NOAA FISHERIES SERVICE
Northeast Fisheries Science Center
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Fleet diversity and ownership concentration

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An ecological approach to measuring **fleet diversity**: the diversity of fishing units *(species)* in the fishery *(ecosystem)*

Defined using different measures

1. **Simpsons Index** ***(0=infinite diversity, 1=no diversity…index is sensitive to species' abundance)***
2. **Shannon Index** ***(0=no diversity, larger numbers=increased diversity…index somewhat sensitive to rare species)***
3. **Effective Diversity** ***(the number of species present in equal proportion at a given index value, calculated separately for Simpsons and/or Shannon)***
4. **Richness** ***(number of species present)***
5. **Gini Coefficient** ***(index of concentration, detects changes in proportions within the ecosystem)***

Indicators of diversity

Sliced in different ways

1. All permit holders
2. All limited access permit holders
3. All LA permit holders landing groundfish

Based on four categories

1. Gear *(trawl, gillnet, longline, handline, other)*
2. Vessel size *(<30, 30-49, 50-74, 75+)*
3. Port group *(defined by county, 23 possible locations)*
4. Area fished *(inshore, offshore)*

All assignments using VTR data (1994 – 2011) and are based on greatest proportion of permit-level landings in each year

Region Name	County
Downeast, ME	Washington
Upper Mid-Coast, ME	Hancock, Knox, Waldo
Lower Mid-Coast, ME	Androscoggin, Cumberland, Kennebec, Lincoln, Sagadahoc
Southern, ME	York
NH Seacoast	Hillsborough, Rockingham, Strafford
Gloucester, North Shore	Essex
Boston Area	Middlesex, Norfolk, Plymouth, Suffolk
Cape and Islands	Barnstable, Dukes, Nantucket
New Bedford, South Shore	Bristol
Rhode Island	Bristol, Kent, Newport, Providence, Washington
CT Sea Coast	Fairfield, Middlesex, New Haven, New London
NY Coastal	Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester
NJ North	Bergen, Essex, Hudson, Morris, Passaic, Sussex, Union, Warren
NJ South	Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Hunterdon, Mercer, Middlesex, Monmouth, Ocean, Salem, Somerset
DE Coastal	Kent, New Castle, Sussex
MD West	Anne Arundel, Baltimore, Baltimore City, Carroll, Cecil, Harford, Howard, Montgomery, Prince George
MD East	Calvert, Caroline, Charles, Dorchester, Kent, Queen Anne's, St. Mary's, Somerset, Talbot, Wicomico, Worcester
VA East	Accomack, Northampton
VA North	Essex, Fairfax, King and Queen, King George, King William, Lancaster, Manassas City, Manassas Park City, Middlesex, New Kent, Northumberland, Prince William, Richmond, Stafford, Westmoreland
VA South	Charles City, Chesapeake City, Chesterfield, Colonial Heights City, Gloucester, Hampton City, Henrico, Isle of Wight

Results

920 unique combinations of gear, size, region and fishing location

All active groundfish permits (FY 1994 – 2011):

- Simpsons Effective Diversity declined – *75 units to 61 (19% / 1.1%)*
- Shannon Effective Diversity declined – *115 units to 95 (17% / 1.0%)*
- Richness declined – *228 species to 190 (17% / 1.0%)*

