Science, Service, Stewardship

Aleutian Islands 2010 Bottom Trawl Survey

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Overview

Survey description

- Survey Objectives
- Survey Design
- Effort Allocation
- Gear
- Protocols

Results from 2010 AI survey

- POP, Atka mackerel, pollock, cod
- Spatial Distribution
- Relative Abundance
- Size Composition
- Abundance Inside/Outside Critical Habitat?

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Survey Objectives

A standardized time series of groundfish population estimates for use in stock assessment

- Relative abundance
- Size and age composition
- Spatial distribution
- Biological parameters (sex, age, condition, feeding habits)
- Ancillary data (e.g., temperature, light, acoustic)
- Special projects

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General Survey Design

- Chartered commercial fishing vessels
- 2 vessels – 70 days (beginning June – mid August)
- Vessels generally 38-50 m LOA, 1700+ HP
- 5 vessel crew + 6 scientists

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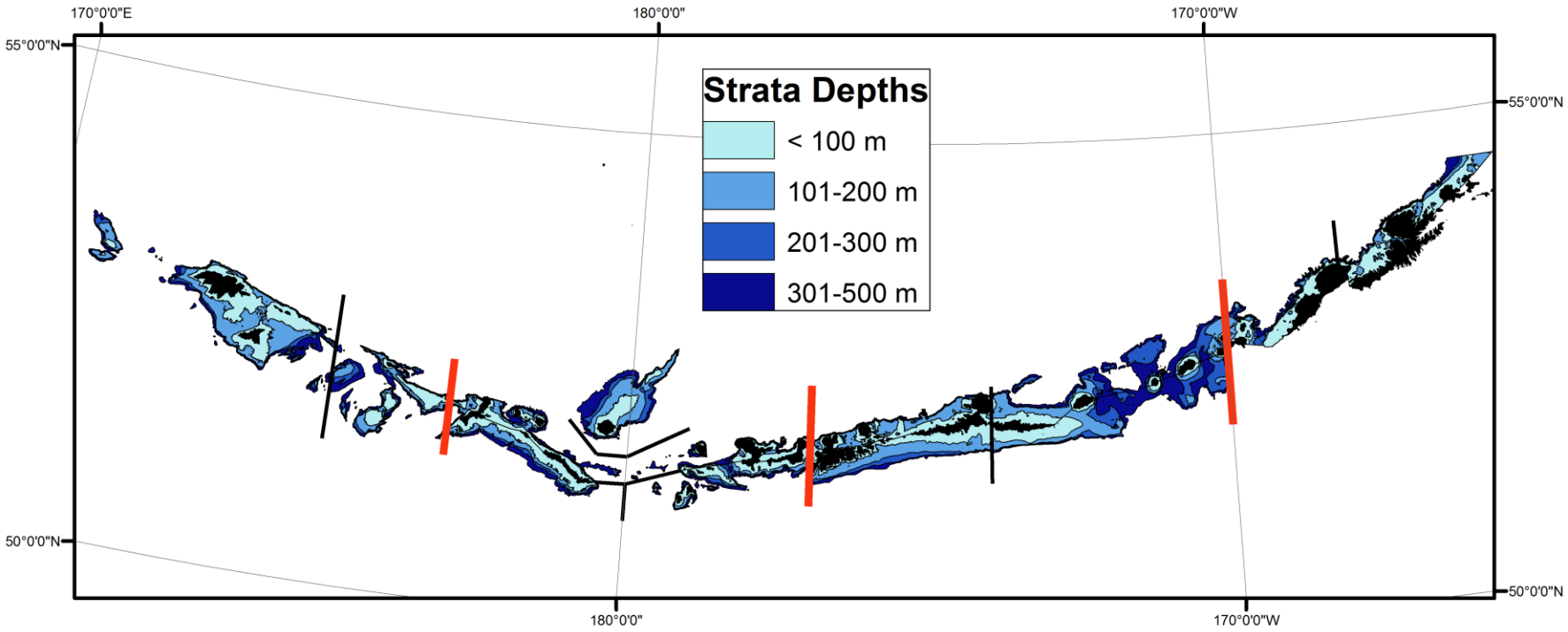
General Survey Design

- Stratified-random survey
- 45 strata based on regulatory areas, bathymetry
- Stations formed from intersection of 5x5 km grid with strata boundaries


170°0'0"E
180°0'0"
170°0'0"W
55°0'0"N
50°0'0"N
Strata Depths
< 100 m
101-200 m
201-300 m
301-500 m

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Strata by Depth

Depth Range	Area (km^2)	% of Total Area
< 100 m	21,598	33.5%
101-200 m	19,540	30.3%
201-300 m	9,298	14.4%
301-500 m	13,979	21.7%
Total	64,415	

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Strata by Regulatory Area

Survey Area	Area (km2)	% of Total Area
Western AI	15,190	23.6%
Central AI	16,543	25.7%
Eastern AI	25,200	39.1%
Southern Bering Sea	7,482	11.6%
Total	64,415	

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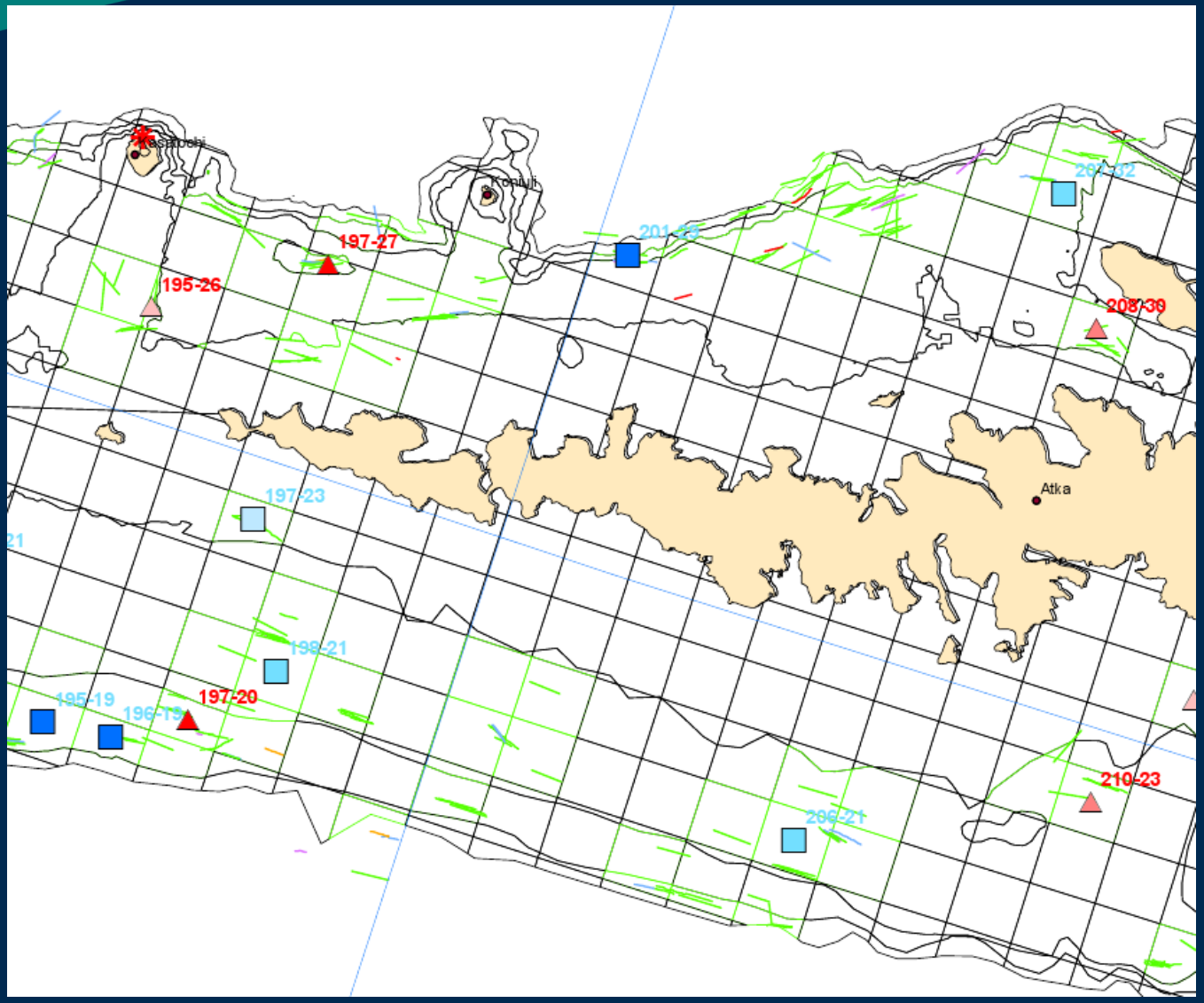
Stations



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Effort Allocation

Neyman allocation for each species (19 species in 2010)

- Variance, strata area
- Weighted mean based on abundance, economic value
- Allows individual contributions of each species/stratum to be examined
- Stations selected from previously towed stations
- Random vessel assignment

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Survey Frequency

- Triennial from 1980 to 1997
  - 1980-1986: Cooperative survey with Japanese vessels (tire gear, objectives?)
- Biennial 2000 – present
  - even years

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AI Survey Stations

Year	Stations	Comment
1980	121	30 min duration
1983	285	
1986	379	
1991	331	
1994	380	15 min duration
1997	396	
2000	416	
2002	414	
2004	419	
2006	357	
2008	0	No survey
2010	417	

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2010 Allocation by Depth

Stratum Depth (m)	2010 Allocation	Tows/1000 km^2
1-100	128	5.93
101-200	171	8.75
201-300	83	8.93
301-500	38	2.72
Entire Survey	420	6.52

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2010 Effort Allocation

INPFC Area	2010 Allocation	Tows/1000 km^2
Western AI	118	7.77
Central AI	129	7.80
Eastern AI	122	4.84
Southern Bering Sea	51	6.81

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2010 Effort Allocation Species Contributions

Species	% of Effort Allocation
Pacific ocean perch	32.1
pollock	16.8
Pacific cod	16.4
Atka mackerel	15.2
Total	80.5

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General Survey Design

- 15 minute trawl (~1.5 km distance fished)
- Poly Nor ‘Eastern net with rollers & bobbins

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Poly Nor'eastern Net

- 12.7 cm mesh
- 3.2 cm liner
- 4 seams
- 3 bridles
- 36 cm bobbins
- 10 cm disks
- Net width: 12 to 18 m
- Net Height: 5.7 to 9 m

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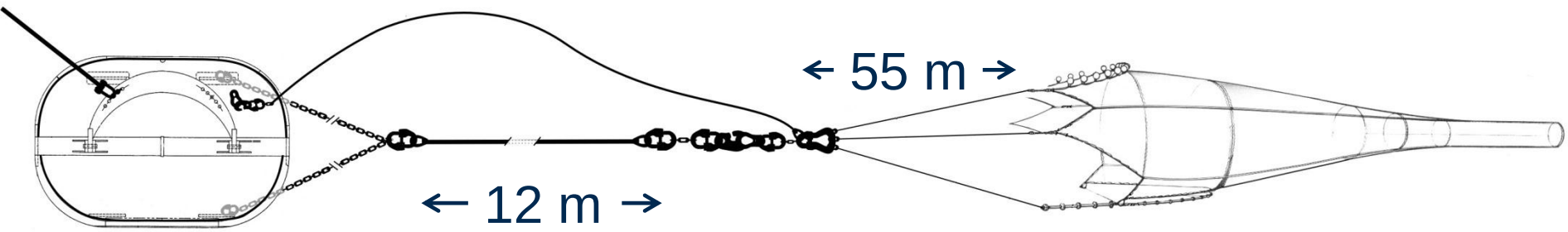
Poly Nor'eastern Net



