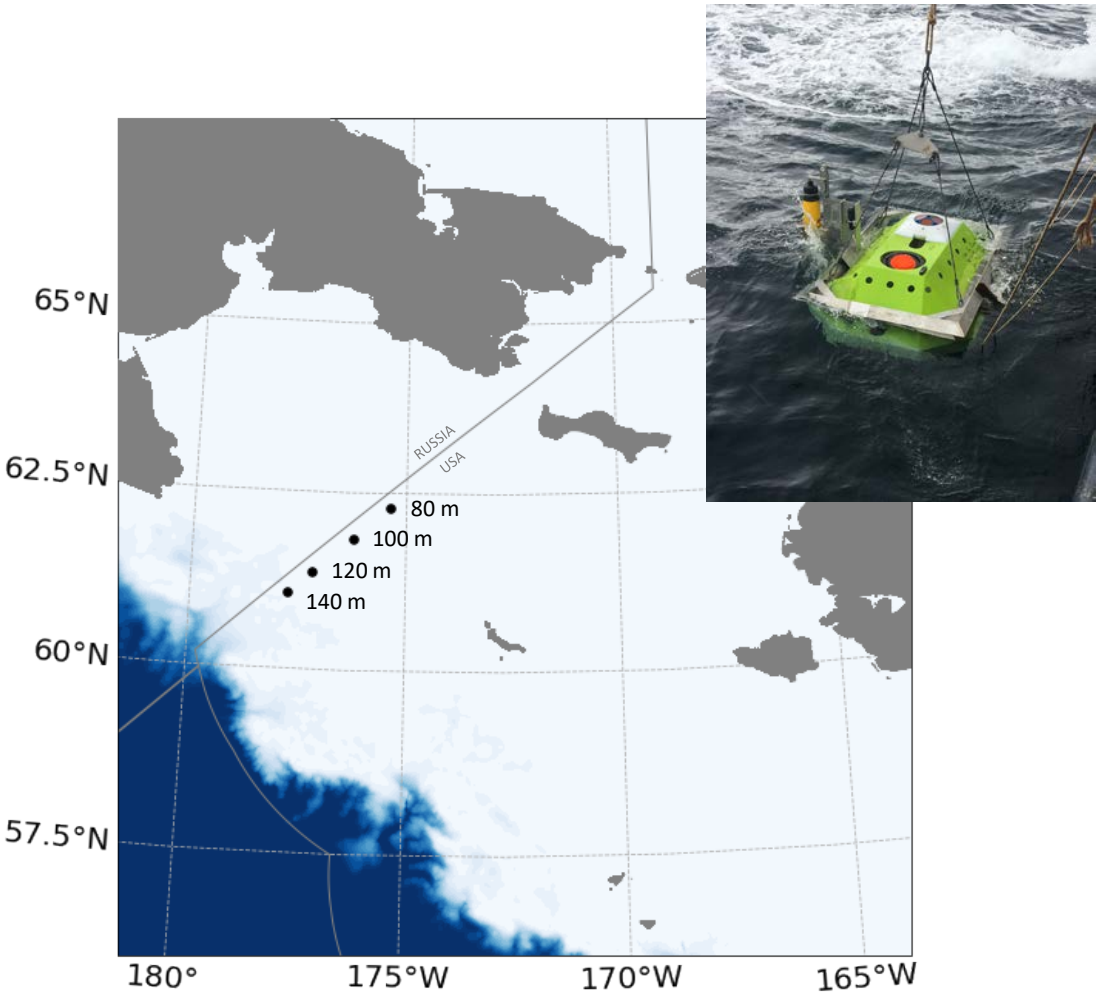
Transboundary movement of walleye pollock in the northwestern Bering Sea

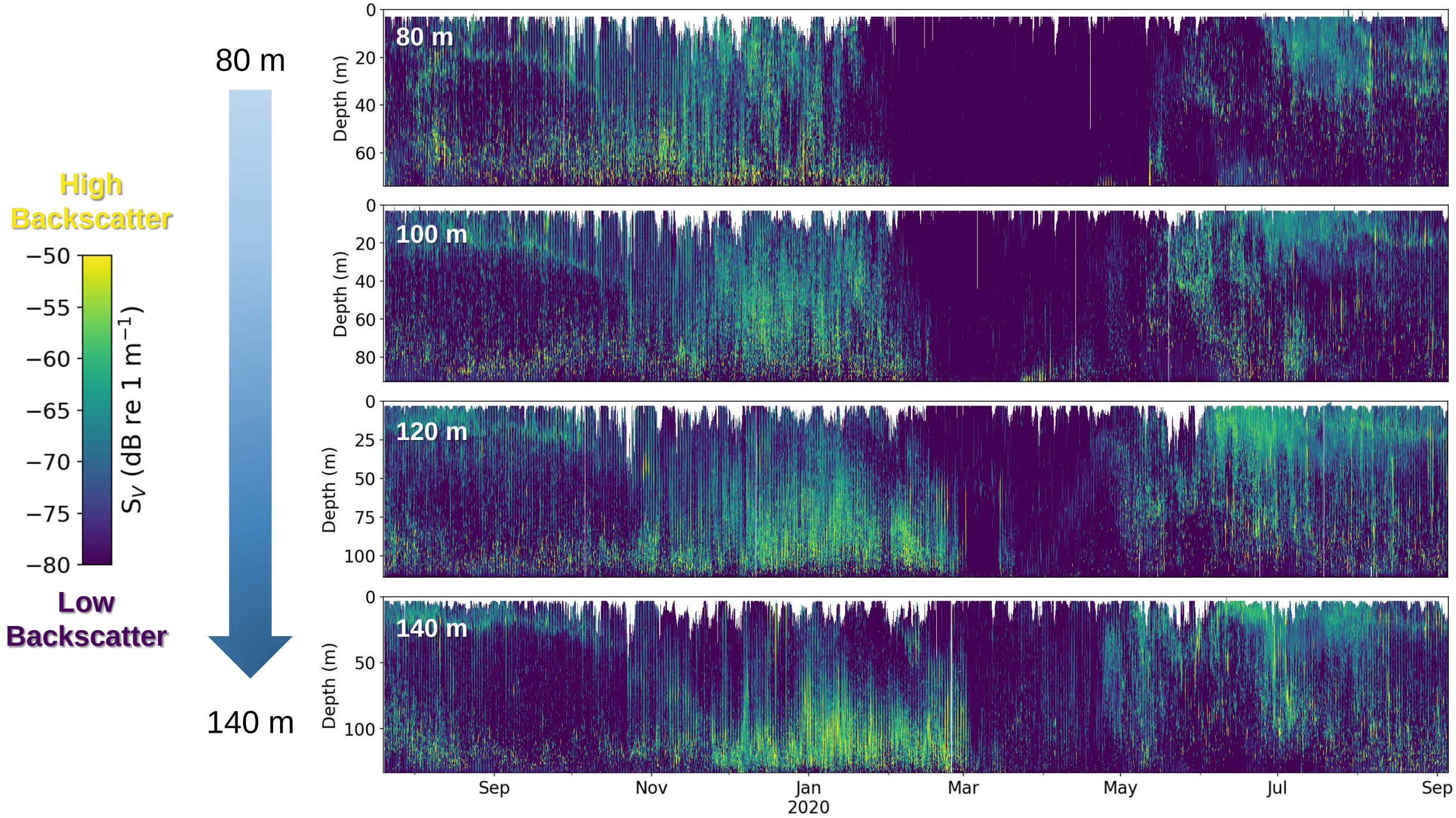
Robert Levine, Alex De Robertis, Mike Levine
Midwater Assessment and Conservation Engineering, AFSC

Jim Ianelli
Resource Ecology and Fisheries Management, AFSC

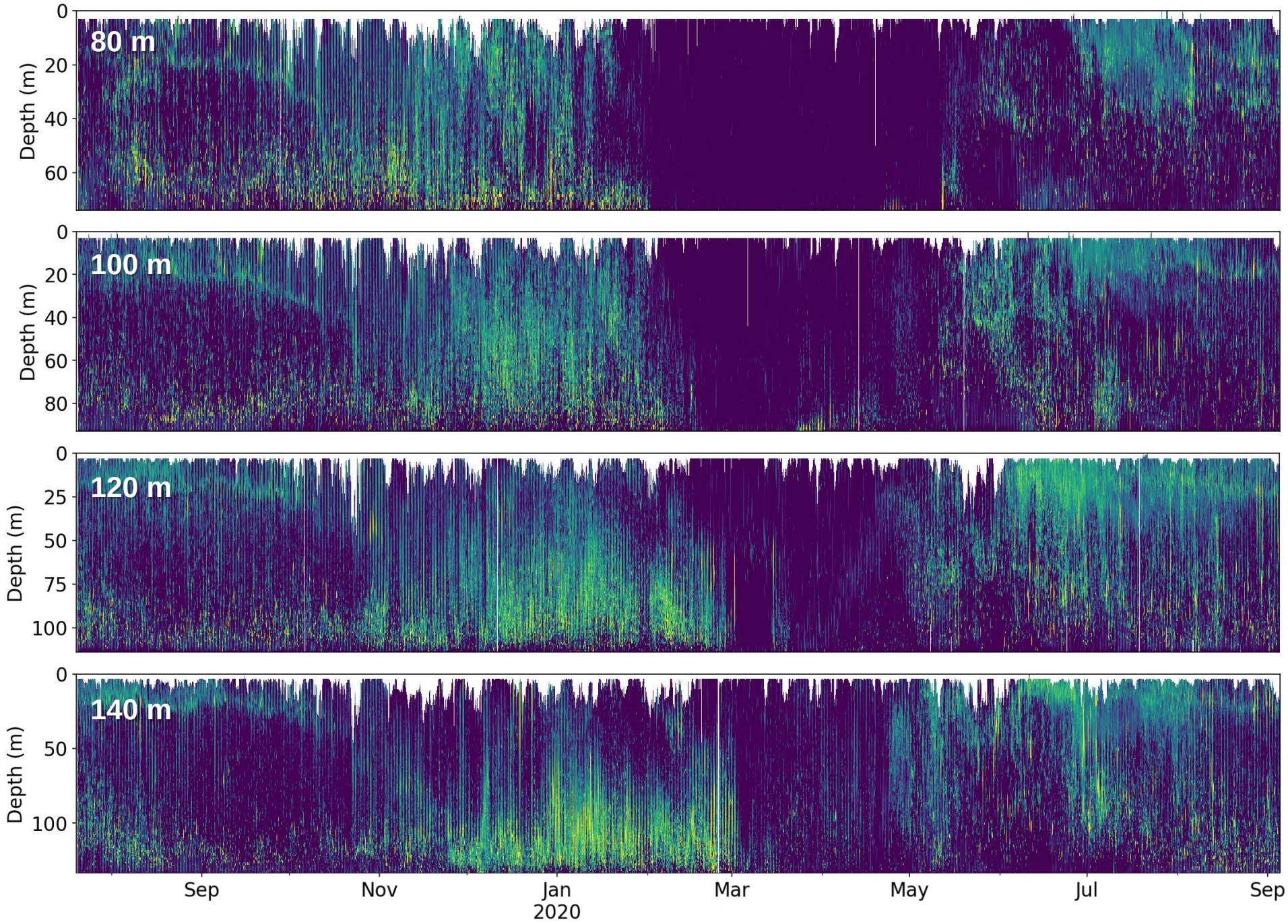
Chris Bassett
Applied Physics Laboratory, UW

