Spatially explicit operational fisheries in New England



Sean Lucey and Mike Fogarty





Photo courtesy of NOAA NMFS

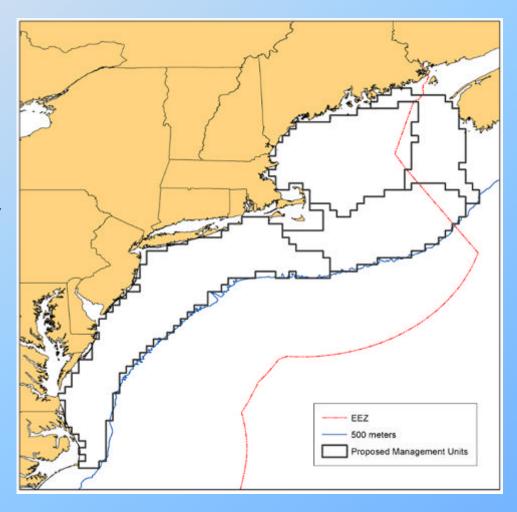
- Northeast U.S. rich tradition of commercial fishing
- Currently managed in a single species/stock context
- Despite legal mandates and precautionary science, many species continue to be overfished



Photo by Daniel Orchard - New York Times.com

Ecosystem Based Fisheries Management

- More holistic
- Humans as part of the ecosystem
- Place based rather than stock based



Goals

- Identify operational fisheries (i.e., species composition and where the commercial fishermen are catching the fish)
- See how current fishing habits align with proposed management units

Identify operational fisheries

- Vessel Trip Reports (VTR)
 - Principal ports located in New England
 - -2004-2008
- Segregated trips
 - Gear type
 - Vessel Size

Gear Types

- Otter Trawl
- Dredge
- Gillnet
- Pot
- Longline
- Seine



salmon-cove.html

Vessel Size

- Small
 - -≤150 Gross Register Tonnage
- Large
 - ->150 Gross Register Tonnage



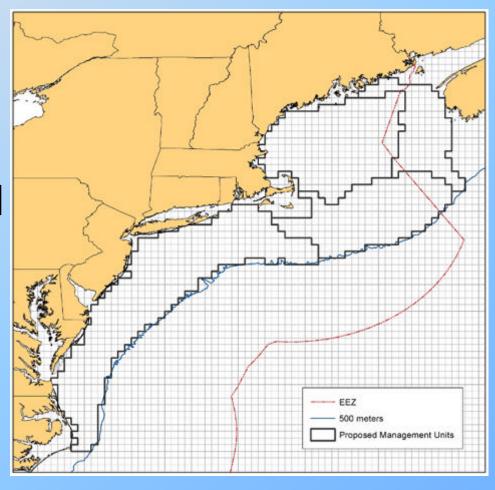
http://www.dimensionsguide.com/fishing-vessel-sizes/



http://shootingmyuniverse.blogspot.com/2009/04/forgotten-photo-friday-three-gloucester.html

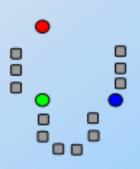
Species Composition

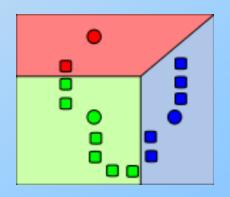
- Species summed
 - Ten minute lat/lon
 - Quarter year
- Weights converted to percentages
 - Arc sine square root transformed

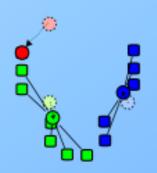


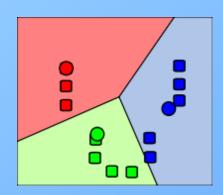
K-mean cluster analysis

- Start with random seed
- Assigns each unit to nearest seed
- Re-evaluates centers
 - Minimizes the total error sum of squares