1.8 x 2.7 m

816 kg

Main wire standard = 2.54 diameter (have used up to 2.98 cm)

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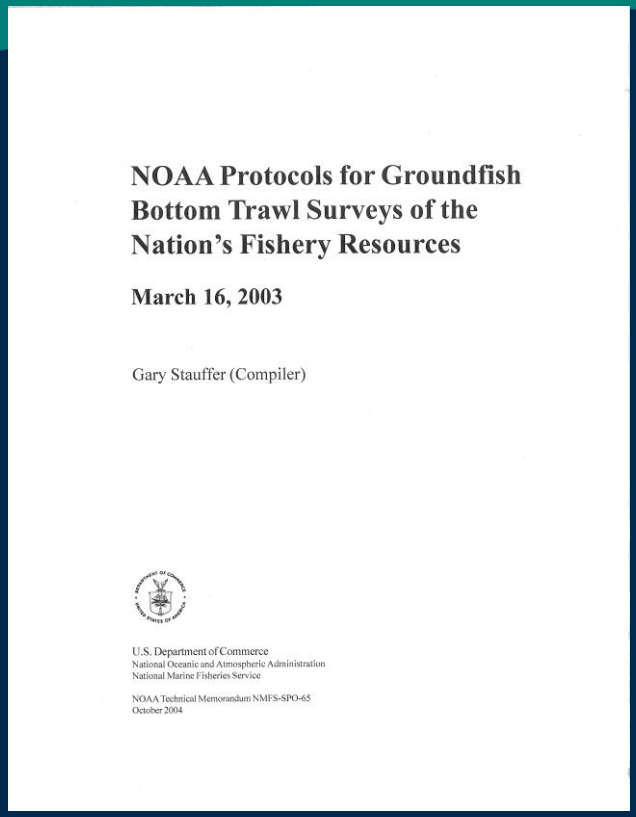
Bottom Trawl Survey Protocols


NOAA Protocols for Groundfish Bottom Trawl Surveys of the Nation's Fishery Resources

March 16, 2003

Gary Stauffer (Compiler)

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

NOAA Technical Memorandum NMFS-SPO-65
October 2004

- Warp Measurement & Monitoring
- Bottom Contact Sensor
  - Tow length = on bottom – off bottom
- Net spread measurement (wing tips)
- Use and Maintenance of AutoTrawl System
- Operations Procedures
- Trawl Construction & Repair
  - Gear Repairs Monitored to Conform to Standards

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Criteria for Good Performance Tow

- 15 minutes towing time
- Constant speed of 3 knots
- Correct scope
- Net mensuration within normal limits
- Constant gear contact with the seafloor
- No hang ups, gear damage, or gear conflicts
- During daylight hours
- Satisfactory performance allows some deviation

Effort Data

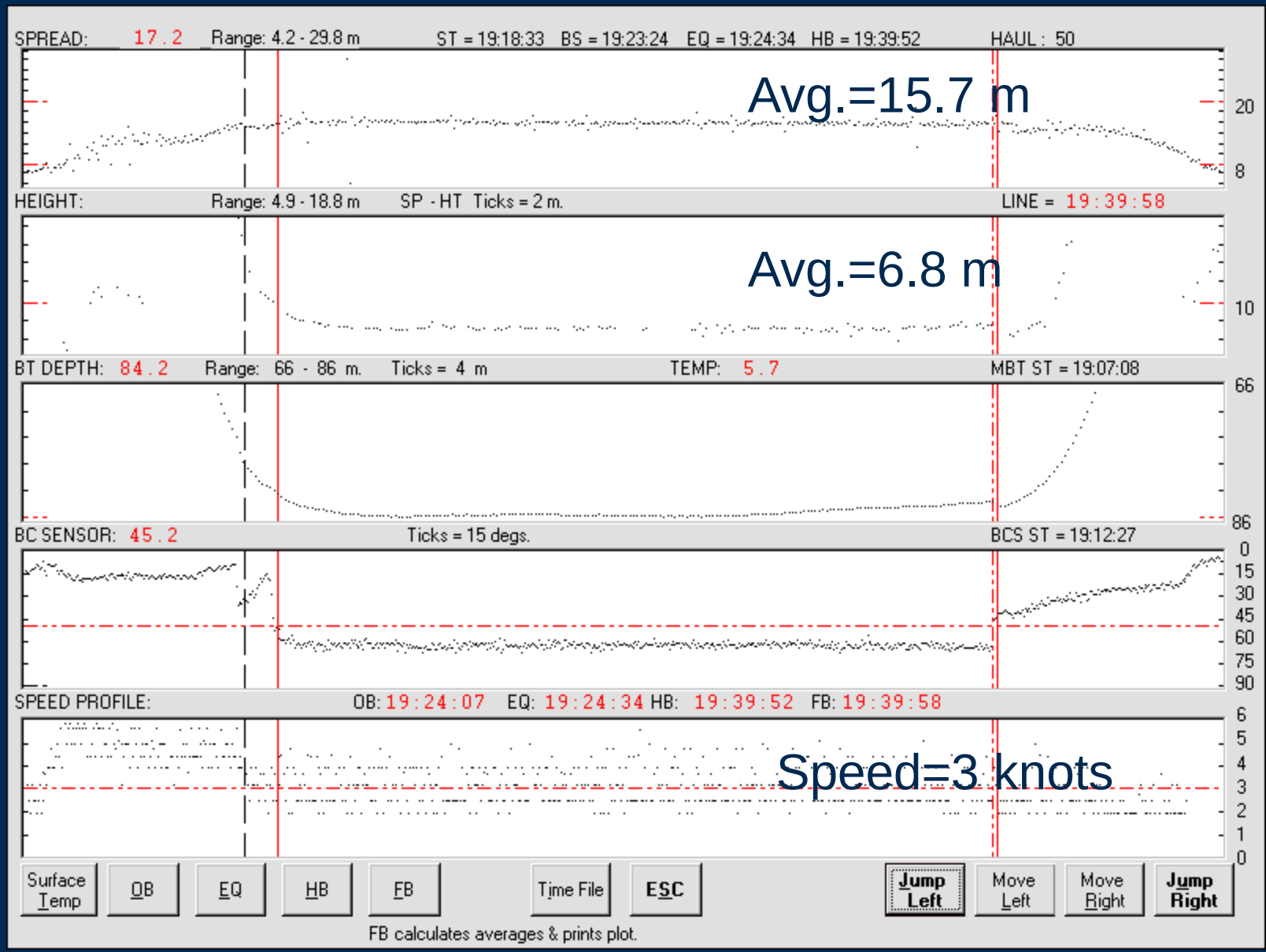
Wing Spread

Net Height

Headrope Depth

Bottom Contact

Speed



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Catch Processing

- All specimens sorted to lowest possible taxon
- Weigh and count (subsample when n > target length #)
- Length = random subsample of catch
- Otolith specimens subsampled from length collection

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Specimen Information

- Age structure (otoliths)
- Diet (stomach scans)
- Life history (maturity, growth)
- Rare or undescribed species

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Data Processing

- Electronic and manual data capture
- Interim database at sea
- Data checking at sea
- Upload to Oracle database
- Extensive data checking, fully audited changes
- Moving toward direct electronic entry to Oracle database
  - wheelhouse (effort) - implemented
  - deck (catch, length etc.) – in progress

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Relative Biomass Estimation:
Area Swept
(net spread x distance fished)

For each Haul:

CPUE=Catch (kg or #) / Area Swept (km^2)

For each Stratum:

Abundance = mean (CPUE) x Stratum Area

Var(Abundance)= (Var(CPUE)/# hauls) x Stratum $Area^2$

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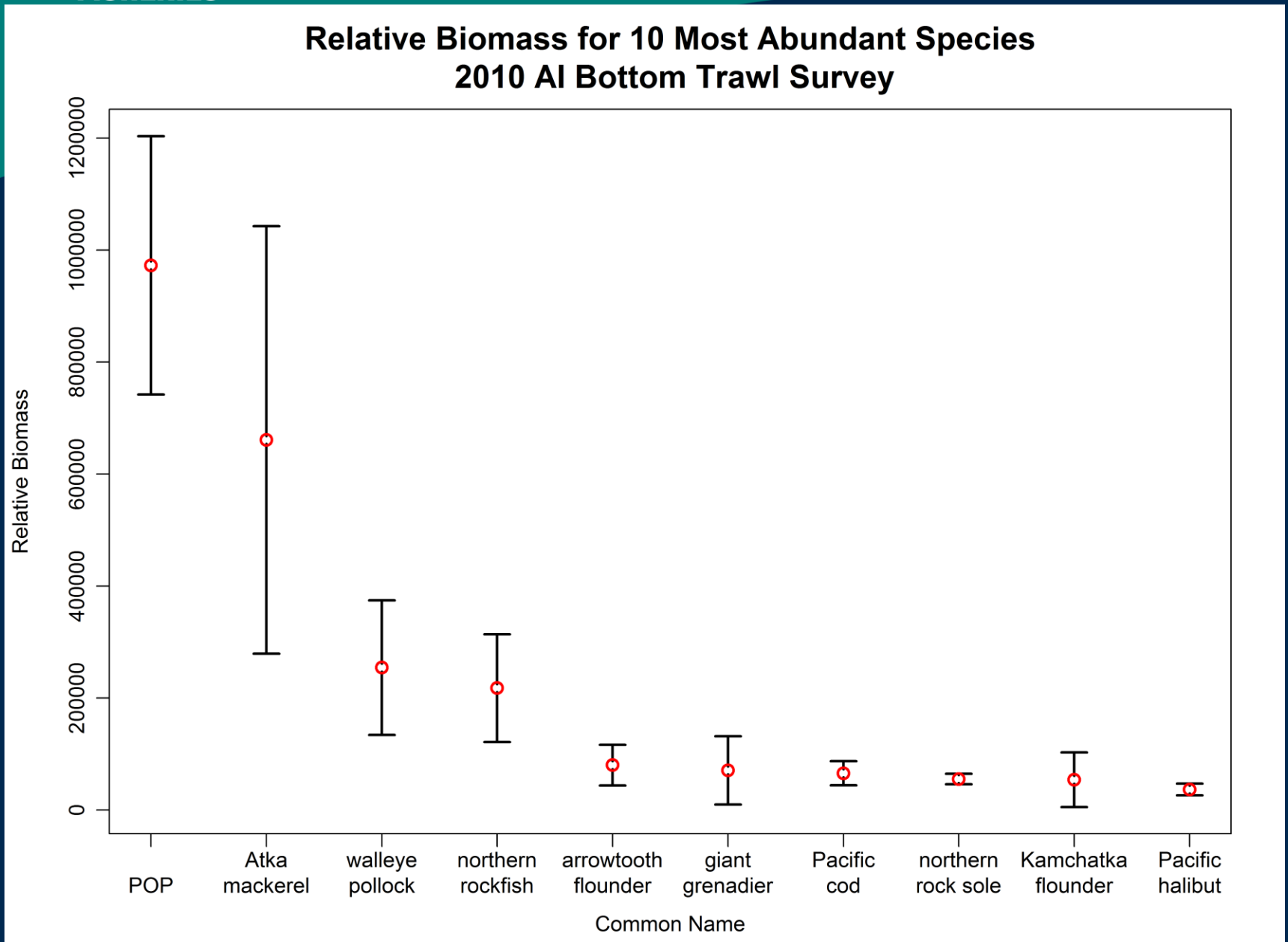