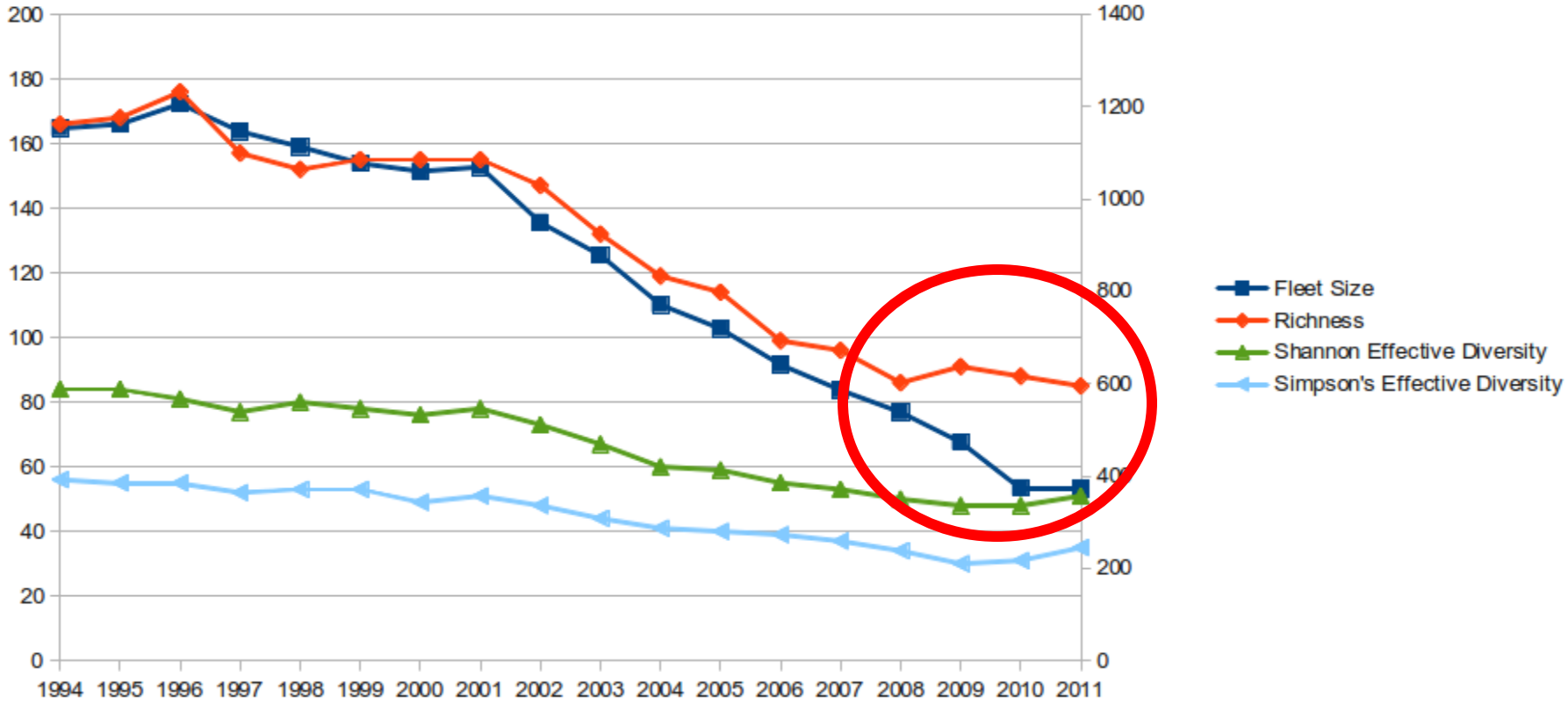
All active LA groundfish permits:

- Simpsons Effective Diversity declined – *67 units to 59 (12% / 0.6%)*
- Shannon Effective Diversity declined – *100 units to 83 (17% / 1.0%)*
- Richness declined – *194 species to 140 (27% / 1.5%)*

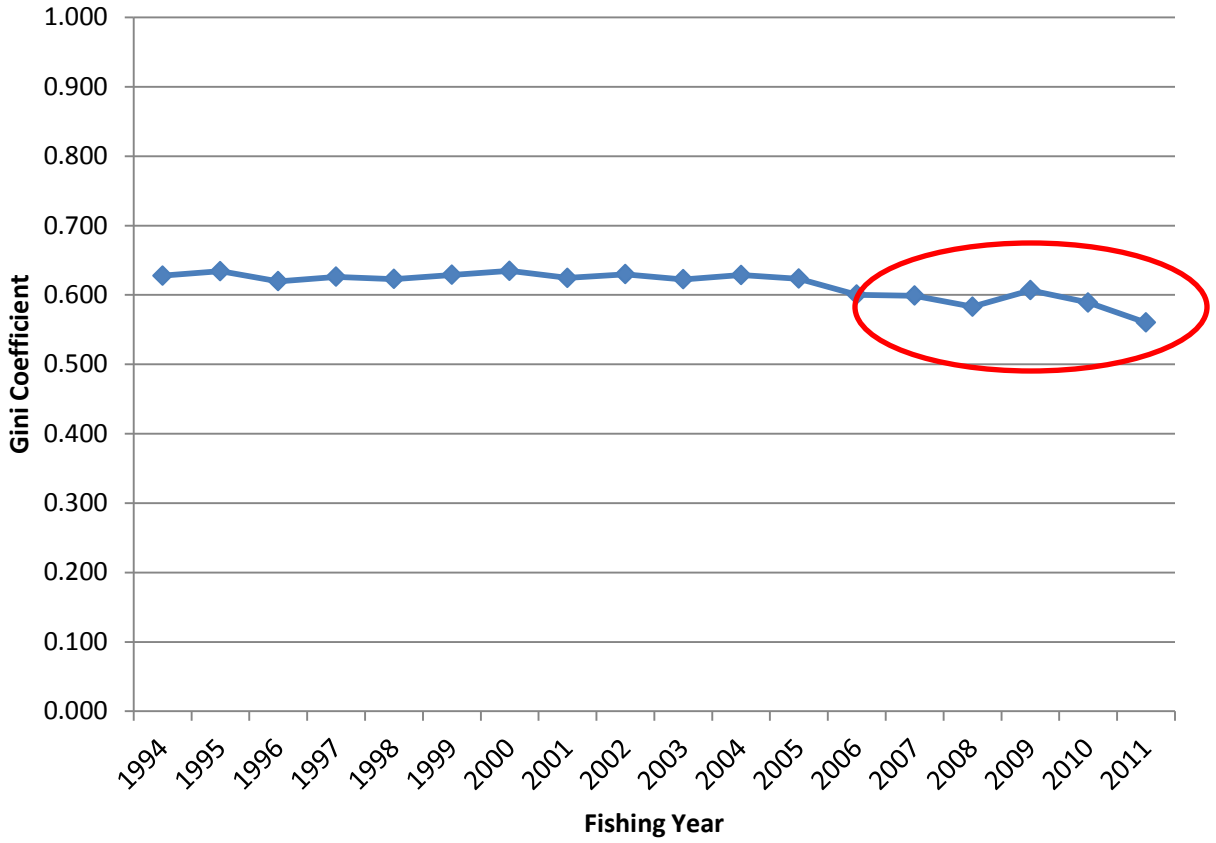
All active LA groundfish permits with groundfish landings:

- Simpsons Effective Diversity declined – *56 units to 35 (38% / 2.1%)*
- Shannon Effective Diversity declined – *84 units to 51 (39% / 2.1%)*
- Richness declined – *166 species to 85 (48% / 2.7%)*

Fleet size, Richness, Shannon and Simpson indices for active LA groundfish permit holders/'species' landing groundfish



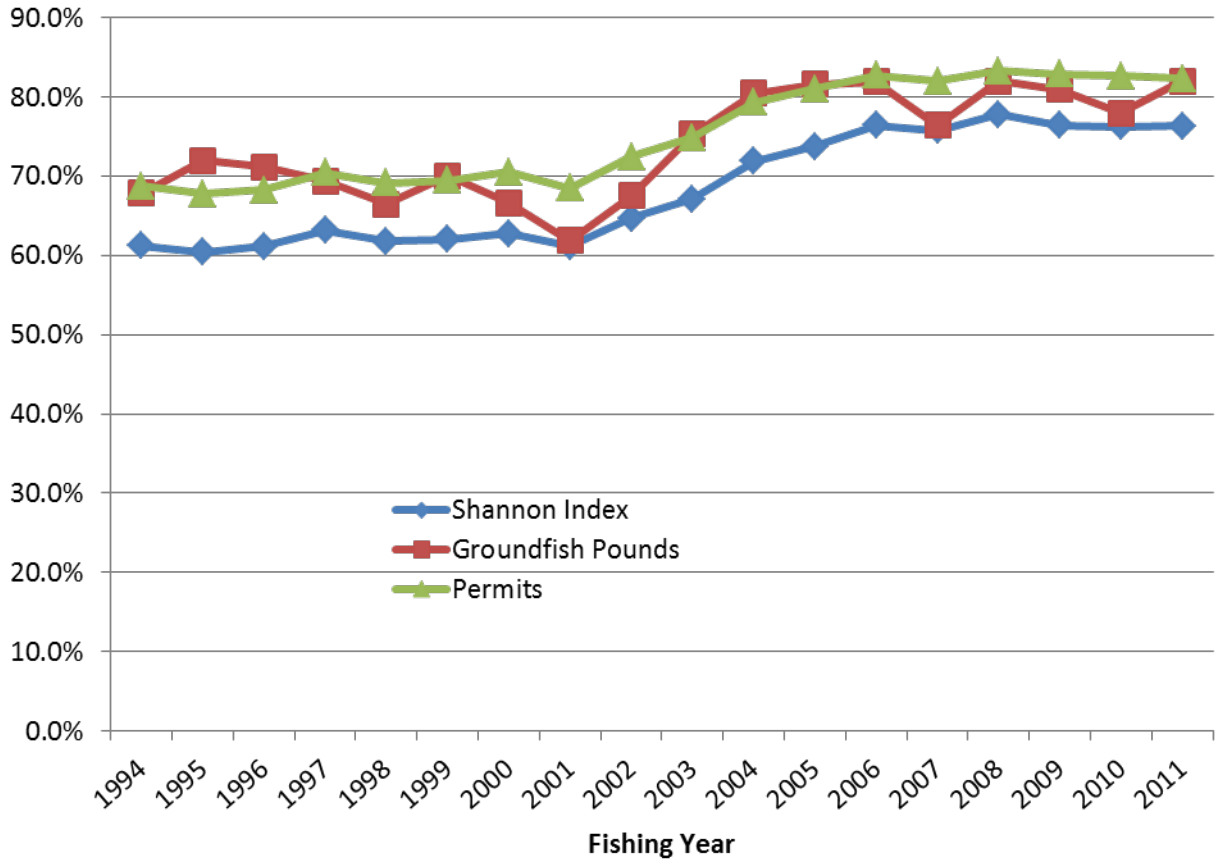
Gini coefficient for active limited access 'species' with groundfish landings



