Discrimination of Steller sea lion prey fish using frequency-dependent acoustic backscatter

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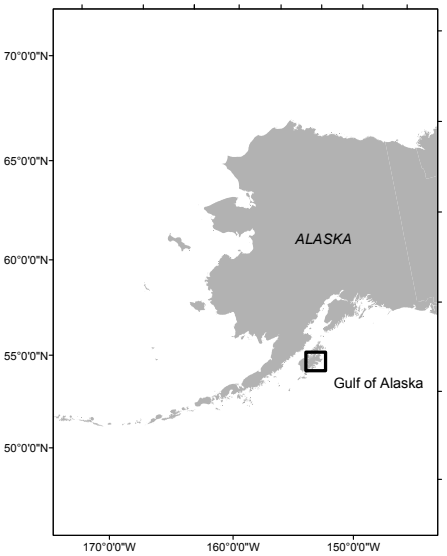
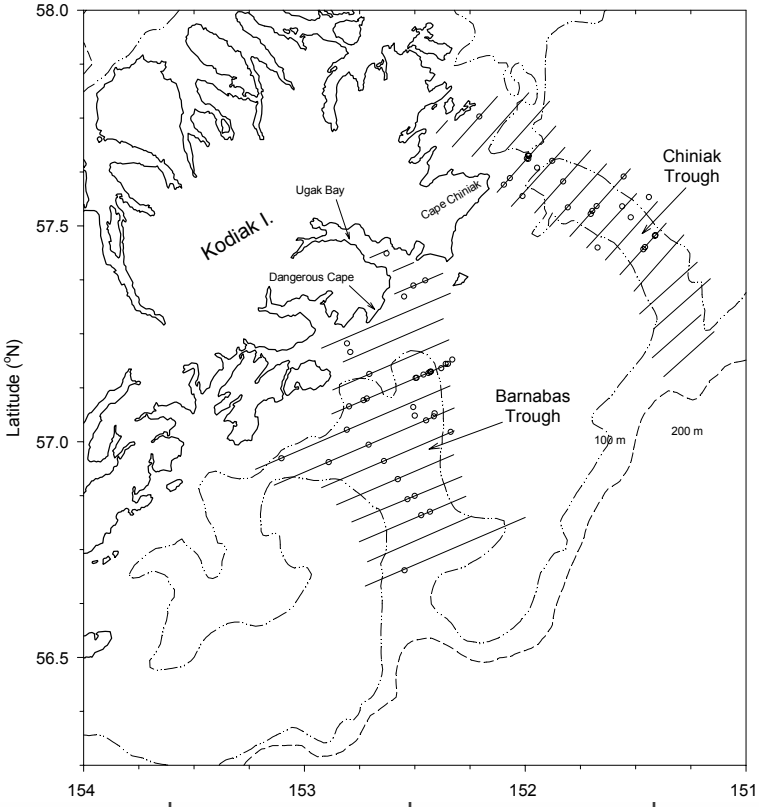
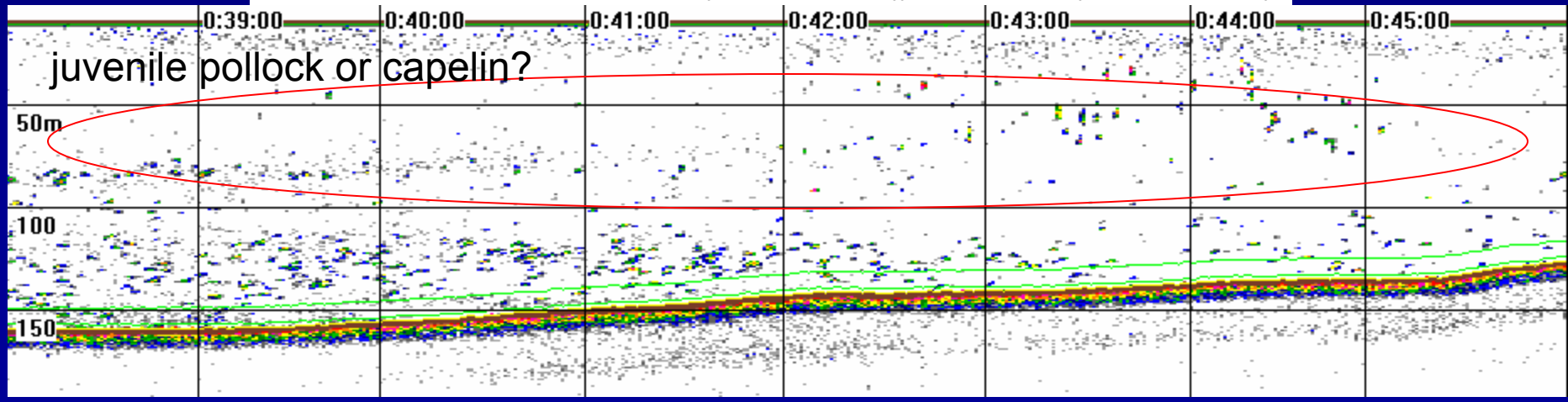
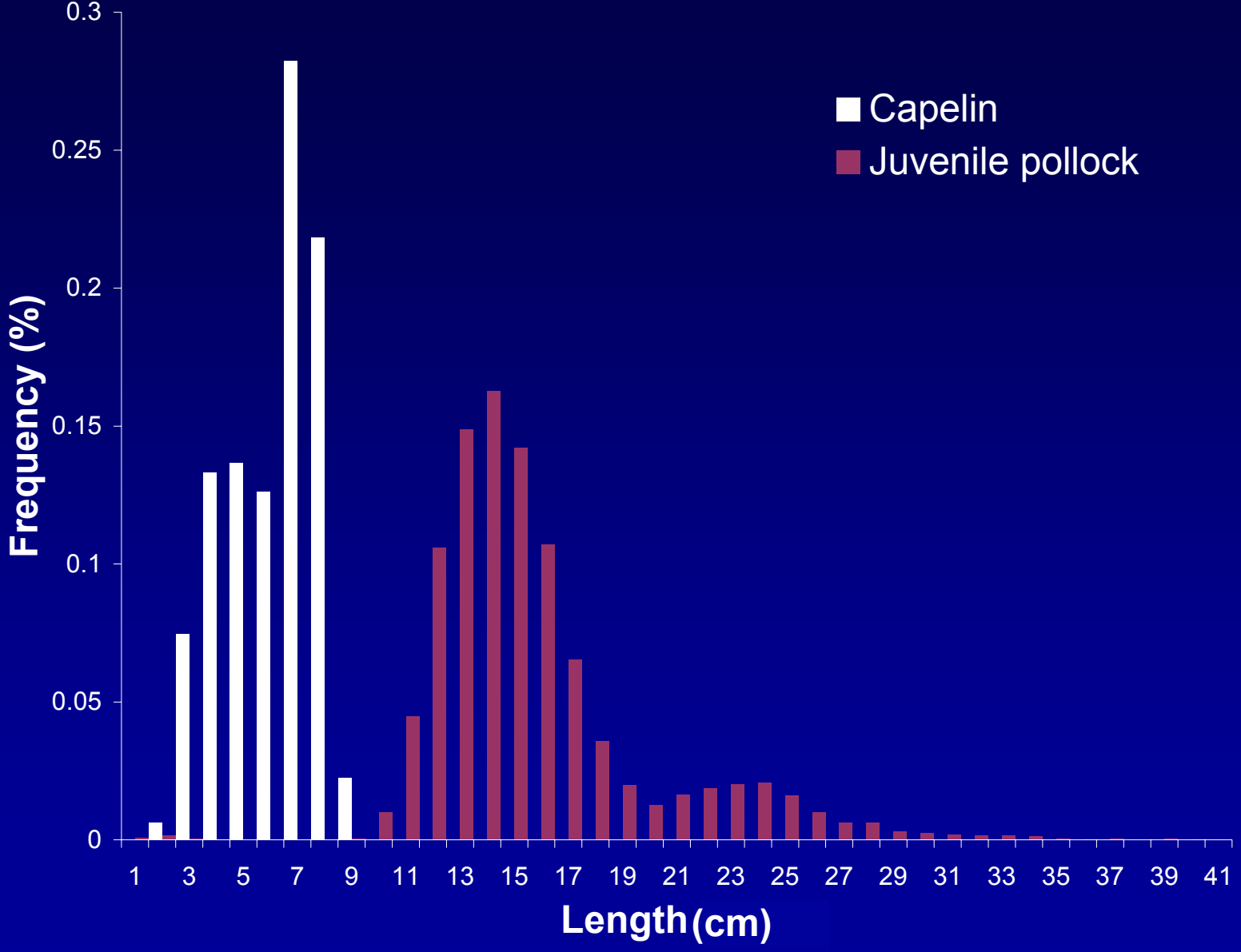
Alaska Fisheries Science Center
National Marine Fisheries Service