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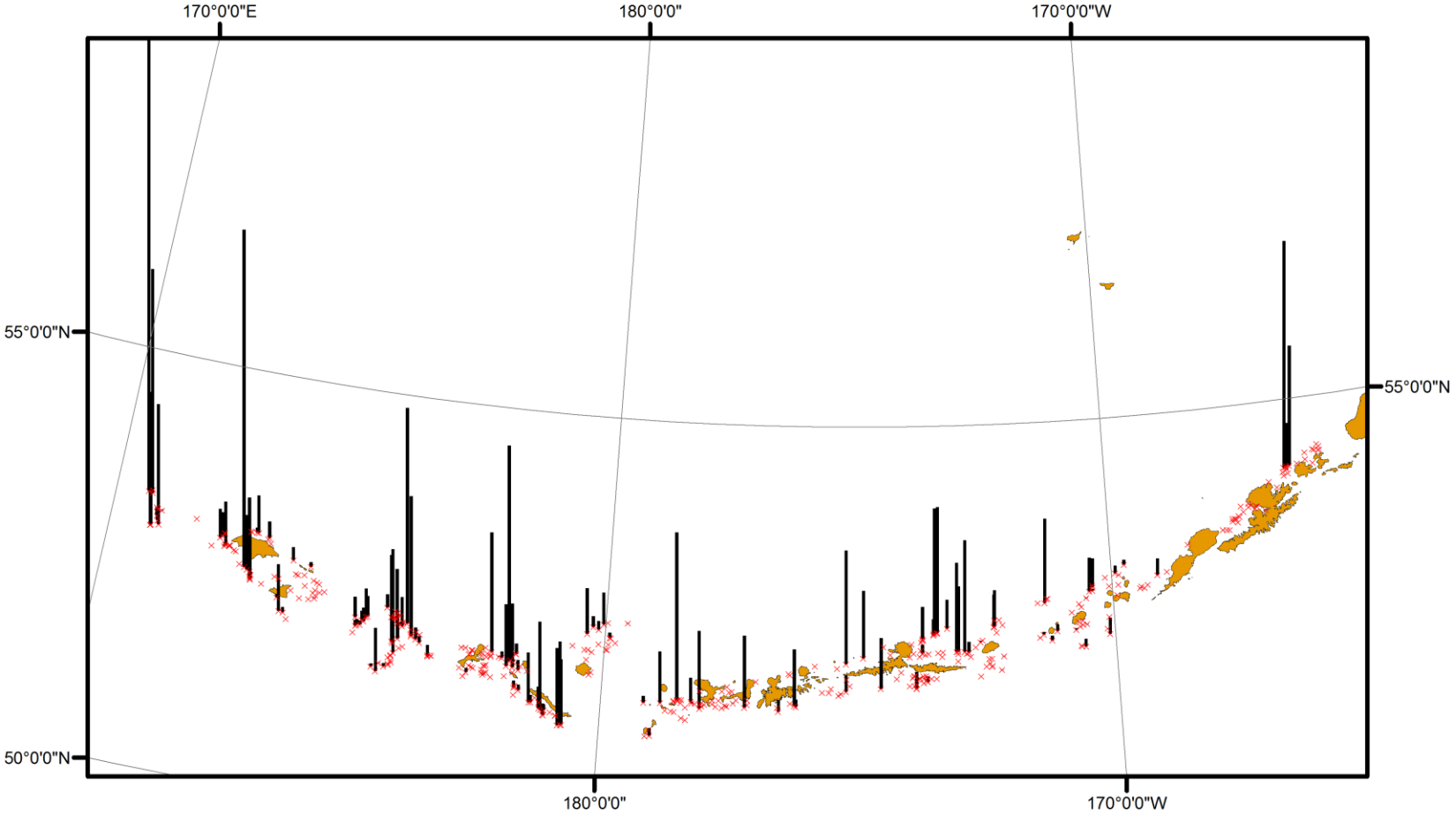
Pacific ocean perch 2010 AI Distribution



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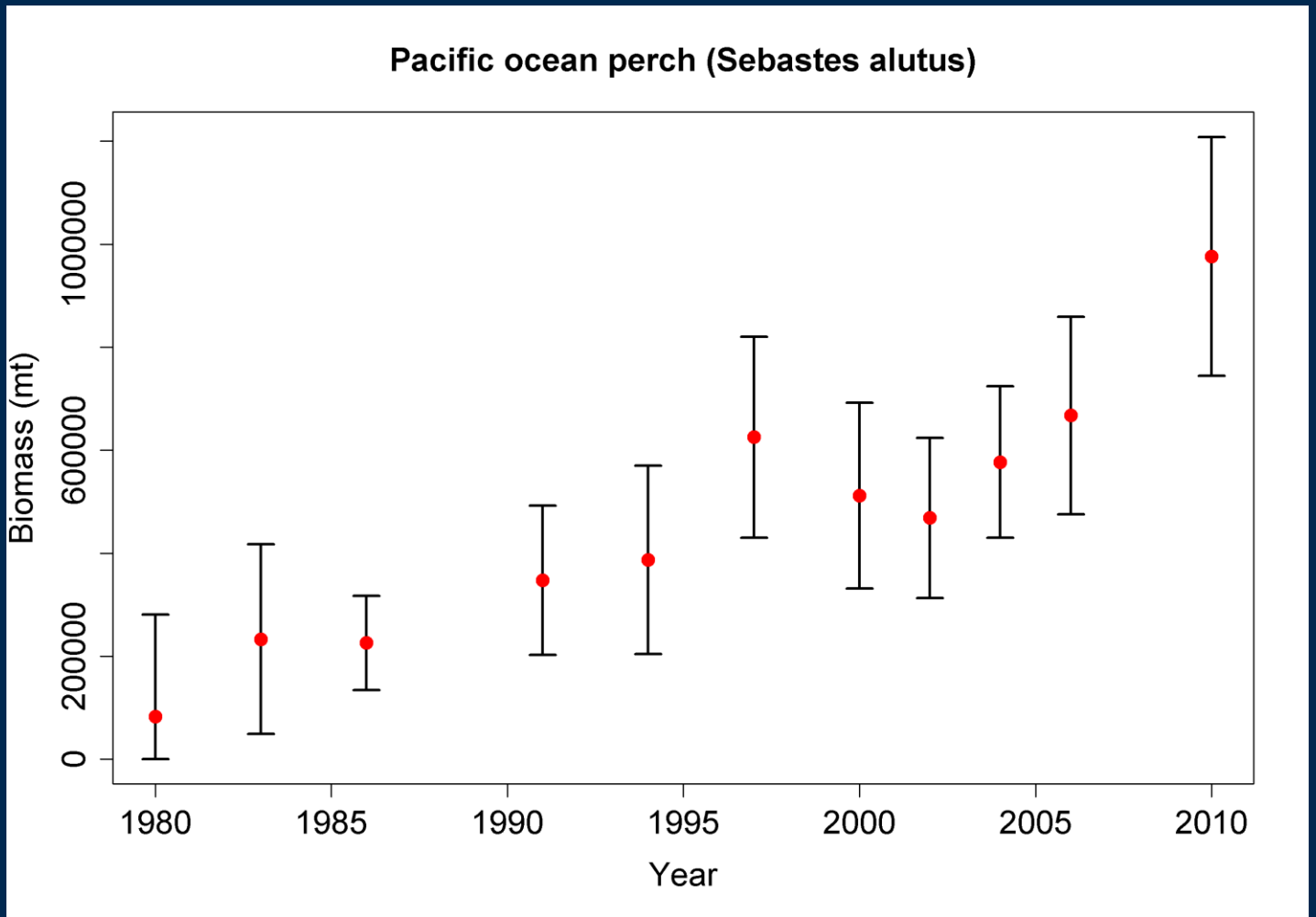
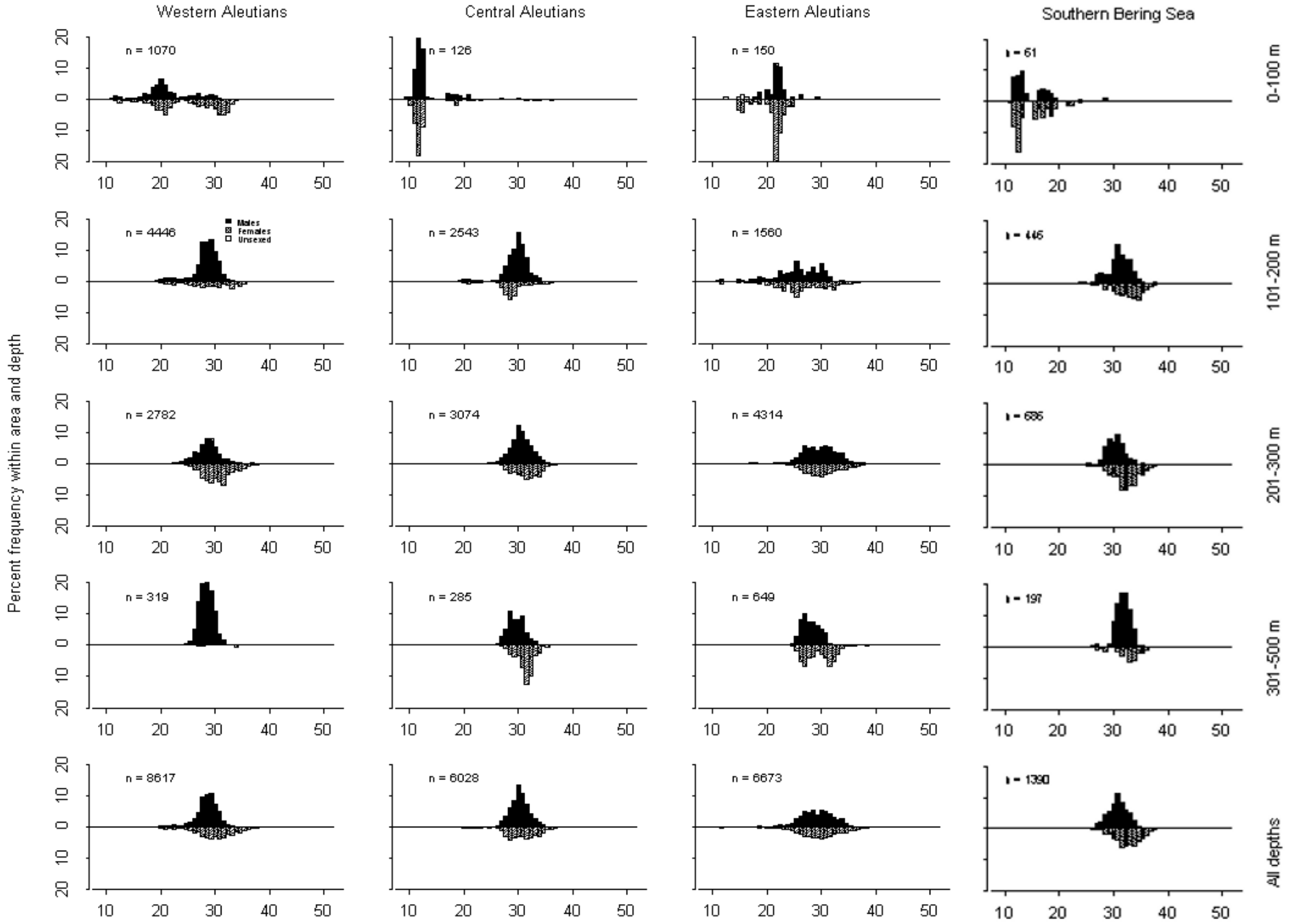
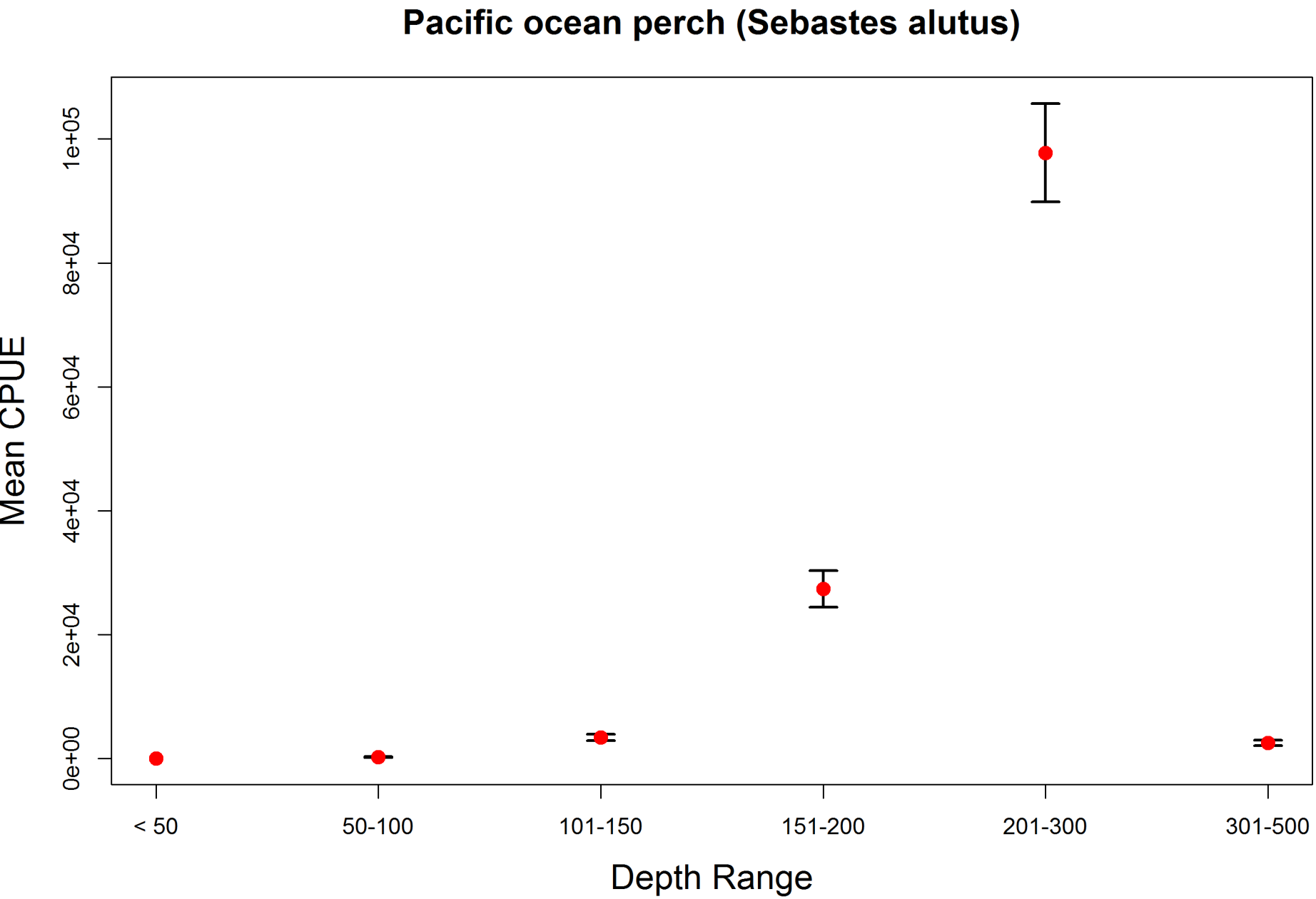
AI survey estimated biomass