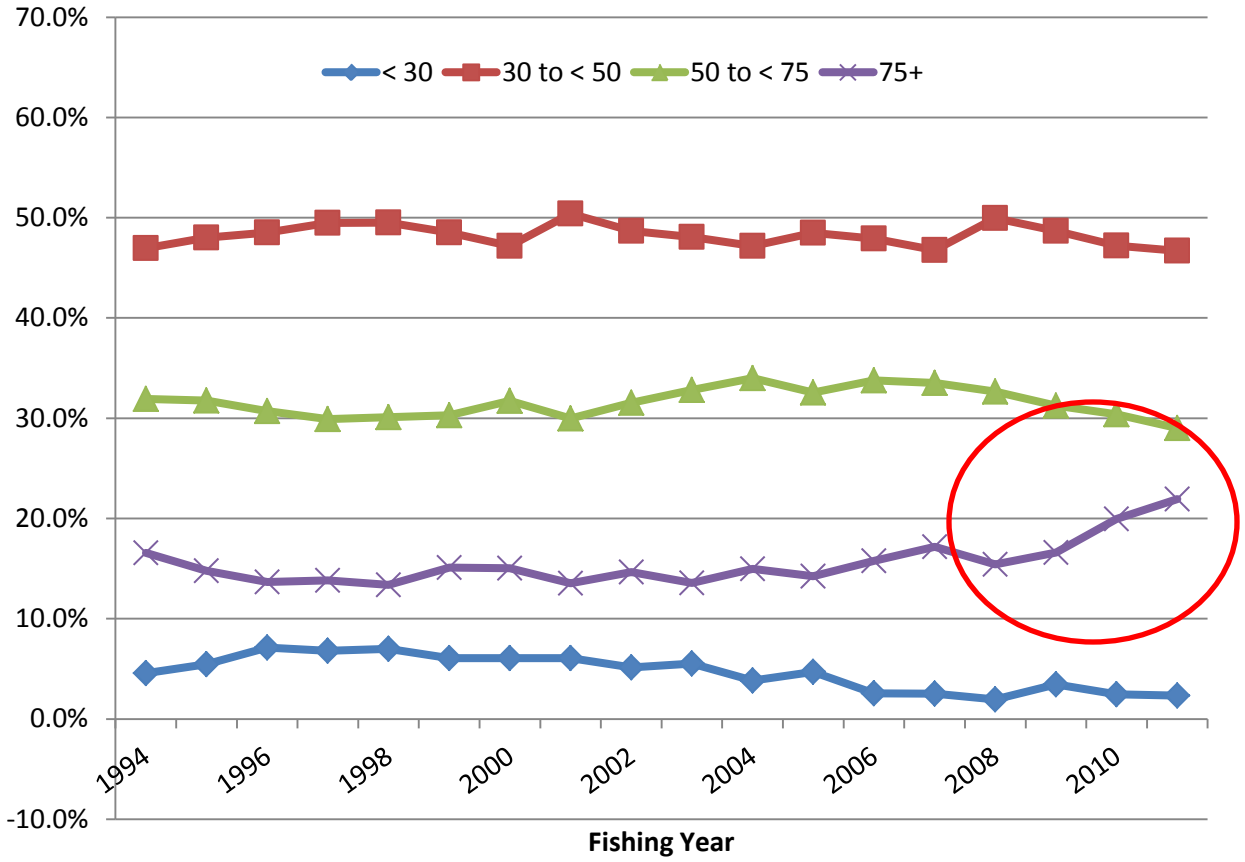
Core ‘species’ present in all 18 years

Region	Area Fished	Gear	Size Class
Upper Mid-Coast Maine	Inshore	Trawl	30 to < 50, 50 to < 75
Lower Mid-Coast Maine	Inshore	Trawl	30 to < 50, 50 to < 75
		Gillnet	30 to < 50
	Offshore	Gillnet	30 to < 50
Southern Maine	Inshore	Gillnet	30 to < 50
		Trawl	30 to < 50
NH Seacoast	Inshore	Gillnet	30 to < 50
		Trawl	30 to < 50, 50 to < 75
Gloucester, North Shore	Inshore	Gillnet	30 to < 50
		Hook	30 to < 50
		Trawl	30 to < 50, 50 to < 75, 75+
	Offshore	Gillnet	50 to < 75
Boston Area	Inshore	Gillnet	30 to < 50, 50 to < 75
		Hook	30 to < 50
		Trawl	30 to < 50, 50 to < 75, 75+
	Offshore	Trawl	75+
Cape and Islands	Inshore	Gillnet	30 to < 50
		Hook	30 to < 50
		Longline	< 30, 30 to < 50
		Trawl	30 to < 50, 50 to < 75
New Bedford, South Shore	Inshore	Gillnet	30 to < 50
	Offshore	Other	75+
		Trawl	50 to < 75, 75+
Rhode Island	Inshore	Gillnet	30 to < 50
		Other	30 to < 50
		Trawl	30 to < 50, 50 to < 75, 75+
	Offshore	Trawl	75+
Seacoast, NY	Inshore	Gillnet	30 to < 50
		Trawl	30 to < 50, 50 to < 75
Northern NJ	Inshore	Trawl	30 to < 50, 50 to < 75

