State of Maine Updates

Erin Summers - Maine Department of Marine Resources

2009 Gear Surveys

2009 Annual Logs

Buoy Density Surveys

Acoustic Monitoring

Gear Trawling Project

Weak Top Rope

2009 Gear Surveys

- Provided to IEC and used to populate co-occurrence model in Maine waters
- Value gained in sampling of configurations of gear used seasonally and regionally
  - Can use this with more flexibility when using minimum trawl lengths to reduce the risk of entanglements in vertical lines

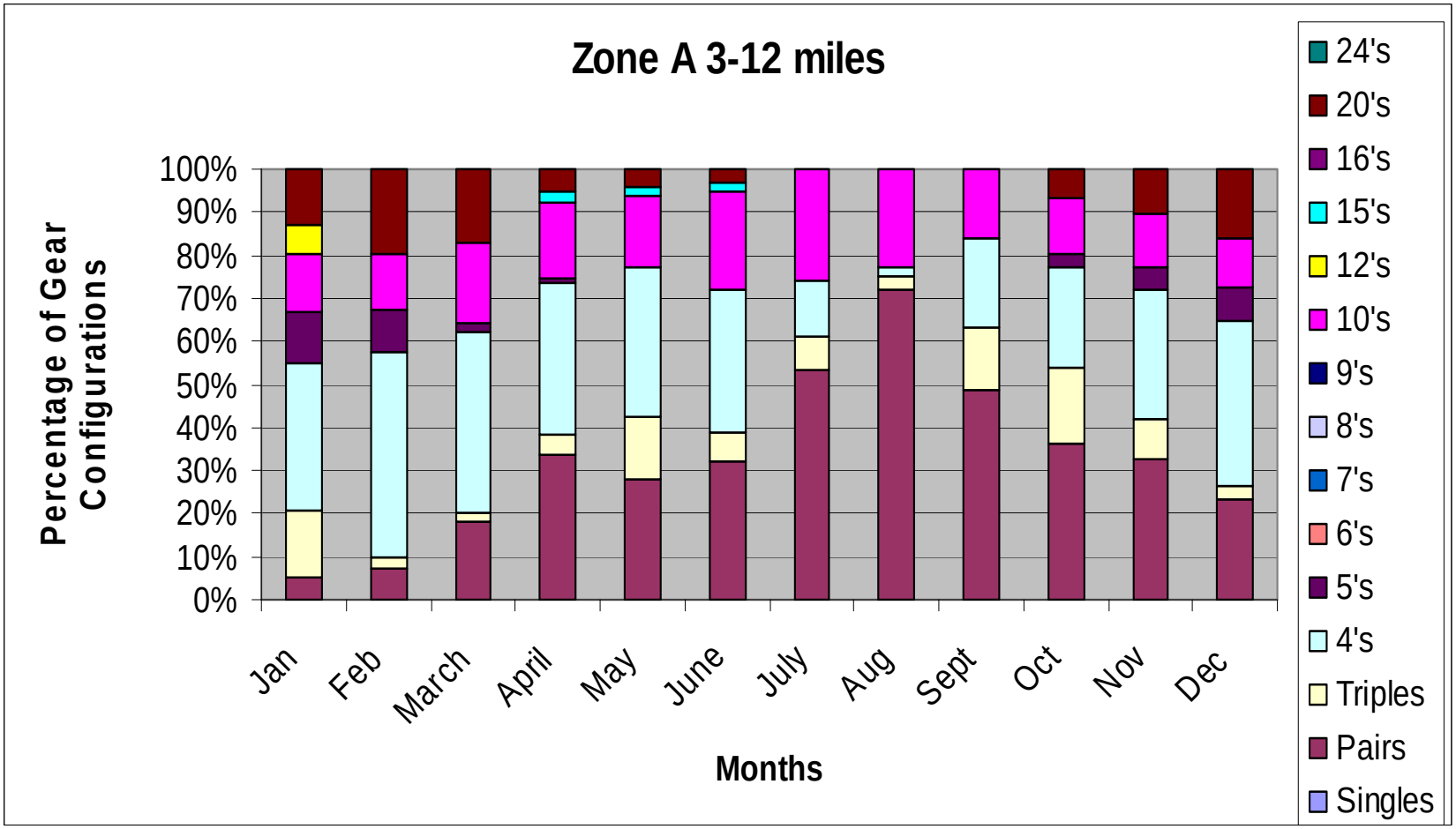
2009 Gear Surveys

DMR Gear Survey

	Responses	Licenses	% Active	# Active	% Covered
A	114	1147	61%	700	16%
B	74	646	63%	407	18%
C	84	947	69%	653	13%
D	112	1183	61%	722	16%
E	40	543	54%	293	14%
F	92	935	52%	486	19%
G	50	510	47%	240	21%
Total	***566***	***5911***		***3501***	***16%***

Given a population size of 6,000 lobstermen and a sample size of about 700 (including those who reported no fishing), with a 95% confidence level this survey has a confidence interval or margin of error of 3.5.

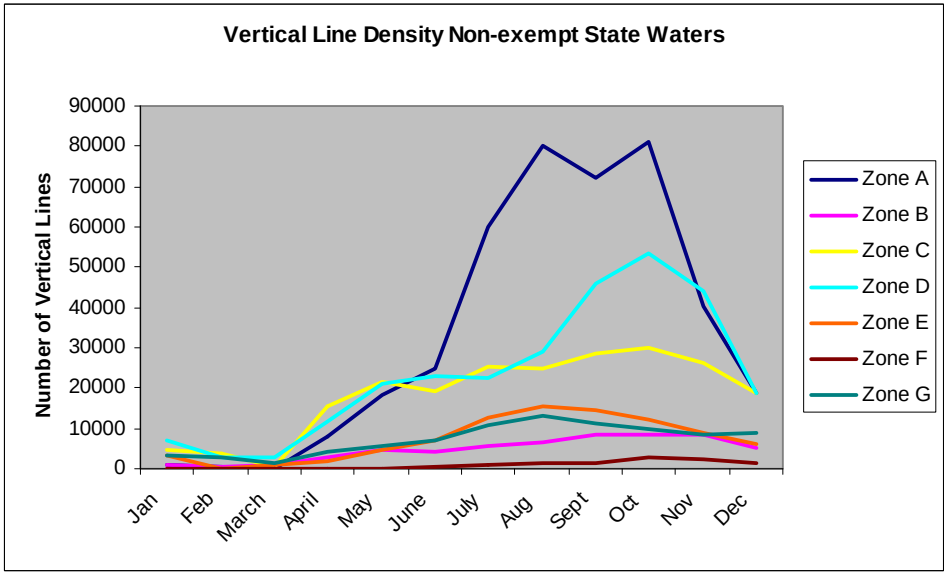
2009 Gear Surveys

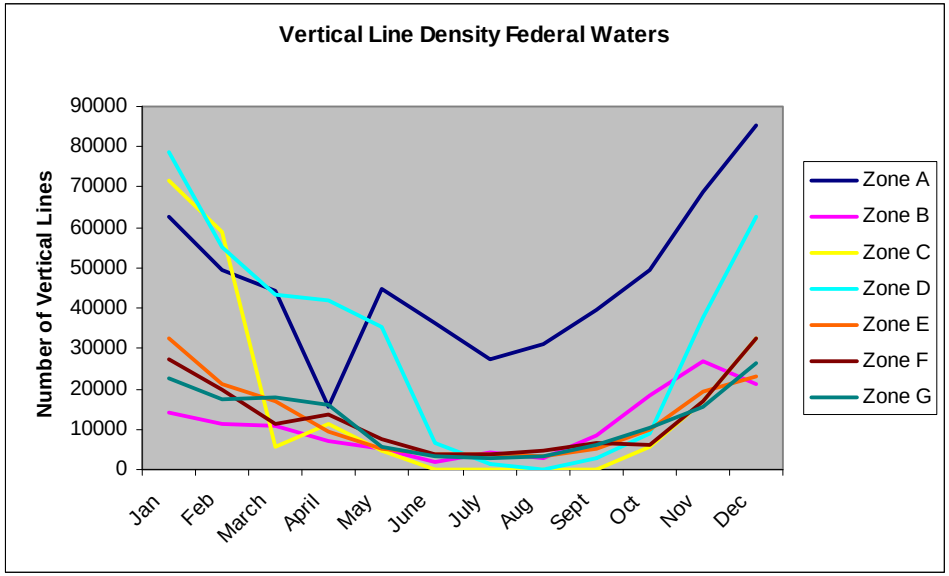


2009 Gear Surveys

- Used the gear configurations, numbers of licenses sold in the State and calculated latent effort to scale sample up to the fishery and estimate a baseline number of lines and calculate a density per square kilometer

2009 Gear Surveys





2009 Gear Surveys

Areas		EL (fa)	Diam EL (")	Toggles	Highflyer	depth (fa)	EL/depth	% EL float
A 12+	**Avg**	95		yes	both	54	1.7	49%
	Min	50	3/8			25	2.0	45%
	Max	180	7/16			100	1.8	50%
A 3-12	**Avg**	69		both	no	50	1.4	48%
	Min	35	11/32			20	1.8	45%
	Max	90	3/8			60	1.5	50%
A Non-exempt	**Avg**	46		both	no	31	1.5	38%
	Min	4	< 5/16			4	1.0	0%
	Max	180	7/16			240	0.8	60%

Areas		Diam GL (')	Avg Soak	Tags purchased	Traps Fished	Trap ratio
A 12+	**Avg**		6	800	501	63%
	Min	3/8	2	800	200	25%
	Max	1/2	11	800	800	100%
A 3-12	**Avg**		5	800	283	35%
	Min	11/32	2	800	32	4%
	Max	7/16	10	800	800	100%
A Non-exempt	**Avg**		4	747	327	44%
	Min	11/32	1	500	50	10%
	Max	1/2	10	800	700	88%

2009 Annual Logs

- A simpler survey asking for number of traps and vertical lines fished by month and region
- Doesn’t get at configurations but was a pilot to determine effectiveness of this method as a reporting scheme
- Have a pending grant to do this again coupled with independent field sampling techniques

2009 Annual Logs

DMR Annual Logs

	Responses	Licenses	% Active	# Active	% Covered
A	**452**	**1147**	**61%**	**700**	**65%**
B	**248**	**646**	**63%**	**407**	**61%**
C	**387**	**947**	**69%**	**653**	**59%**
D	**363**	**1183**	**61%**	**722**	**50%**
E	**161**	**543**	**54%**	**293**	**55%**
F	**218**	**935**	**52%**	**486**	**45%**
G	**169**	**510**	**47%**	**240**	**71%**
Total	***1998***	***5911***		***3501***	***57%***

Given a population size of 6,000 lobstermen and a sample size of about 2,100 (including those who reported no fishing), with a 95% confidence level this survey has a confidence interval or margin of error of 1.7.