Western Aleutians
Central Aleutians
Eastern Aleutians
Southern Bering Sea
0-100 m
101-200 m
201-300 m
301-500 m
All depths
n = 1070
n = 126
n = 150
n = 61
n = 4446
n = 2543
n = 1560
n = 446
n = 2782
n = 3074
n = 4314
n = 686
n = 319
n = 285
n = 649
n = 197
n = 8617
n = 6028
n = 6673
n = 1390
Males
Females
Unsexed
Percent frequency within area and depth
Length (cm)


Pacific ocean perch (Sebastes alutus)
Mean CPUE
0e+00
2e+04
4e+04
6e+04
8e+04
1e+05
< 50
50-100
101-150
151-200
201-300
301-500
Depth Range

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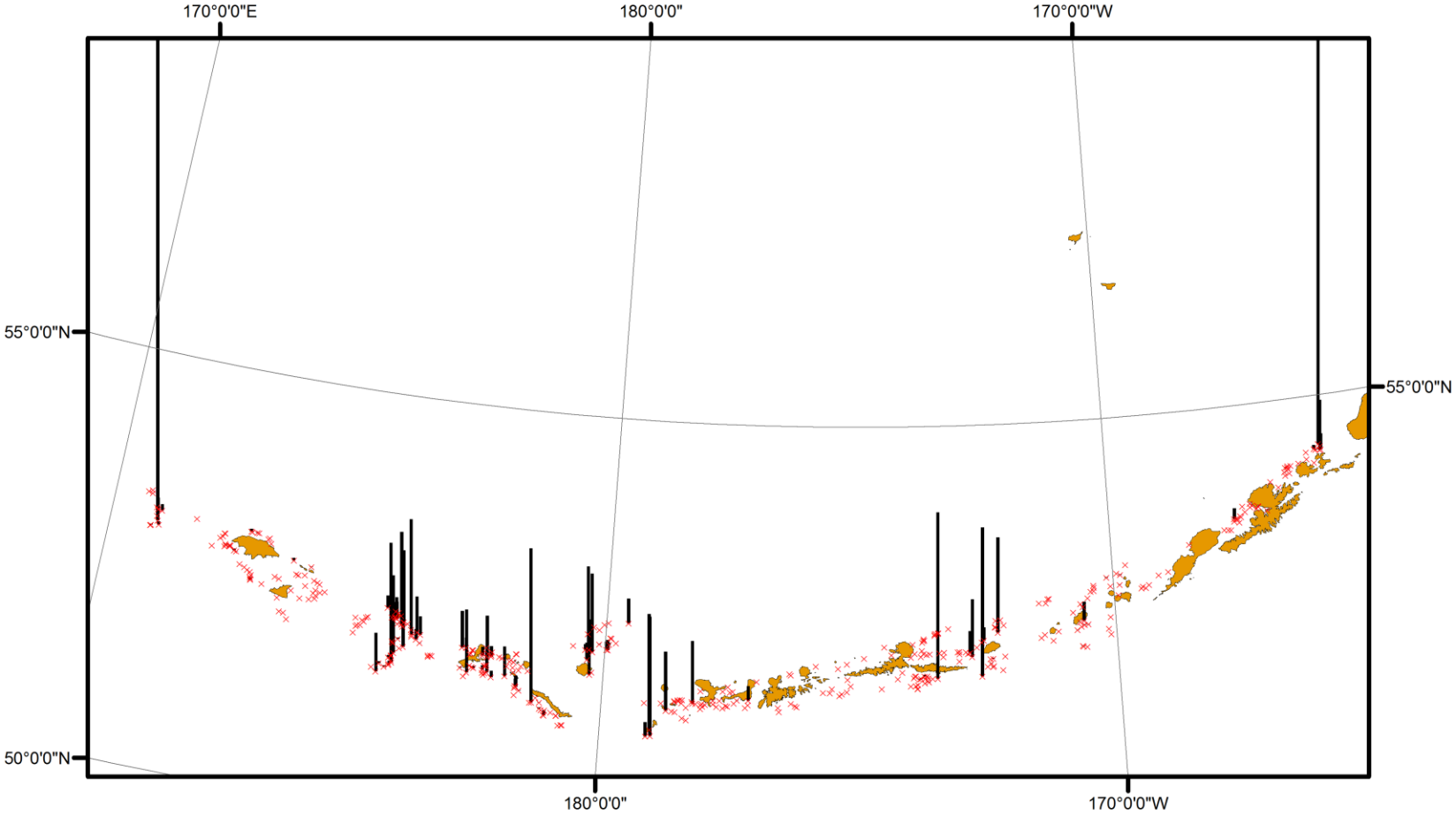
Atka mackerel 2010 AI Distribution