Goal: Quantify the seasonal movements of walleye pollock across the US/Russia boundary




High Backscatter
−50
−55
−60
−65
−70
−75
−80
S_V (dB re 1 m^{-1})
Low Backscatter
80 m
140 m
80 m
100 m
120 m
140 m
Depth (m)
0
20
40
60
80
100
25
50
75
Sep
Nov
Jan
2020
Mar
May
Jul
Sep

Seasonal patterns were consistent across all four sites



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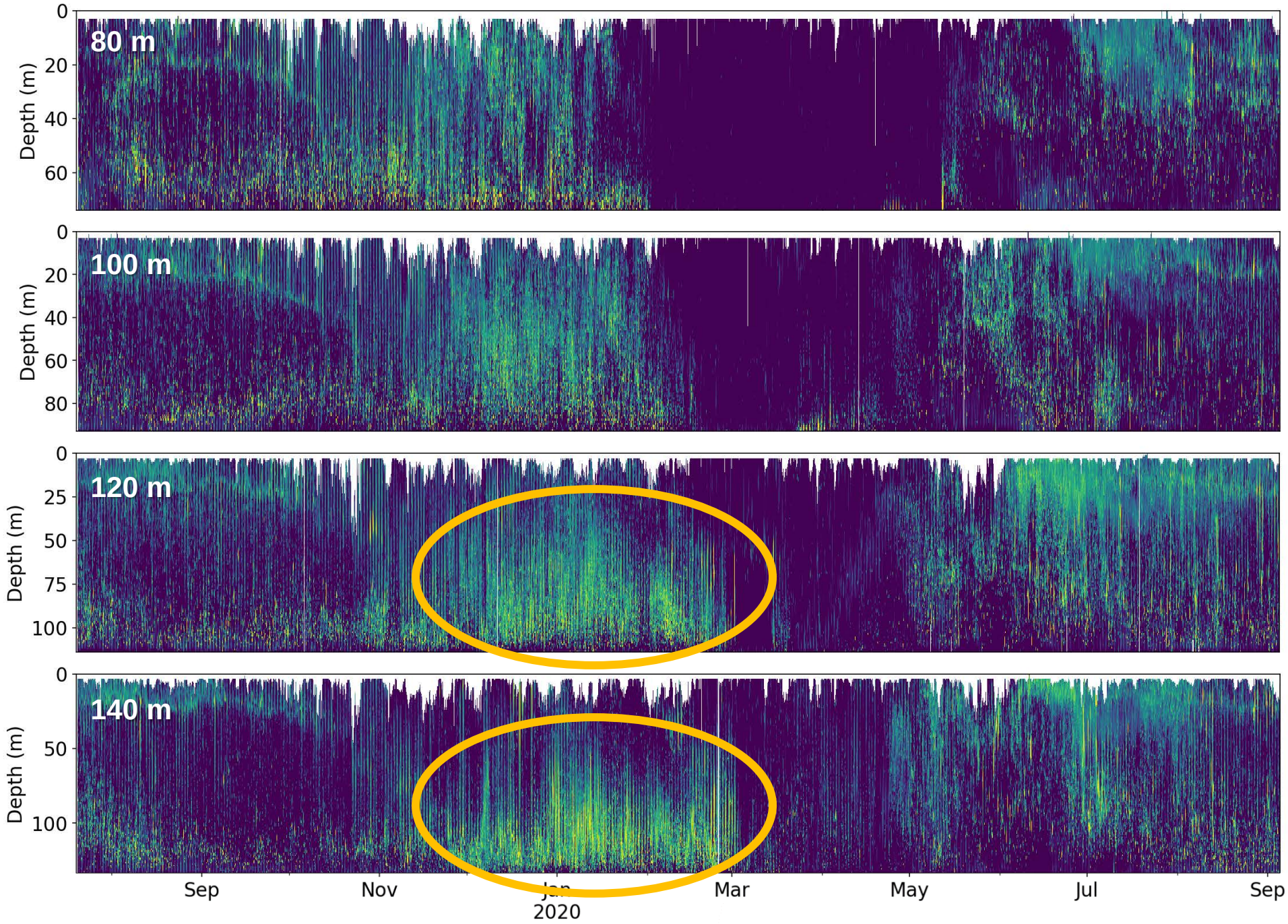
Peak fish abundance occurred from Dec – Feb

Backscatter was highest at the 120 and 140 m sites during winter



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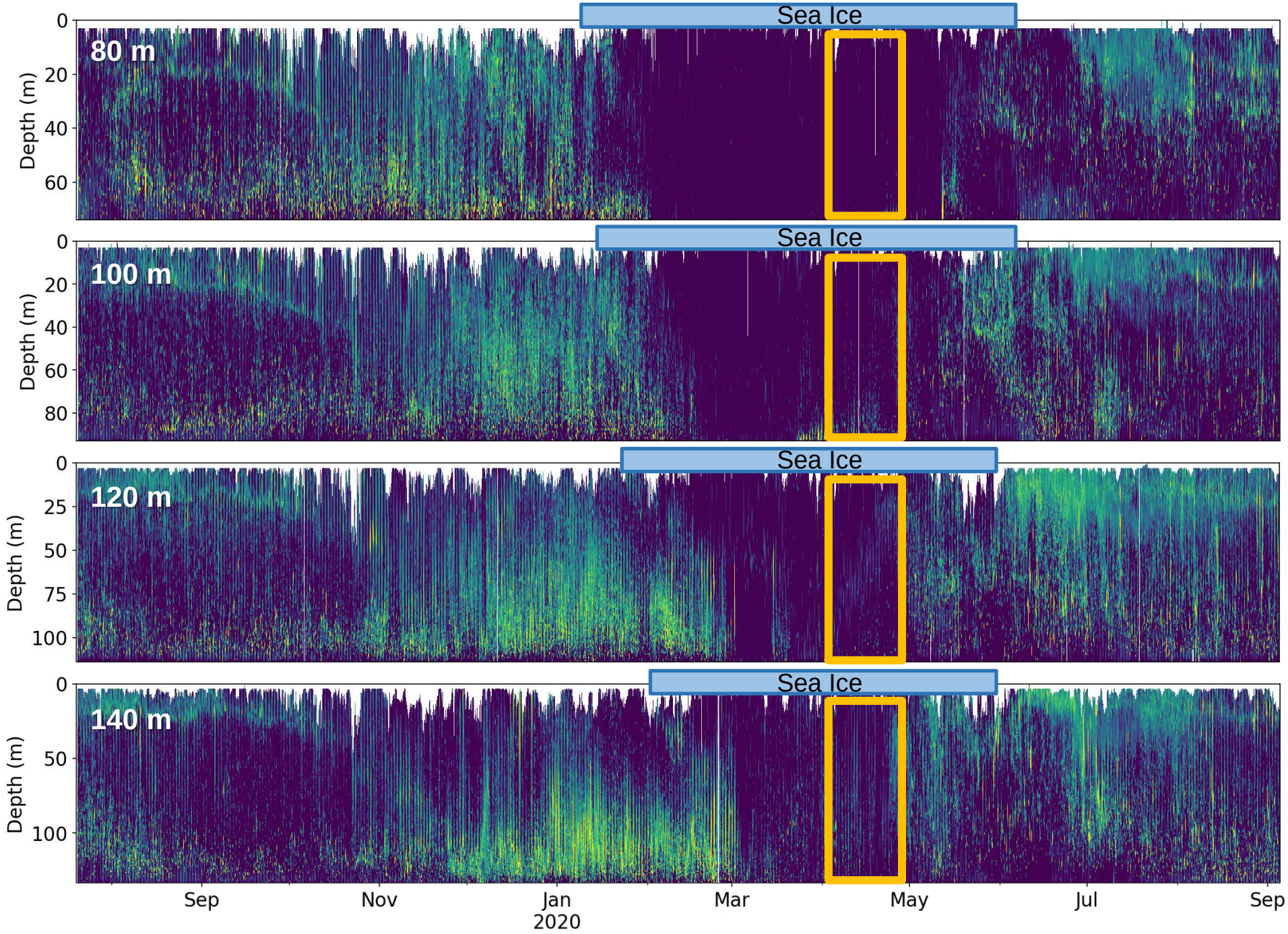

