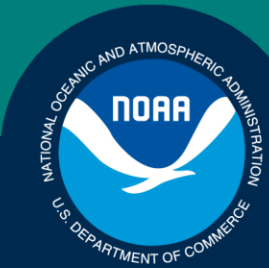


Science, Service, Stewardship



Georges Bank Flatfish Survey Cooperative Design and Results

Michael Martin - NEFSC

October 16, 2015

**NOAA
FISHERIES
SERVICE**

NOAA

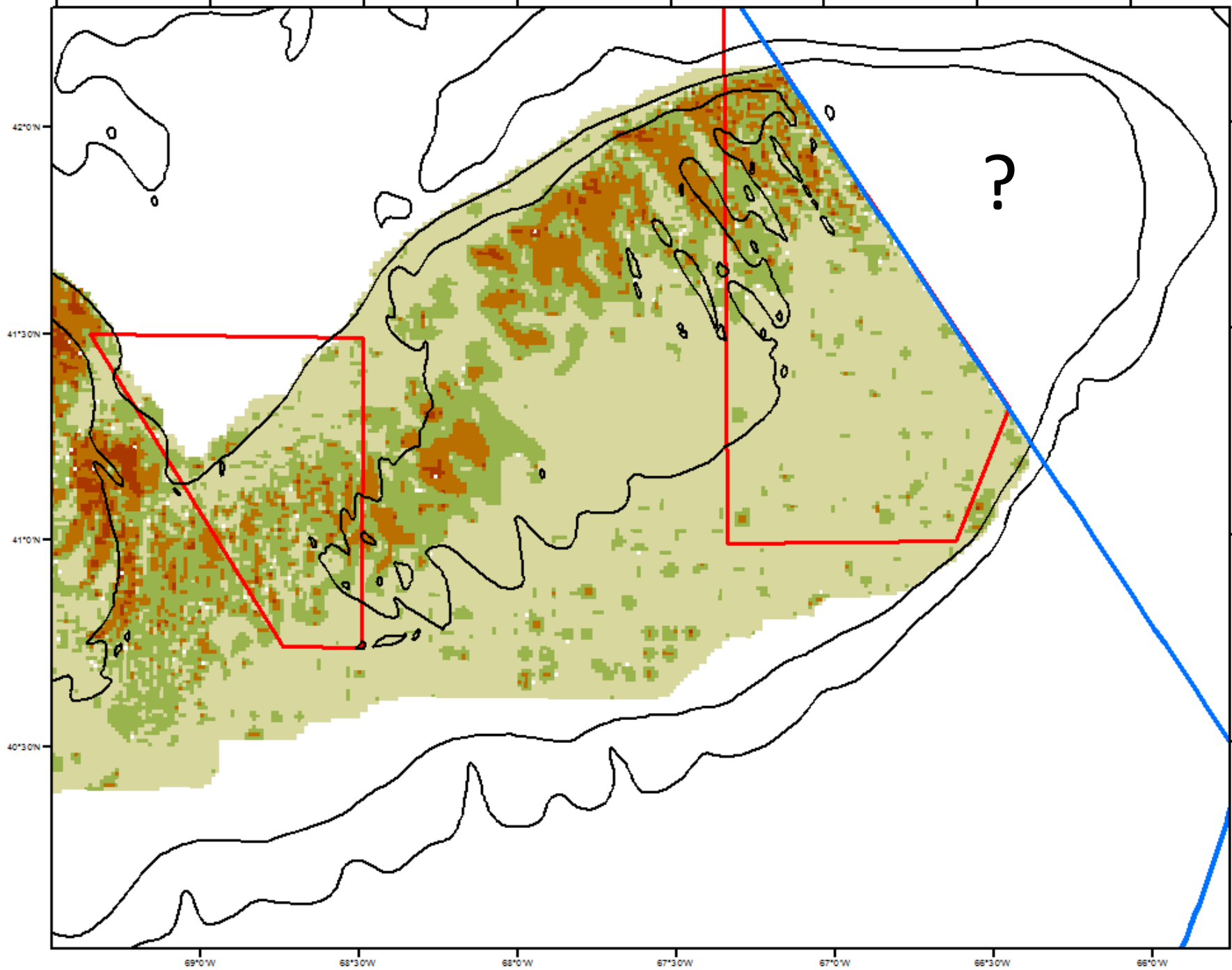
Collaborative Survey Planning

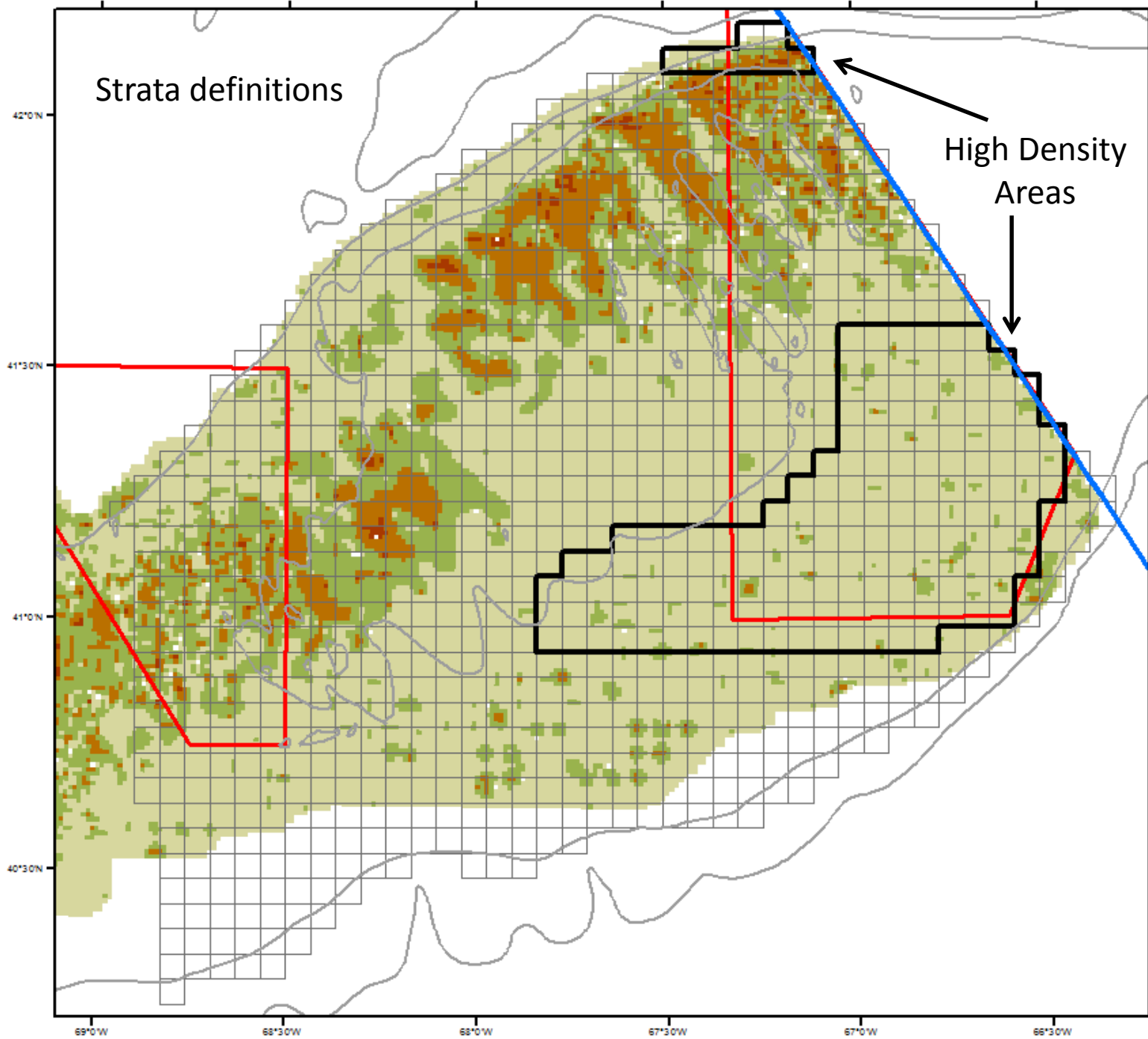
Survey planning meetings:

- June – early August, 2013
- New Bedford, Point Judith
- Fishermen, net manufacturers, NMFS scientists

Solicited Guidance on:

- Stratification
- Gear
- Trawling Protocols





Survey Design

- 925 total grid cells (3x3 nm)
- Untrawlable Areas
 - Harris and Stokesbury, 2010 (sand, pebble, cobble, boulder)
 - Considered untrawlable if:
 - any boulder
 - any cobble
 - > 50% pebble
 - 619 grid cells trawlable (67 %)