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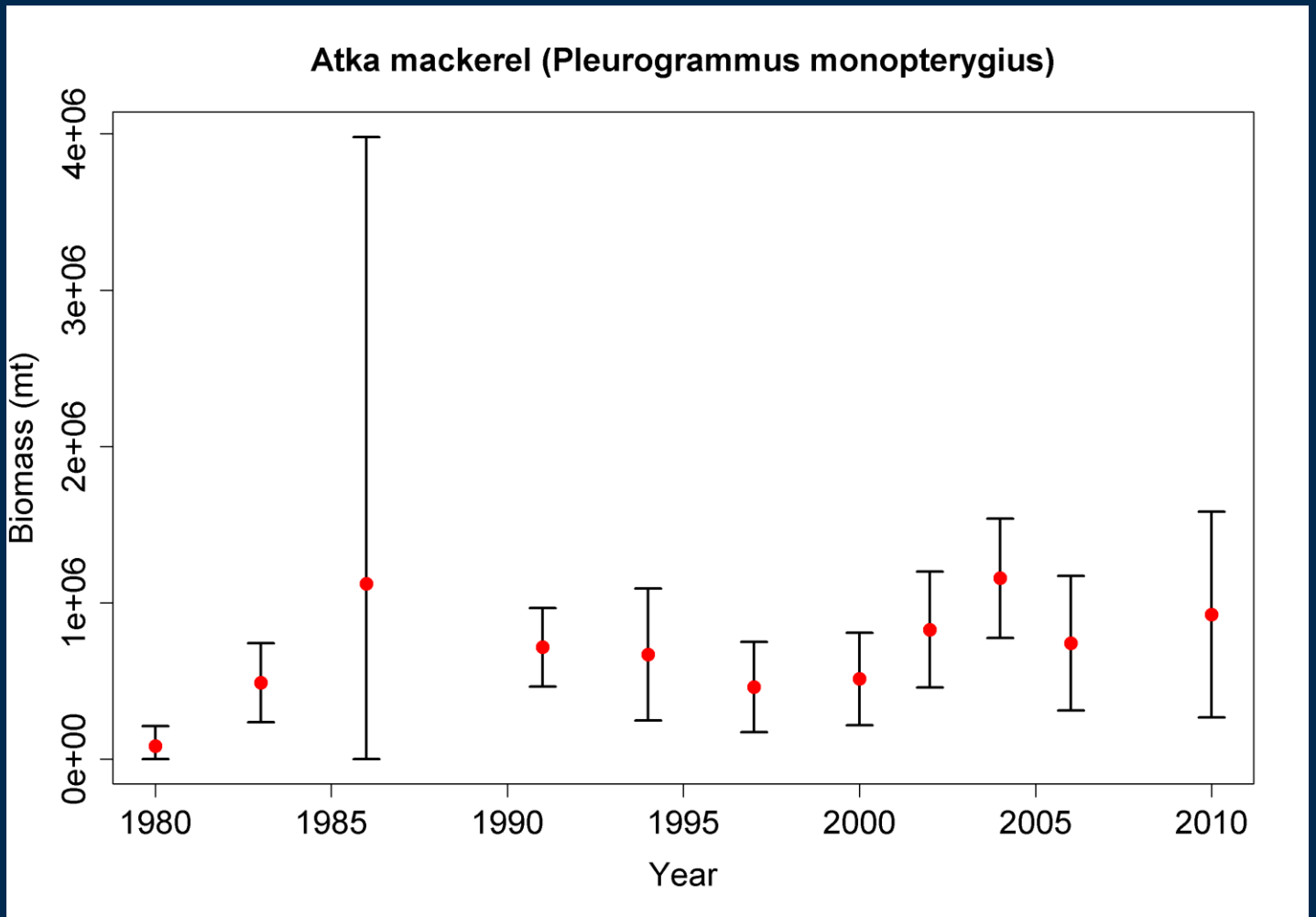
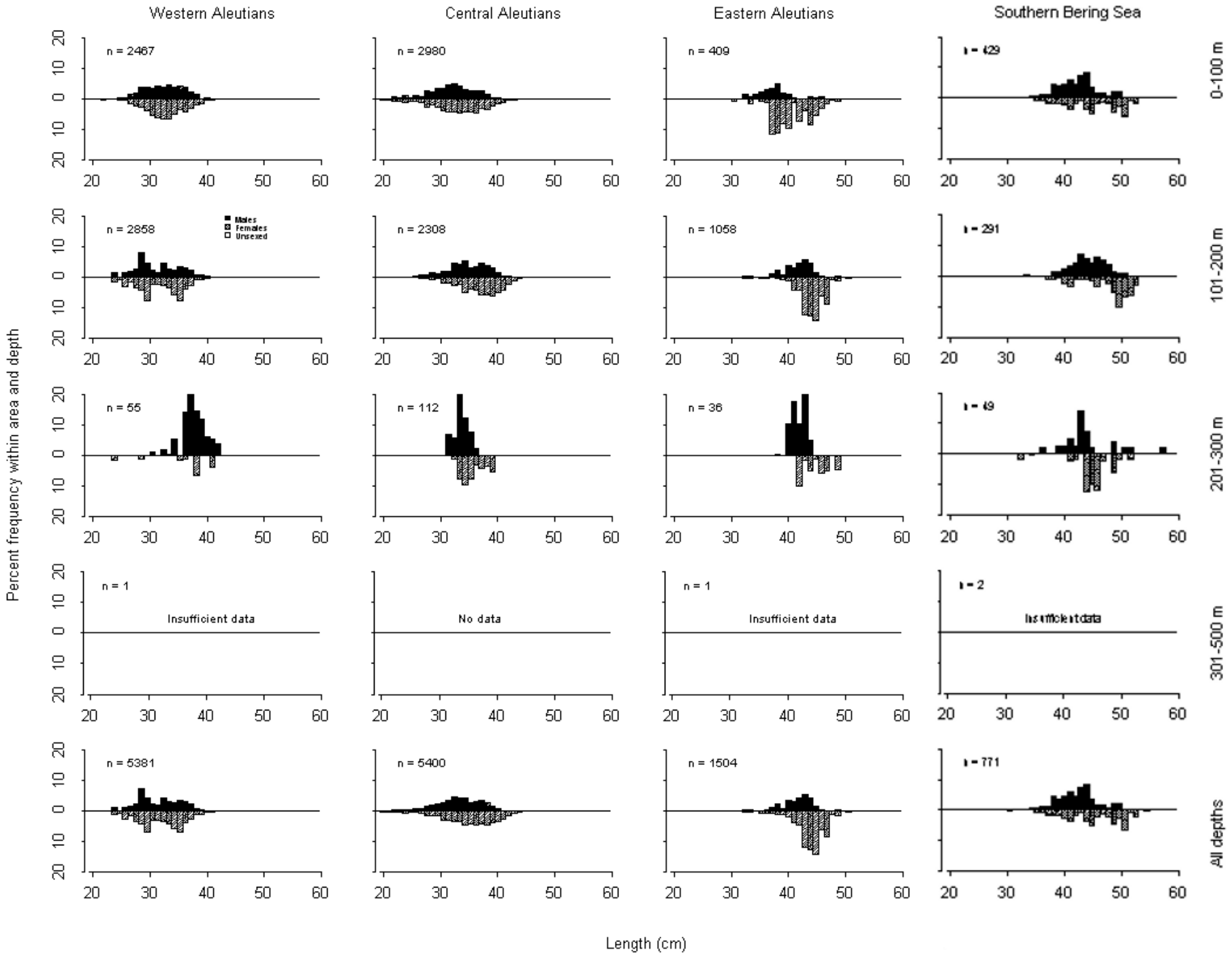
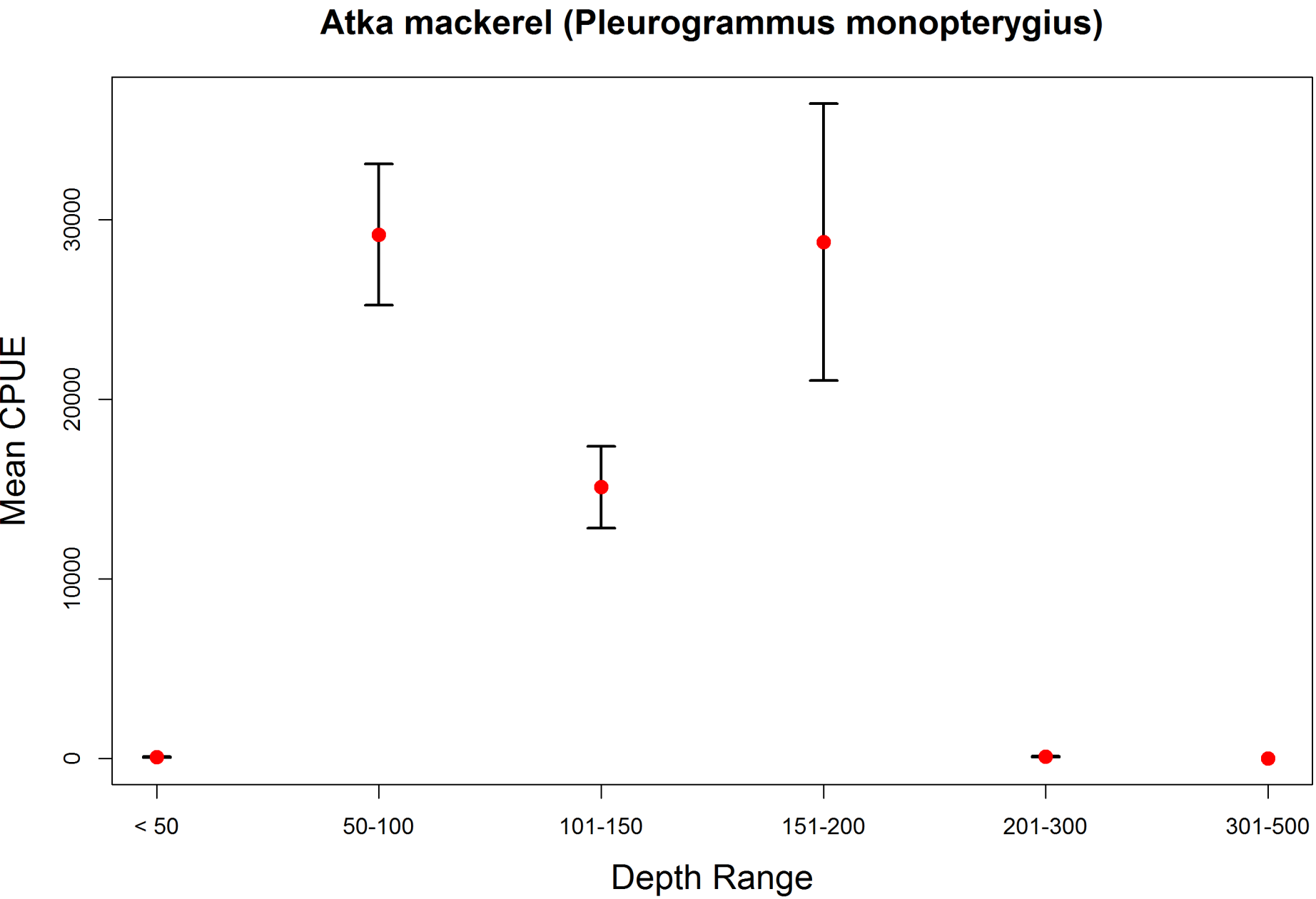
AI survey estimated biomass




Western Aleutians
Central Aleutians
Eastern Aleutians
Southern Bering Sea
0-100 m
101-200 m
201-300 m
301-500 m
All depths
Percent frequency within area and depth
Length (cm)
Males
Females
Unsexed
n = 2467
n = 2980
n = 409
n = 429
n = 2858
n = 2308
n = 1058
n = 291
n = 55
n = 112
n = 36
n = 49
n = 1
n = 1
n = 2
Insufficient data
No data
Insufficient data
Insufficient data
n = 5381
n = 5400
n = 1504
n = 771


Atka mackerel (Pleurogrammus monopterygius)
Mean CPUE
0
10000
20000
30000
< 50
50-100
101-150
151-200
201-300
301-500
Depth Range

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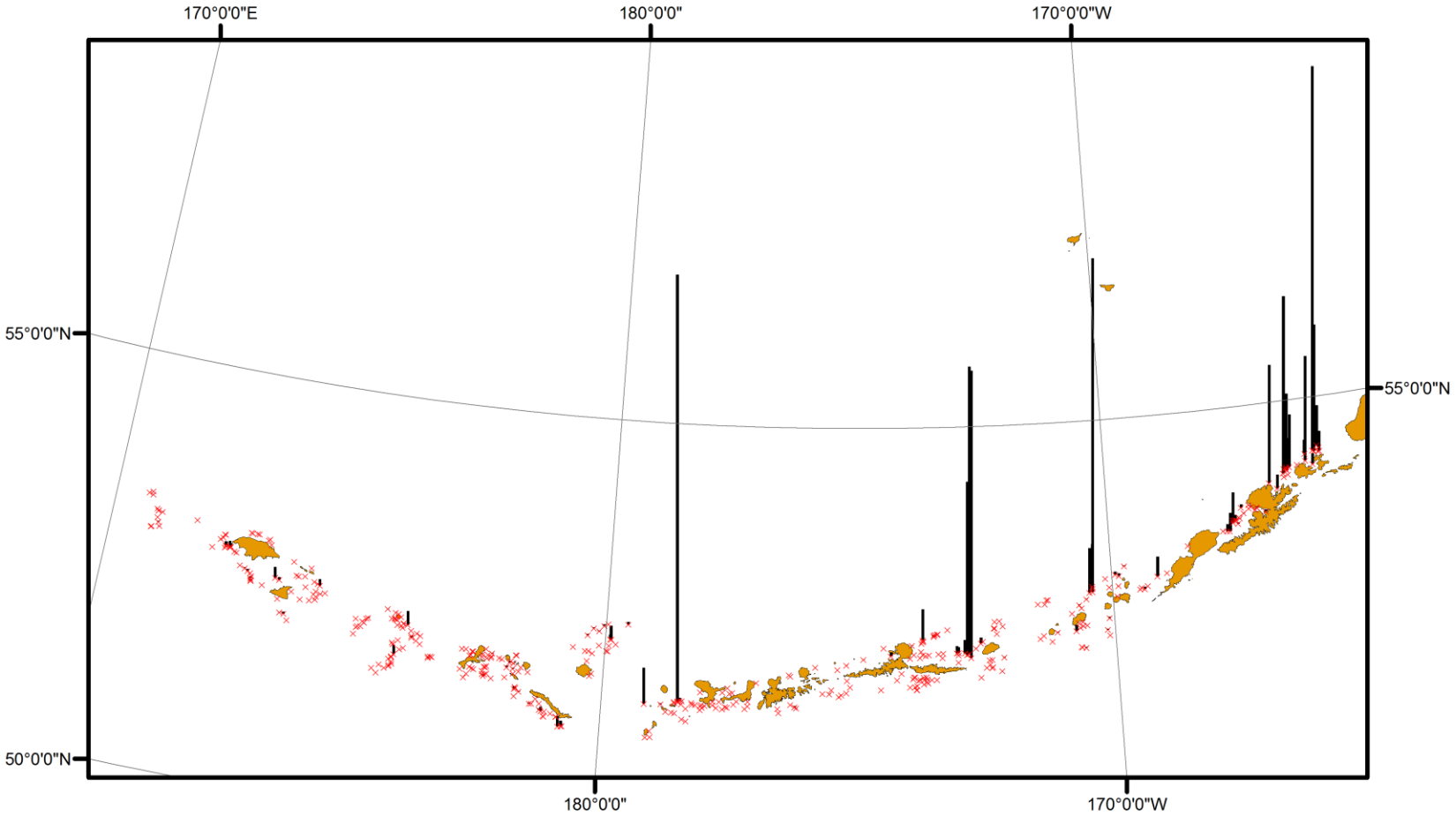
Walleye Pollock 2010 AI Distribution