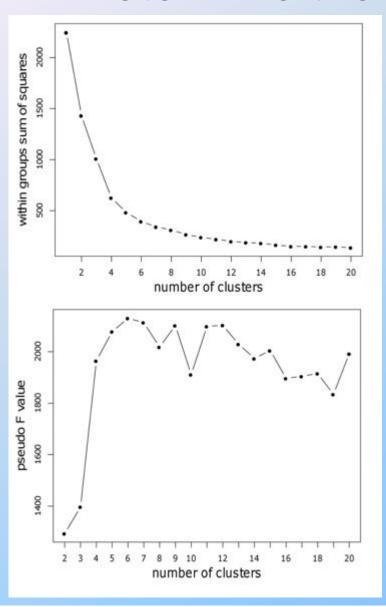








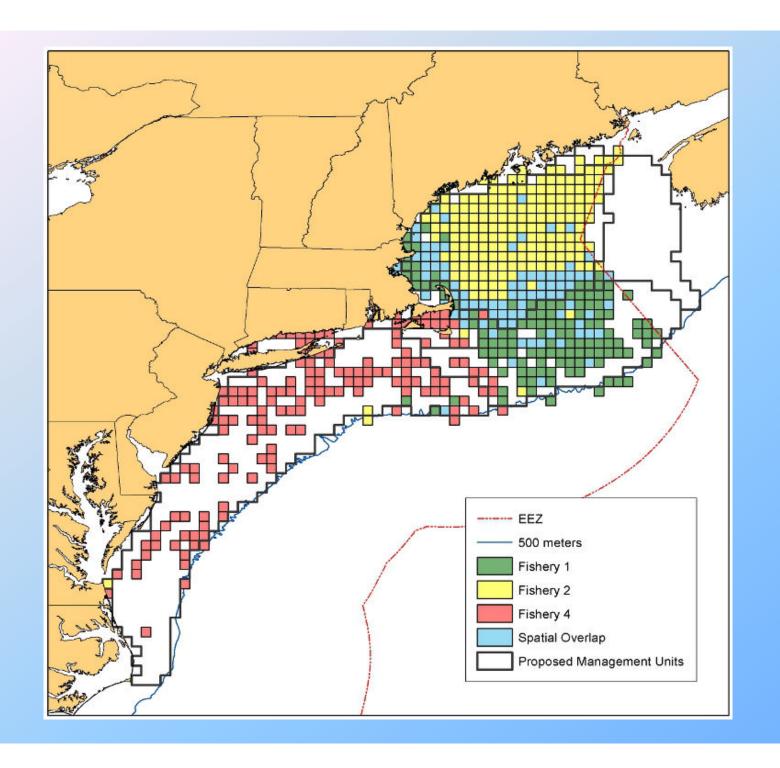
Determine the number of clusters

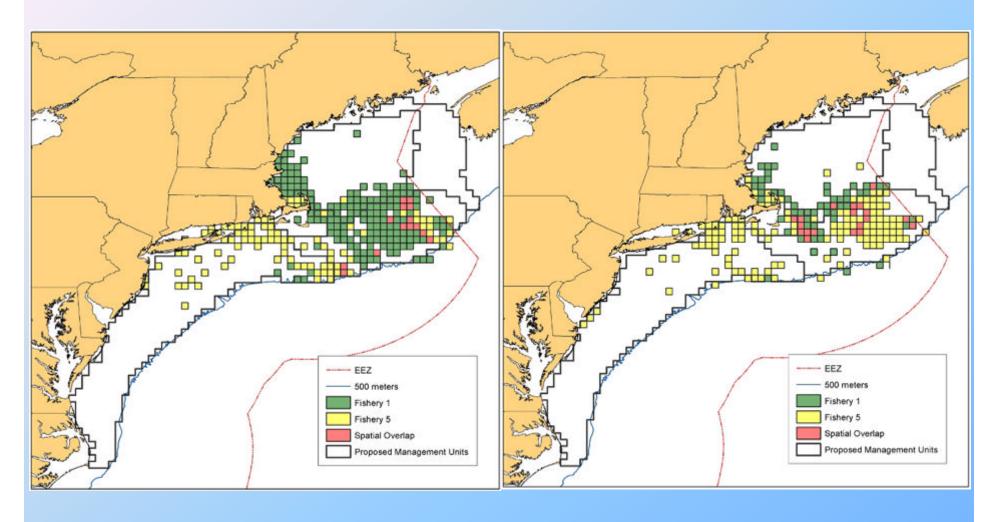


Scree Plot

Pseudo-F

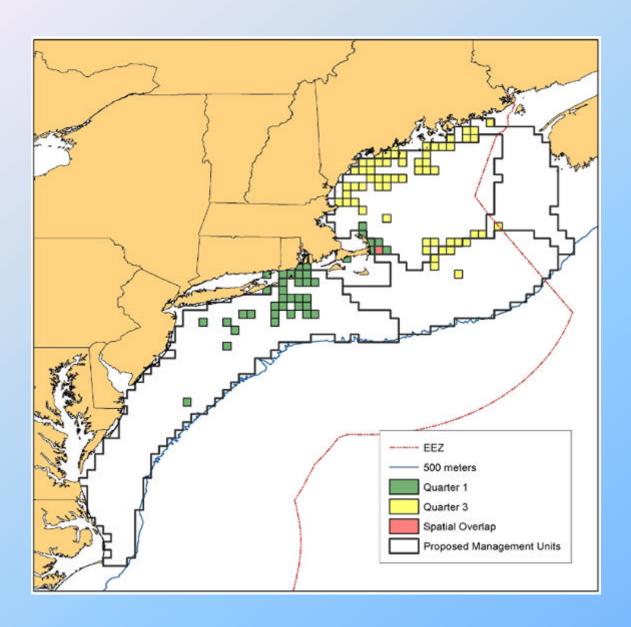
Cluster	1	2	3	4	5	6	7	8	9	10	total	
small	322	649	403	190	479	34	13	378	56	130	2654	
large	259	299	172	28	125	198	121	287	86	0	1575	
total	581	948	575	218	604	232	134	665	142	130	4229	
Seasons												
Cluster	1	2	3	4	5	6	7	8	9	10	total	
winter	130	243	118	51	140	47	91	190	0	77	1087	
spring	248	232	184	34	128	60	30	98	43	19	1076	
summer	88	234	129	60	201	72	0	129	89	4	1006	
fall	115	239	144	73	135	53	13	248	10	30	1060	
total	581	948	575	218	604	232	134	665	142	130	4229	
Species												
	1	2	3	4	5	6	7	8	9	10	1	
Atlantic Cod											Contr	ibution S
Haddock												Sm Med
Pollock												Lar
Red Hake												201
Silver Hake												
White Hake												
Monkfish												
Red fish												
Scup												
Vinter Flounder												
merican Plaice												
Witch Flounder												
mmer Flounder												
lowtail Flounder												
Skate												
tlantic Herring												
								l				
merican Lobster											l	
merican Lobster antic Sea Scallop												
tlantic Mackerel merican Lobster lantic Sea Scallop Loligo Illex												