Stratum	Trawlable	Untrawlable	Total
High Density	150 (89%)	18 (11%)	168
Low Density	469 (62%)	288 (38%)	757

- Original allocation – Stratified random
 - 150 stations (89 in high density area, 61 in low density area)

Untrawlable Areas

42°0'N

41°30'N

41°0'N

40°30'N

69°0'W

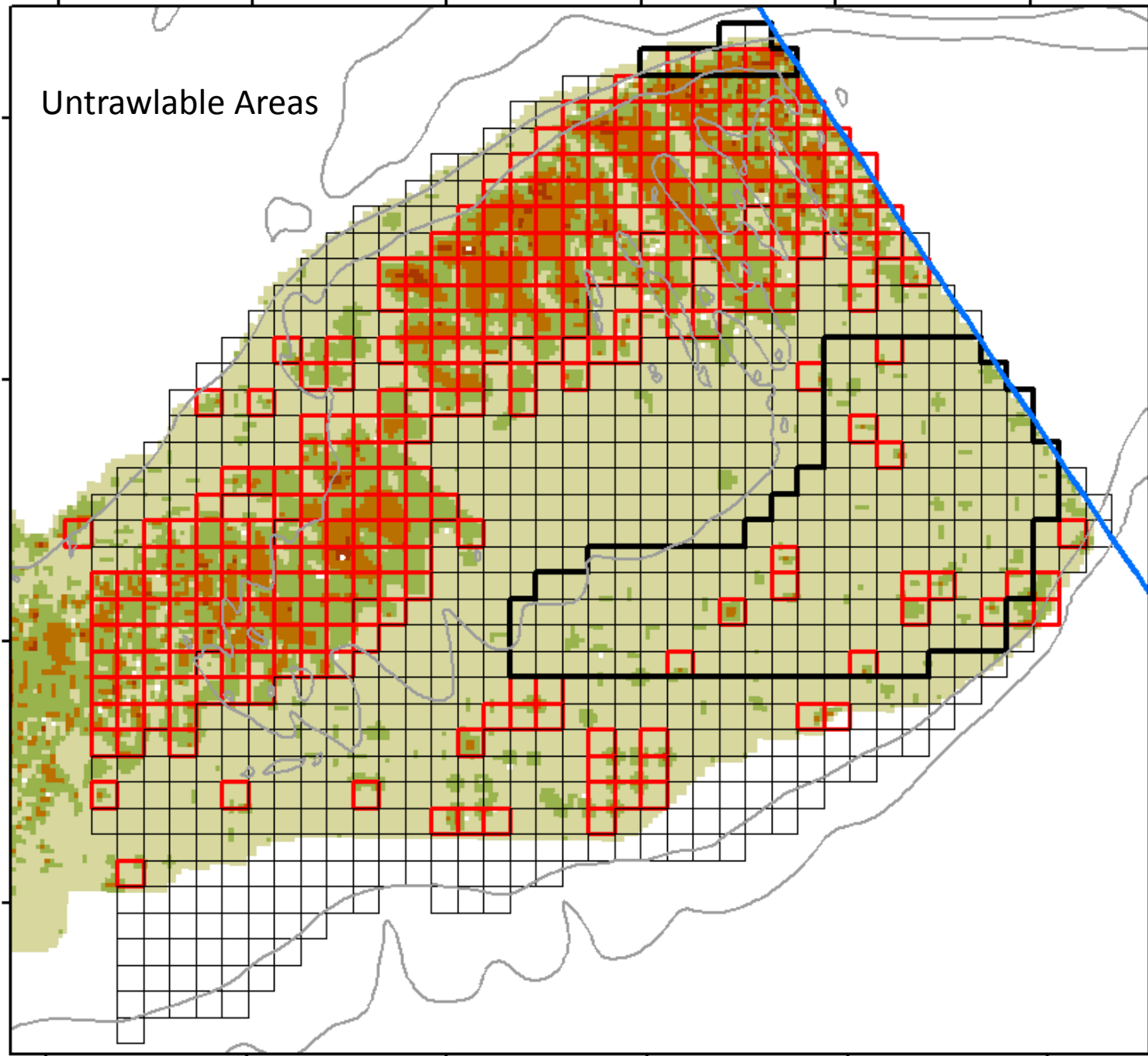
68°30'W

68°0'W

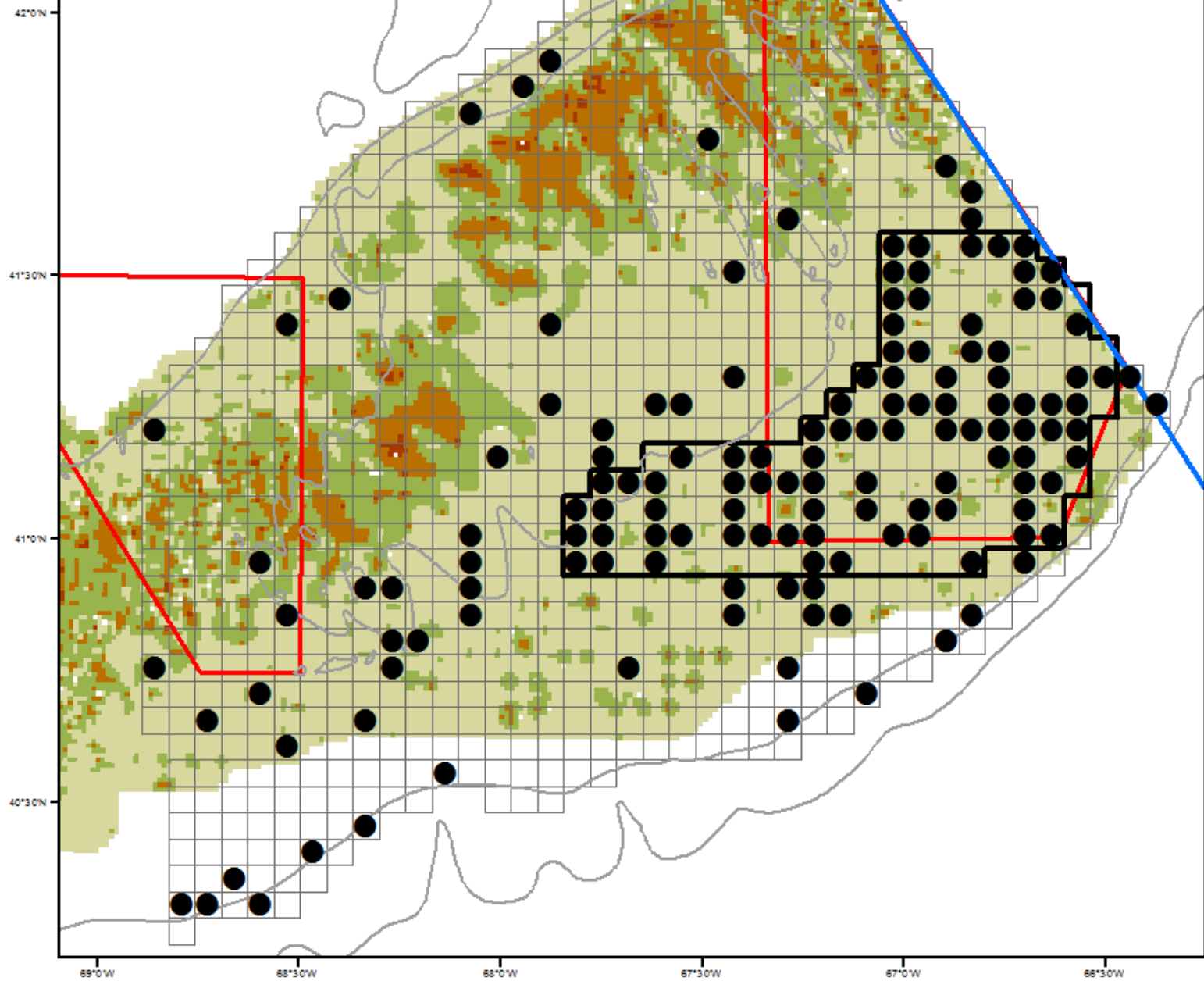
67°30'W

67°0'W

66°30'W



Original Station Allocation



Trawl

- Previously used in yellowtail flounder cooperative research survey (2003-2005)
- Two-seam, two-bridle flounder net
- Sweep - 4" rubber cookies
- 20 fathom bridles with 5 fathom extensions
- Two modifications to improve catch of smaller fish
 1. Mesh size in the lower wings and first bottom belly reduced from 20 cm to 12 cm
 2. 1" codend liner