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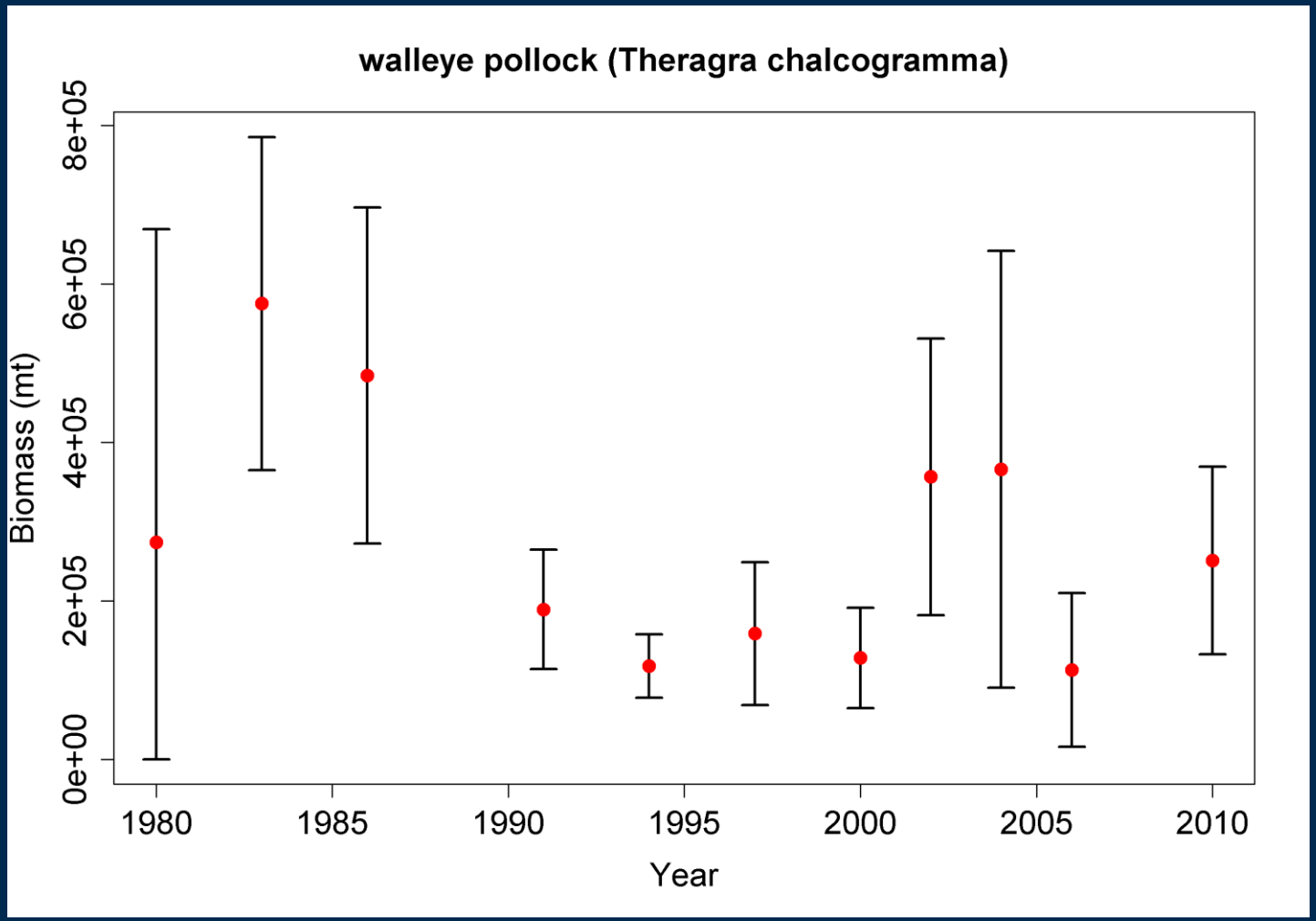
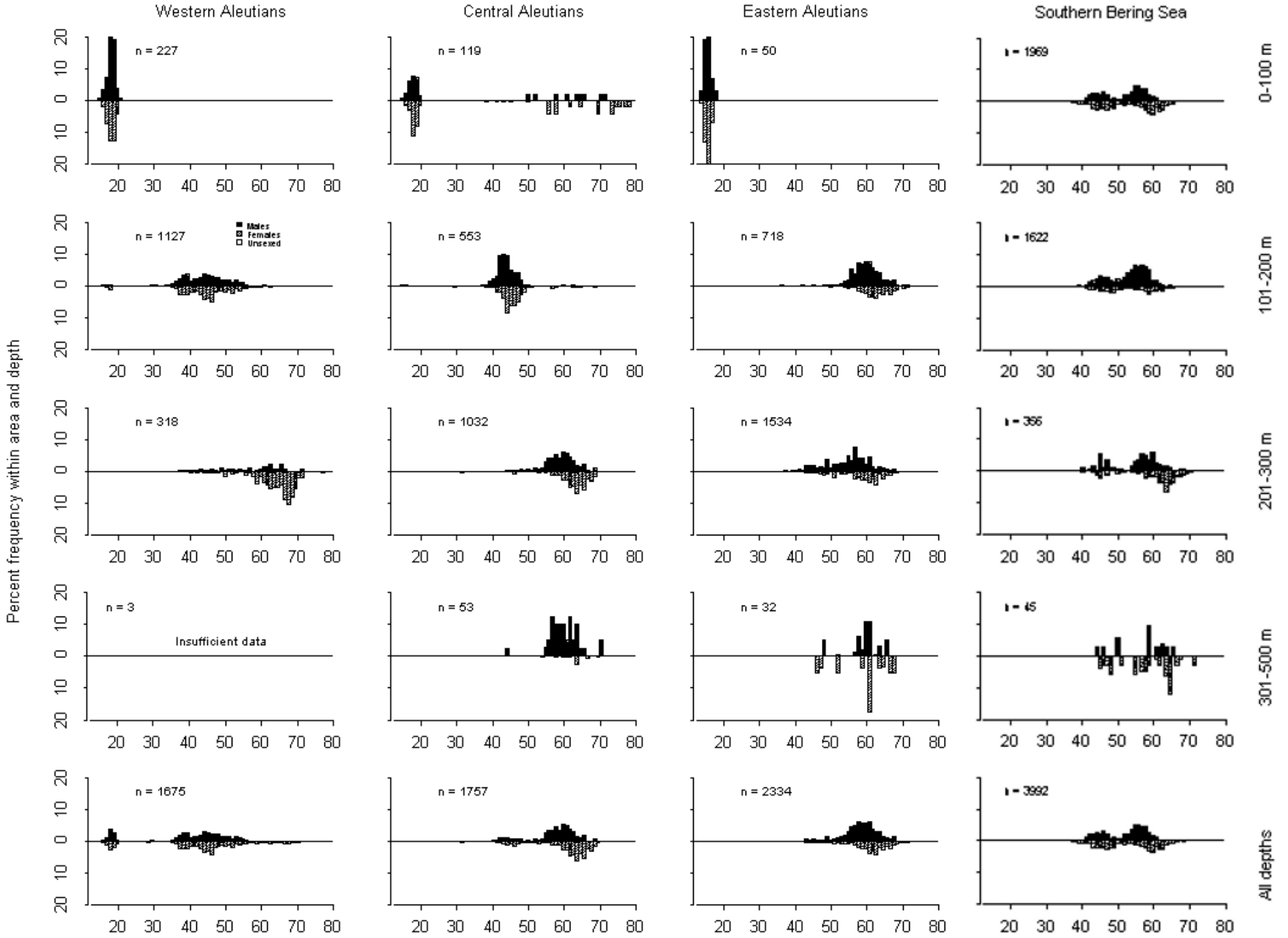
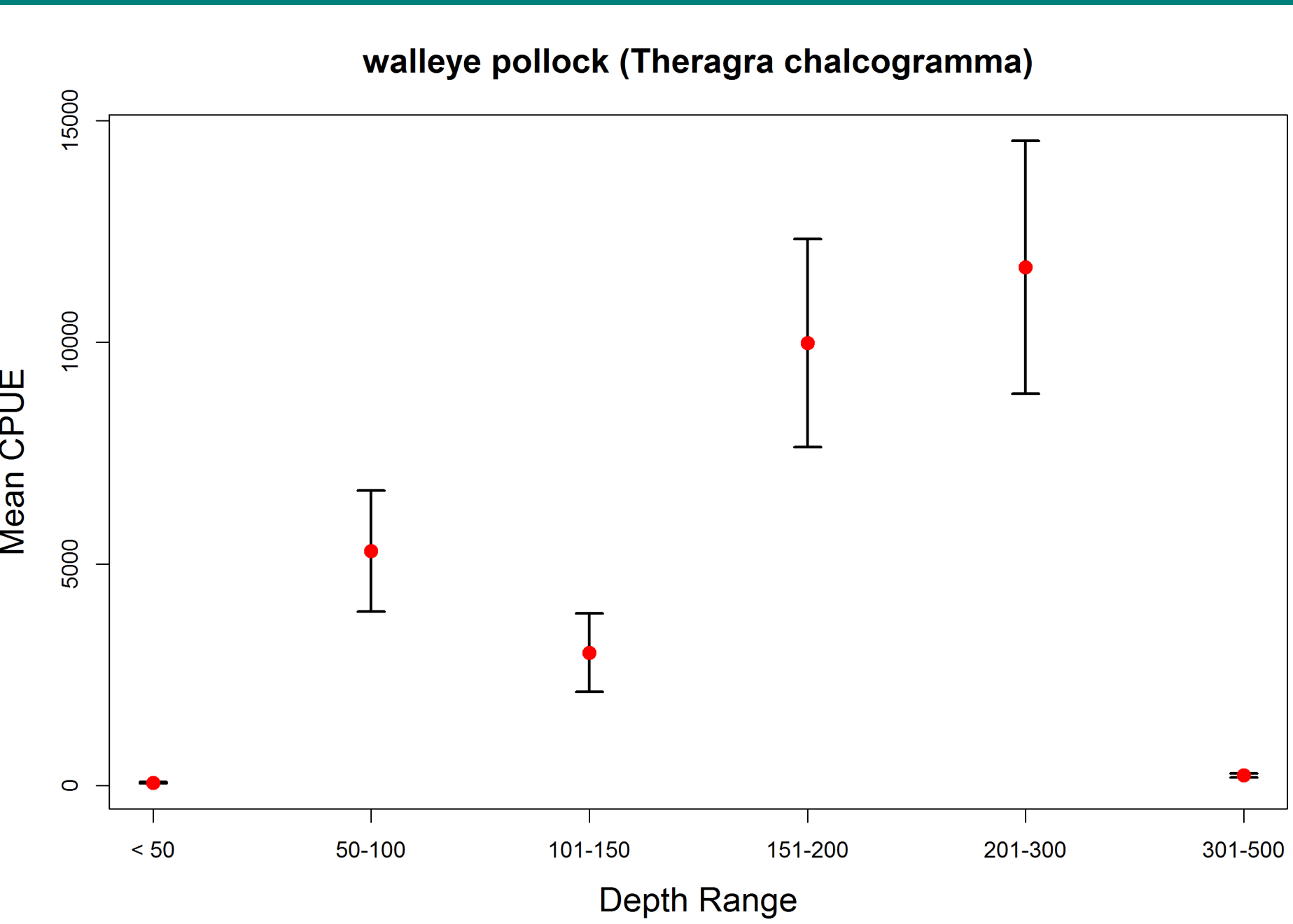
AI survey estimated biomass