2009 Annual Logs

Zone A Summary

		Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
EXEMPT	# of active fishermen	10	9	25	94	170	293	387	394	377	313	180	55
	Total # of traps	1895	1490	6000	28140	55861	108386	164950	174147	160557	129534	69479	17058
	Total # of endlines	938	742	3043	16441	34022	72156	114151	119869	106446	83599	42073	8150
	Avg. Configuration	2.02	2.01	1.97	1.71	1.64	1.50	1.45	1.45	1.51	1.55	1.65	2.09
	Avg. # of trap per fisherman	189.5	165.6	240.0	299.4	328.6	369.9	426.2	442.0	425.9	413.8	386.0	310.1
	Avg. # of endlines per fisherman	93.8	82.4	121.7	174.9	200.1	246.3	295.0	304.2	282.4	267.1	233.7	148.2
NON-EXEMPT	# of active fishermen	24	21	26	71	86	103	106	113	128	131	107	69
	Total # of traps	4578	4140	6090	18297	23365	27950	30009	31783	38308	40313	31940	19718
	Total # of endlines	1630	1316	2189	7394	9563	12080	13450	14256	16829	16545	12014	8329
	Avg. Configuration	2.81	3.15	2.78	2.47	2.44	2.31	2.23	2.23	2.28	2.44	2.66	2.37
	Avg. # of trap per fisherman	190.8	197.1	234.2	257.7	271.7	271.4	283.1	281.3	299.3	307.7	298.5	285.8
	Avg. # of endlines per fisherman	67.9	62.7	84.2	104.1	111.2	117.3	126.9	126.2	131.5	126.3	112.3	120.7
FEDERAL	# of active fishermen	73	67	72	102	112	99	78	79	98	123	124	107
	Total # of traps	39851	37783	39147	47082	49679	41287	29788	29052	38766	58978	64964	58254
	Total # of endlines	8708	8090	8651	11424	11739	10012	6849	7253	10352	15147	15446	13494
	Avg. Configuration	4.58	4.67	4.53	4.12	4.23	4.12	4.35	4.01	3.74	3.89	4.21	4.32
	Avg. # of trap per fisherman	545.9	563.9	543.7	461.6	443.6	417.0	381.9	367.7	395.6	479.5	523.9	544.4
	Avg. # of endlines per fisherman	119.3	120.7	120.2	112.0	104.8	101.1	87.8	91.8	105.6	123.1	124.6	126.1
Exempt	Seasonal Latency of Licenses	98%	98%	94%	77%	59%	29%	7%	5%	9%	25%	57%	87%
Non-exempt	Seasonal Latency of Licenses	85%	86%	83%	54%	45%	34%	32%	27%	17%	15%	31%	55%
Federal	Seasonal Latency of Licenses	48%	52%	49%	28%	21%	30%	45%	44%	30%	13%	12%	24%
	Seasonal Latency of Traps (Zone A)	93%	93%	92%	86%	80%	73%	66%	64%	64%	65%	74%	85%

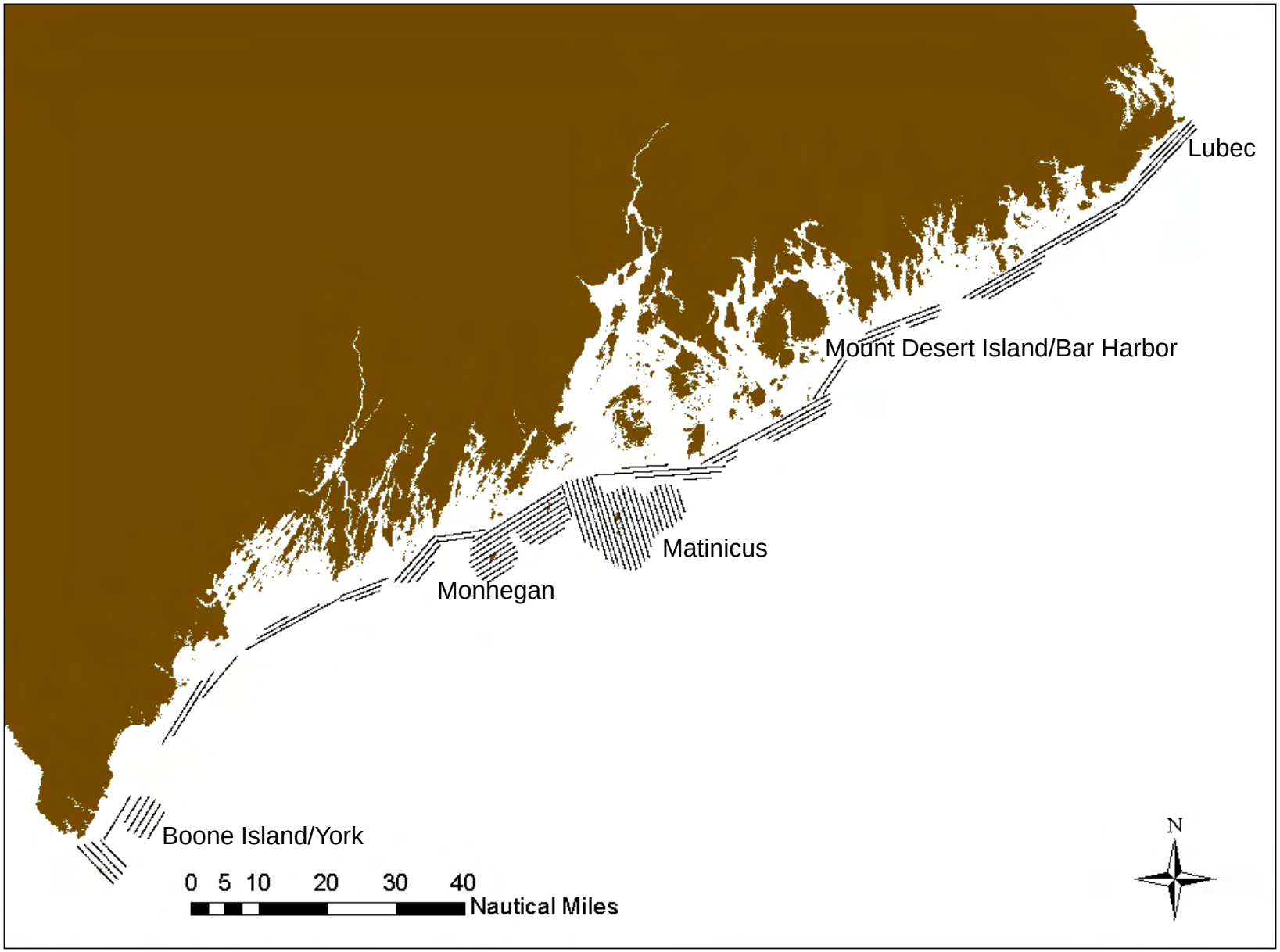
Overall Latency in Zone A	5.4%
# registered licenses in zone A	1159
Total # of returns in Zone A	478
% of total returns in Zone A	41.2%
# of returns by zone A/exempt	415
% of returns by zone A/exempt	86.8%
# of returns by zone A/non-exempt	155
% of returns by zone A/non-exempt	32.4%
# of returns by zone A/federal	141
% returns by zone A/federal	29.5%
# purchased trap tags in Zone A	651851

Similar methods used to extrapolate the number of vertical lines in the population and then scale the density to a measure of vertical lines per square kilometer