August 2000
August 2001

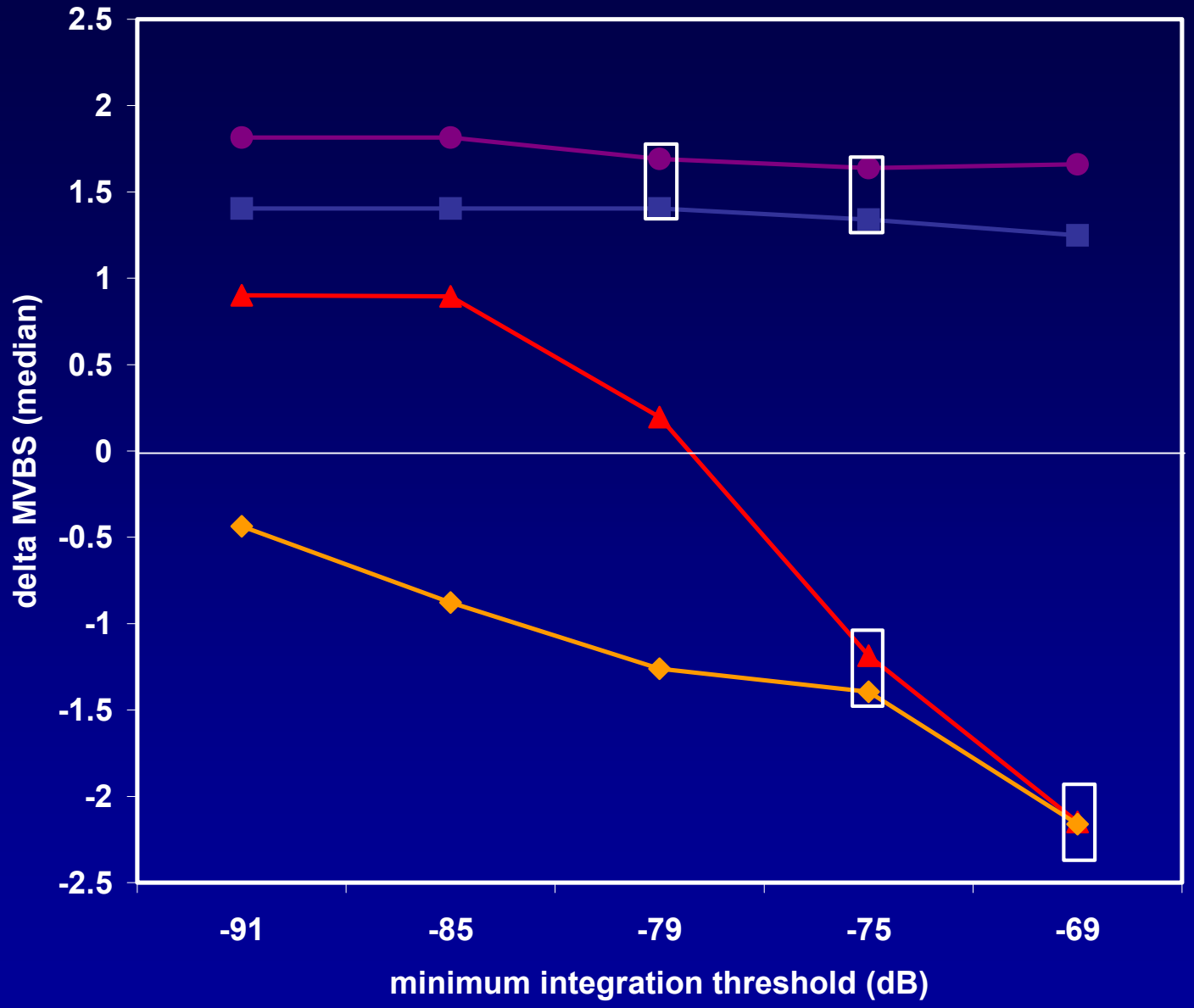


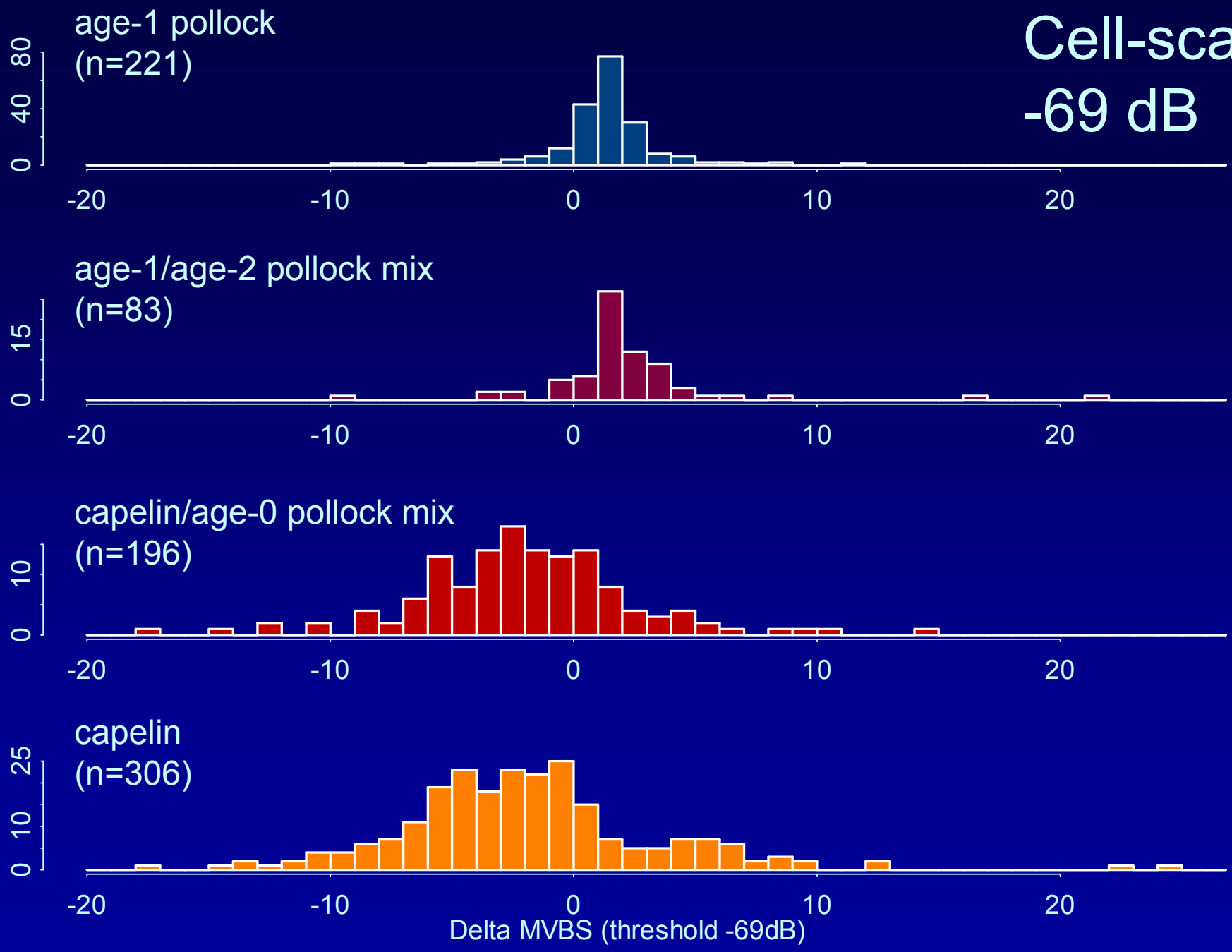

Capelin
Juvenile pollock
Frequency (%)
0.3
0.25
0.2
0.15
0.1
0.05
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41
Length (cm)