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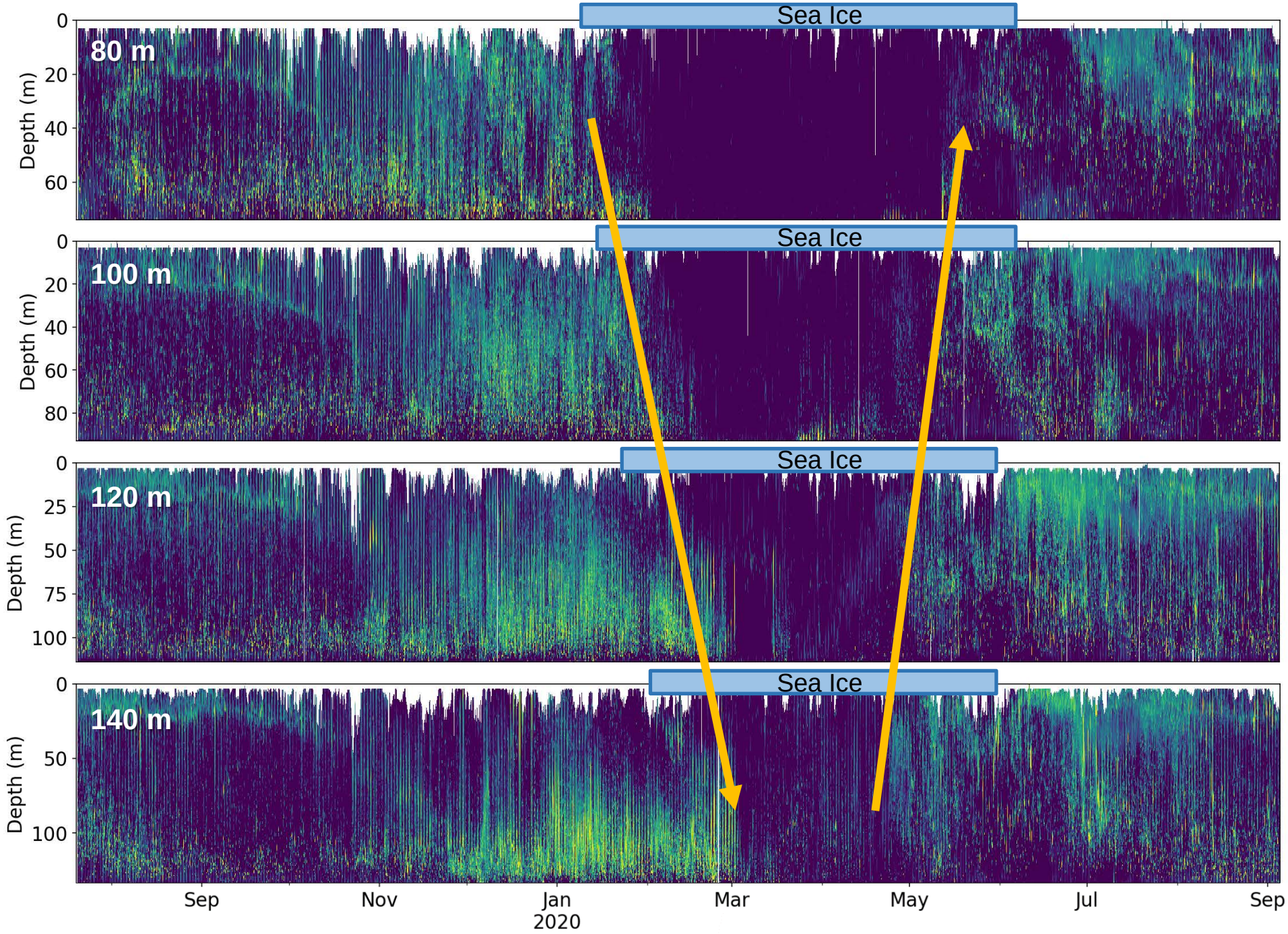
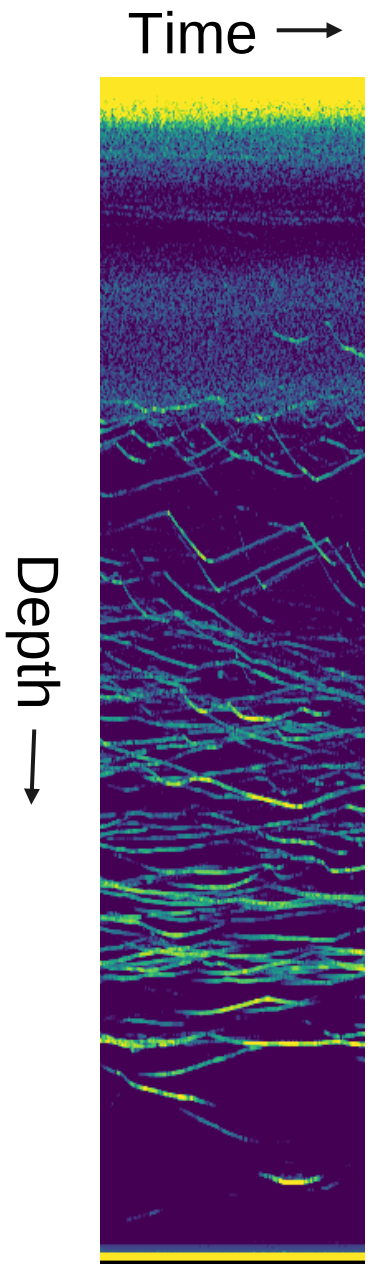


Tracking individual fishes



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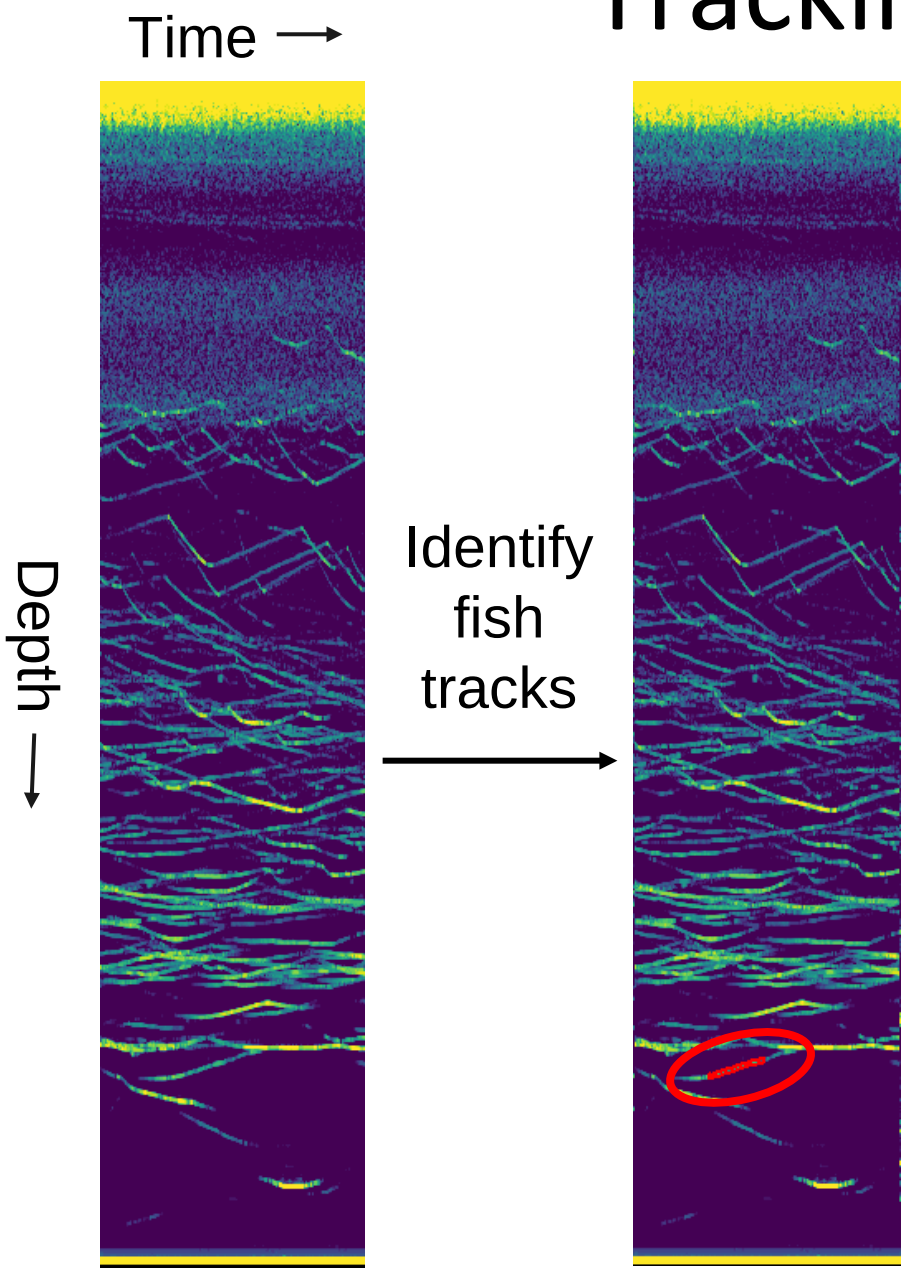