Western Aleutians
Central Aleutians
Eastern Aleutians
Southern Bering Sea
0-100 m
101-200 m
201-300 m
301-500 m
All depths
Percent frequency within area and depth
n = 227
n = 119
n = 50
n = 1969
n = 1127
n = 553
n = 718
n = 1622
n = 318
n = 1032
n = 1534
n = 356
n = 3
Insufficient data
n = 53
n = 32
n = 45
n = 1675
n = 1757
n = 2334
n = 3992
Males
Females
Unsexed
20 10 0 10 20
20 30 40 50 60 70 80


walleye pollock (Theragra chalcogramma)
Mean CPUE
0
5000
10000
15000
< 50
50-100
101-150
151-200
201-300
301-500
Depth Range

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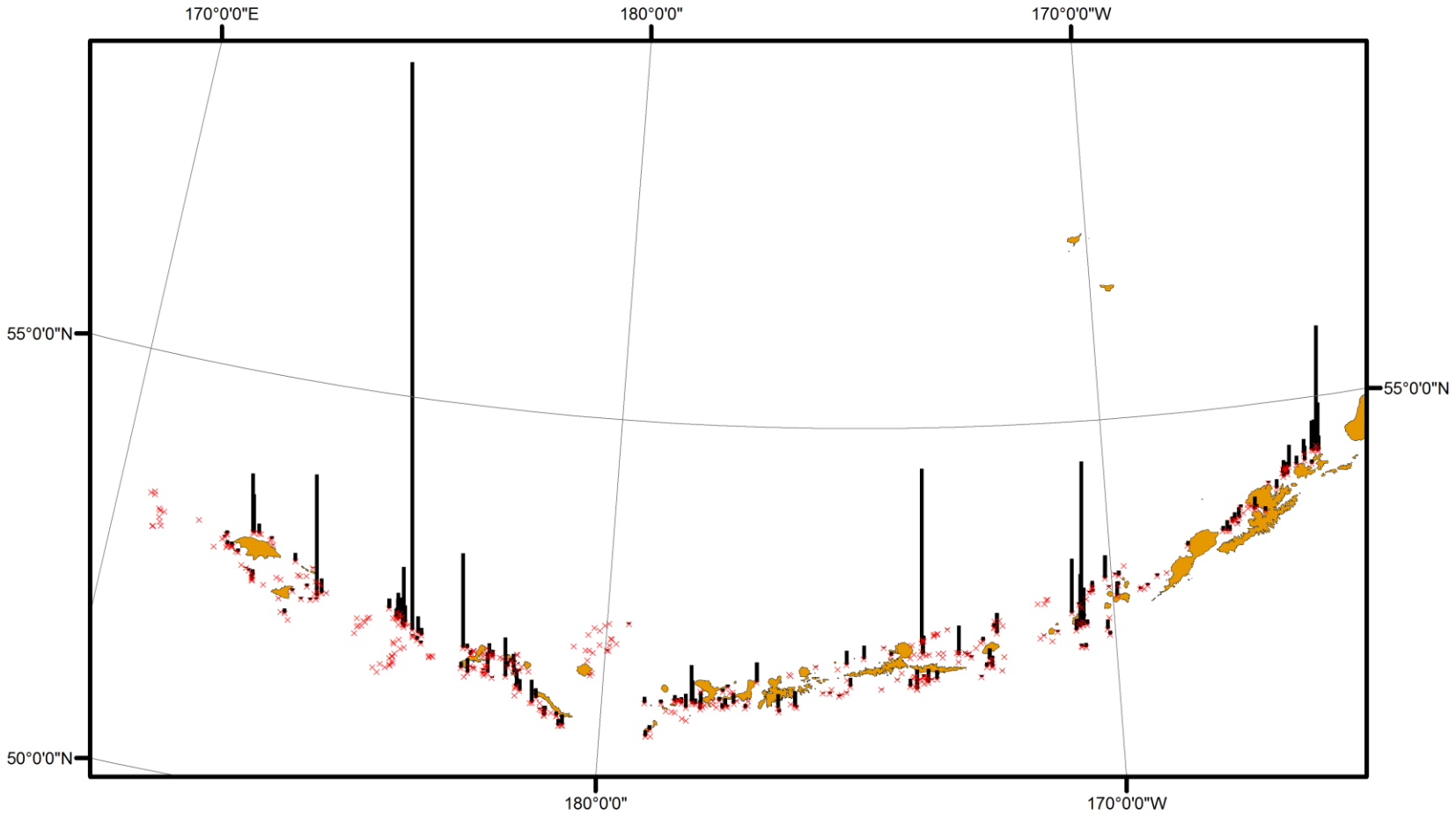
Pacific cod
2010 AI Distribution



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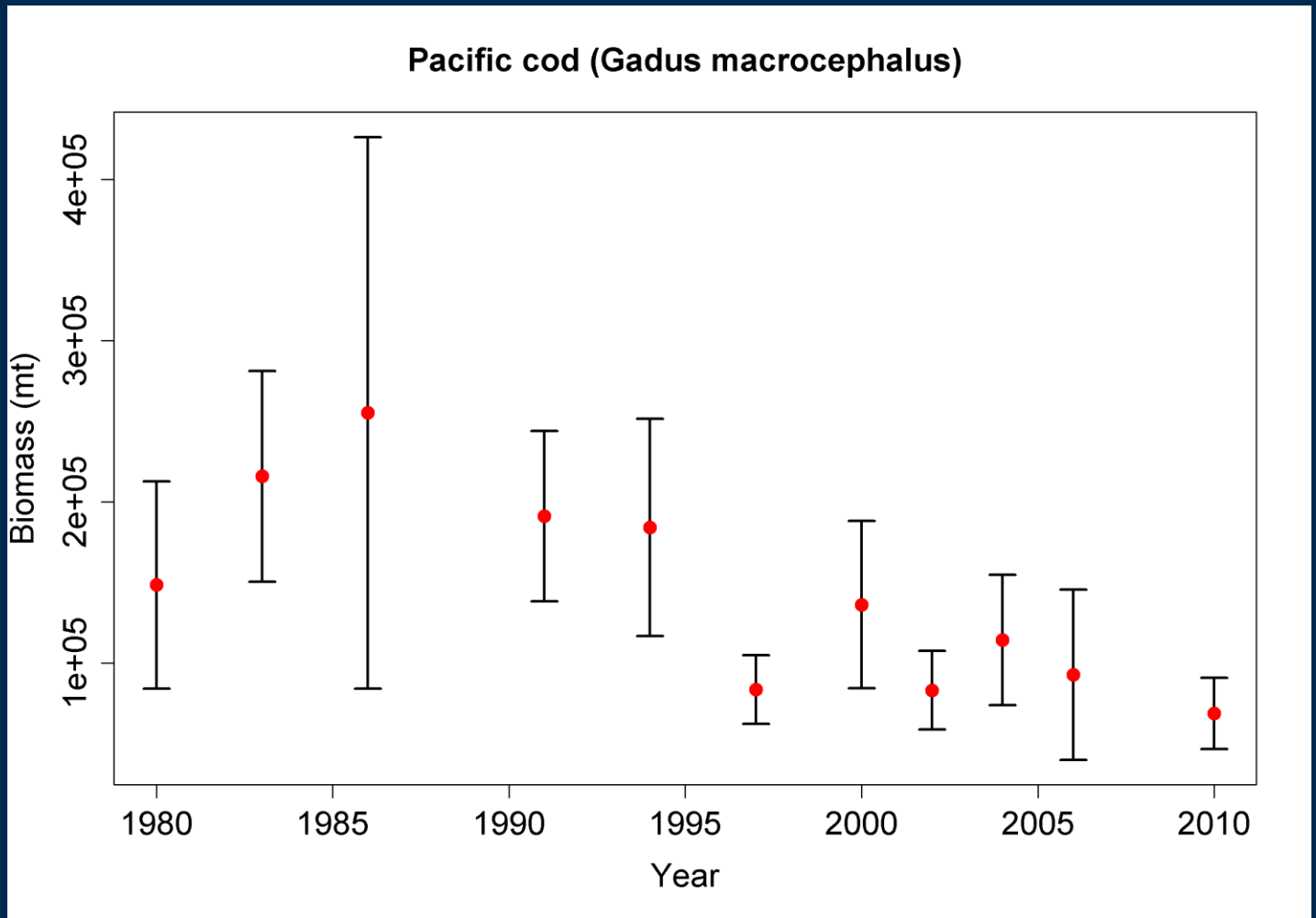
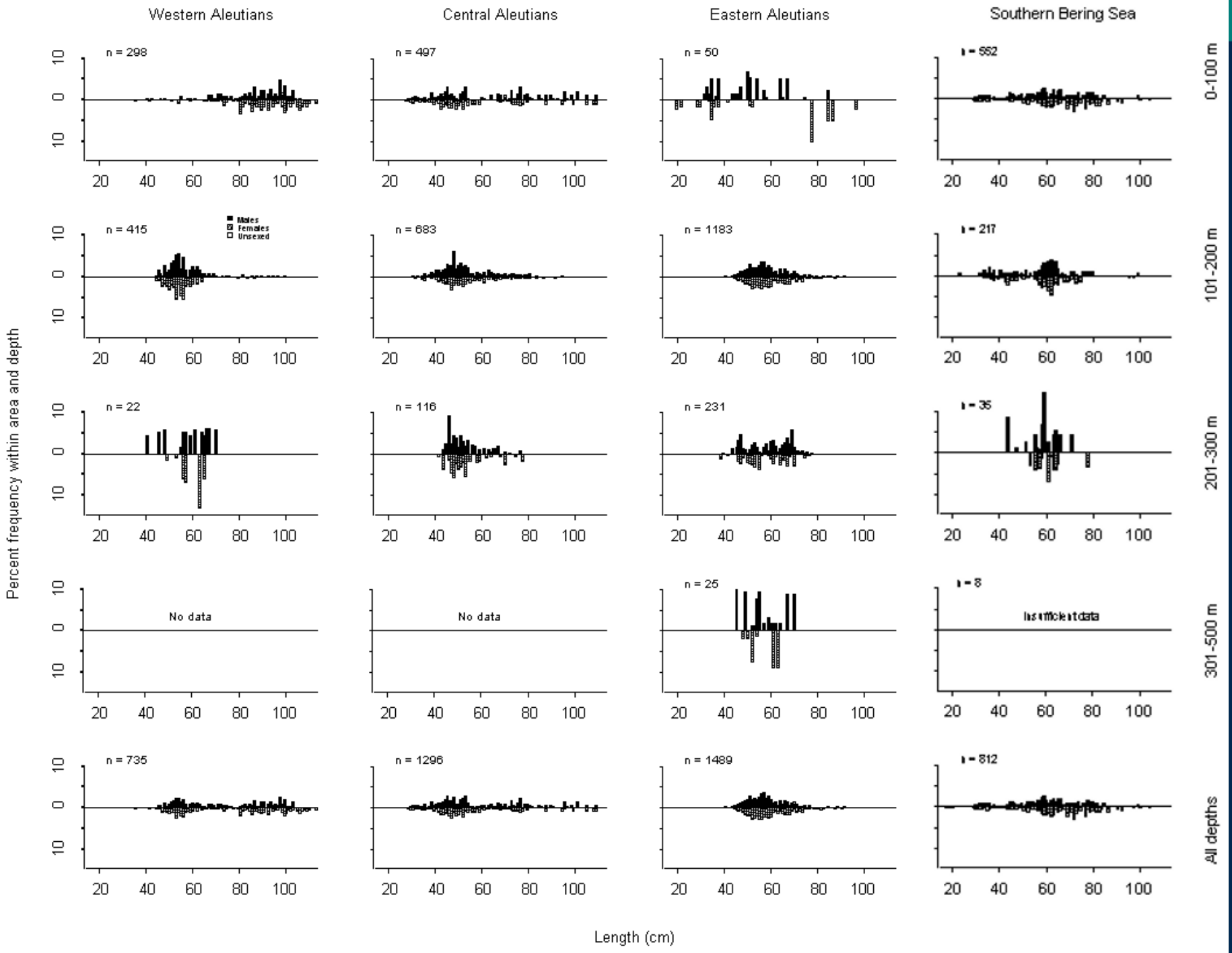
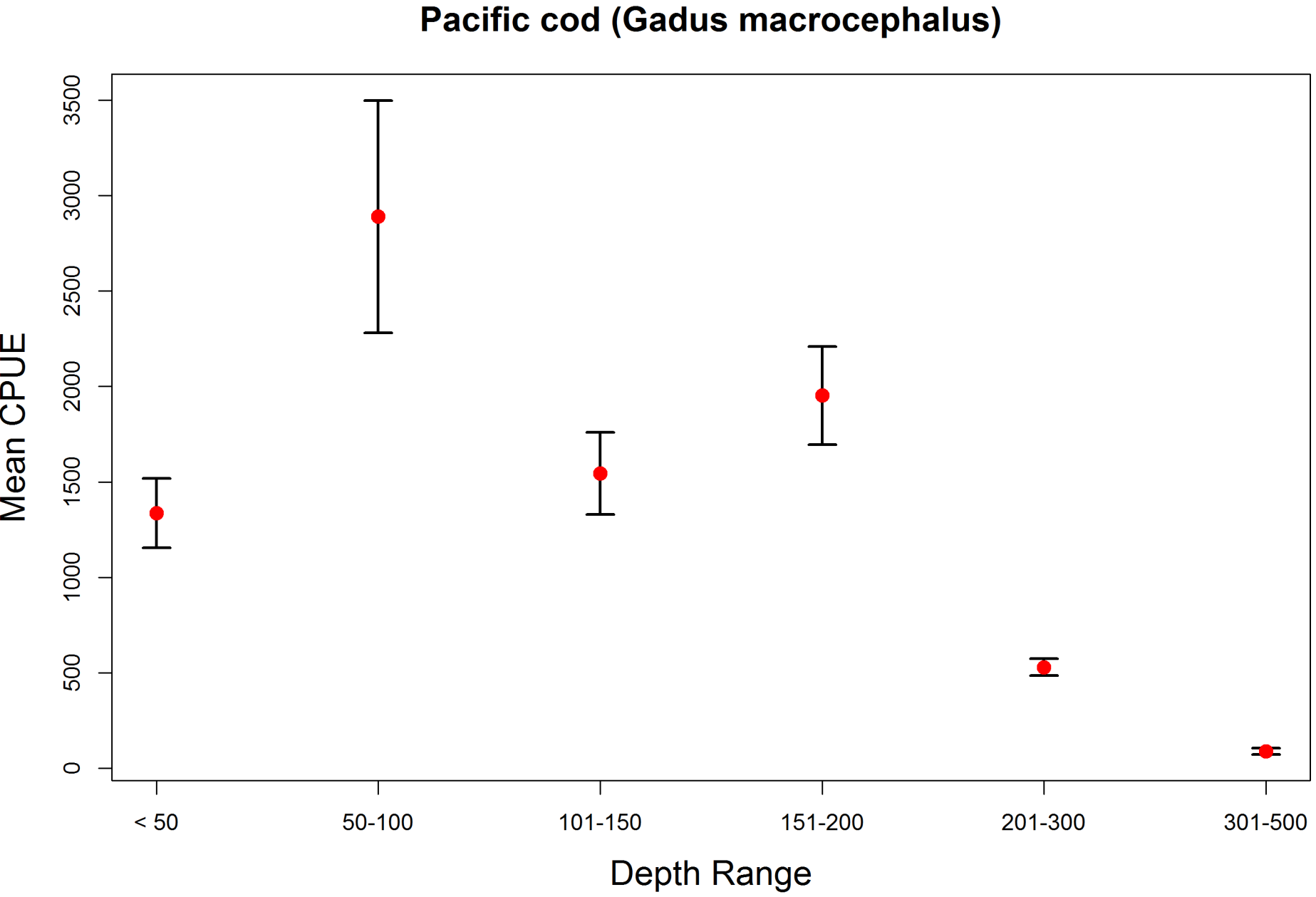
AI survey estimated biomass