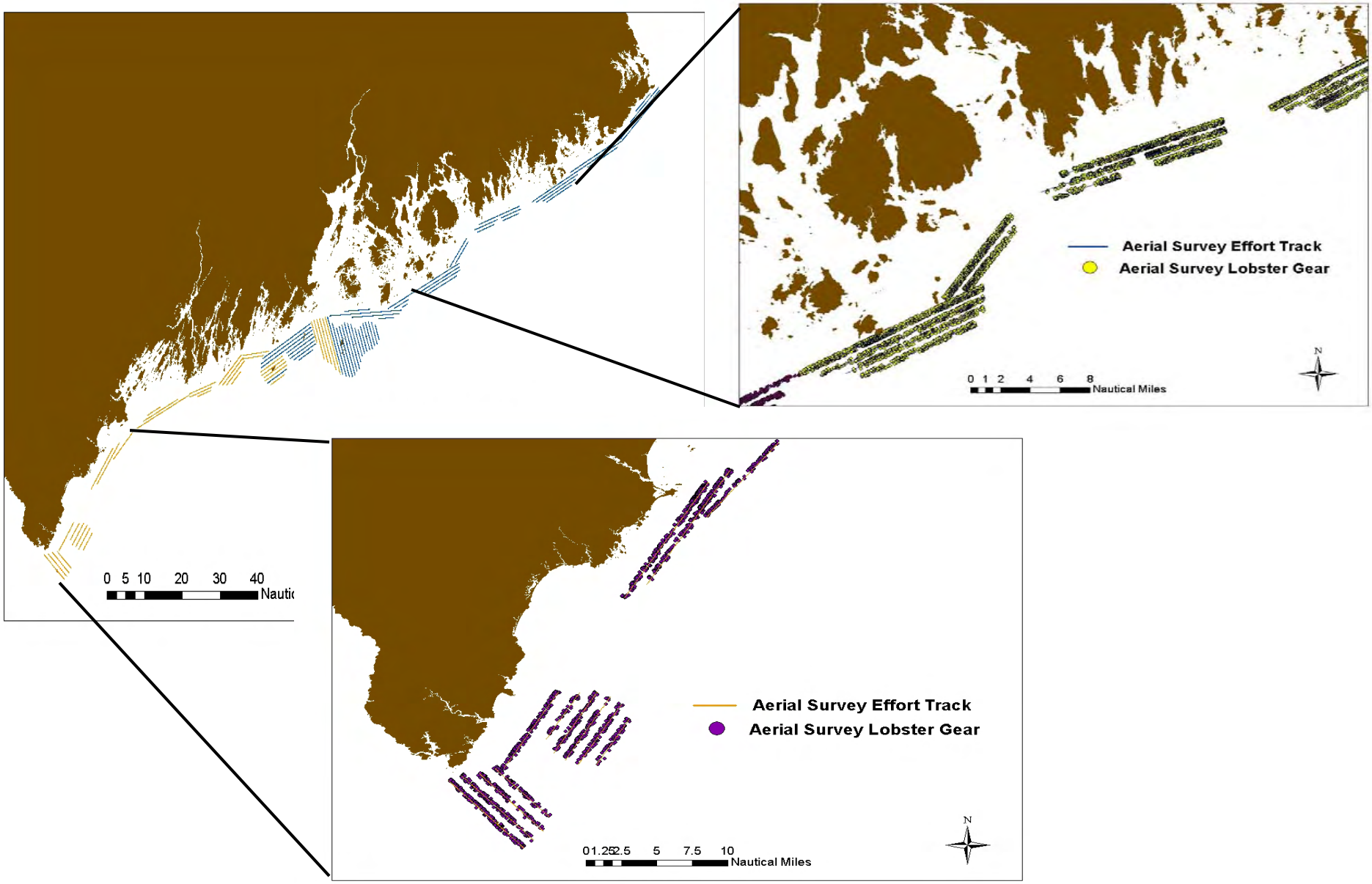
Buoy Density – Aerial Surveys

- Contracted Kappa Mapping, Inc. to fly surveys and digitally map the locations of buoys in a GIS format using stereo photography
- Flew surveys in two segments: Zones C-G in Nov. 2010 and Zones A-D in June 2011
- Buoy locations classified as “certain”, “probable” and “possible”. Only the first two were used in analysis.

Buoy Density – Aerial Surveys



Buoy Density – Aerial Survey



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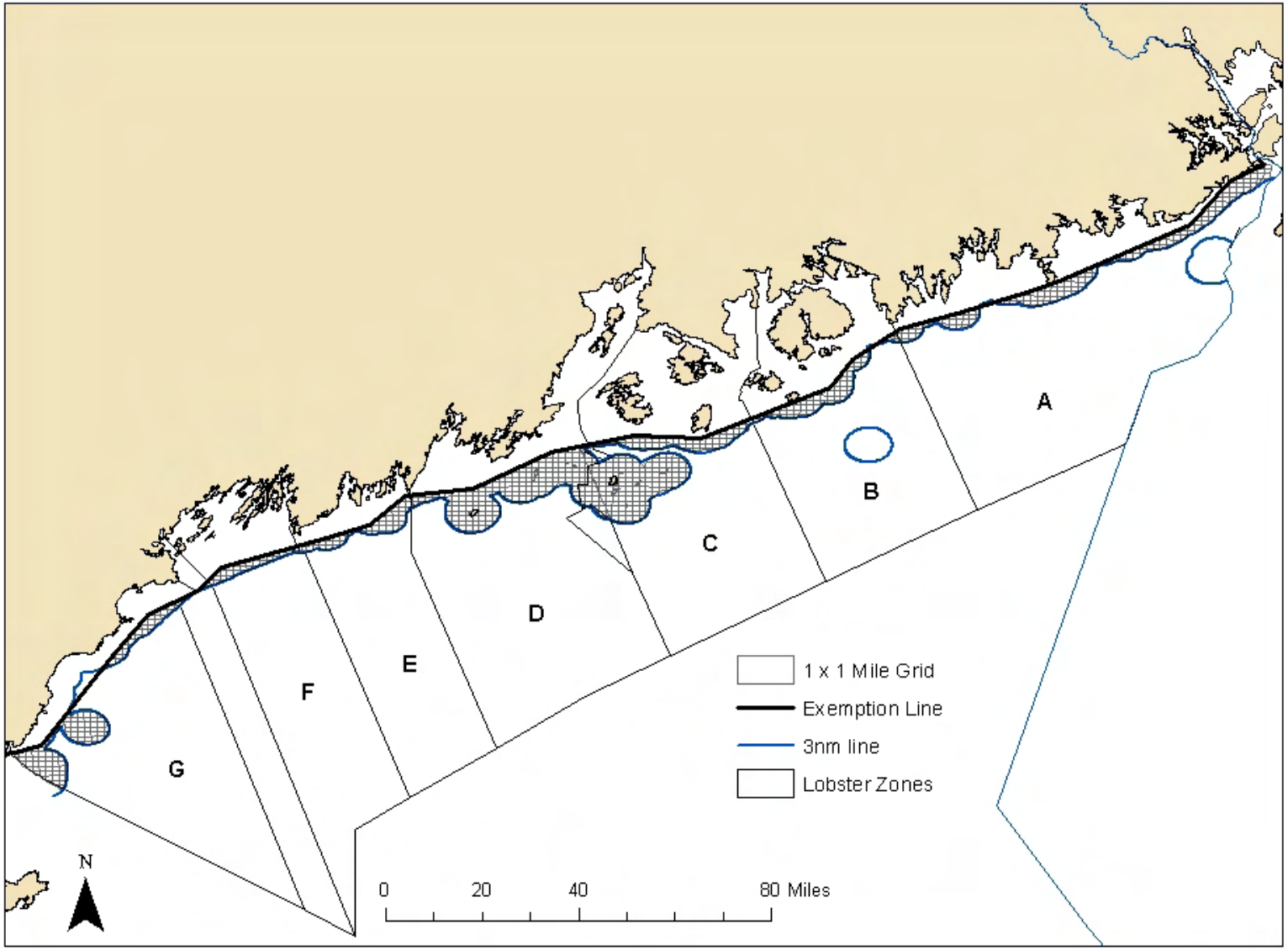