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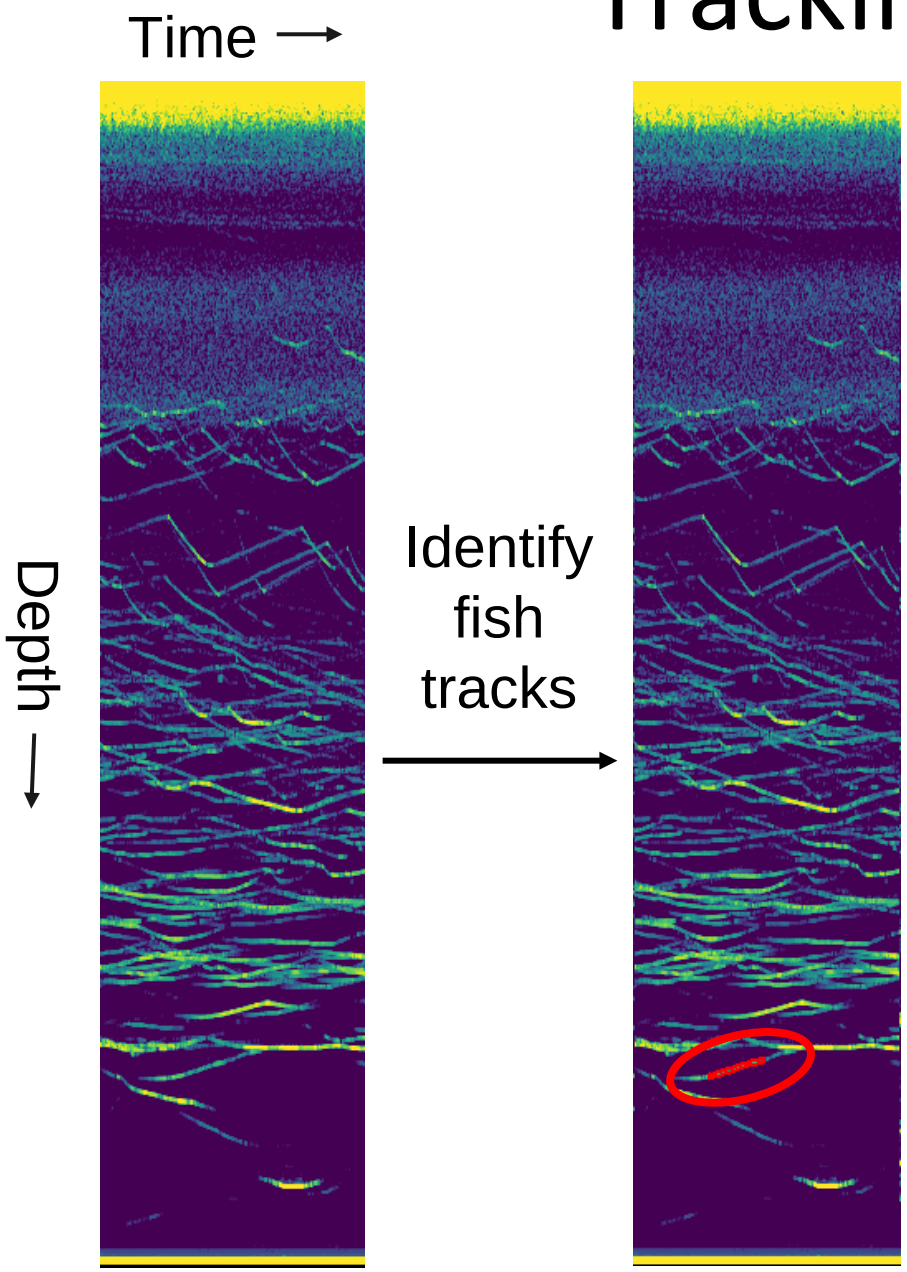
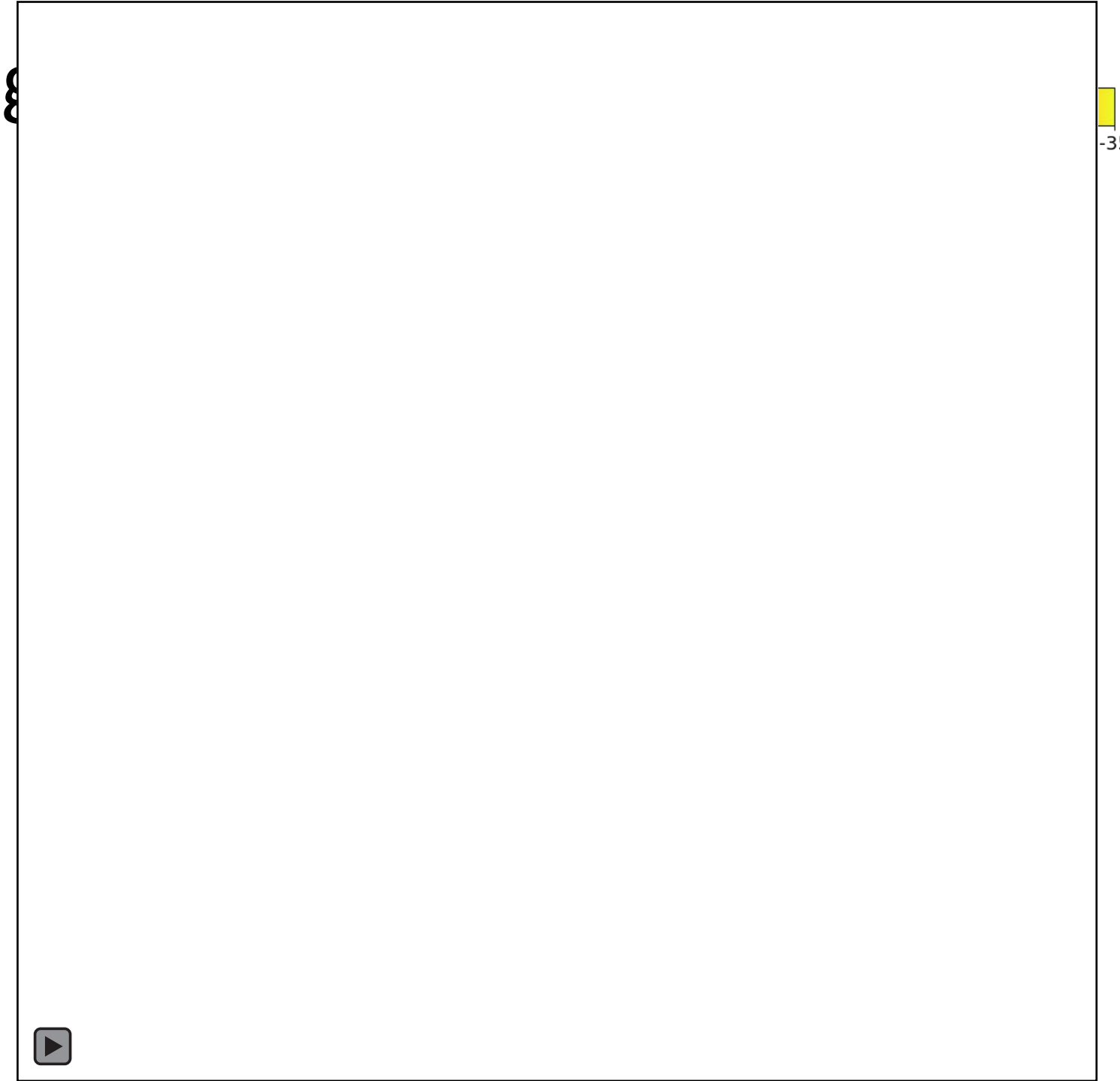
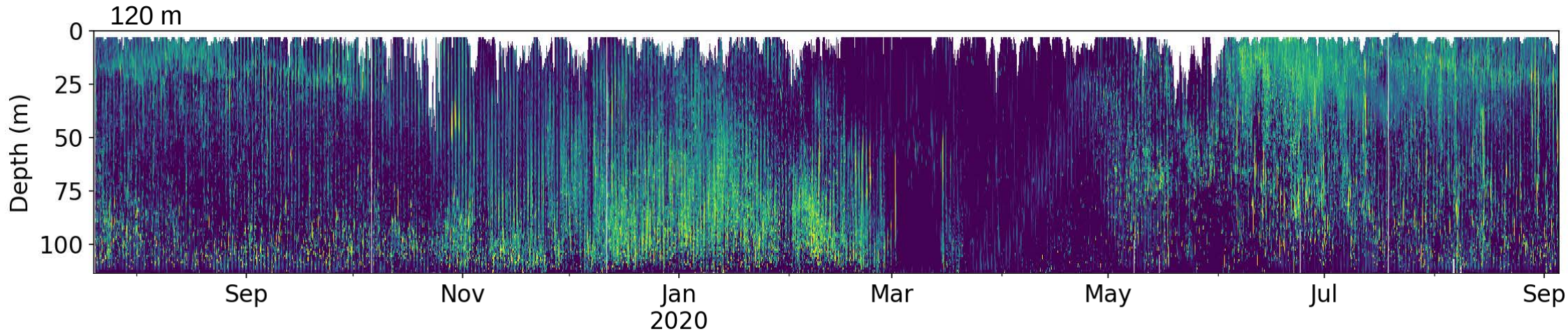
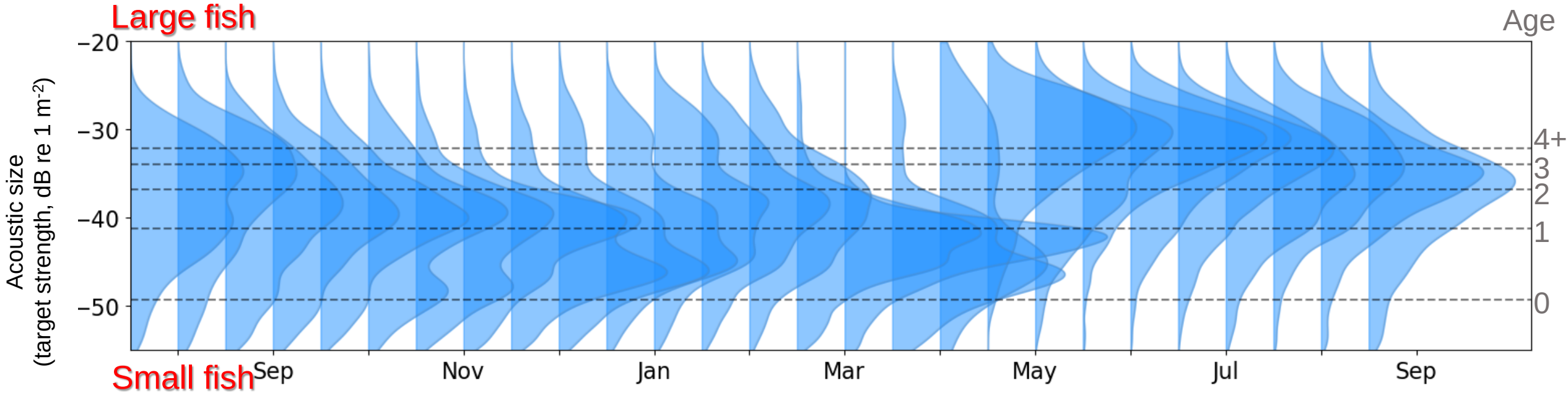