Doors

- 84 inch 734 kg Thyboron type IV
- 23 fathom restrictor wire between the doors to ensure consistency in door spread

Trawling Protocols

- 20 minute tows (starting at winch lock)
- Speed 2.8 kts (2.6 – 3.0)
- Scope ratio 4:1
- $\geq 75\%$ of tow must be in grid cell
- If grid cell not trawlable – nearest unoccupied grid cell in correct stratum
- Door spread
- Temperature/Depth recorded (3 second interval) –
 - Seabird SBE39

Biological Protocols

- Yellowtail flounder and winter flounder sorted and weighed
- Everything else returned to water as quickly as possible
- If ≤ 150 fish – all fish measured
- Otherwise random subsample of 150 fish measured

- Age samples

Length Range (cm)	1-30	31-40	>40
Bin Interval	5	2	1
# of age Samples/bin	1	1	5

Survey Execution

- August 15 – 26, 2013
- Two vessels – Mary K and Yankee Pride
- 24 hour sampling

After 1 week:

- Clear we were going to finish allocated stations early
- Mean door spreads very consistent (41-42 m)
- Added 25 additional stations
- Re-allocated remaining tows to vessels in most efficient pattern

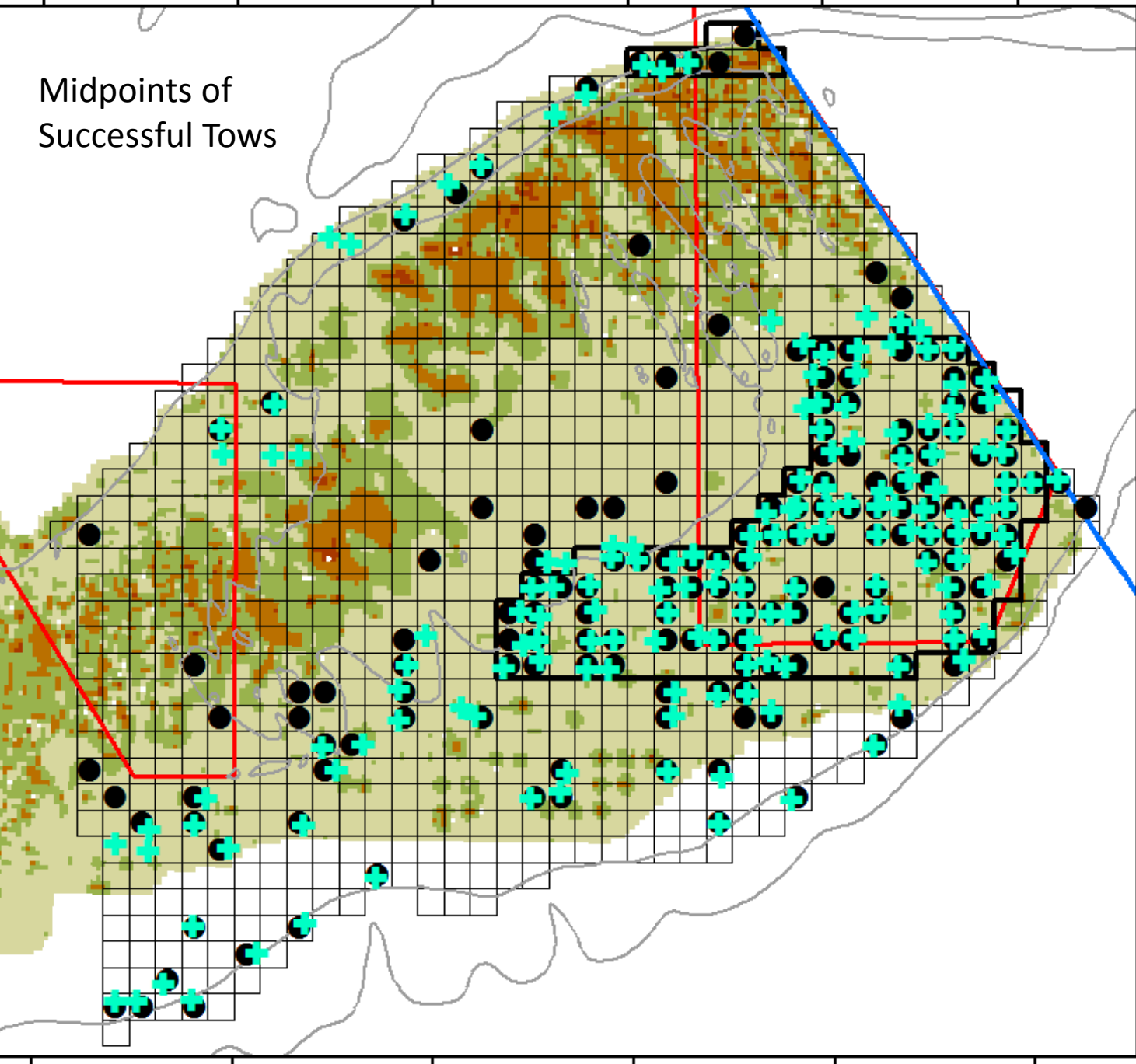
Midpoints of Successful Tows

42°0'N

41°30'N

41°0'N

40°30'N



68°10'W

68°30'W

69°0'W

69°30'W

70°0'W

70°30'W

Results

- Sampled 103 high density stations (~69% of available stations)
- Sampled 66 low density stations (~14% of available stations)
- Overall sampled 169 stations (~27% of available stations)

Catch per Tow (lbs.)

Stratum	Mean	Max
High Density	58.7	808.7
Low Density	13.0	178.3

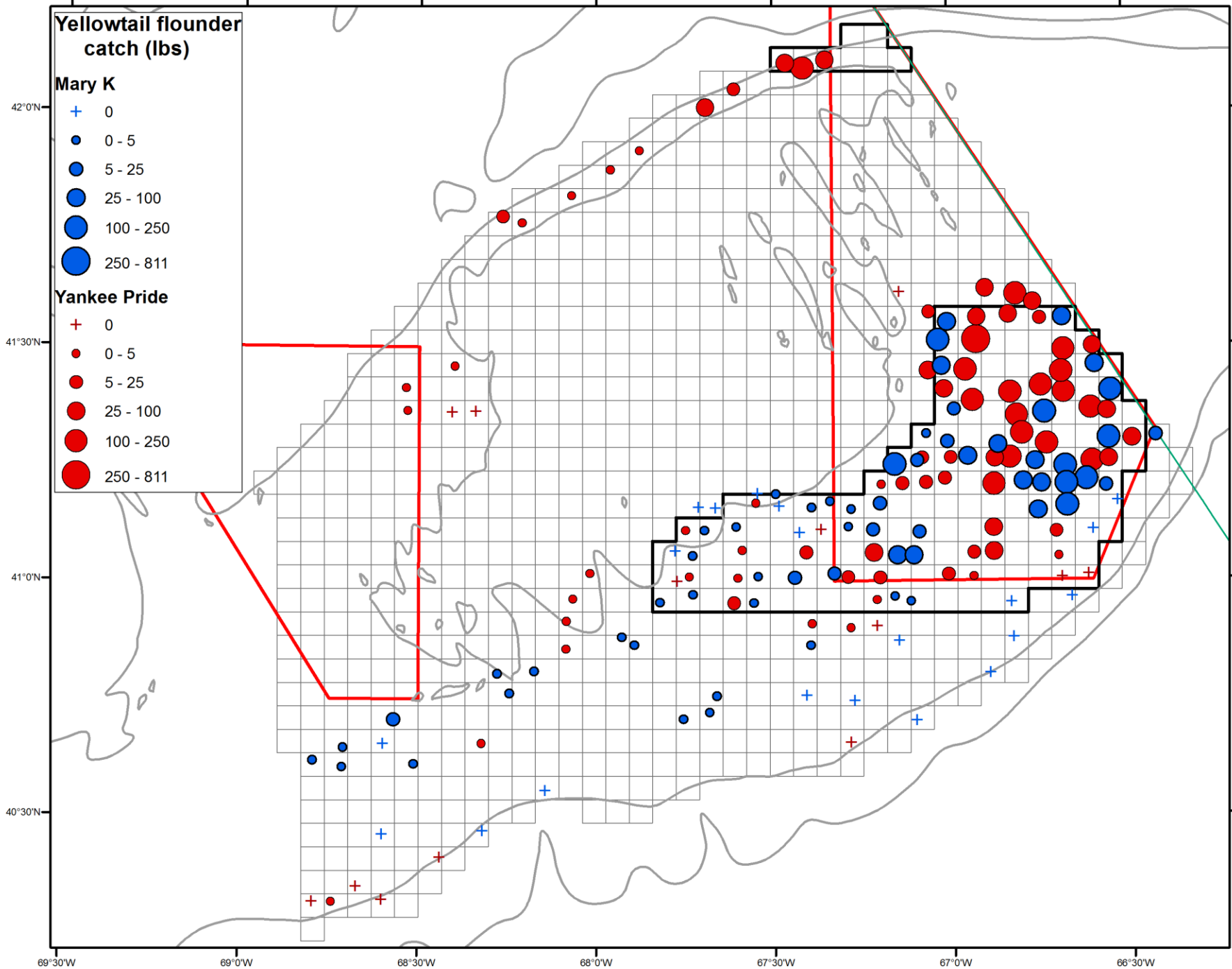
Yellowtail flounder catch (lbs)