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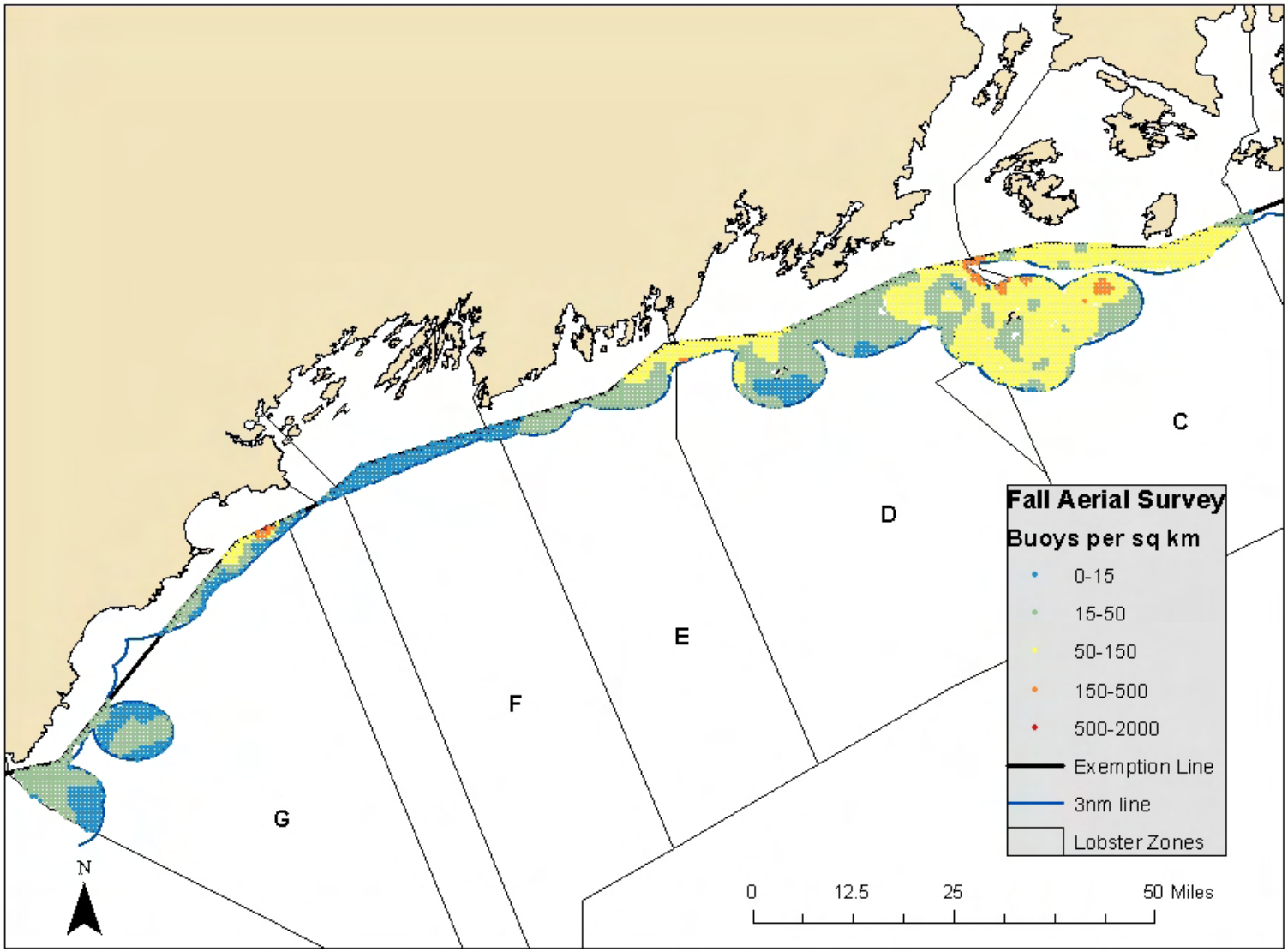
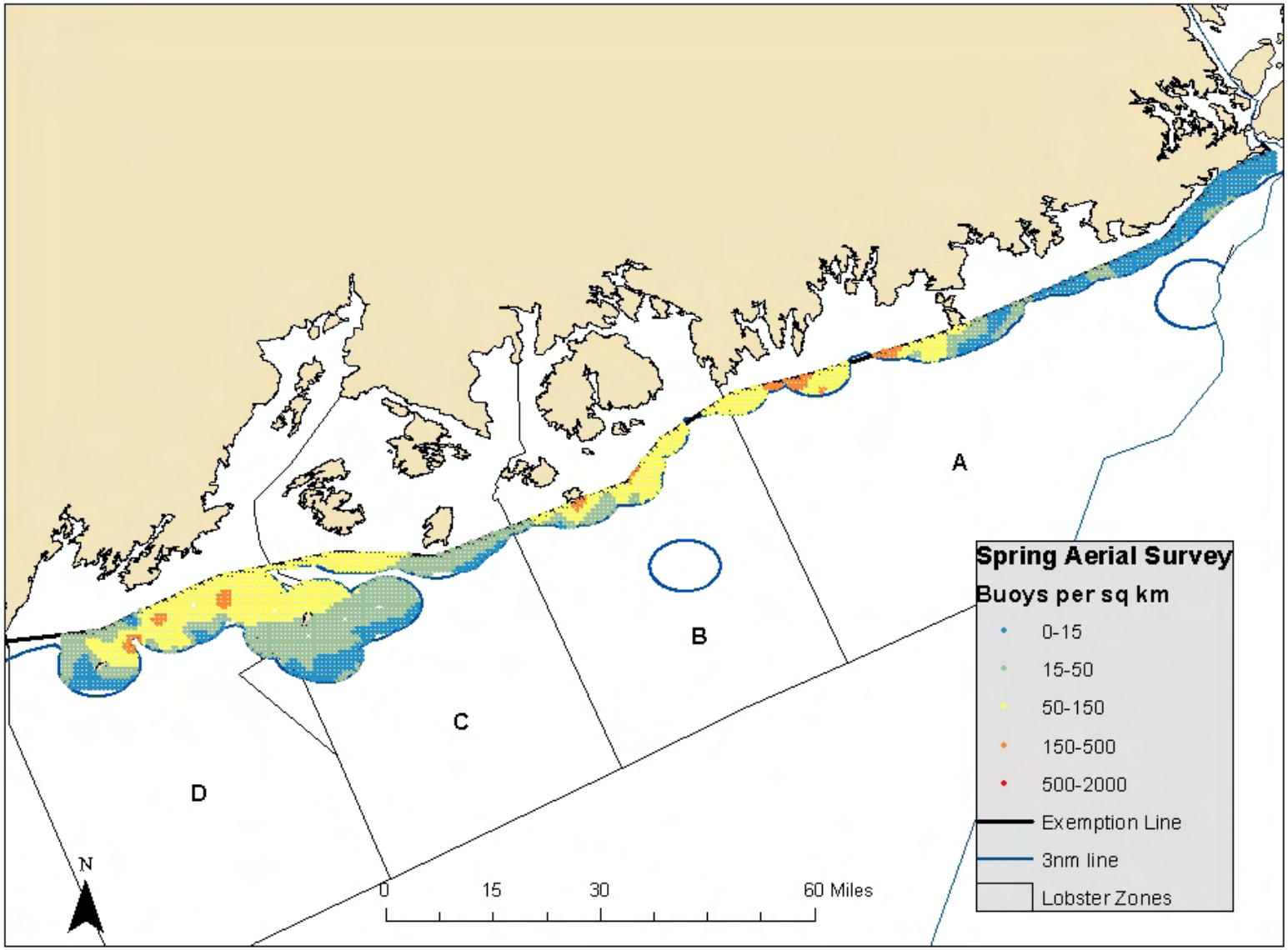


Buoy Density – Aerial Surveys

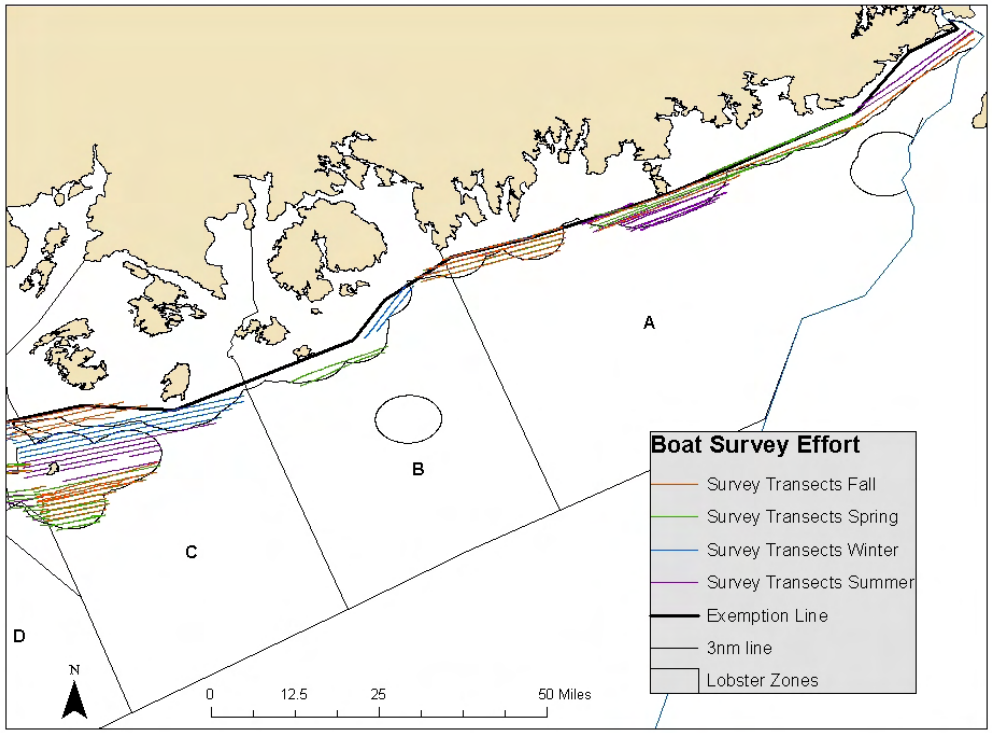


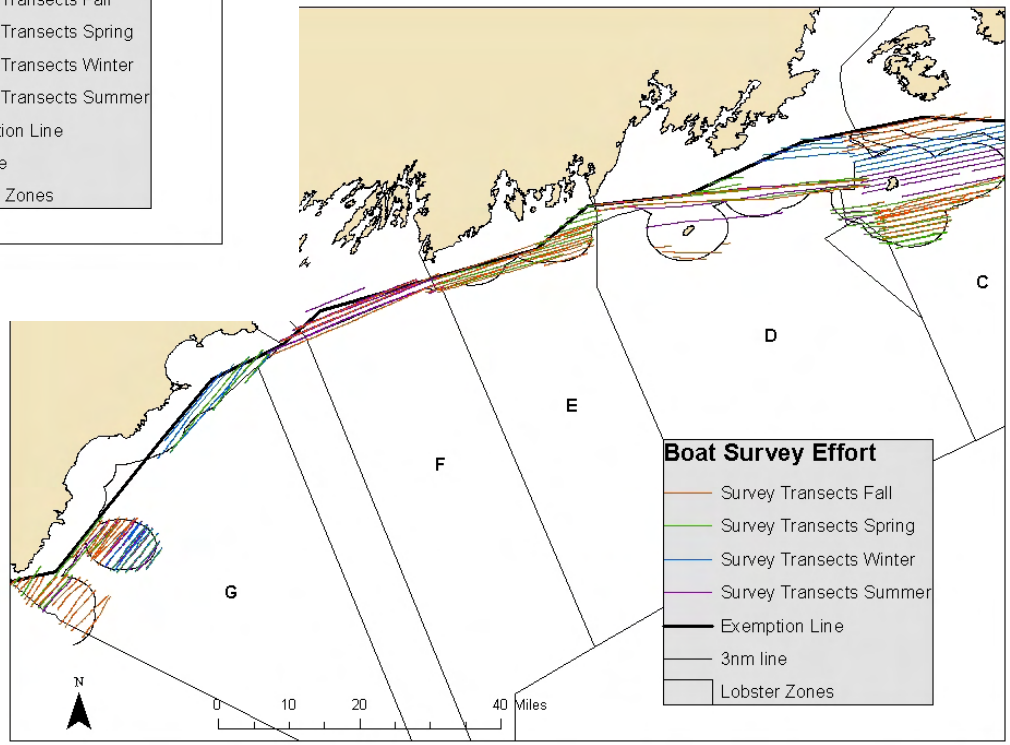
Buoy Density – Boat Surveys

- Worked with Gulf of Maine Lobster Foundation to conduct boat surveys and digitally map the locations of buoys in a GIS format using Logger data collection software.
- Surveys in three study regions: Zones A/B, C/D, E/F/G every 2 weeks April – Nov and once a month Dec – March.
- Buoy locations were recorded up to 100m from the port side of the vessel using a laptop wired into a portable GPS unit.