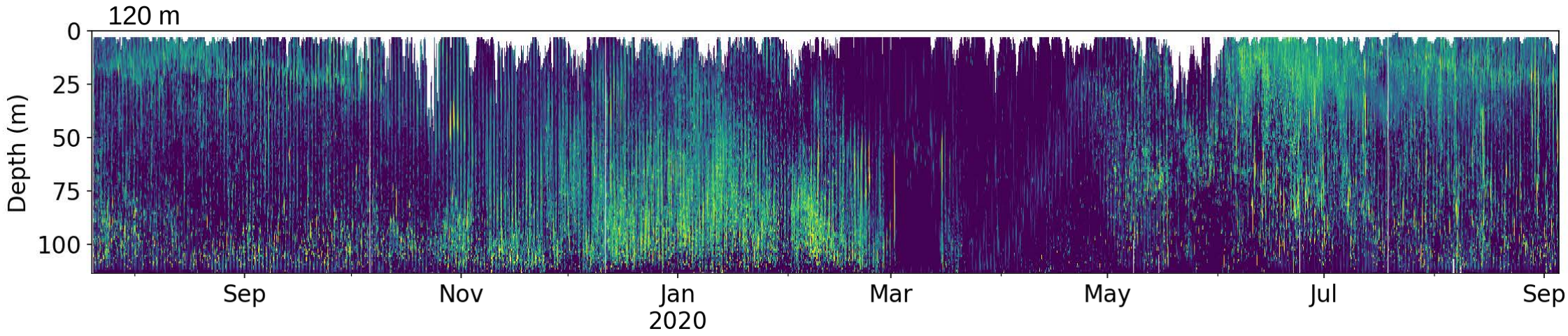


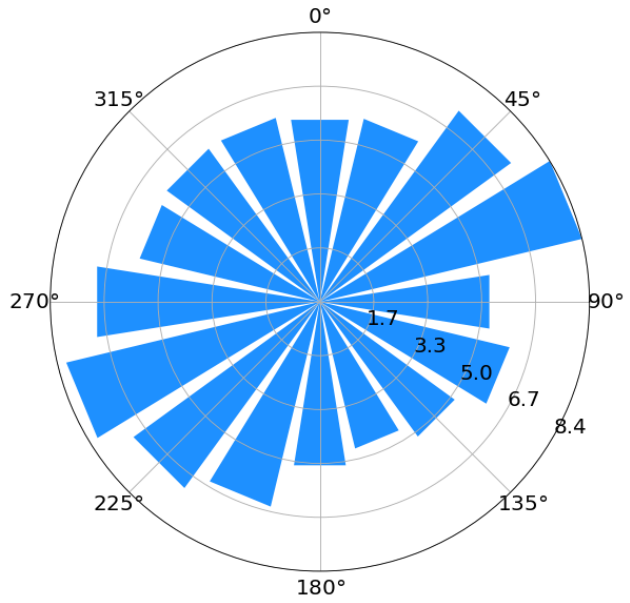
Seasonal variability in size composition

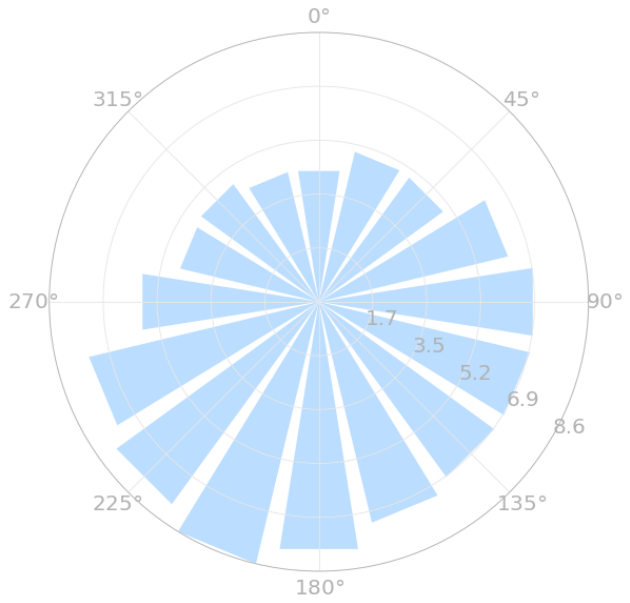


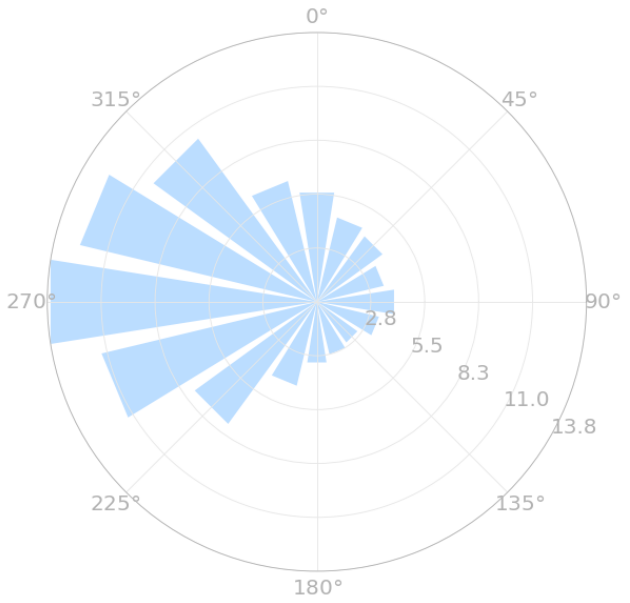


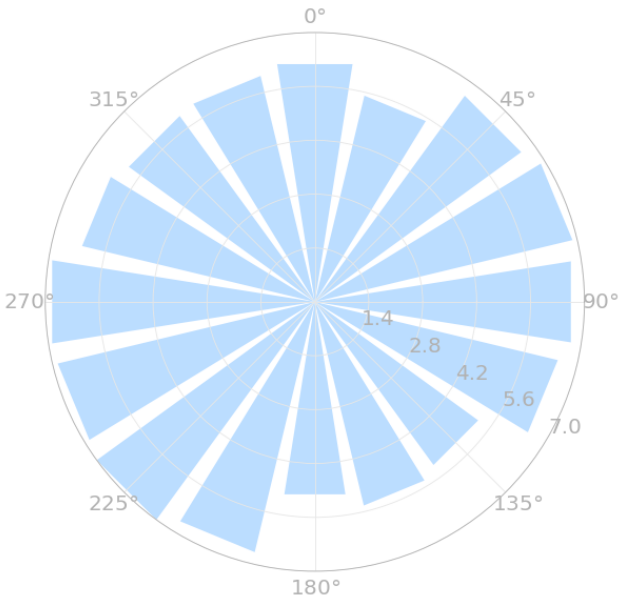
Seasonal patterns in fish movement











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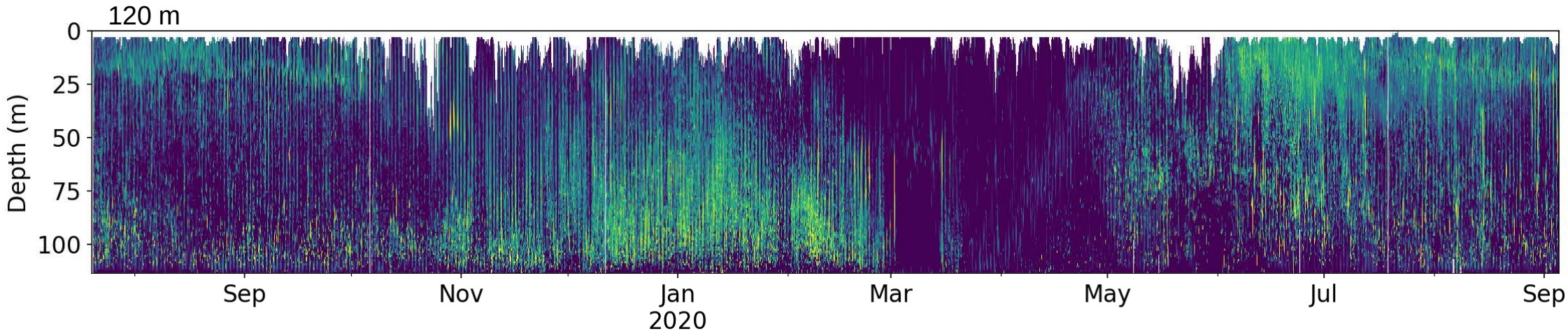