Mary K

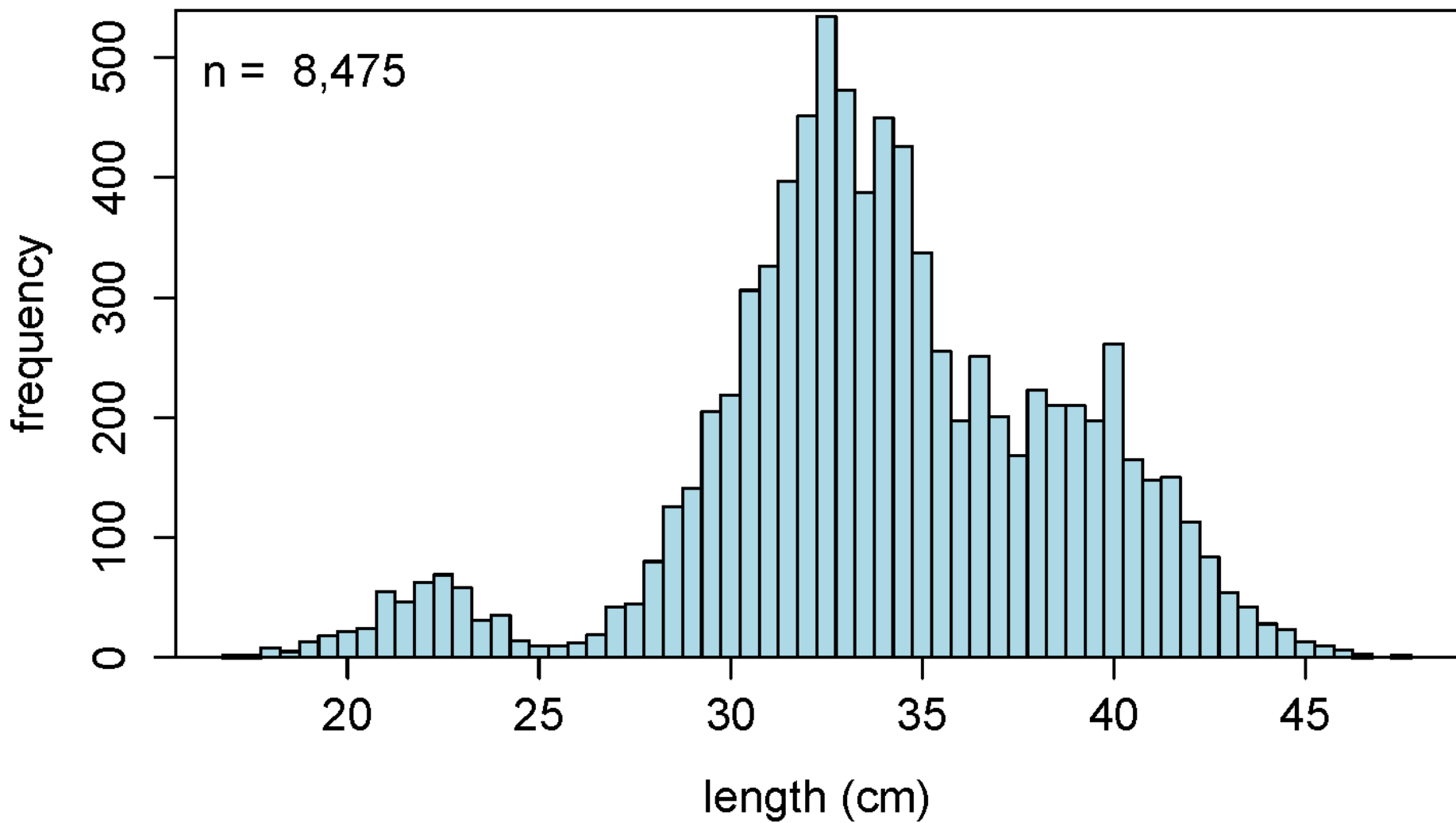
- + 0
- 0 - 5
- 5 - 25
- 25 - 100
- 100 - 250
- 250 - 811

Yankee Pride

- + 0
- 0 - 5
- 5 - 25
- 25 - 100
- 100 - 250
- 250 - 811



yellowtail flounder combined length frequency



Winter flounder catch (lbs)