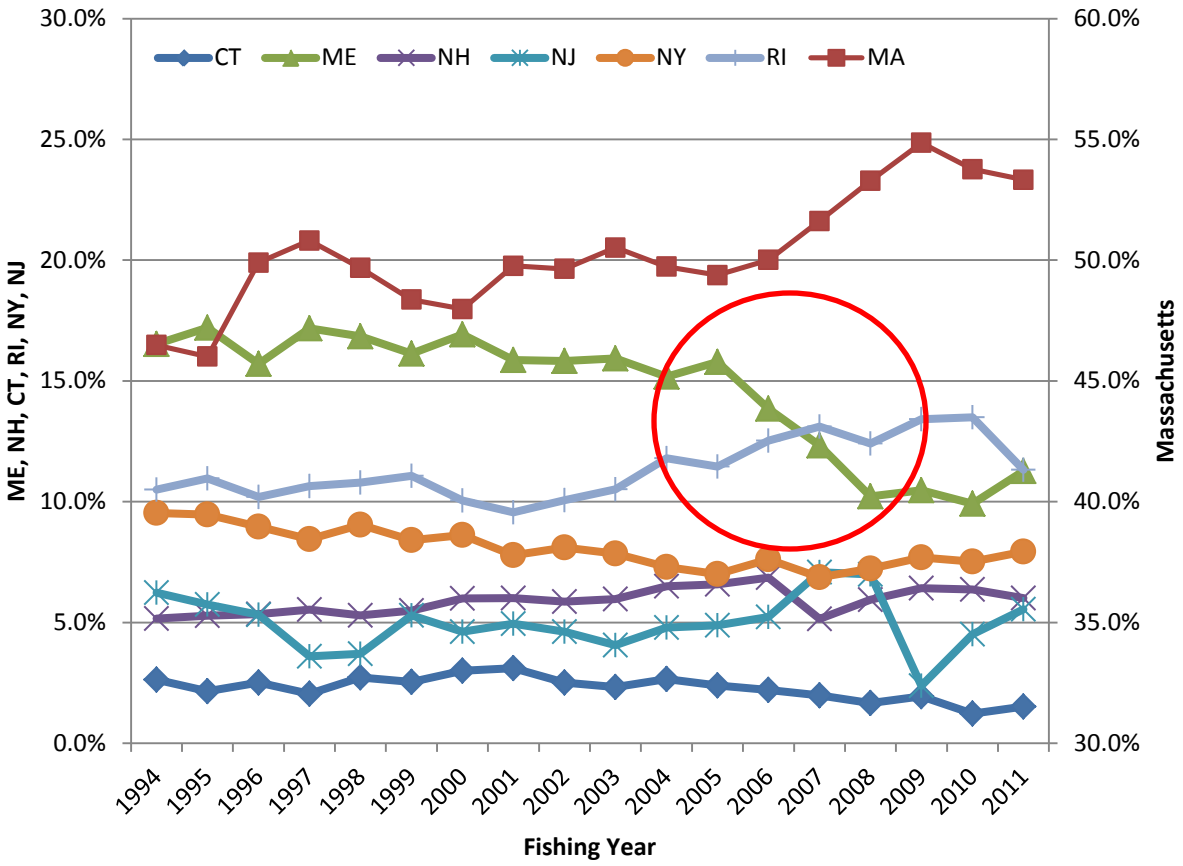
Share of Shannon index represented by core species



Share of Shannon index by vessel size class



Share of Shannon index by homeport state



Bottom line

- Number of 'species' dropped considerably from 1994-2011
- Rate of decline averaged 1% per year from 1994-2001, 4.5% per year from 2002-2011
- Fishery 'ecosystem' has grown slightly more homogenous as 'species' have departed
- Since 2008 number of active LA groundfish vessels landing groundfish has declined by 35% but 'species' richness has remained nearly constant
- Diversity indices, though declined, represent a relatively diverse 'ecosystem'

Trends in **ownership concentration**

Three different metrics

1. Number of permits (MRIs)
2. Ownership of PSC (Ownership groups)
3. Sector-level ACE (Sectors)

Notes: (1) CPH caveat
(2) Owner Group ID caveat
(3) Differences from Annual Report