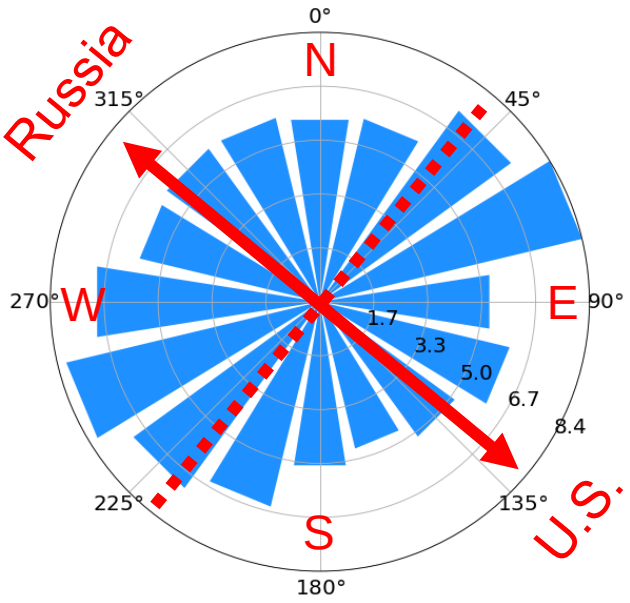

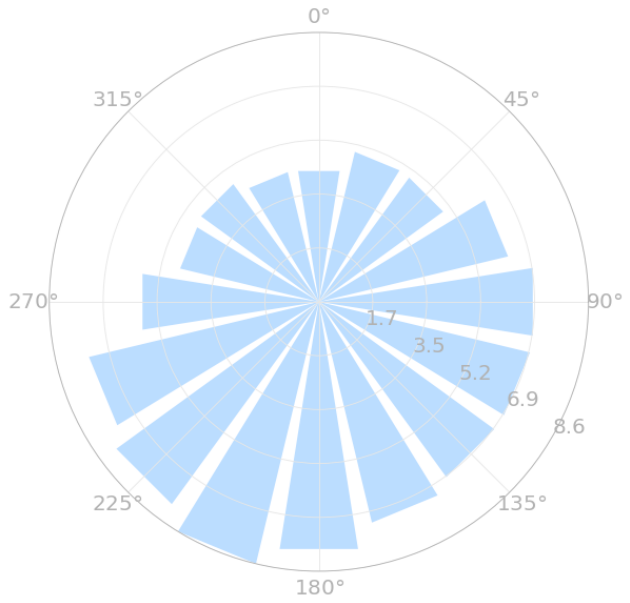

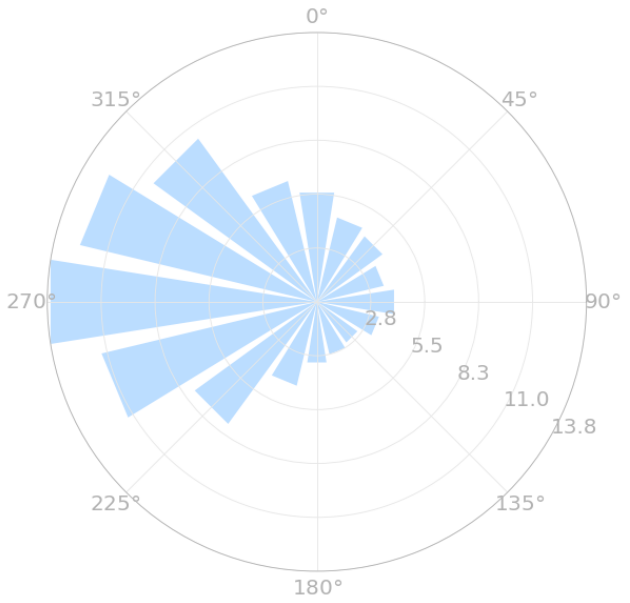

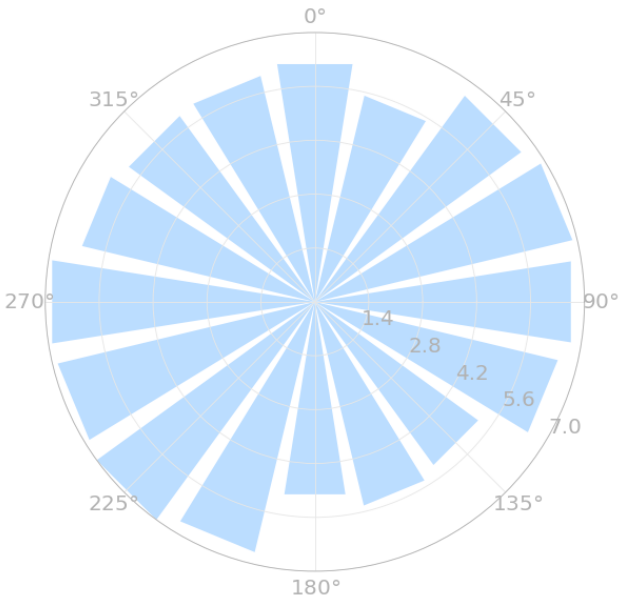

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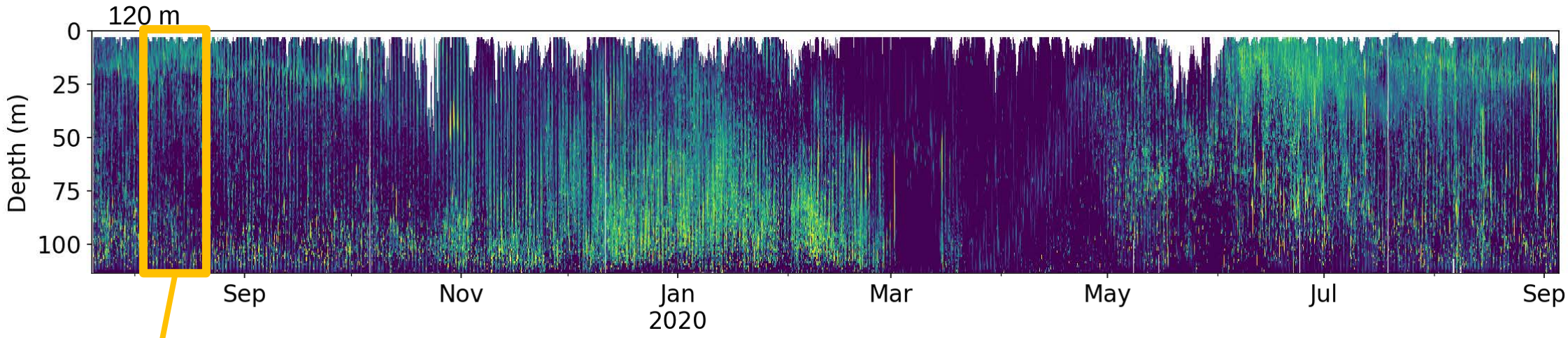