Mary K

- + 0
- 0 - 3
- 3 - 10
- 10 - 25
- 25 - 50
- 50 - 140

Yankee Pride

- + 0
- 0 - 3
- 3 - 10
- 10 - 25
- 25 - 50
- 50 - 140

42°0'N

41°30'N

41°0'N

40°30'N

69°30'W

69°0'W

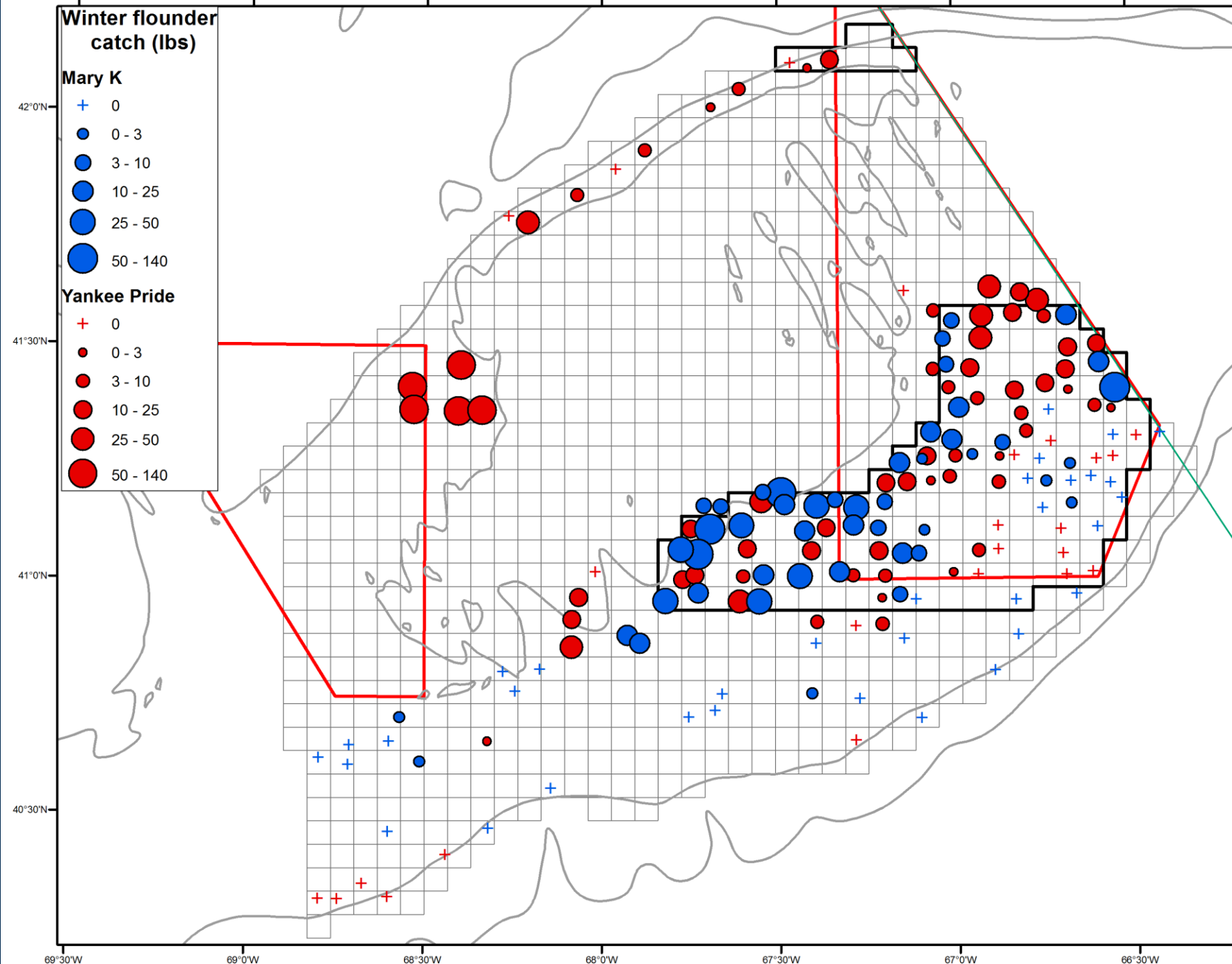
68°30'W

68°0'W

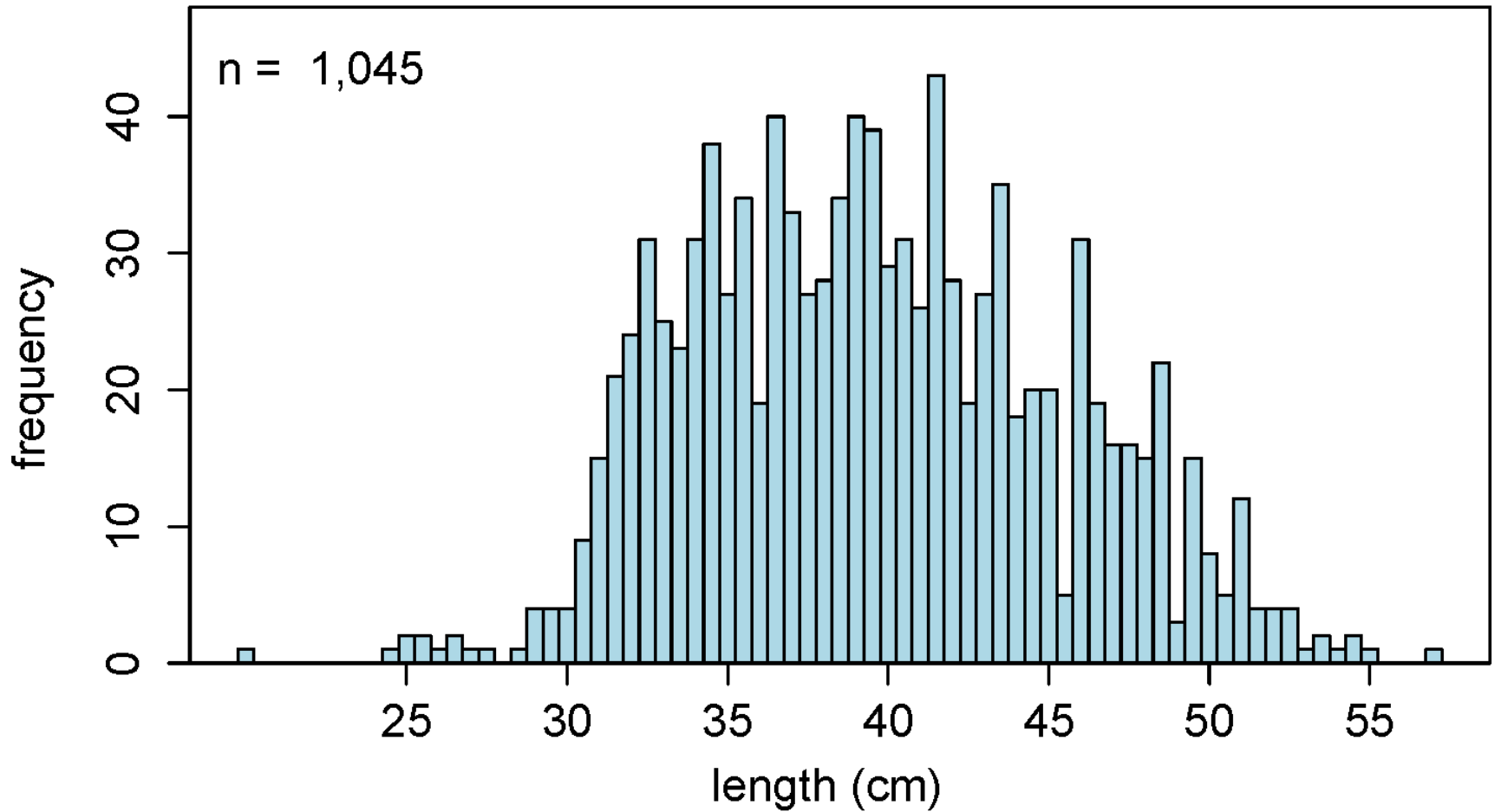
67°30'W

67°0'W

66°30'W



winter flounder combined length frequency



Area Swept Calculations:

- On bottom to off bottom from SBE39 data (depth recorder)
- Distance fished estimated from smoothed gps data
- Mean door spread estimated from spread sensor data
- Area swept = distance fished x mean door spread
- CPUE = catch/area swept

Biomass - Standard Stratified Random Calculation

- Within stratum mean CPUE x stratum area (with variance)
- Combined stratum estimates for total (with variance)

Biomass Estimates

stratum	biomass (mt)	min biomass (mt)	max biomass (mt)	population (1,000's)	min population (1,000's)	max population (1,000's)
high density	1,888	1,256	2,519	5,051	3,492	6,611
low density	1,873	617	3,128	5,525	1,861	9,189
total	3,760	2,353	5,168	10,576	6,590	14,563