Ownership group definition:

	Owner			
MRI	Art	Bob	Carl	
123	X	X		<= Entity 1
456	X	X		
789	X		X	<= Entity 2
987		X	X	<= Entity 3
654			X	<= Entity 4

Results

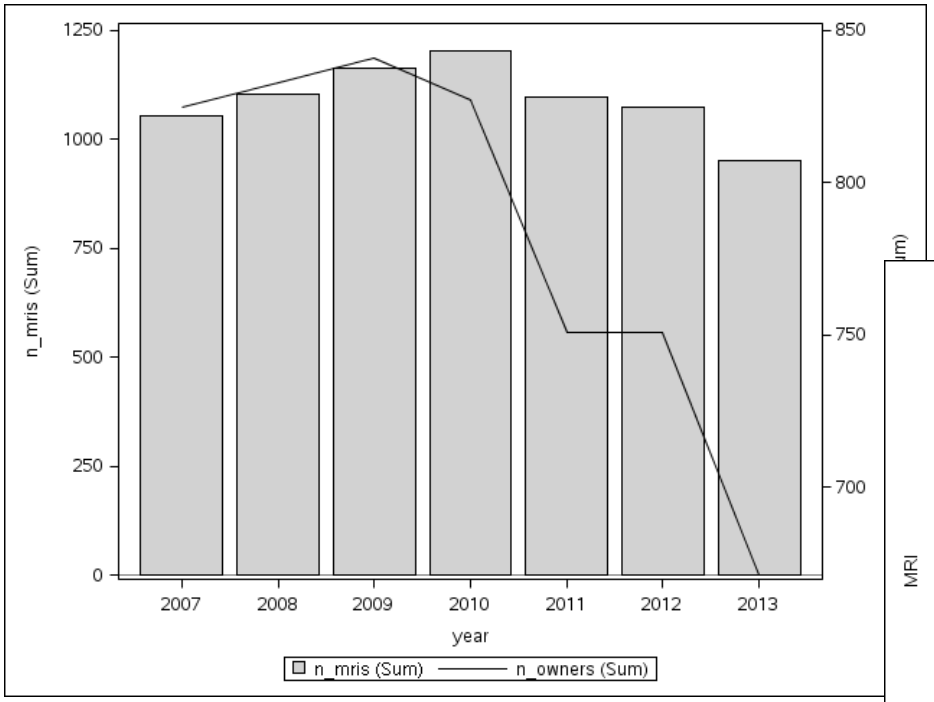
PSC total share at MRI level

- Largest individual MRIs are assigned ~1.1% of all PSC
- Median MRI holds ~0.3%
- GB and GOM winter flounder, redfish most concentrated (8% / 6% / 4.5% shares, respectively, for largest MRI-level holders)
- Shares stable over time, affected mostly by CPH status

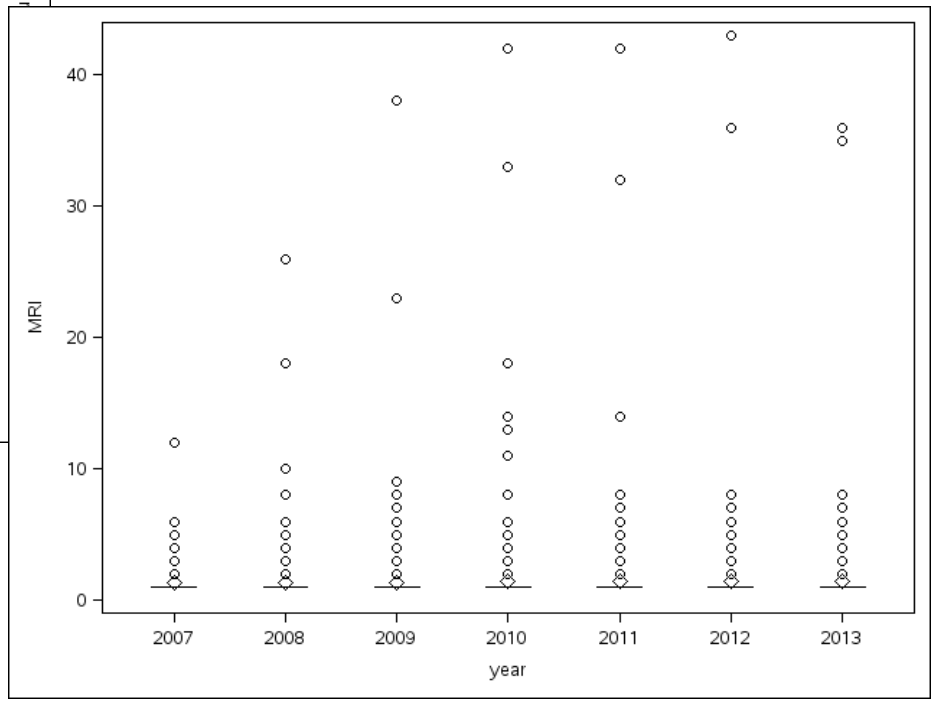
PSC total share at Owner Group level

- Largest group holds ~9.5% of all PSC in 2013, up from just over 2% in 2007
- 2nd largest holds 4%, up from 1.9% in 2007
- Median owner group holds 0.5%, stable over time
- GB and GOM winter flounder, GB yellowtail flounder and GB cod most concentrated (12% / 26% / 15% / 12% respectively)
- Trend towards increased concentration from 2007 – 2010, stable from 2010-2013