Buoy Density – Boat Surveys

Buoy Density – Boat Surveys





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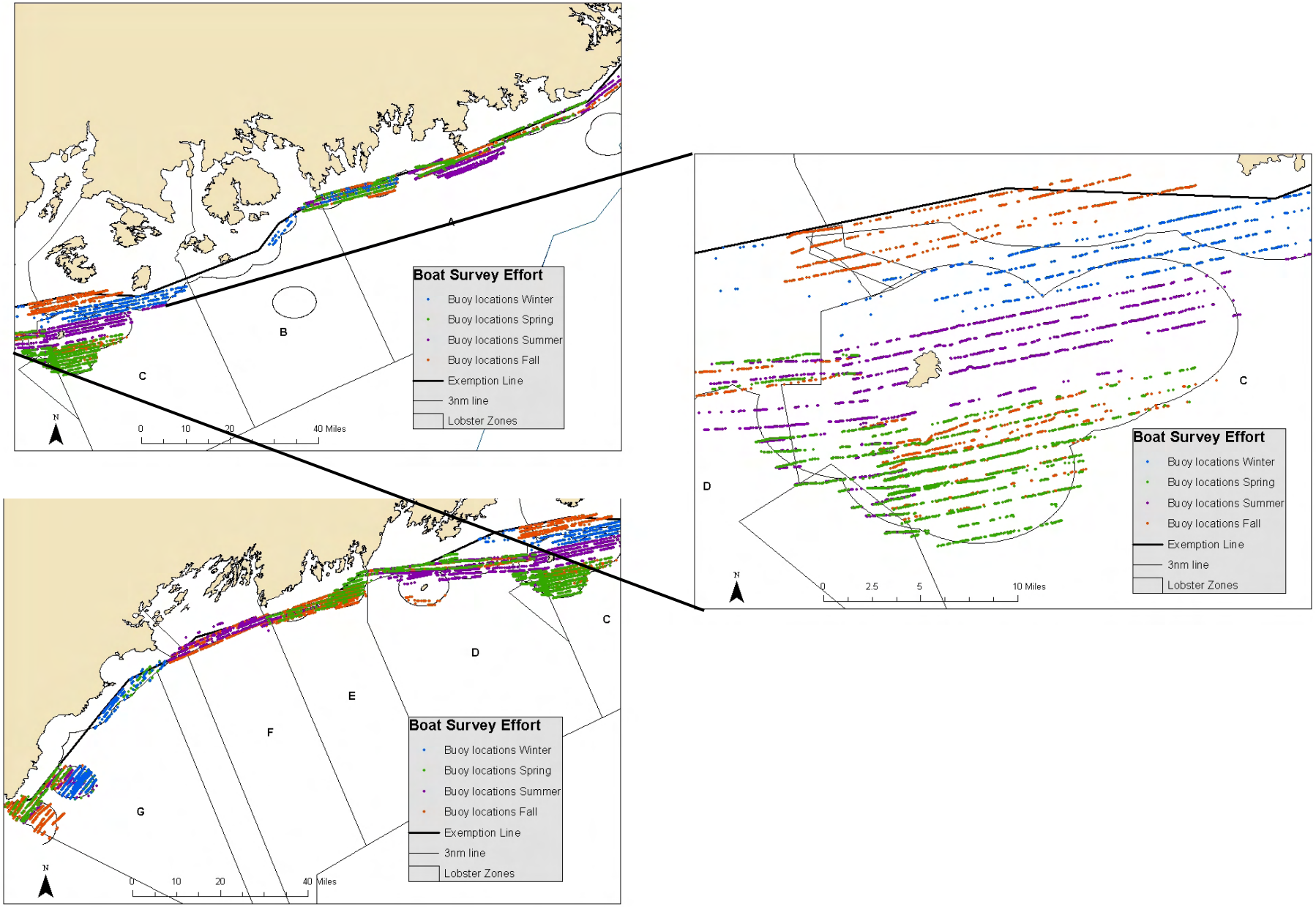
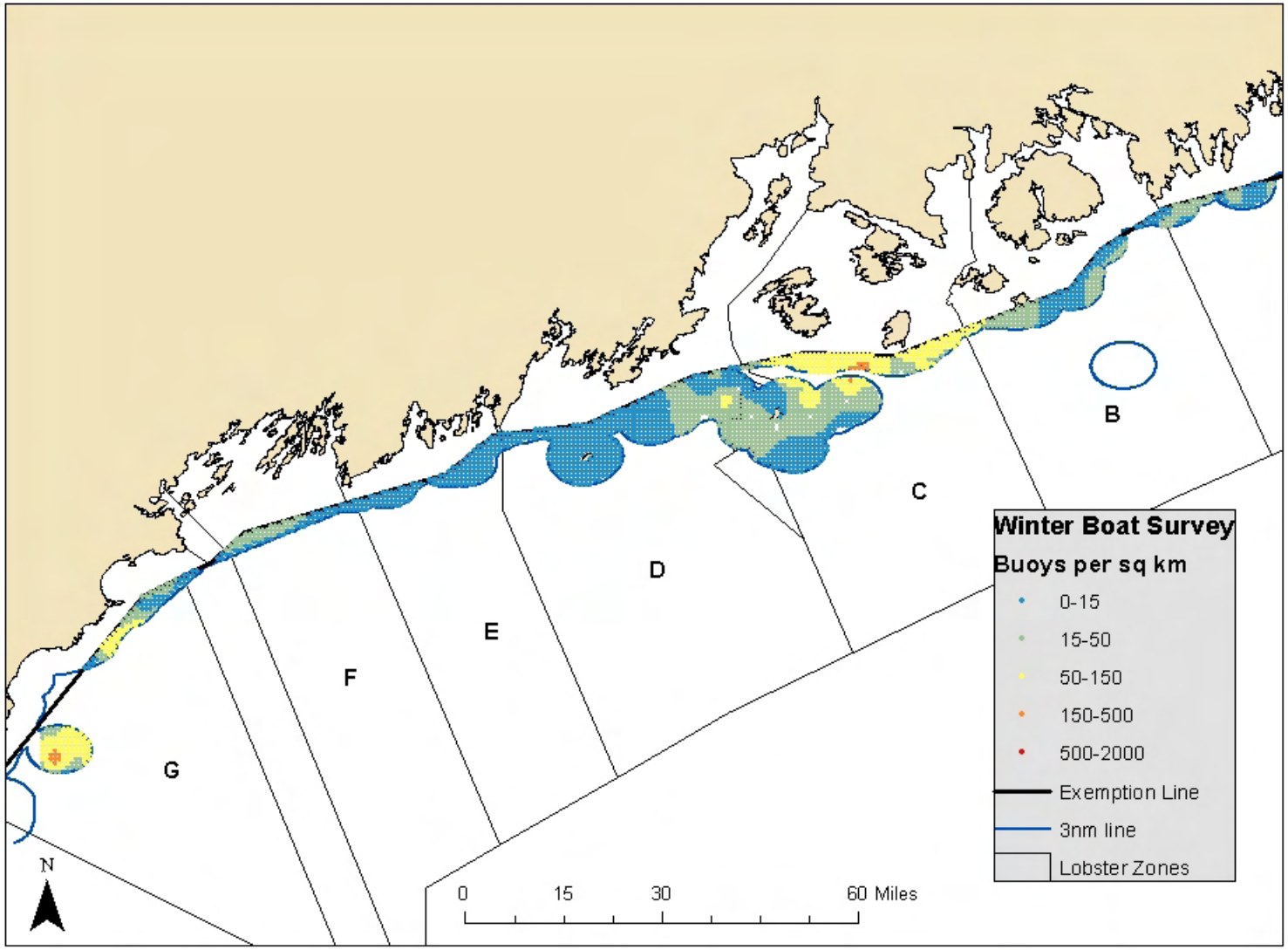


