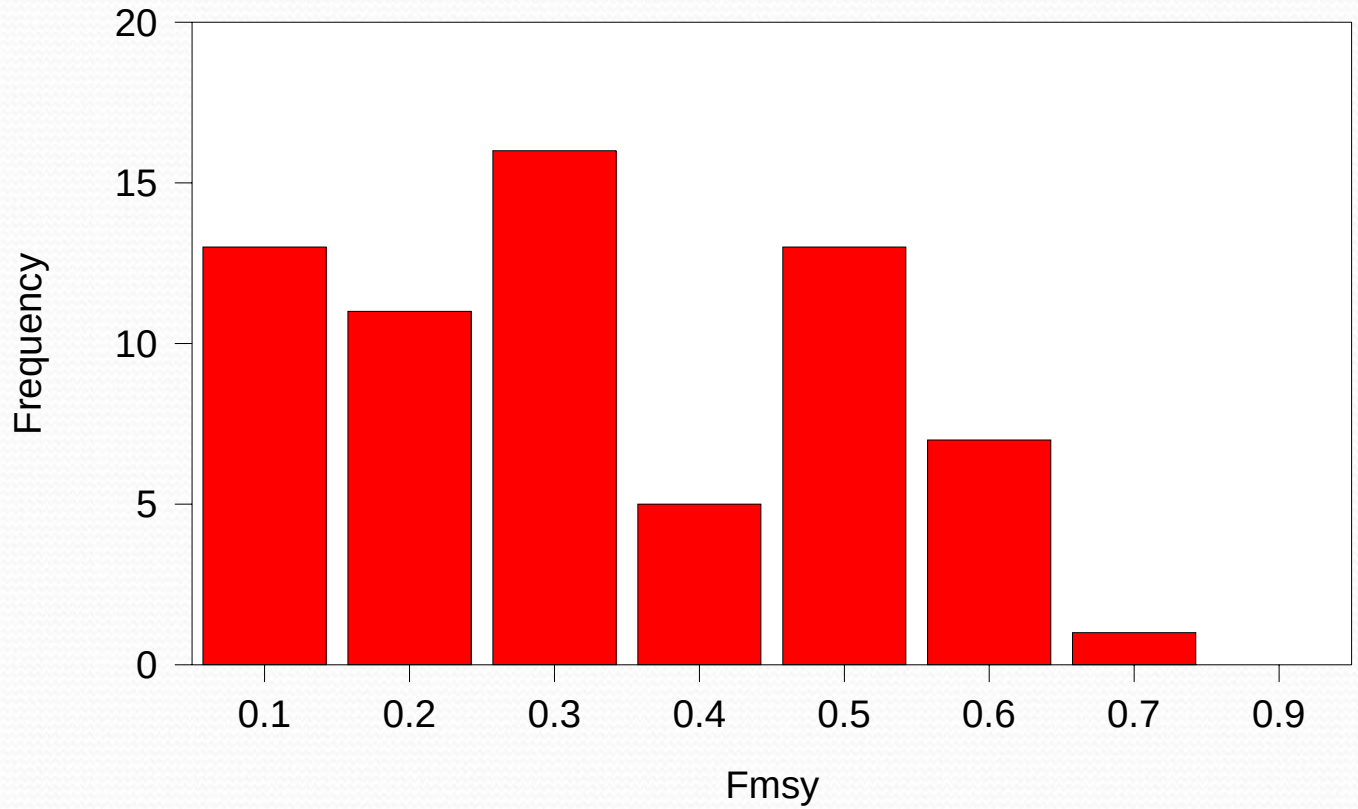
Primary Production Required (PPR)