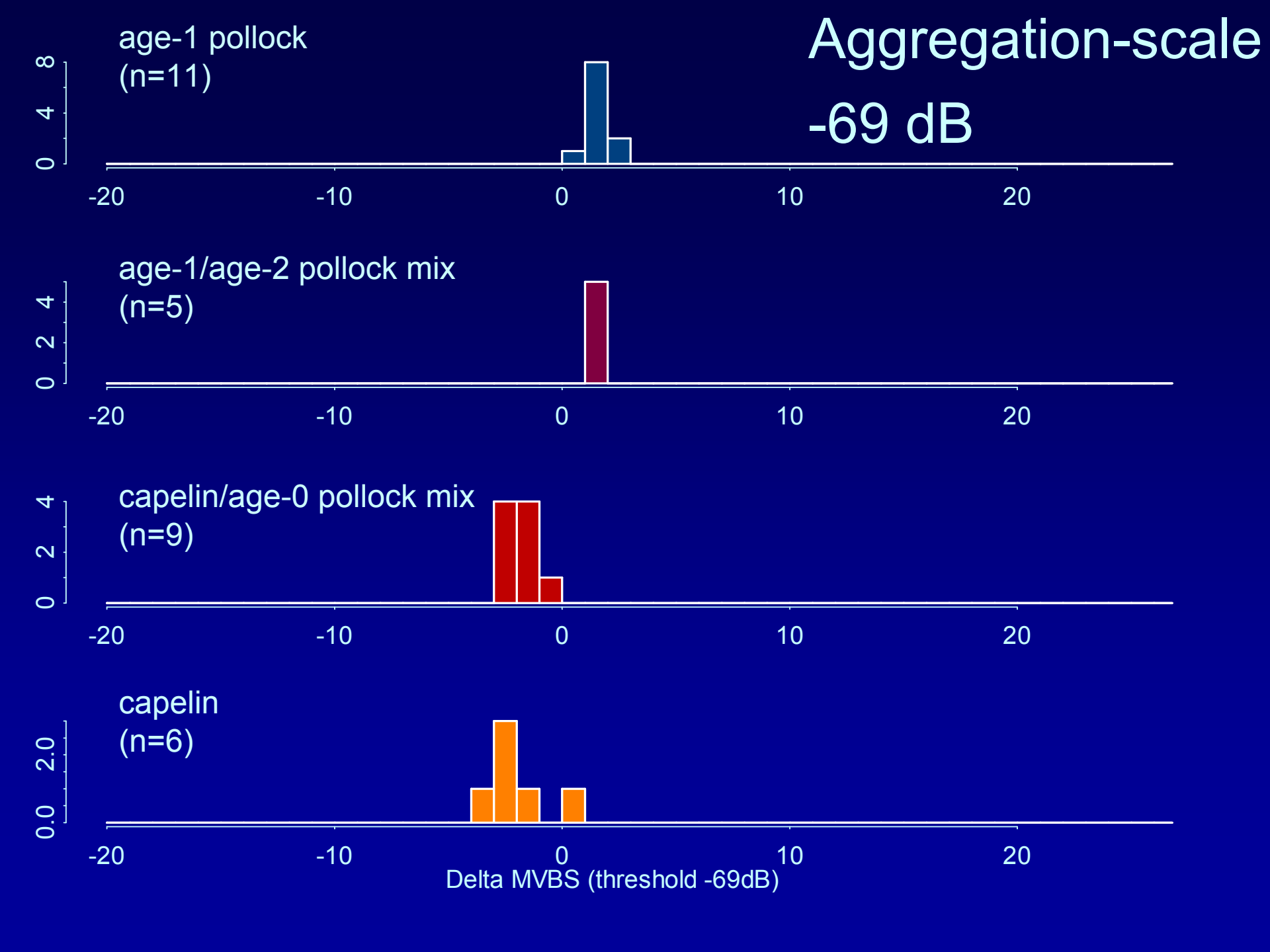
Methods

- Collect acoustic data at 38 kHz and 120 kHz
- Select portions of scattering layers
  - directly sampled by trawls
  - juvenile pollock or capelin dominant species (> 80%)
- Bin data at two resolutions
  - 0.1 nmi x 5 m cells
  - ~ 1 nmi x 20 m “aggregations”
- Use integration thresholds -91 dB to -69 dB
- Calculate Δ MVBS = MVBS @ 120 – MVBS @ 38
- Does Δ MVBS vary with species?

Cell-scale analysis

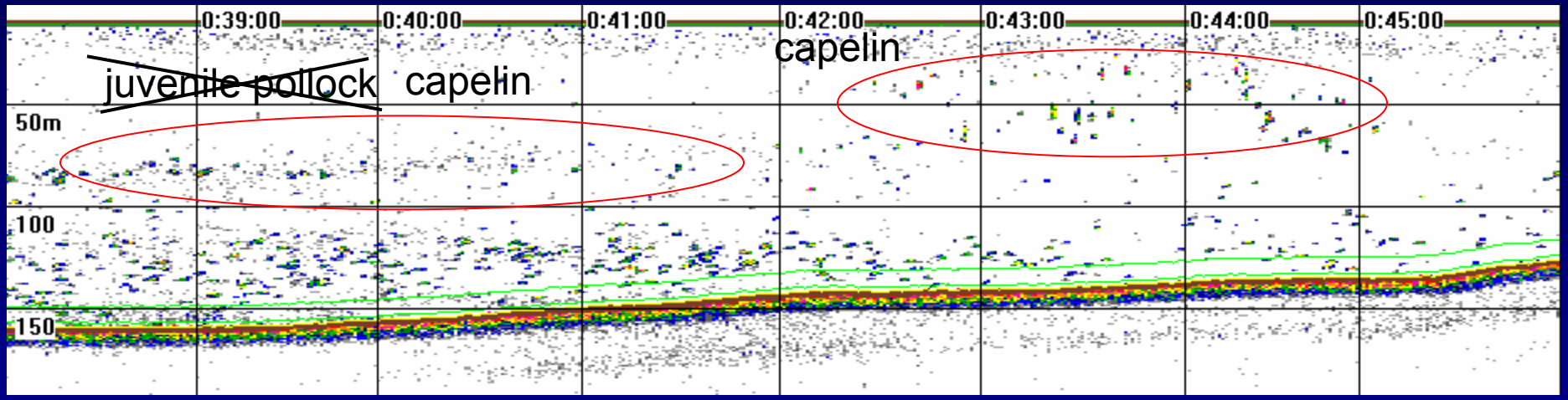



Cell-scale
-69 dB
age-1 pollock
(n=221)
0
40
80
-20
-10
0
10
20
age-1/age-2 pollock mix
(n=83)
0
15
-20
-10
0
10
20
capelin/age-0 pollock mix
(n=196)
0
10
-20
-10
0
10
20
capelin
(n=306)
0
10
25
-20
-10
0
10
20
Delta MVBS (threshold -69dB)