Buoy Density – Boat Surveys



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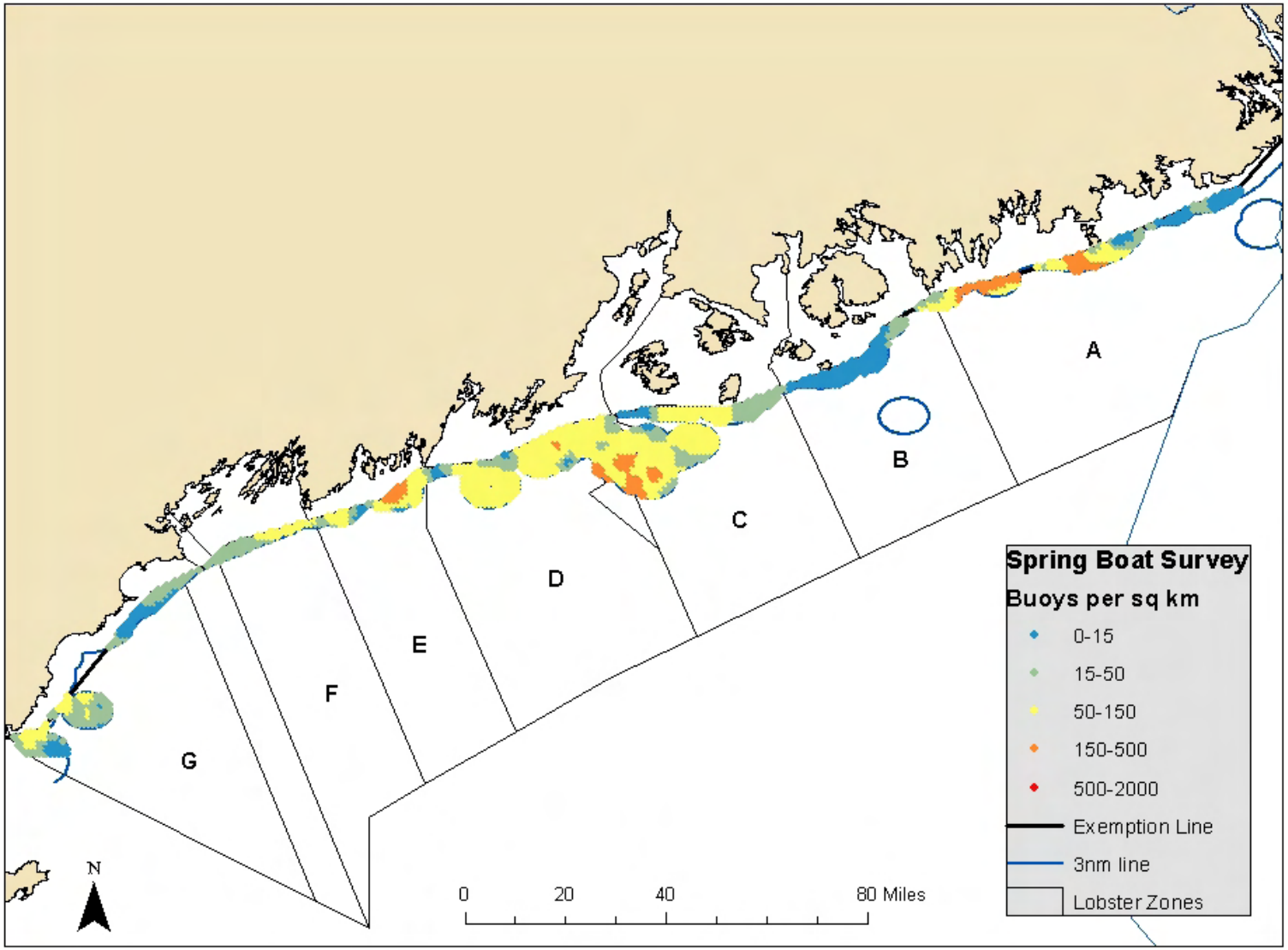

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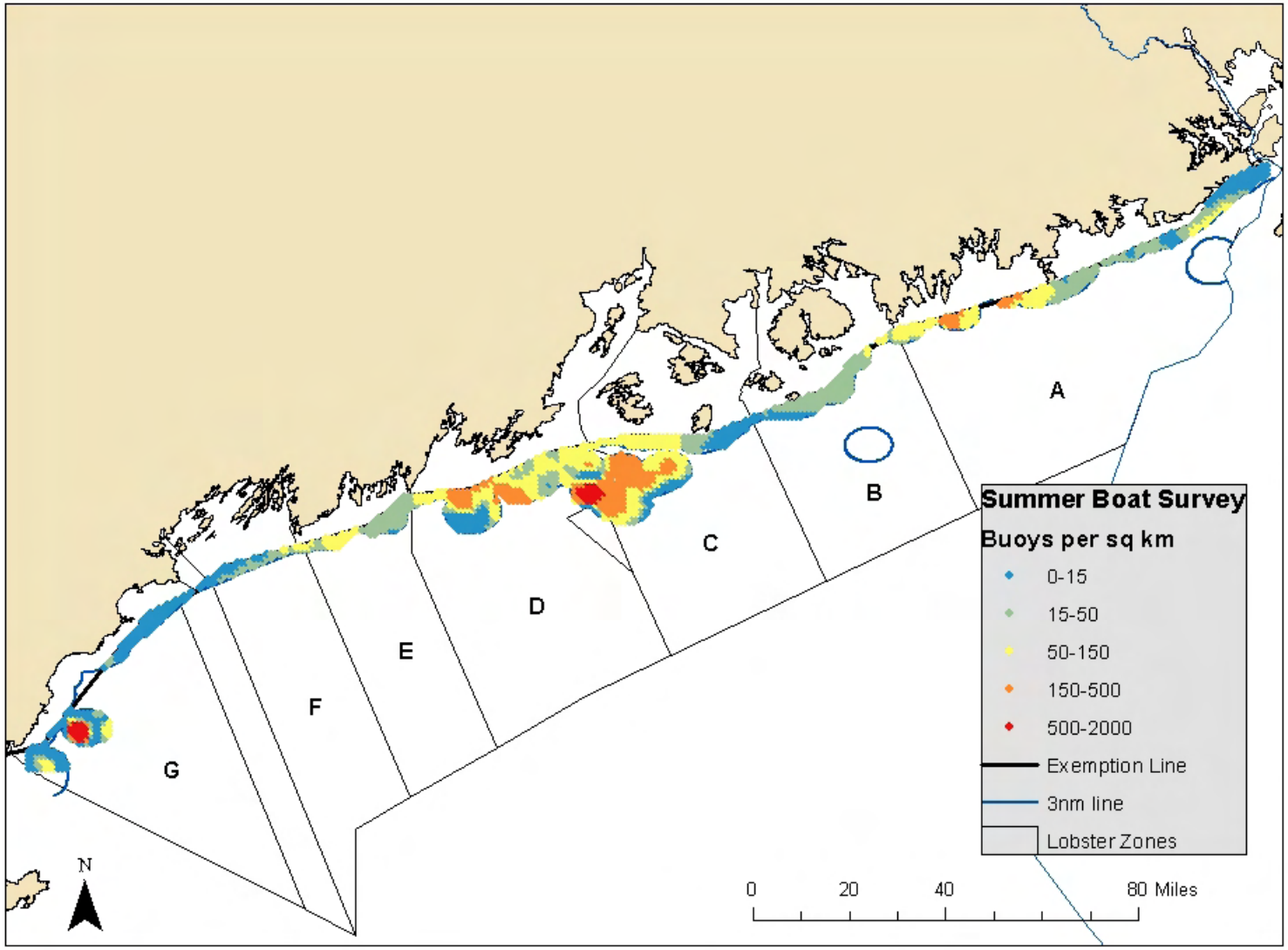