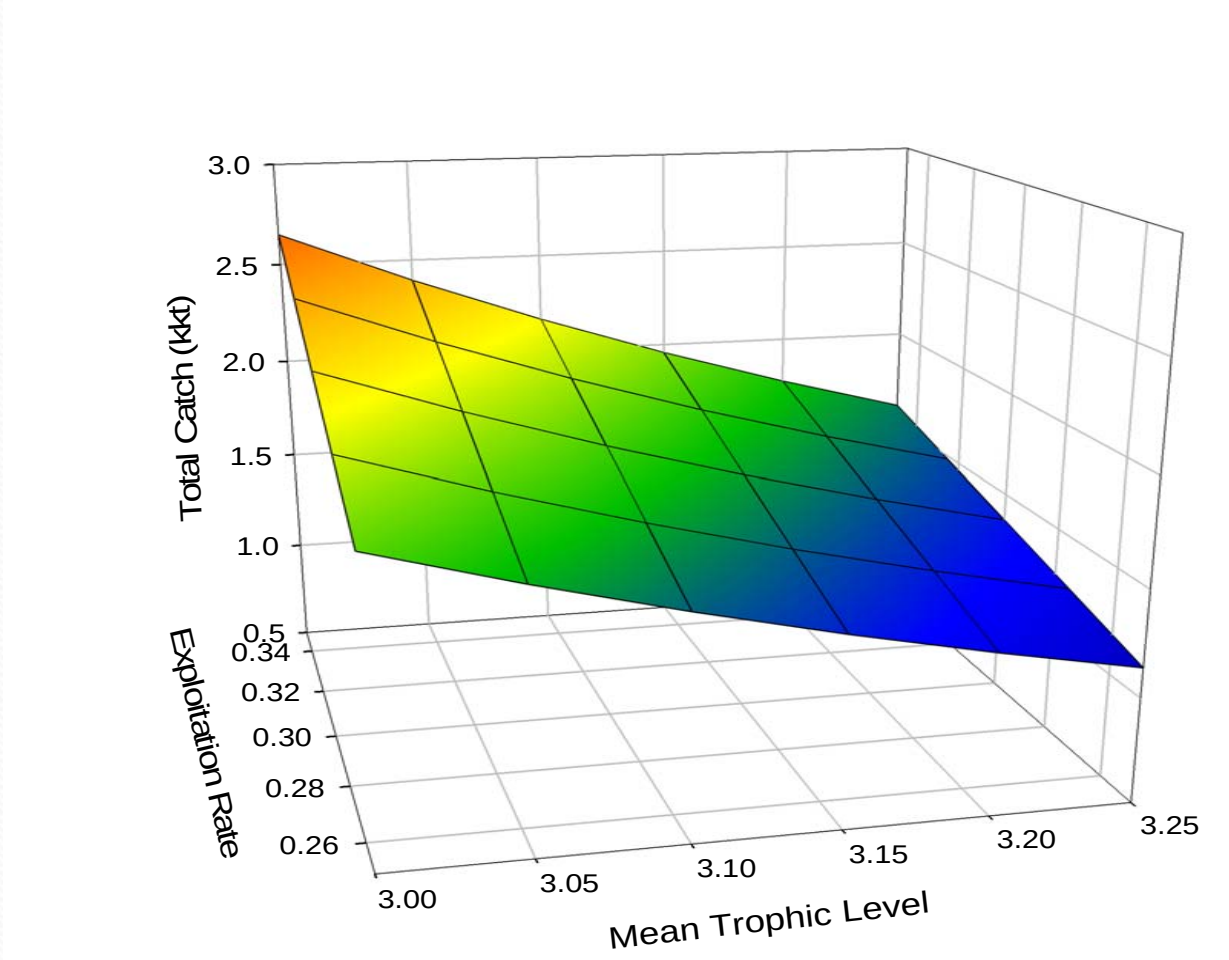
Trophic Level Distribution