Aggregation-scale
-69 dB
age-1 pollock
(n=11)
0
4
8
-20
-10
0
10
20
age-1/age-2 pollock mix
(n=5)
0
2
4
-20
-10
0
10
20
capelin/age-0 pollock mix
(n=9)
0
2
4
-20
-10
0
10
20
capelin
(n=6)
0.0
2.0
-20
-10
0
10
20
Delta MVBS (threshold -69dB)

∆ MVBS vs. Scrutinizing

Sign type	# 5-nmi segments	agree	disagree
juvenile pollock	18	83%	17%
capelin	25	92%	8%


0:39:00
0:40:00
0:41:00
0:42:00
0:43:00
0:44:00
0:45:00
juvenile pollock
capelin
capelin
50m
100
150

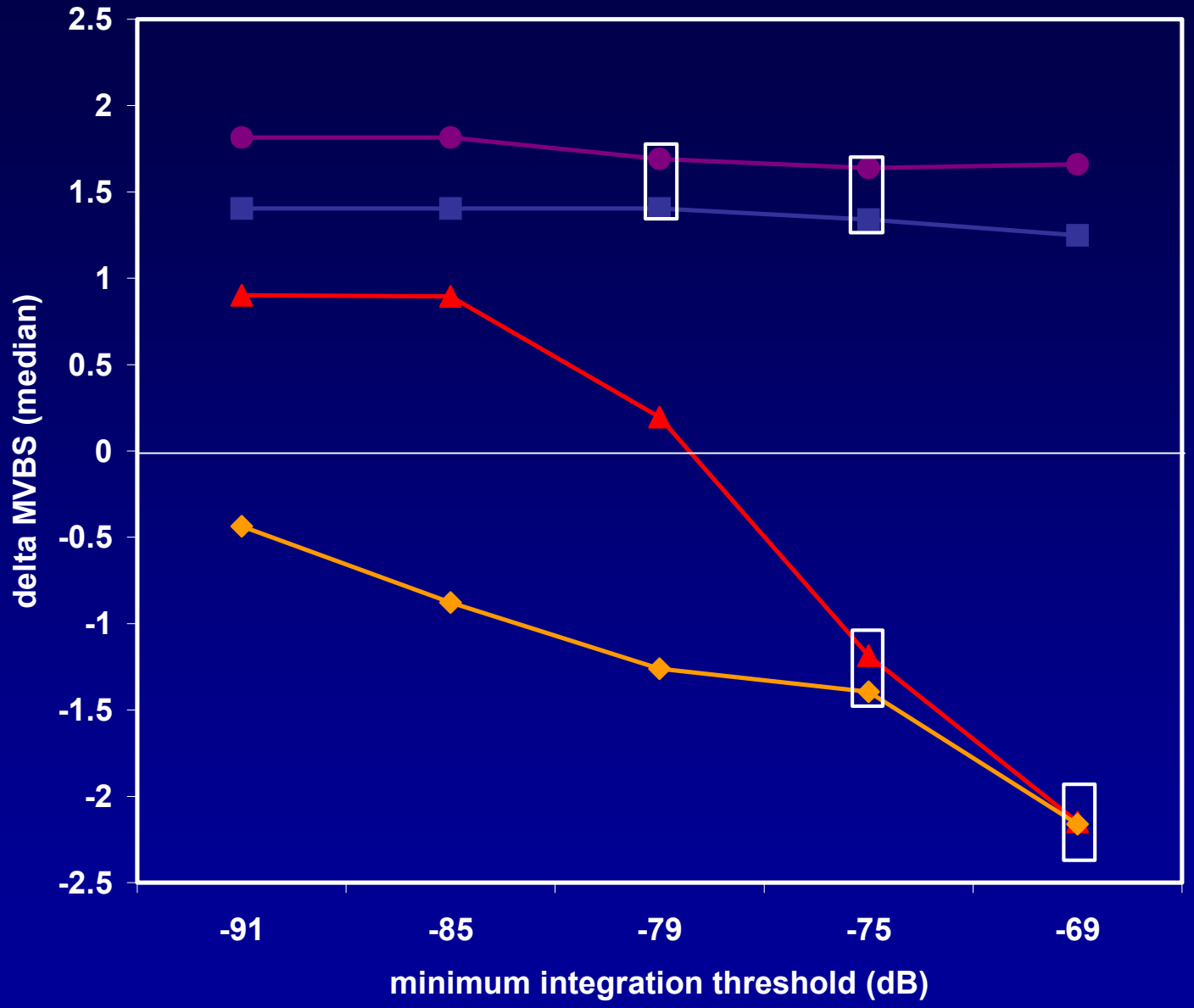
Conclusions

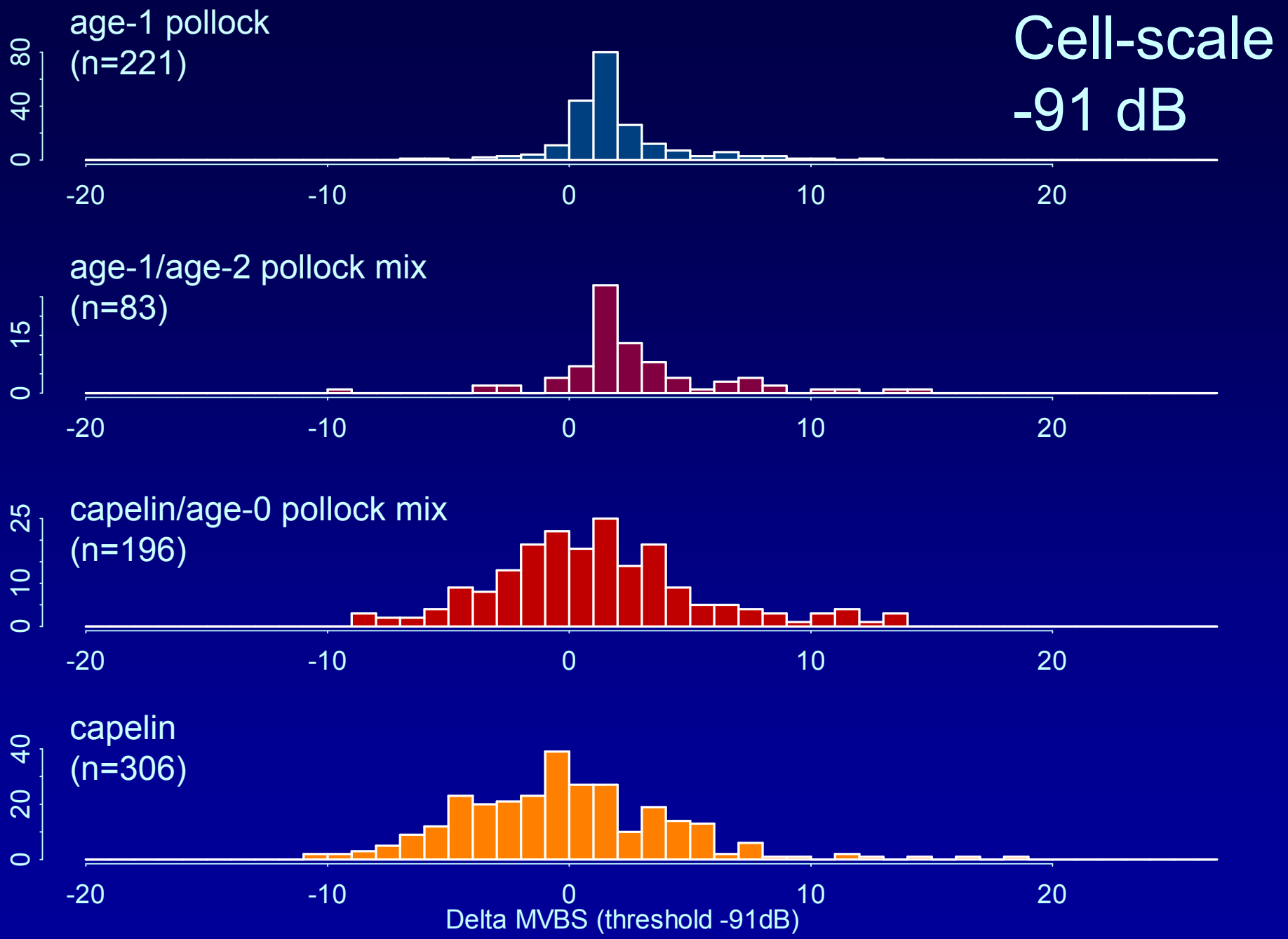
- Δ MVBS at high integration thresholds can be an effective technique to distinguish between juvenile pollock and capelin
- Include with other indicators for scrutinizing acoustic data collected during SSL prey studies