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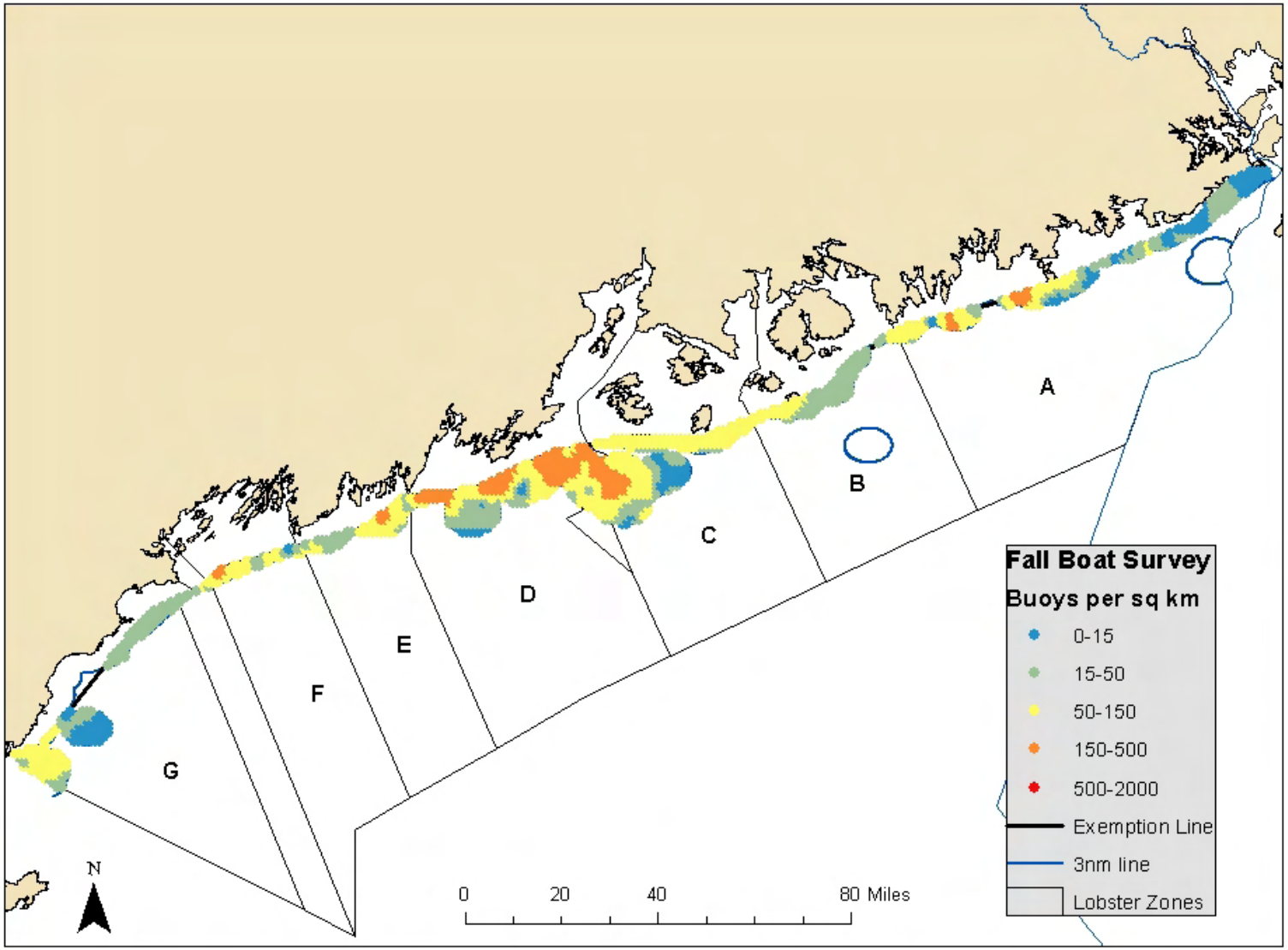
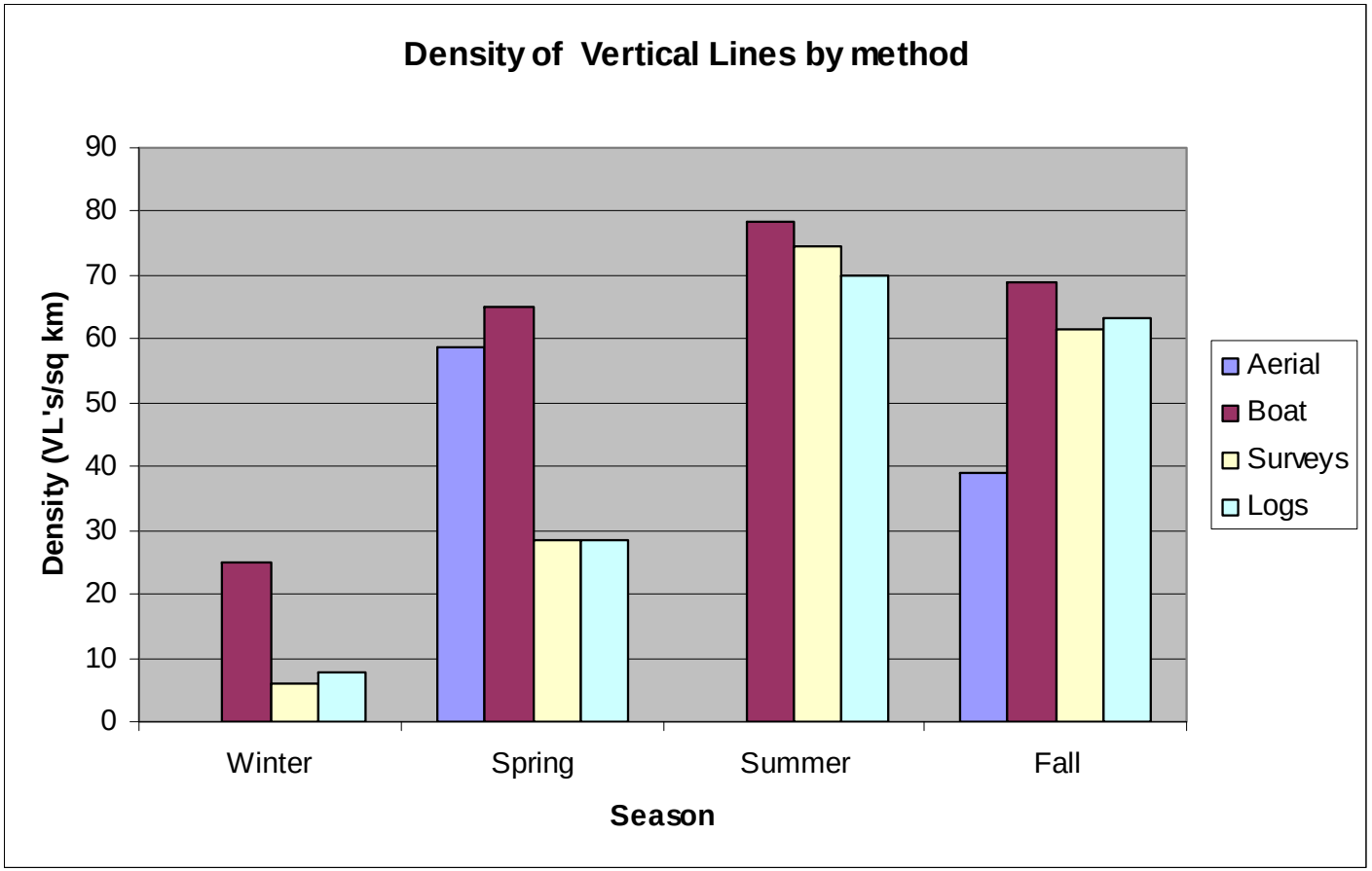


Buoy Density - Comparisons



There is variability between methods with marked lower densities reported in the spring and winter with surveys than counted by boat and aerial surveys. However, densities in the summer and fall during the peak of the fishery track closer between methods.

Buoy Density - Comparisons

p-values for paired t-tests:

	Aerial spring	Aerial fall	Boat winter	Boat spring	Boat summer	Boat fall	Survey winter	Survey spring	Survey summer	Survey fall
Aerial spring	x									
Aerial fall		x								
Boat winter			x							
Boat spring	0.643			x						
Boat summer					x					
Boat fall		0.041				x				
Survey winter			0.022				x			
Survey spring	0.091			0.031				x		
Survey summer					0.896				x	
Survey fall		0.437				0.638				x
Log winter			0.040				0.465			
Log spring	0.049			0.030				0.993		
Log summer					0.759				0.879	
Log fall		0.156				0.728				0.910

All but one of the significant differences between the average density of buoys/km^2 by method in Maine coastal waters using a 95% confidence interval were comparisons using the boat based surveys. Due to the spotty nature of the boat survey effort, interpolating methods have a tendency to overestimate around areas of gear hotspots

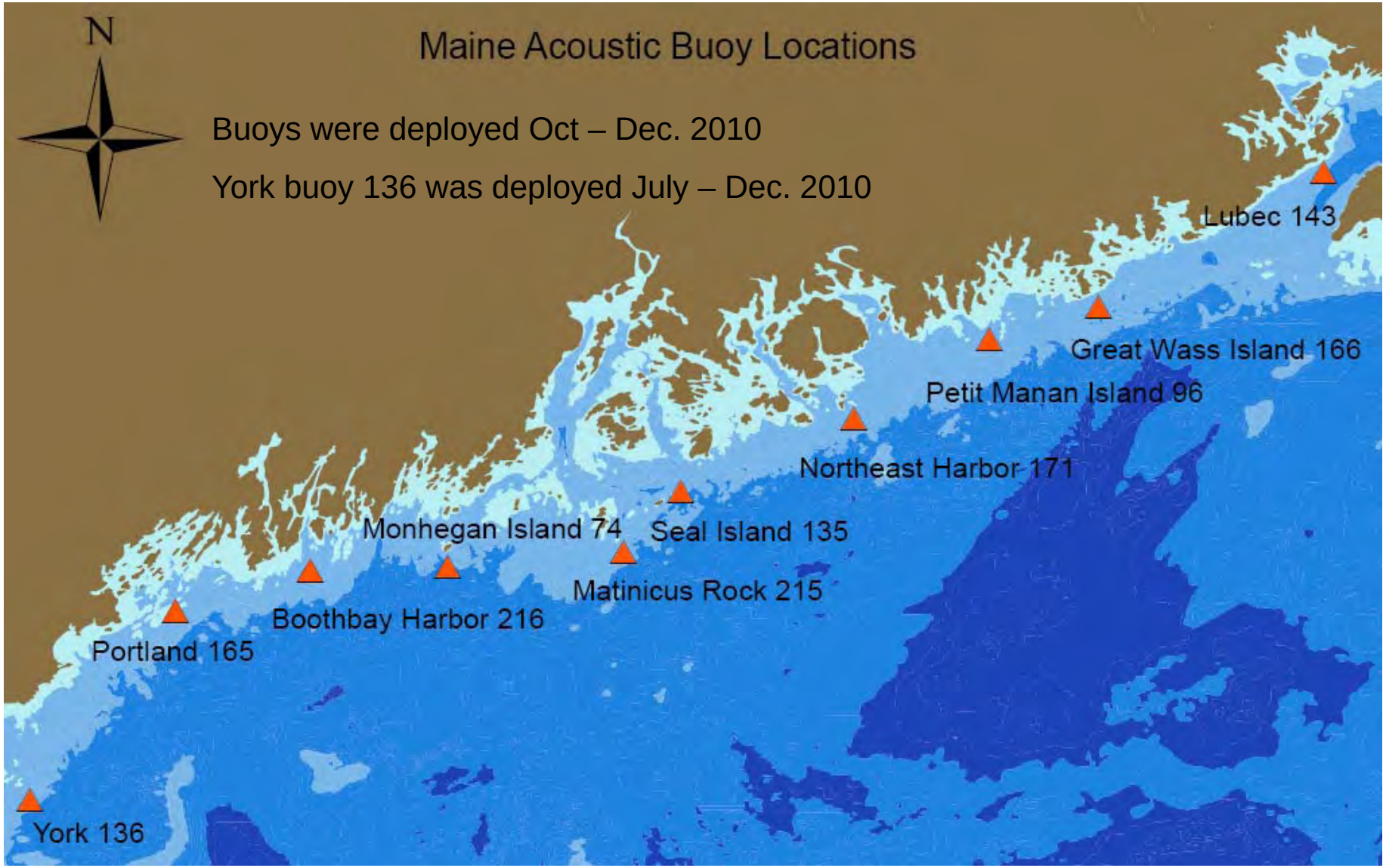
Buoy Density - Comparisons

- Aerial surveys obtain great spatial coverage and are therefore the most useful estimation of buoy density but are prohibitively expensive
- Boat surveys are a more cost effective way of ground-truthing survey data but the effort needs to be increased so that high and low spots are not over smoothed in interpolation processes
- DMR has a pending grant to continue and expand the boat survey portion of this work and assess the validity of this method as a monitoring tool