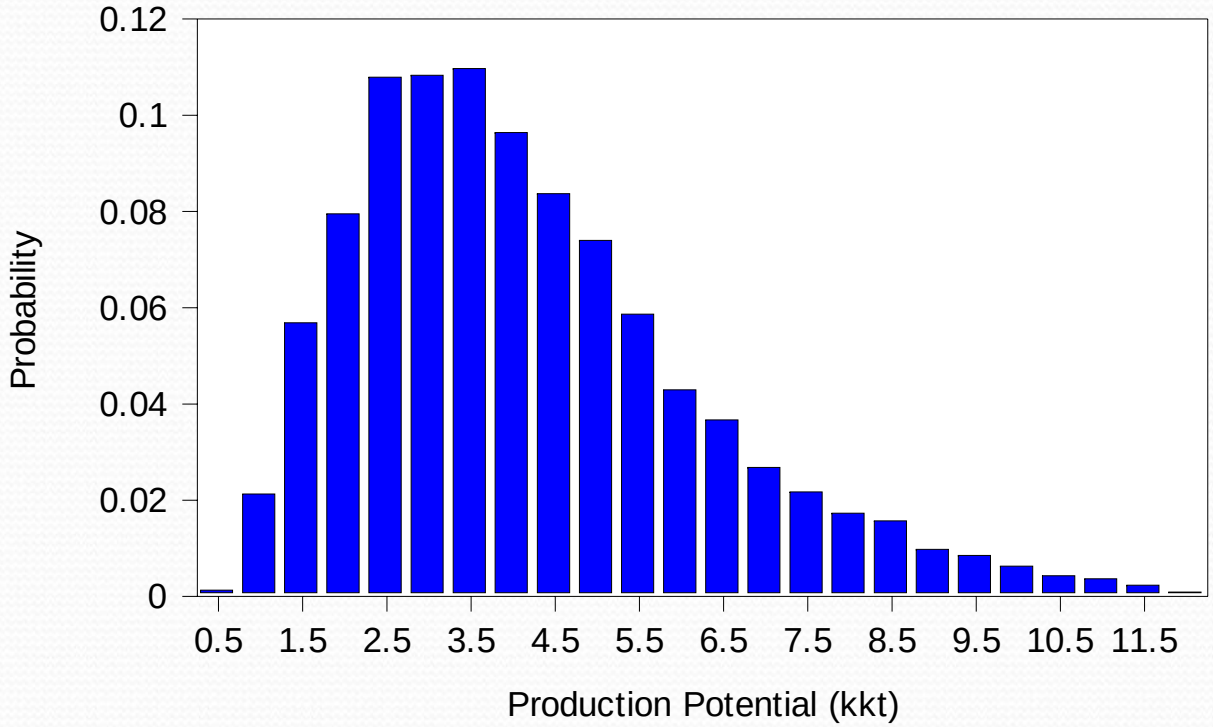
Distribution of Fmsy Estimates for U.S. Assessments 2006-2007