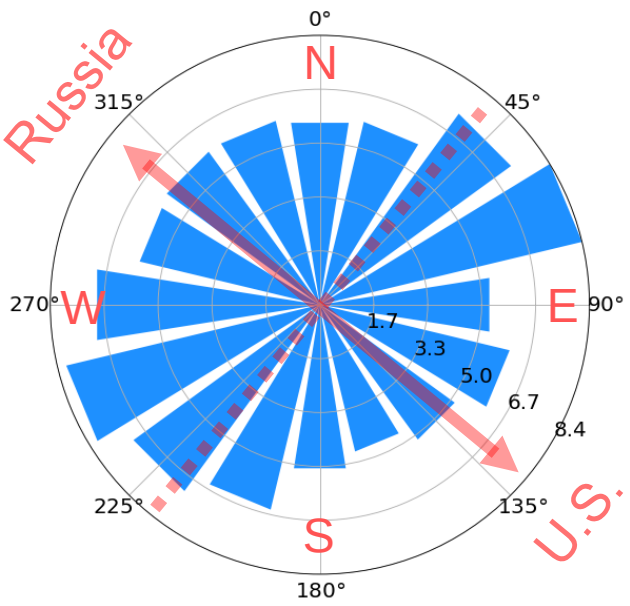

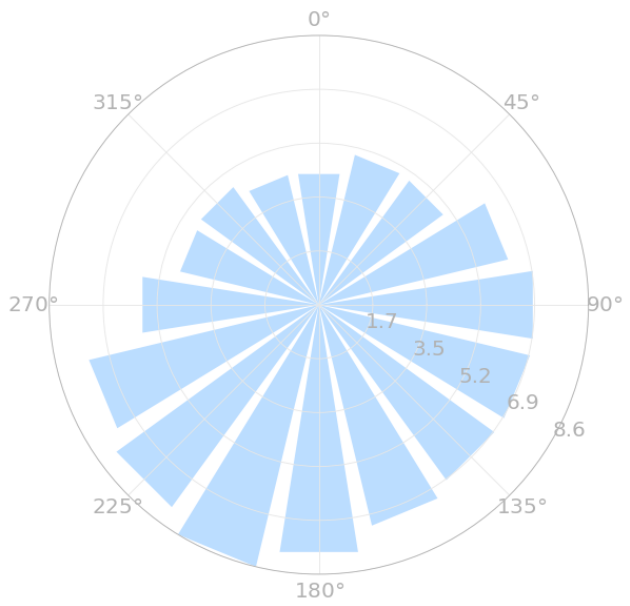

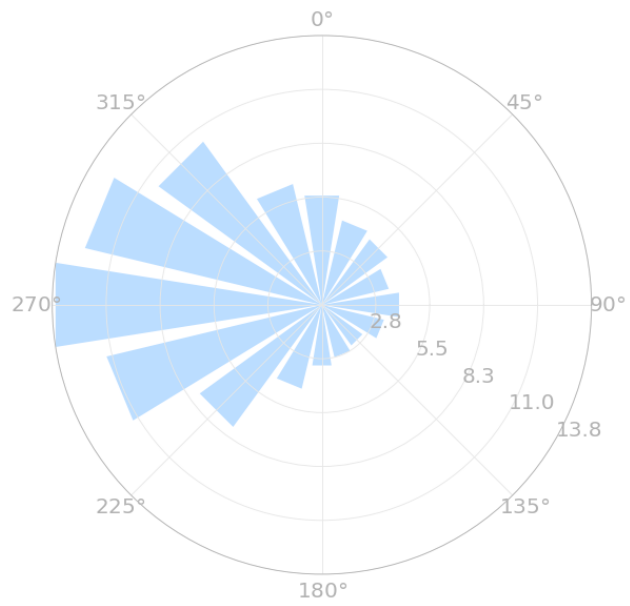

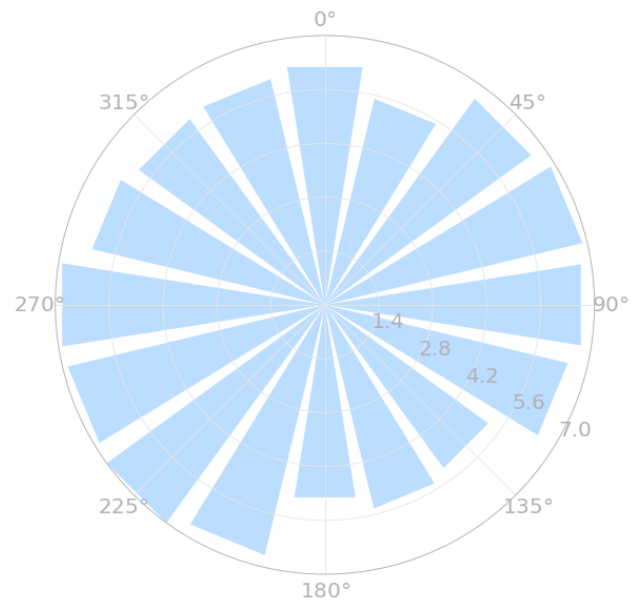

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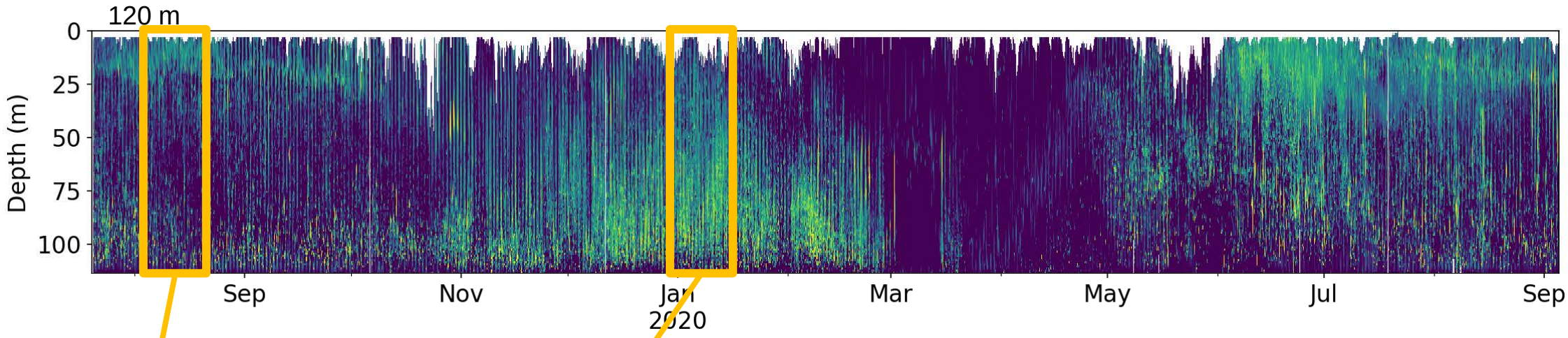

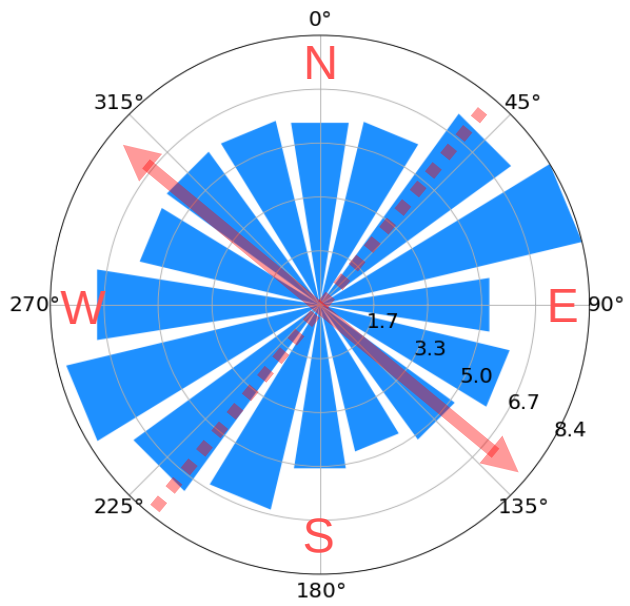

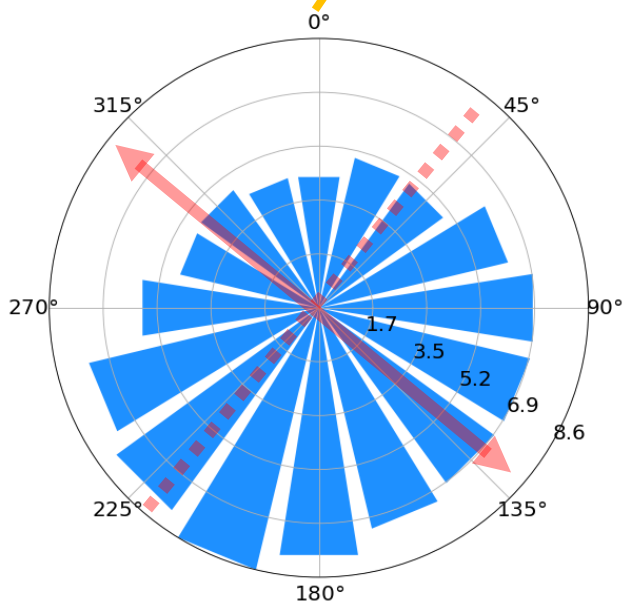

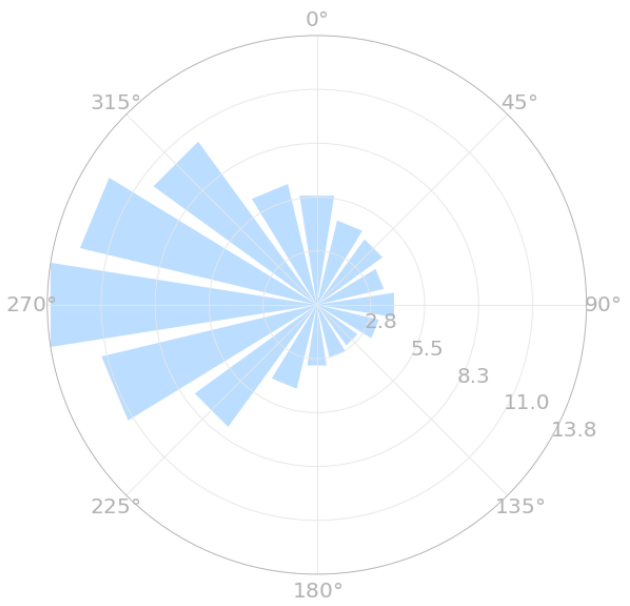

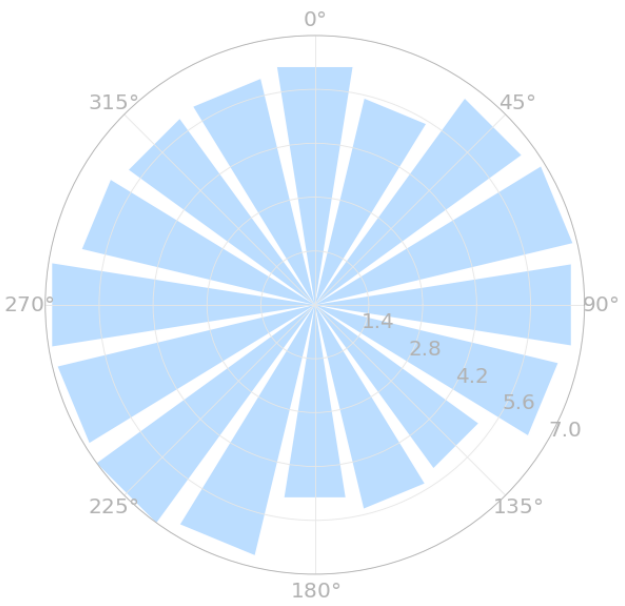

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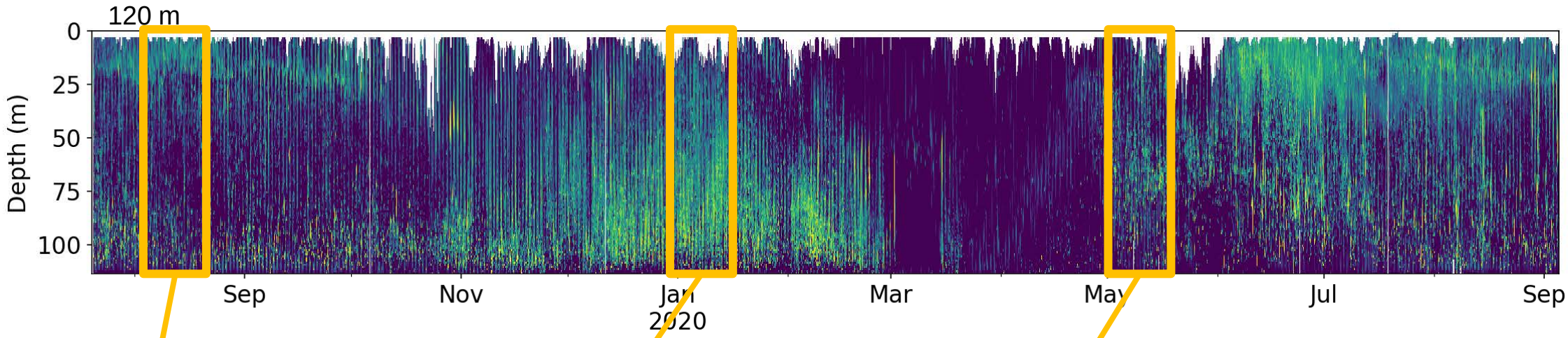