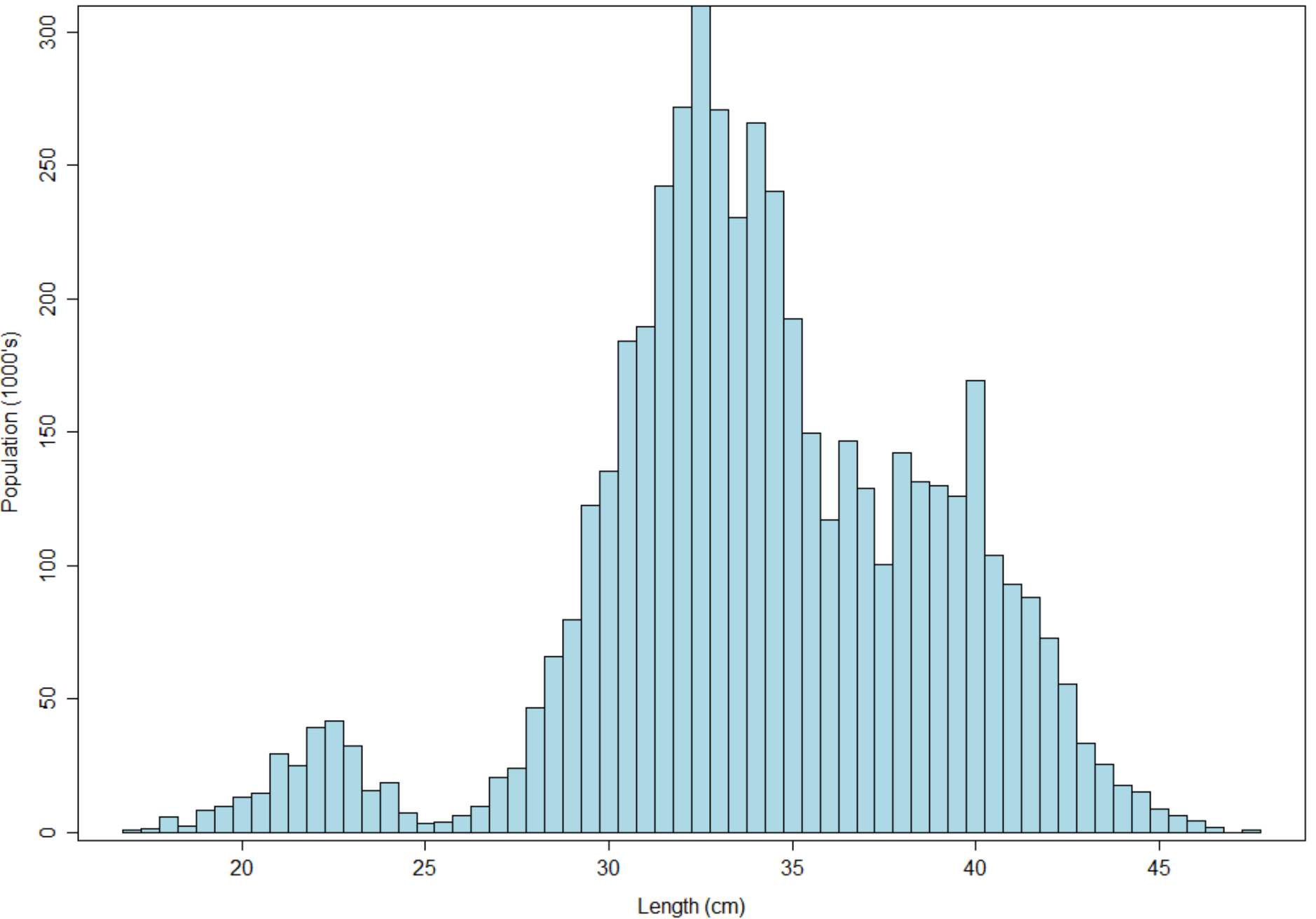
Not absolute biomass

- Unknown catch efficiency
- Large untrawlable area – uncertain boundaries

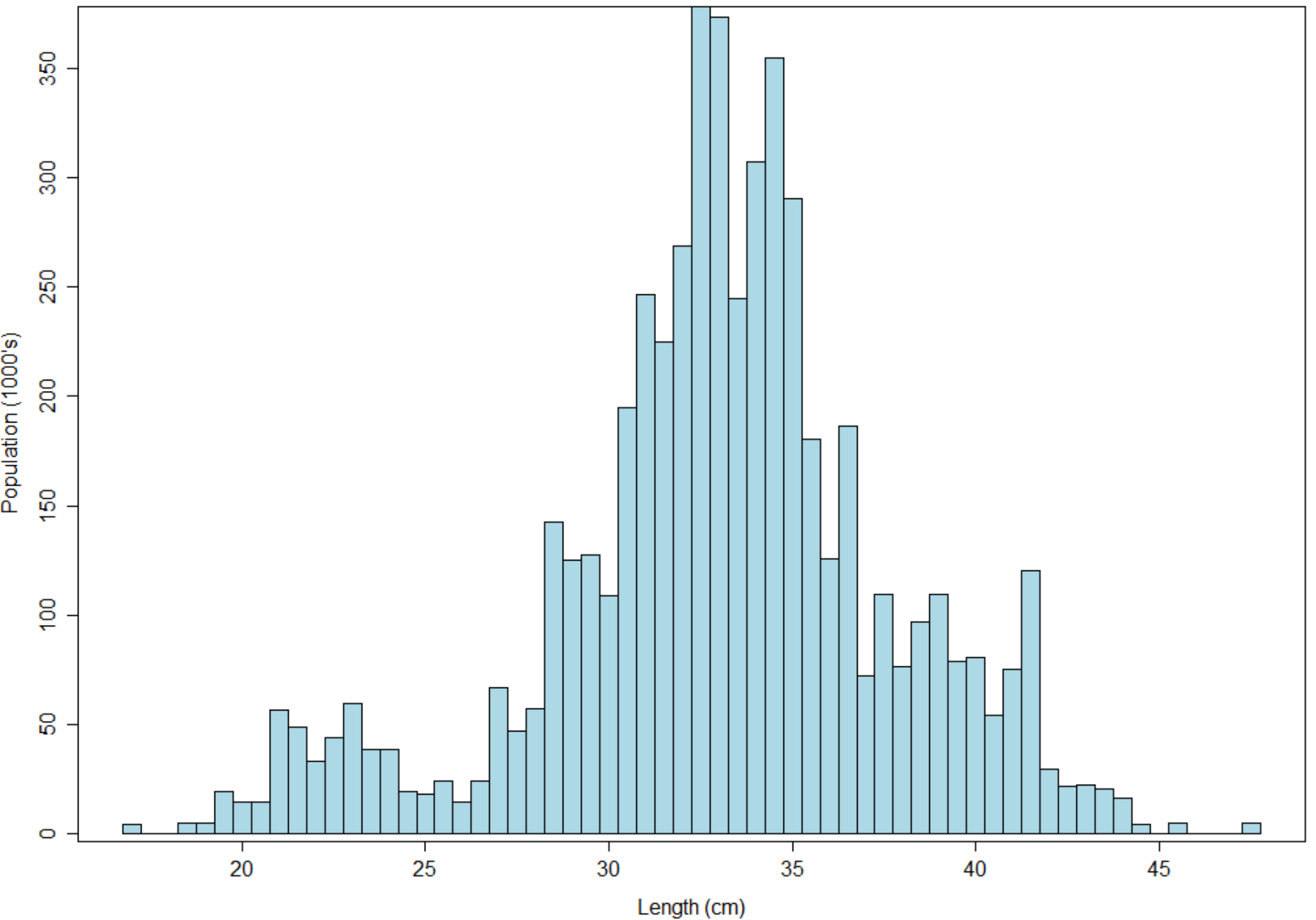
Trawlable Areas Only

stratum	biomass (mt)	min biomass (mt)	max biomass (mt)	population (1,000's)	min population (1,000's)	max population (1,000's)
high density	1,685	1,121	2,249	4,510	3,118	5,902
low density	1,160	382	1,938	3,423	1,153	5,693
total	2,846	1,883	3,808	7,933	5,267	10,600