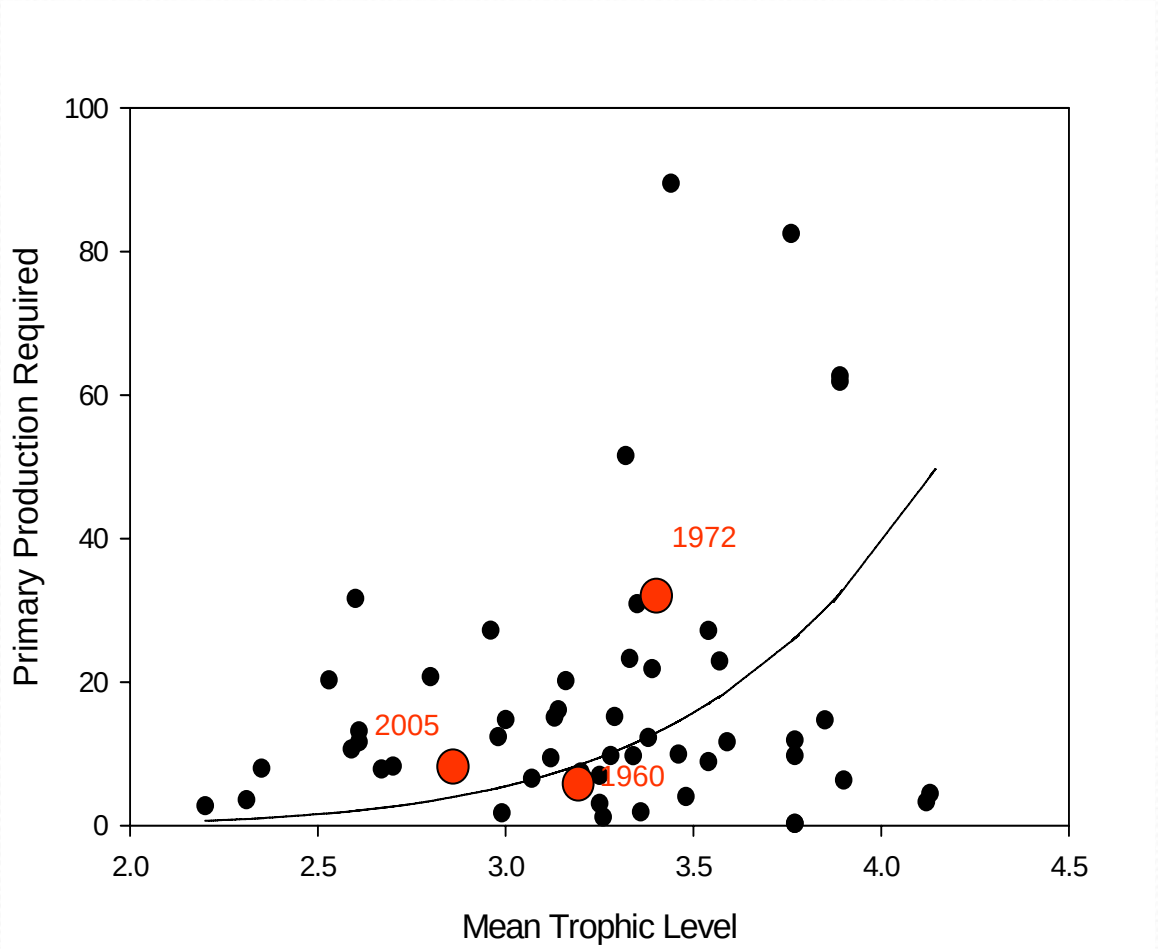
Potential Catch (million tons)



Simulated Production Potential with Beta-Distributed Transfer Efficiencies



Ecosystem Overfishing Criterion Tudela et al. (2005)



Consumptive Demand of Apex Predators and Threatened Species

Species Group	Consumption
Sharks- coastal	9517.873
Sharks- pelagics	9757.914
Highly Migratory Species	109224.6
Baleen Whales	1429008
Odontocetes	934722.3
Sea Birds	74002
Total	2566233

Conclusions

- Food chain considerations indicate a production potential of 4.8-6.2 million tons and a potential catch (landings and discard) of 1.55-1.86 million tons for ‘reasonable’ ecosystem exploitation levels.
- Estimates of MSY for system components including invertebrates and other finfish approximately 1.3 million tons.
- Need to account for discards and increased consumptive demand for recovering high trophic level predators
- Ecosystem metrics indicate overfished condition

Aggregate B_{MSY} and MSY Levels for Species Groups based on Single Species Analysis

Species Group	BMSY(kt)
GARM Species	1,424.79
Pelagics	1,295.98
Elasmobranchs	1,155.73
Invertebrates	3,755.0
Total	7,631.5

Biomass Considerations for Protected Species

Species Group	Biomass 1996-2000 (MT)
Baleen Whales	114,341
Odontocete Whales	14,869
Sea Turtles	146,467
Total	275,675