Western Aleutians
Central Aleutians
Eastern Aleutians
Southern Bering Sea
0-100 m
101-200 m
201-300 m
301-500 m
All depths
Percent frequency within area and depth
Length (cm)
Males
Females
Unsexed
n = 298
n = 497
n = 50
n = 552
n = 415
n = 683
n = 1183
n = 217
n = 22
n = 116
n = 231
n = 35
No data
No data
n = 25
n = 8
Insufficient data
n = 735
n = 1296
n = 1489
n = 812


Pacific cod (Gadus macrocephalus)
Mean CPUE
0
500
1000
1500
2000
2500
3000
3500
< 50
50-100
101-150
151-200
201-300
301-500
Depth Range

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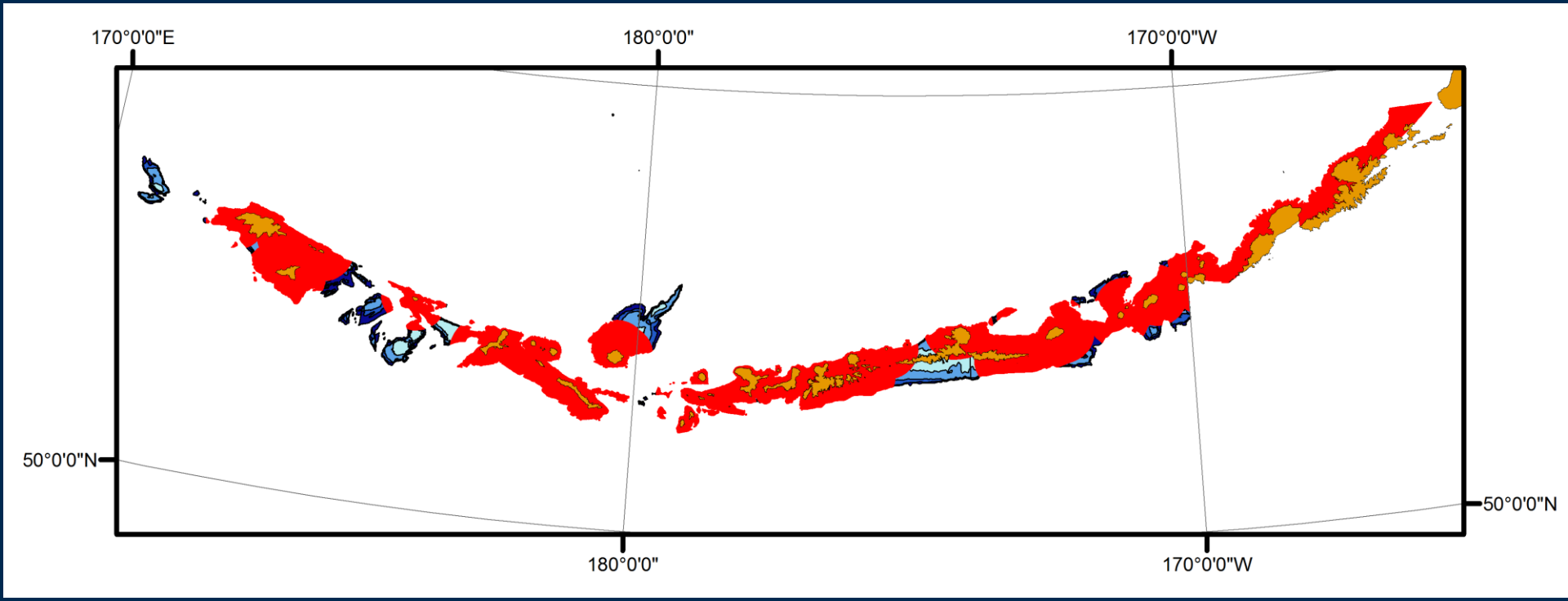
AI survey strata and Steller Sea Lion Critical Habitat overlap



- 82.1% of AI survey in SSL critical habitat
- Other areas mostly offshore banks or deeper water

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AI Survey Area in SSL Critical Habitat by Area and Depth

Depth range	% in SSL Critical Habitat
< = 100 m	89.8
101-200 m	80.9
201-300 m	75.6
301-500 m	76.2

Area	% in SSL critical Habitat
Western AI	66.4
Central AI	88.2
Eastern AI	82.2
Southern Bering Sea	100

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Pacific ocean perch

Depth range	Inside CPUE kg/km^2	Outside CPUE kg/km^2
< 100 m	157	408
101-200 m	12,215	26,061
201-300 m	73,269	92,002
301-500 m	2,553	2,400

Area	Inside CPUE kg/km^2	Outside CPUE kg/km^2
Western AI	25,273	69,515
Central AI	20,781	18,344
Eastern AI	16,792	25,846
Southern Bering Sea	15,828	NA

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Atka mackerel

Depth range	Inside CPUE kg/km^2	Outside CPUE kg/km^2
< 100 m	23,262	31,979
101-200 m	15,277	48,955
201-300 m	4,935	15,874
301-500 m	4	0

Area	Inside CPUE kg/km^2	Outside CPUE kg/km^2
Western AI	10,371	48,695
Central AI	16,084	4,808
Eastern AI	9,802	43
Southern Bering Sea	20,762	-

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Walleye pollock

Depth range	Inside CPUE kg/km^2	Outside CPUE kg/km^2
< 100 m	6,524	152
101-200 m	7,588	881
201-300 m	13,256	1,427
301-500 m	274	18

Area	Inside CPUE kg/km^2	Outside CPUE kg/km^2
Western AI	743	298
Central AI	3,716	2,299
Eastern AI	11,009	1,702
Southern Bering Sea	22,028	-

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Pacific cod

Depth range	Inside CPUE kg/km^2	Outside CPUE kg/km^2
< 100 m	2,493	108
101-200 m	2,083	257
201-300 m	2,388	376
301-500 m	87	99

Area	Inside CPUE kg/km^2	Outside CPUE kg/km^2
Western AI	2,981	85
Central AI	1,006	45
Eastern AI	1,623	716
Southern Bering Sea	1,936	-