Yellowtail Flounder Population Length Composition High Density

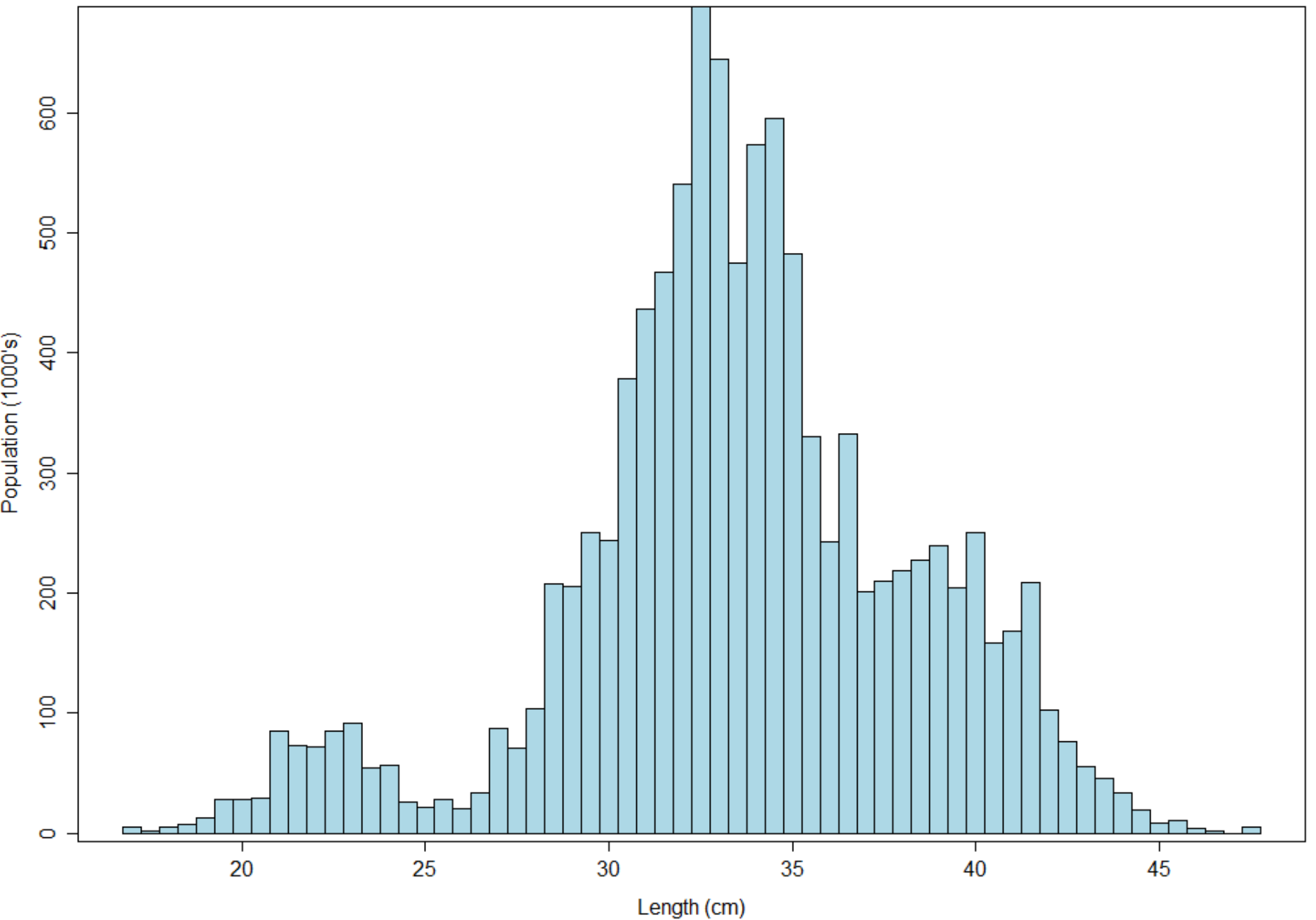


Yellowtail Flounder Population Length Composition Low Density



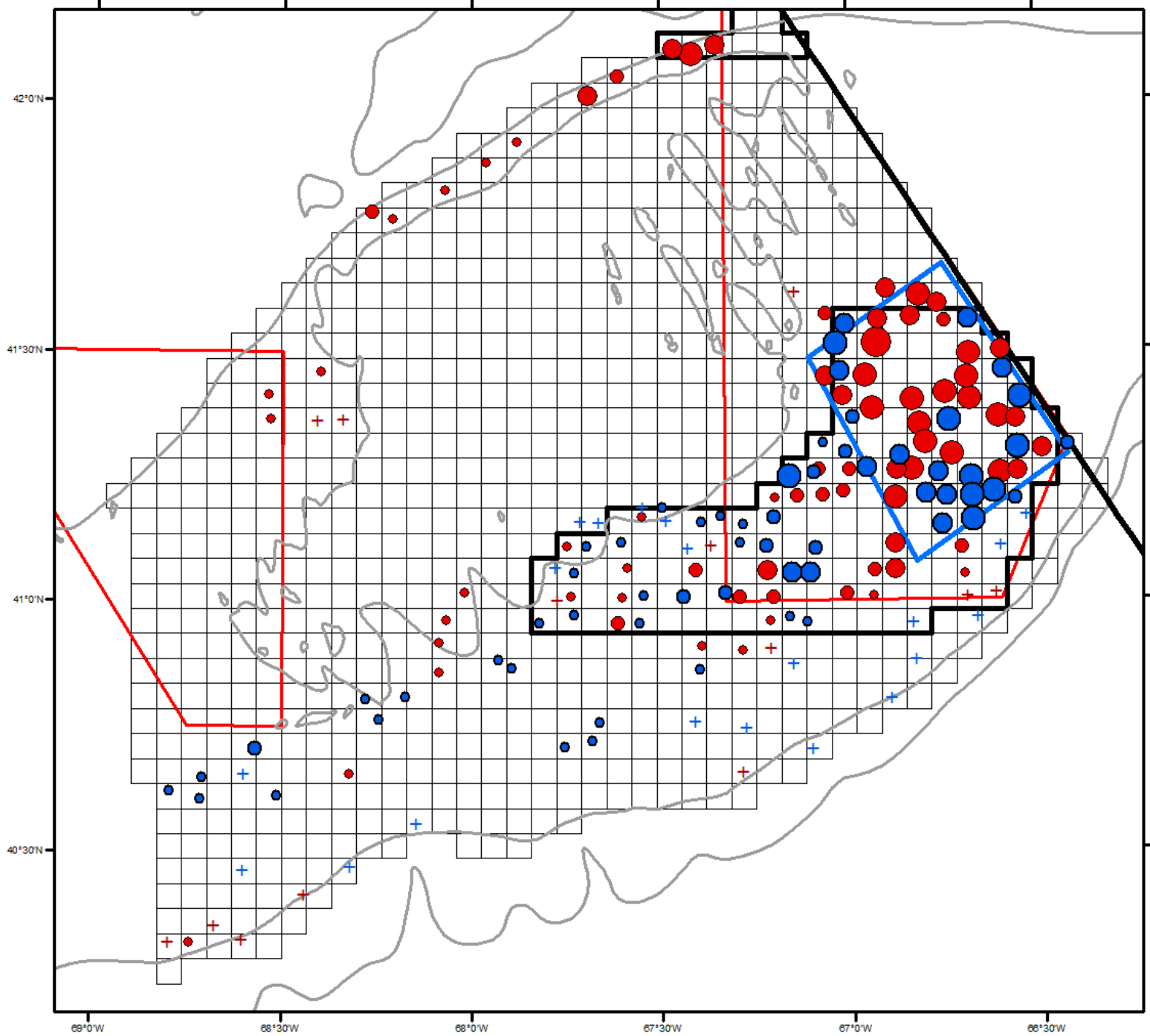
Yellowtail Flounder Population Length Composition