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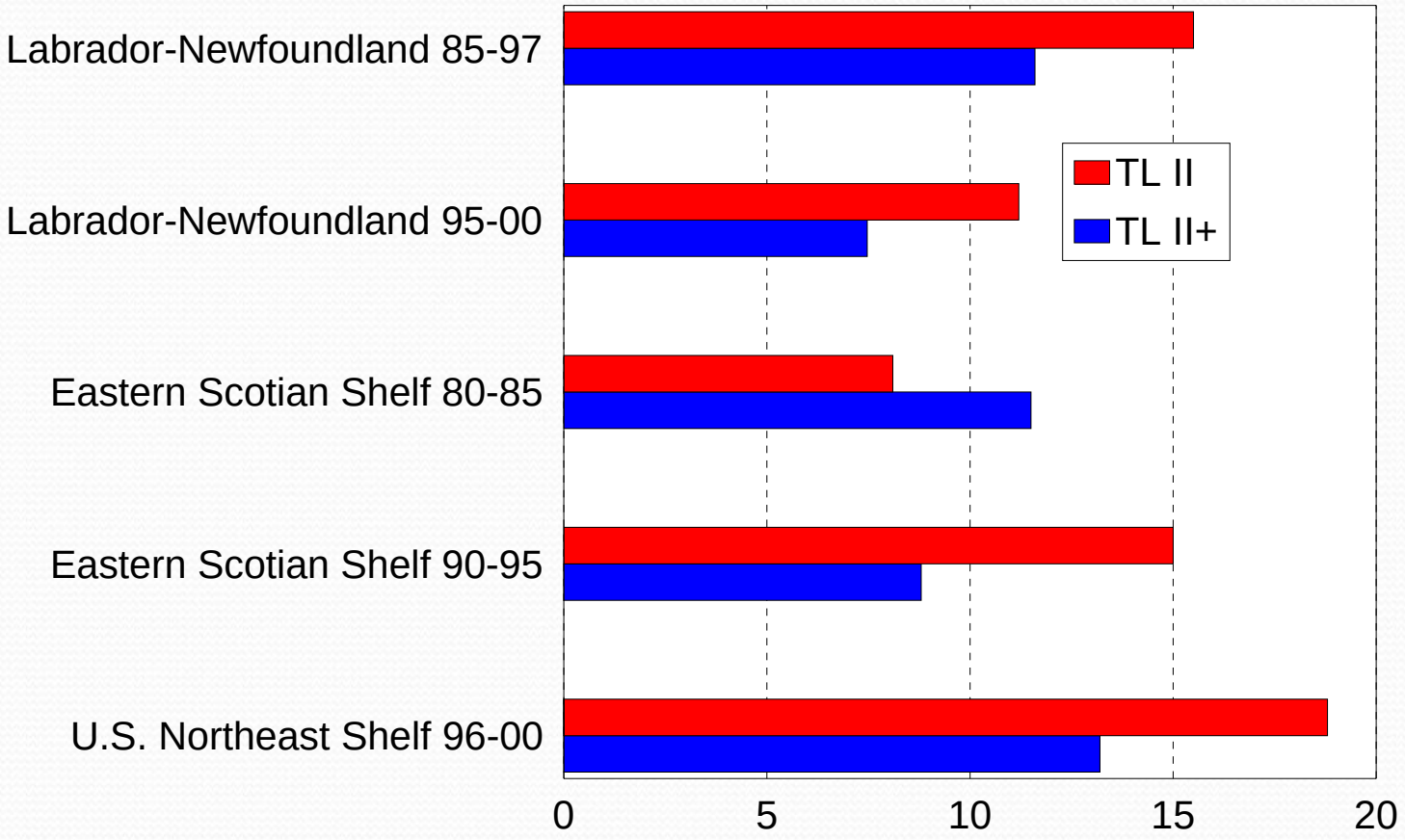
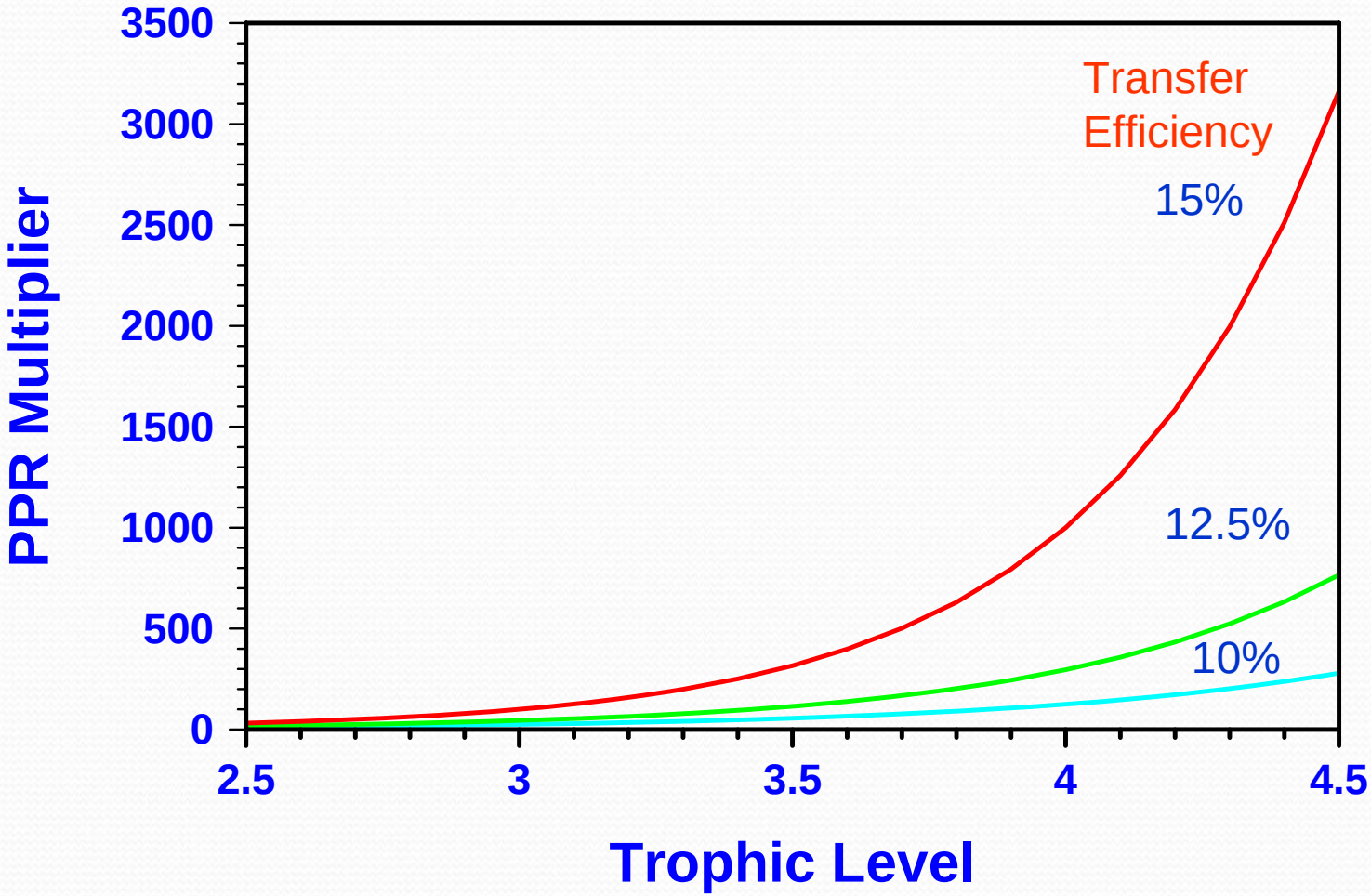
The Bottom Line

Biomass Requirements at MSY	7.631.5 (kt)
Minimum Biomass Requirements for Protected Resources	275.7 (kt)
Available Biomass under MSY Policy	6,523.0 (kt)
Deficit	1,384.2 (kt)

Estimated Transfer Efficiencies Northwest Atlantic



Results Sensitive to Transfer Efficiencies



Satellite-Derived Primary Production Estimates