Acknowledgements

- Crew of NOAA Ship *Miller Freeman*
- Scientific personnel from RACE and REFM divisions of AFSC

Cell-scale analysis

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capelin/age-0 pollock mix
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0
10
25
-20
-10
0
10
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capelin
(n=306)
0
20
40
-20
-10
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10
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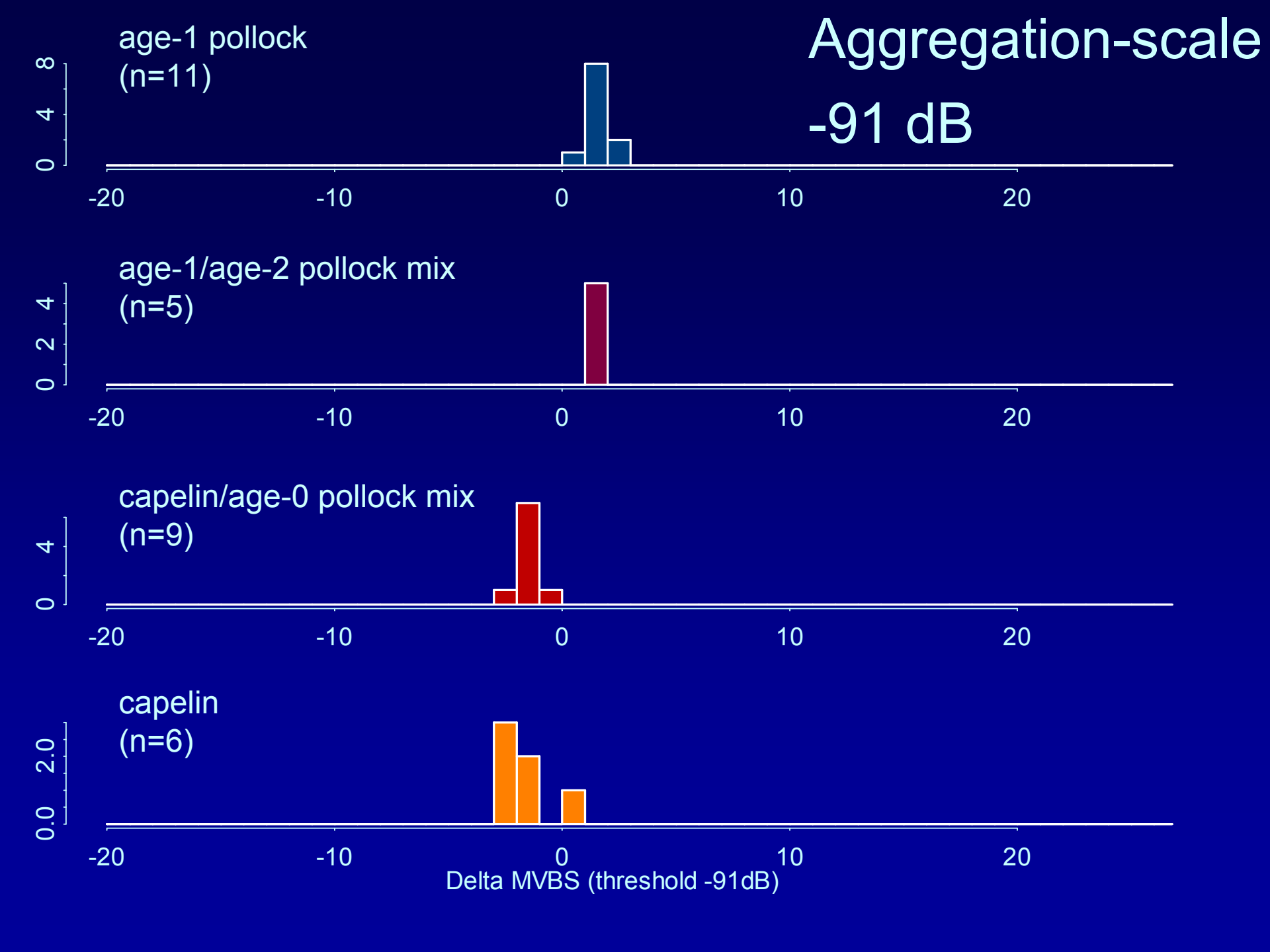
Delta MVBS (threshold -91dB)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capelin/age-0 pollock mix
(n=9)
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4
-20
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0
10
20
capelin
(n=6)
0.0
2.0
-20
-10
0
10
20
Delta MVBS (threshold -91dB)