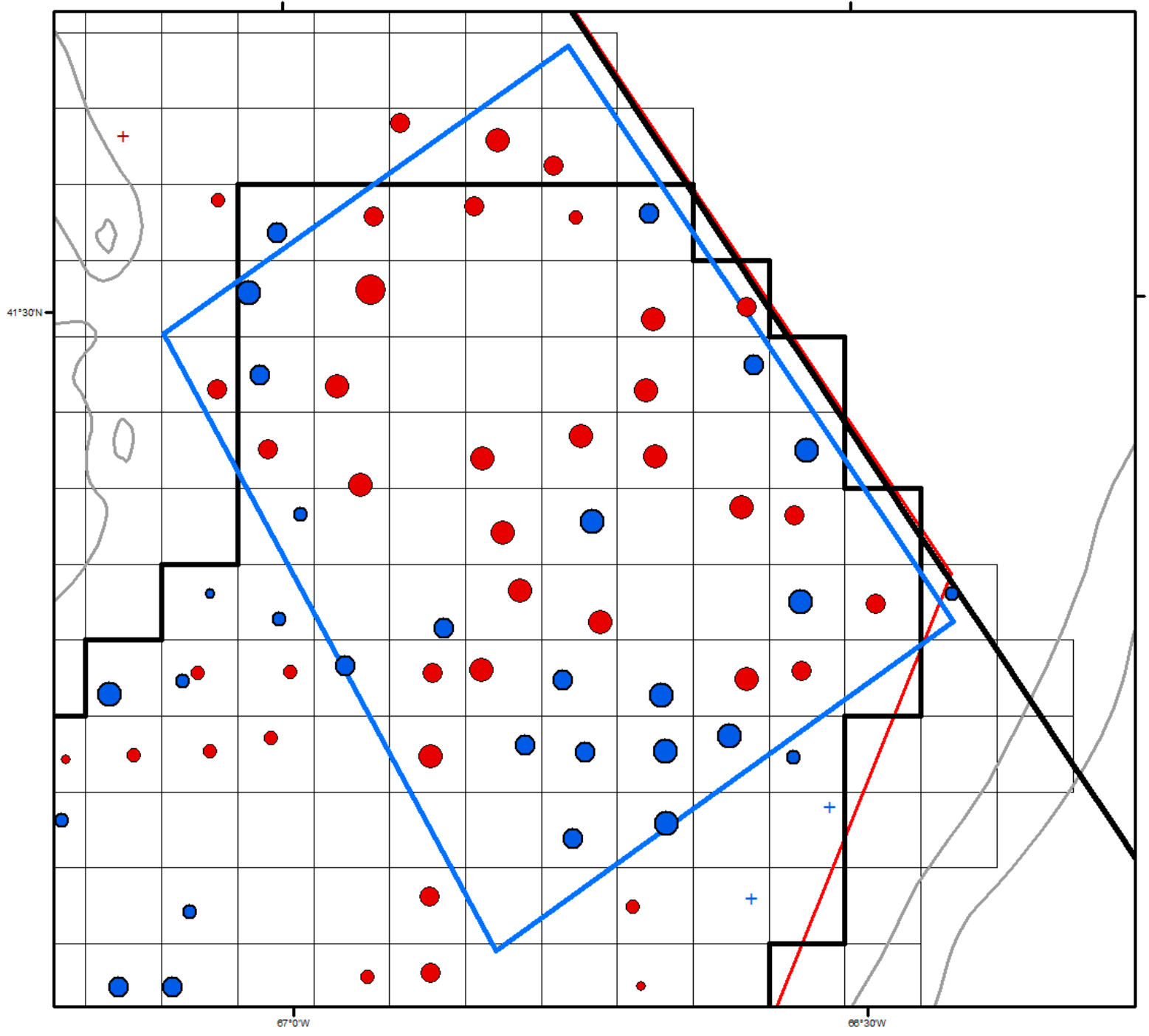
Total

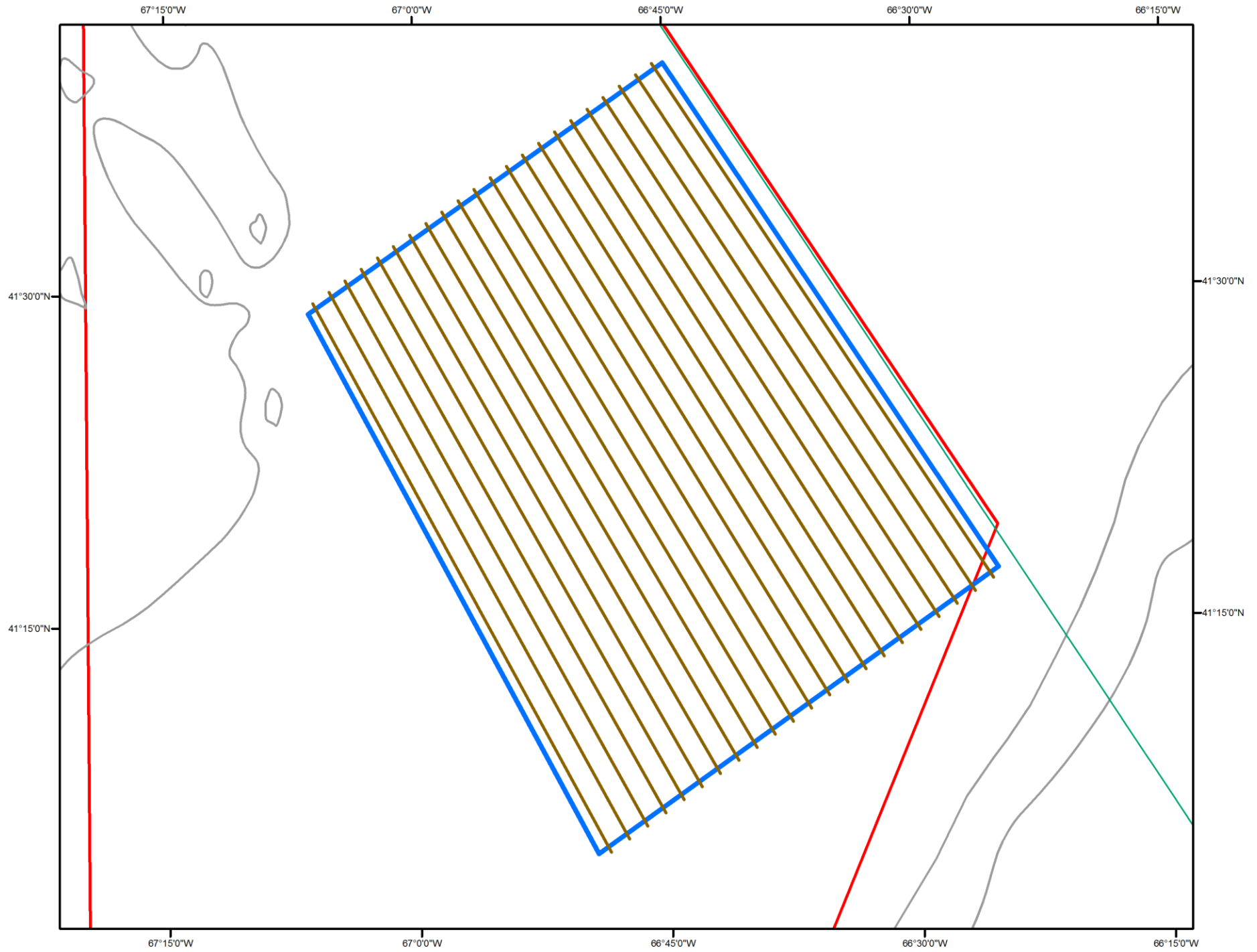


Hera-Bigelow paired tow catch efficiency study
October 17-20, 2014

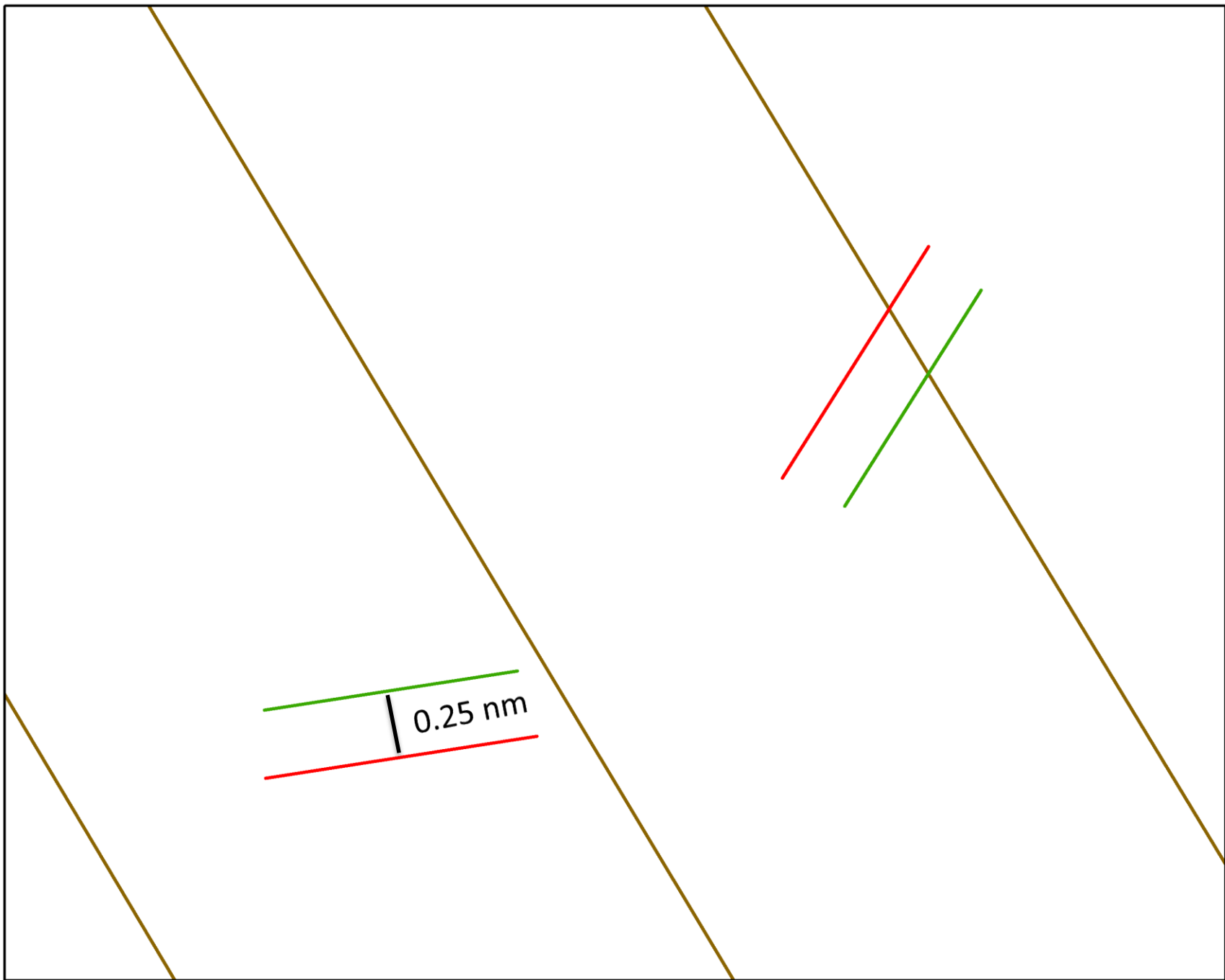












Study Area - ~51 km x 36 km (~28 nm x 16 nm)

Habcam

- 18 Habcam transects (each ~ 28 nm long)
- Transect spacing ~ .9 nm
- Start/End waypoints, course (true and magnetic)
- Along prevailing current

Trawl catchability comparison

- 53 paired tows (minimum separation of midpoints = 1.5 km)
- 0.25 nm between tows

Methods

24 hours/day

Hera – Same gear and protocols as for Pilot Flatfish Study

- 2.8 kts target speed for 20 minutes
- 84 inch 734 kg Thyboron type IV
- 23 fm (42 m) restrictor wire between the doors to ensure consistent door spread

Bigelow – Standard survey protocols

- 3.0 kts target speed for 20 minutes

Effort = on bottom to off bottom

CPUE's in kg/km²

Preliminary results

- Modeled estimates not complete yet
 - Need to include numbers, lengths
 - More accurate, robust answer available soon

Ratio of overall weight CPUE's

species	Hera CPUE	Bigelow CPUE	Ratio
fourspot flounder	199.71	38.69	5.16
yellowtail flounder	520.25	239.04	2.18
monkfish	67.23	37.63	1.79
sea scallop	435.46	197.82	2.20
winter flounder	173.94	58.97	2.95
windowpane	30.18	11.07	2.73

- Hera/Bigelow flatfish CPUE ratios larger during daytime
- No Habcam results yet