April-June

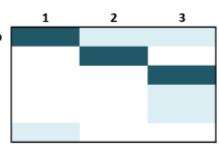
July-September

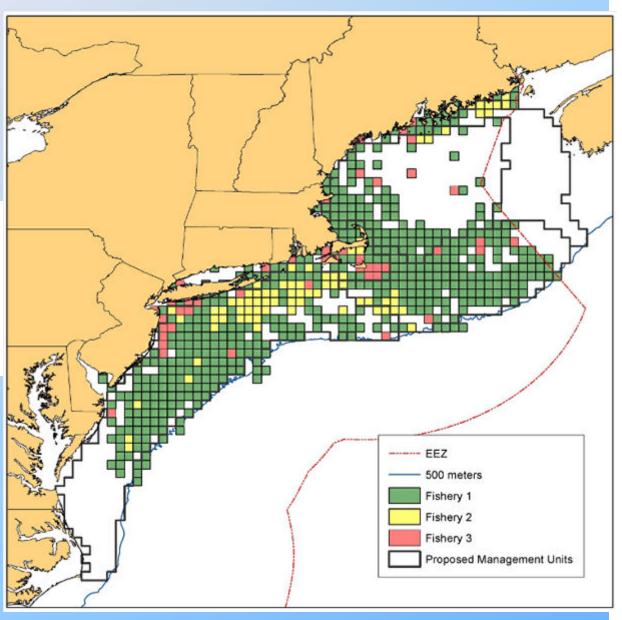


Dredge Fisheries

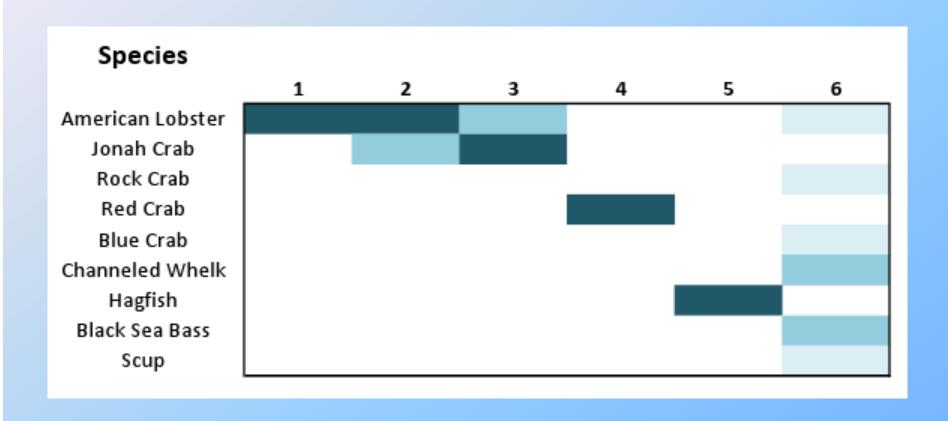
Species

Atlantic Sea Scallop Ocean Quahog Atlantic Surf Clam Bay Scallop Urchin Monkfish

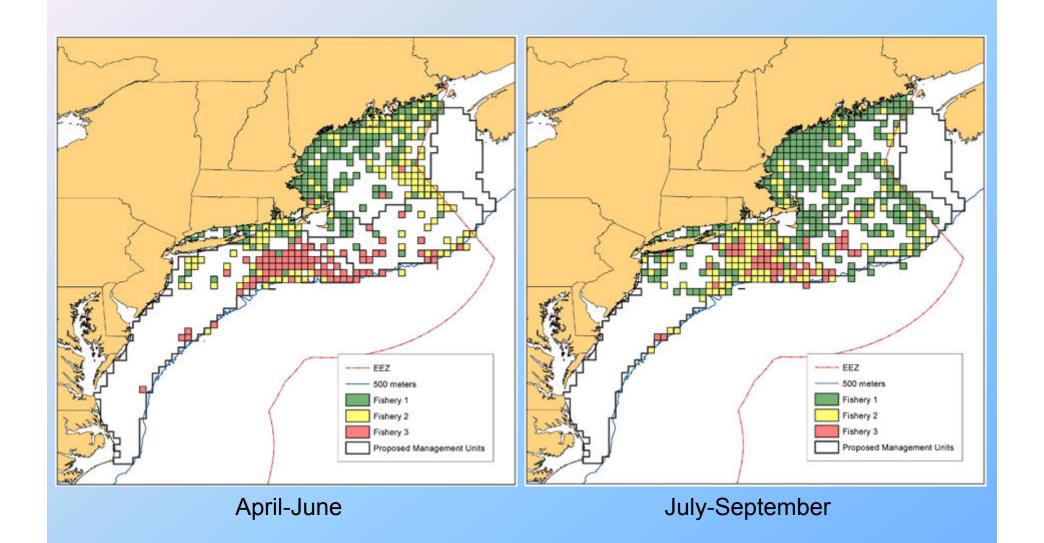




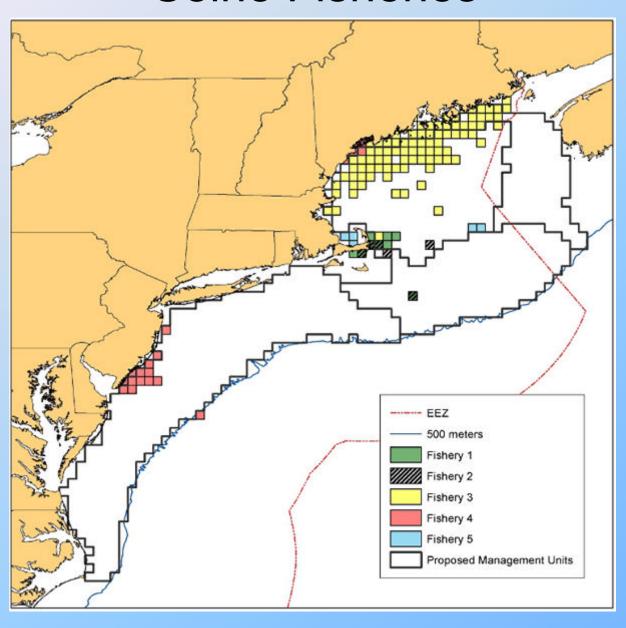
Pot Fisheries



Pot Fisheries



Seine Fisheries



Conclusions

- VTR data complex
- Actual extent on operational fisheries could be masked by more dominate fisheries
- Some fisheries could be considered subfisheries of a larger cluster

Conclusions Continued

- Success of EBFM will be in the involvement and buy-in of stakeholders
- Reflect current fishing practices
- Simplify regulations

Finally

- Operational fisheries match well with management units determined by oceanographic/ biological properties
- Borders need to be treated as fluid and be periodically reassessed
- Should simply fishery management plans

Questions?