Number of MRIs and Ownership Groups



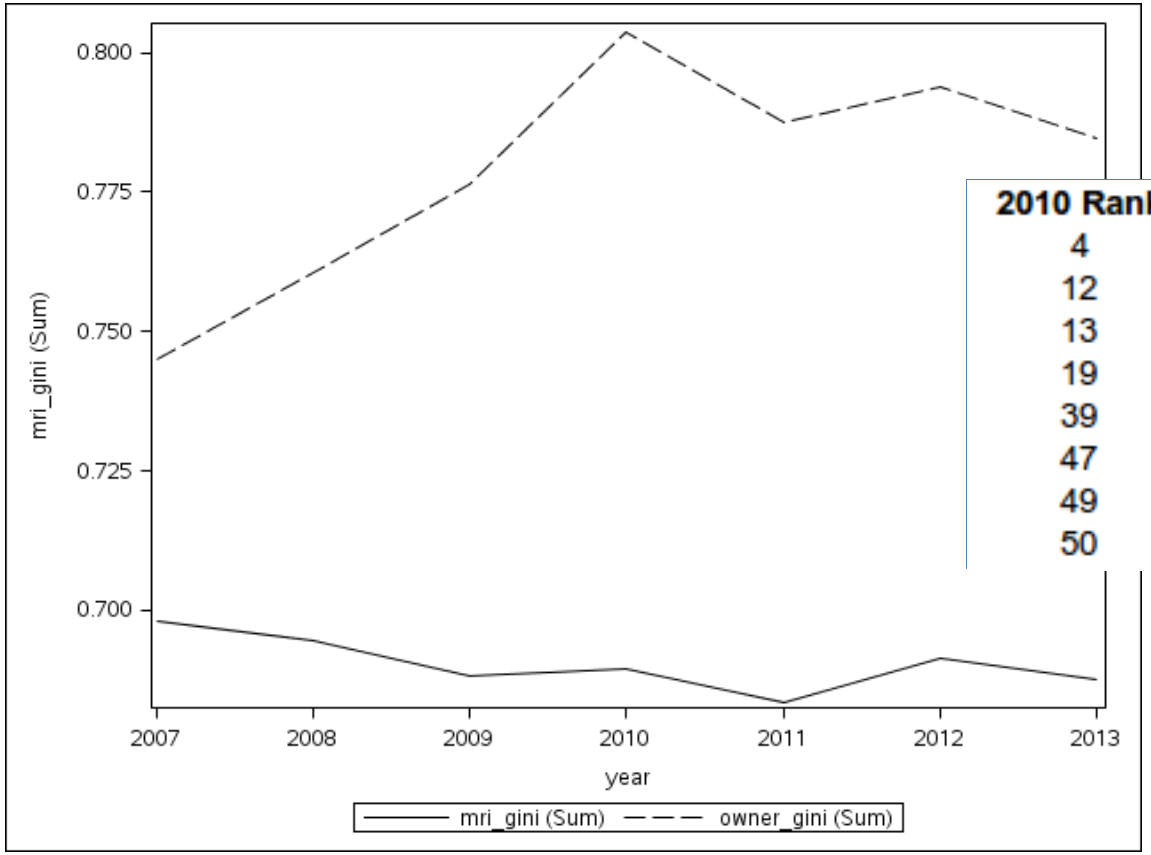
Number of MRIs per Ownership Group



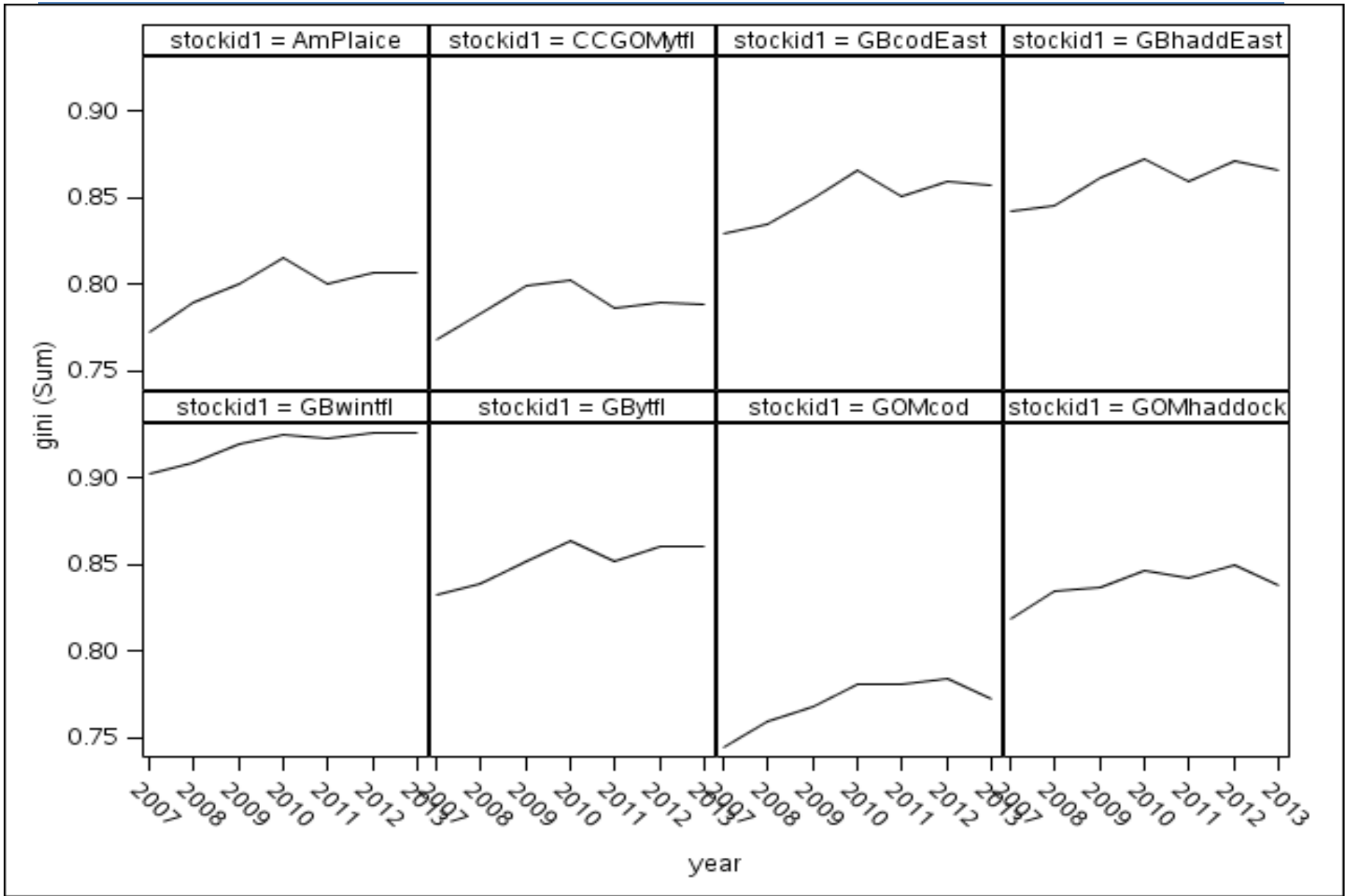
Ownership Group share of total PSC allocated

	2007	2008	2009	2010	2011	2012	2013
Bottom 90th percentile	44%	41%	38%	34%	36%	35%	37%
Bottom 75th percentile	17%	16%	15%	12%	14%	13%	14%
Bottom 50th percentile	2%	2%	2%	1%	2%	1%	2%
Bottom 25th percentile	0%	0%	0%	0%	0%	0%	0%
Top five ownership groups	*8%*	*12%*	*16%*	*20%*	*18%*	*20%*	*21%*

Gini coefficients for MRI and Ownership Group



2010 Rank	State	Gini
4	New Hampshire	0.425
12	Maine	0.437
13	Delaware	0.44
19	Vermont	0.444
39	Rhode Island	0.467
47	Massachusetts	0.475
49	Connecticut	0.486
50	New York	0.499


stockid1 = AmPlaice
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stockid1 = GOMcod
stockid1 = GOMhaddock
gini (Sum)
0.90
0.85
0.80
0.75
2007
2008
2009
2010
2011
2012
2013
year

Bottom line

- Interpret with caution:
  - CPH program use expanding with over 100 CPH permits enrolled in Sectors *(30% +/- in permit banks)*
  - Database differences exist pre and post-2010
  - Ownership definitions matter, different definitions may yield different results and even trends
- Ownership of PSC is highly concentrated (Gini = 0.78)
- PSC ownership share varies across stocks
  - GB winter flounder most concentrated (Gini = 0.93)
  - GOM cod least concentrated (Gini = 0.77)
- Top five owner's shares increased from 8% of total in 2007 to 21% in 2010, remaining nearly constant thereafter