Acoustic Monitoring

- Acoustic Monitoring
  - 10 buoys set inside of state waters in the fall of 2010 and analysis is on-going
  - Pending grant proposal to continue and expand acoustic monitoring in both coastal and offshore waters of Maine

Acoustic Monitoring



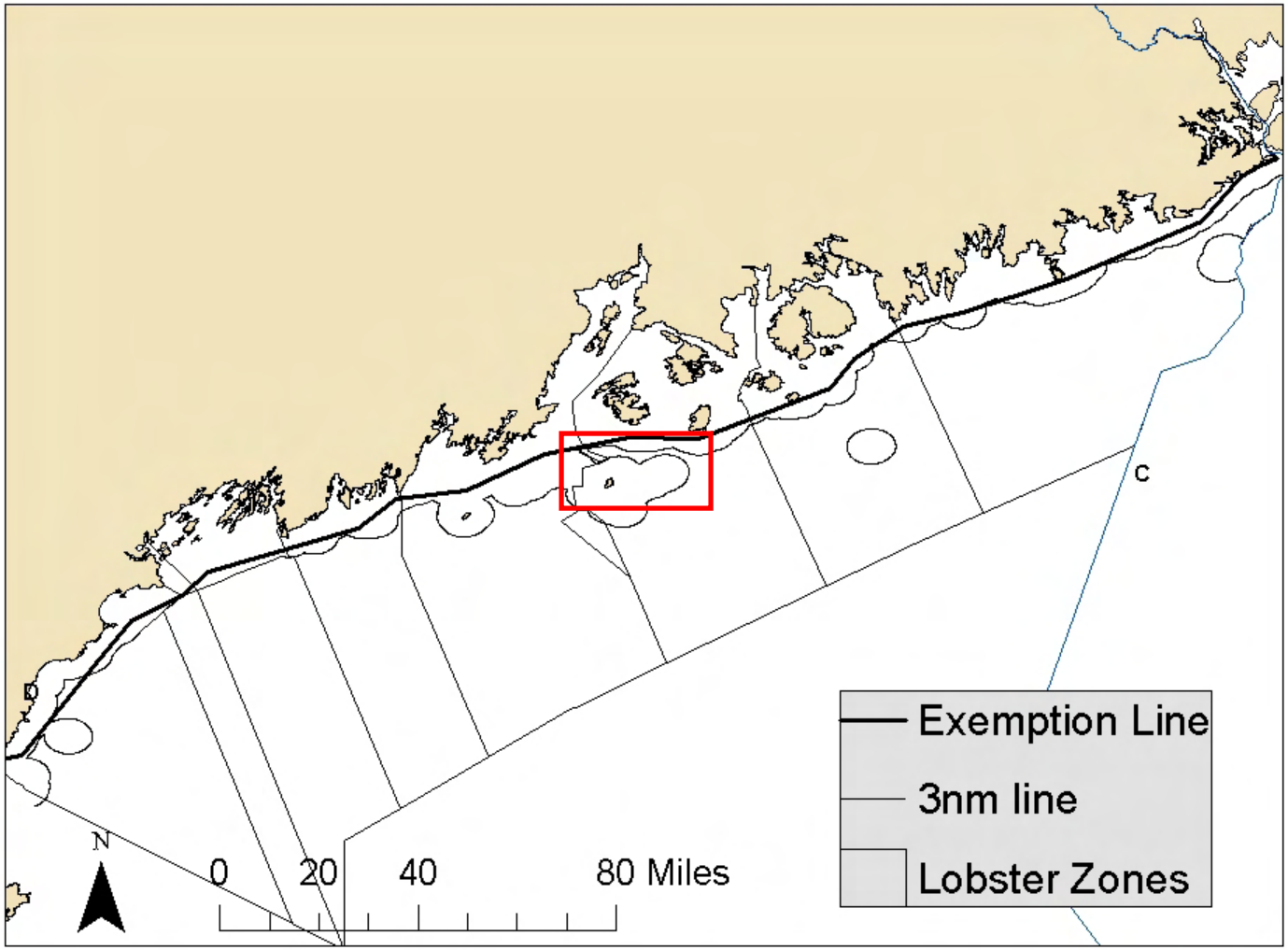
Acoustic Monitoring

Buoy Number	1 week block	Species	Present/absent?
143	20100918--20100924	Mn	Absent
143	20100918--20100924	Bp	Present
143	20100918--20100924	Eg	Present
143	20100925--20101001	Mn	Absent
143	20100925--20101001	Bp	Present
143	20100925--20101001	Eg	Present
143	20101002--20101008	Mn	Absent
143	20101002--20101008	Bp	Absent
143	20101002--20101008	Eg	Present
143	20101009--20101015	Mn	Present
143	20101009--20101015	Bp	Present
143	20101009--20101015	Eg	Present
143	20101016--20101022	Mn	Absent
143	20101016—20101022	Bp	Absent
143	20101016--20101022	Eg	Present
143	20101023--20101029	Mn	N/A
143	20101023--20101029	Bp	N/A
143	20101023--20101029	Eg	Present

Gear Trawling Project

- Six fishermen in Zone D who historically fish pairs set trawls August through Nov.
- Hauled 50 “experimental” traps in the following configurations: 2 sets of triples, 2 sets of 5’s, 2 7-trap trawls (1 with 1 buoy line and 1 with 2) and 2 10-trap trawls (1 with 1 buoy line and 1 with 2)
- Hauled 50 “control” traps that were rigged as normal as singles or pairs
- Kept logbooks documenting haul time, gear loss, catch rates, set location, depth, bottom type, etc.

Gear Trawling Project



Gear Trawling Project

- 4,145 hauls of “control” gear
- 4,823 hauls of “experimental” gear
- “Control” traps set on 55% mud/gravel bottom and 45% rock/hard bottom
- “Experimental” traps set on 68% mud/gravel bottom and 32% rock/hard

Gear Trawling Project

	Control	Experimental
Sternmen	2.3	2.3
Depth (fa)	36.1	38.5
EL length	49.9	51.7
Ratio	1.4	1.4
GL length	10.8	12.8
Count	2.7	2.6
Soak	6.5	6.7
CPUE	0.5	0.5
Haul time	3.3	9.5
Gear loss	2	91
Gear damage	20	131

Gear Trawling Project

- Only used 6 fishermen in one area – would like to expand to more areas and larger sample size
  - Some fished away from “regular” fishing area to avoid gear conflicts and move to softer bottom
- Funded research is a great way for fishermen to try things out without fear of economic loss
- Gear loss and damage substantial even on softer bottom in just 4 months of fishing
- Some positive experiences with lower gear loss, expenses and time
  - Depends on bottom type, number of sternmen, size of vessel, etc
  - One endline will not work over 5-traps

Gear Trawling Project

Weak Top Rope

- Sent ropes to Southwest Ocean Technologies for breaking strength testing
- Broken as a straight length to simulate fishing operations
- Tested different diameters, including 7/16 and 3/8”, as well as 11/32” spliced or knotted into the upper 1/3 of the line

Weak Top Rope

ID #	Rope Config	Rope Type	Diameter	AVG break strength	% strength reduction	% strength retained
1	Solid line	Sink	3/8	4203		
2	Solid line	Float	3/8	3636		
3	Solid line	Sink	7/16	4109		
4	Solid line	Float	7/16	4304		
5	Solid line	Sink	11/32	2592		
6	Spliced*	Float	3/8	2573	29%	71%
7	Spliced*	Sink	3/8	2573	39%	61%
8	Spliced*	Float	7/16	2477	42%	58%
9	Spliced*	Sink	7/16	2622	36%	64%
10	Knotted*	Float	3/8	1582	56%	44%
11	Knotted*	Sink	3/8	1614	62%	38%
12	Knotted*	Float	7/16	1740	60%	40%
13	Knotted*	Sink	7/16	1710	58%	42%

3/8” and 7/16” float or sink line with 11/32” sink line spliced into the upper 1/3 of the rope reduced the strength by 29-42% when compared to straight 3/8” or 7/16” lines but was not different than using just a 11/32” line

3/8” and 7/16” float or sink line with 11/32” knotted into the upper 1/3 of the rope reduced strength by 56-62% and is a 36% decrease from straight 11/32” line

None reach 1100lbs breaking strengths and the second scenario is counter to suggested knot free lines

Future Work

- Pending grants to continue and increase acoustic monitoring, annual log surveys and boat based buoy density surveys
- Utilizing spring 2012 to publish all of the data presented for the surveys, acoustics and gear work