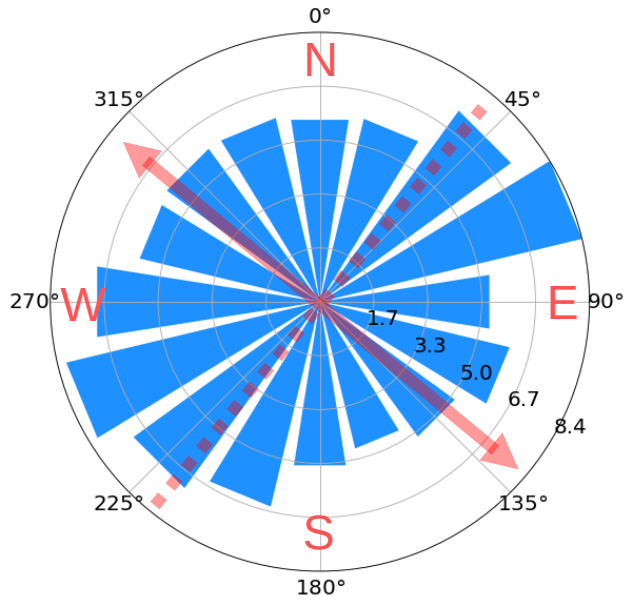

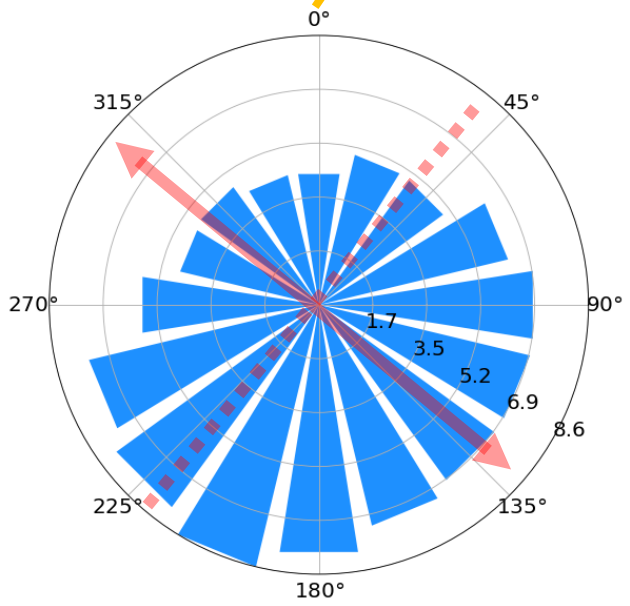

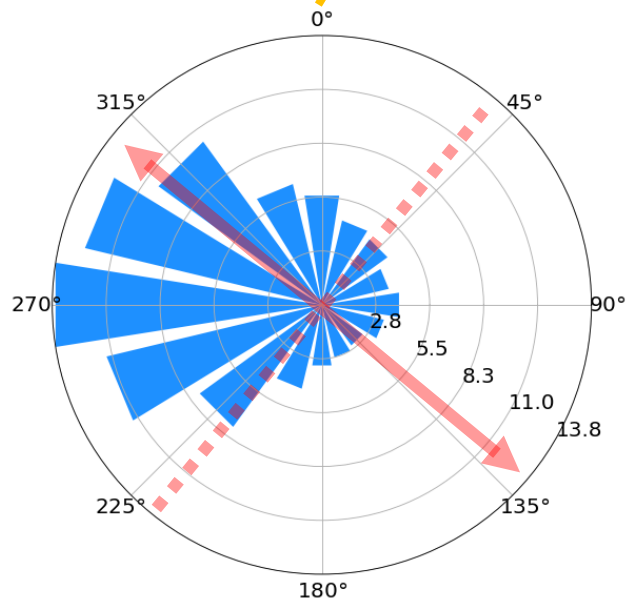

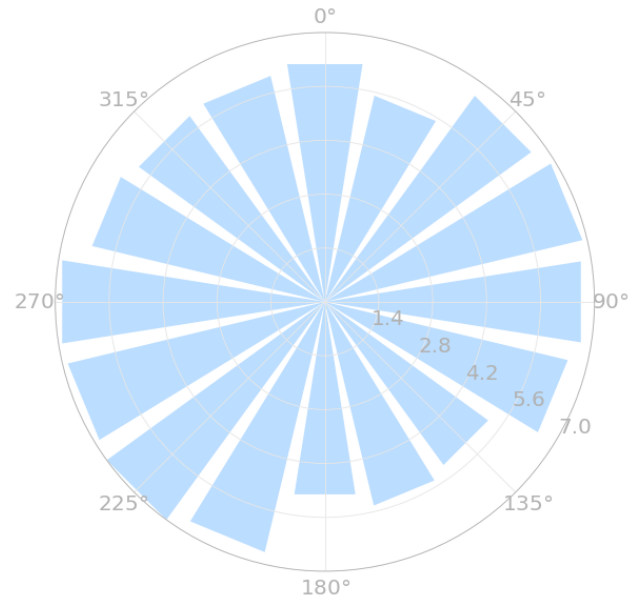

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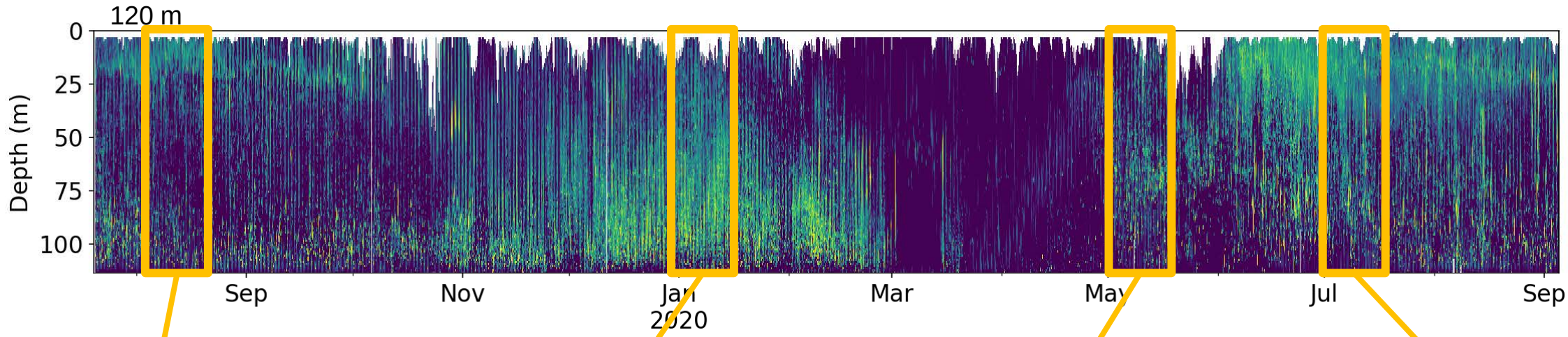
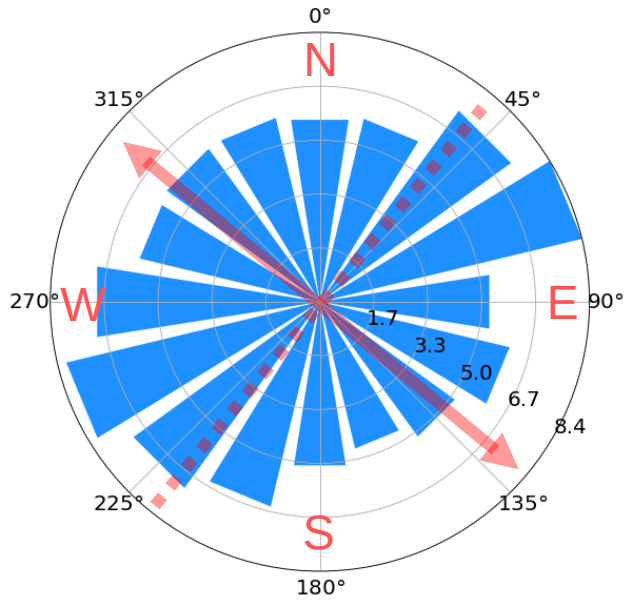
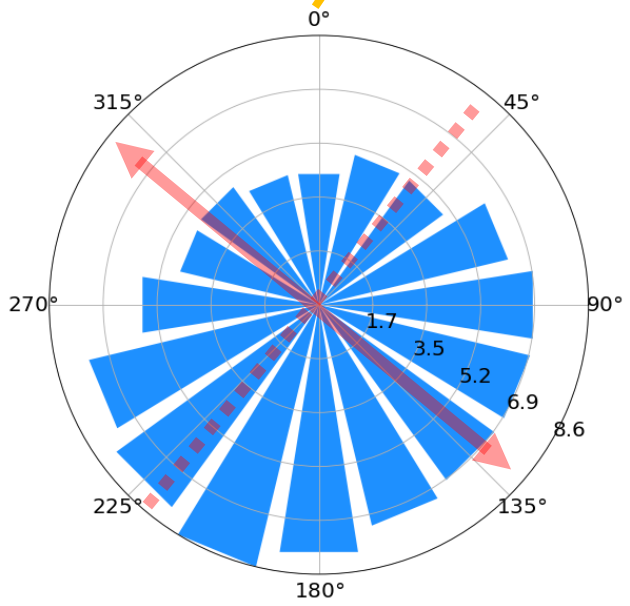
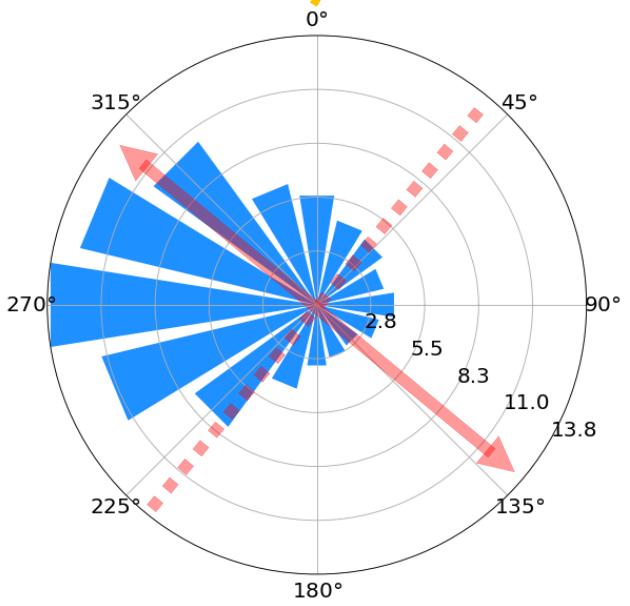
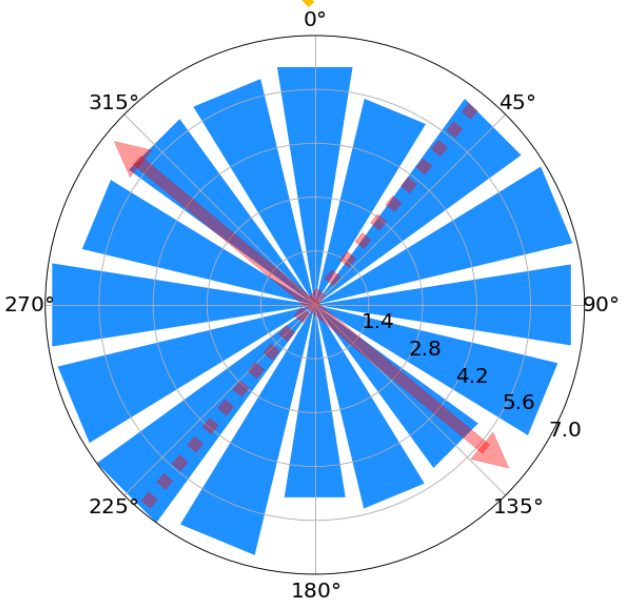






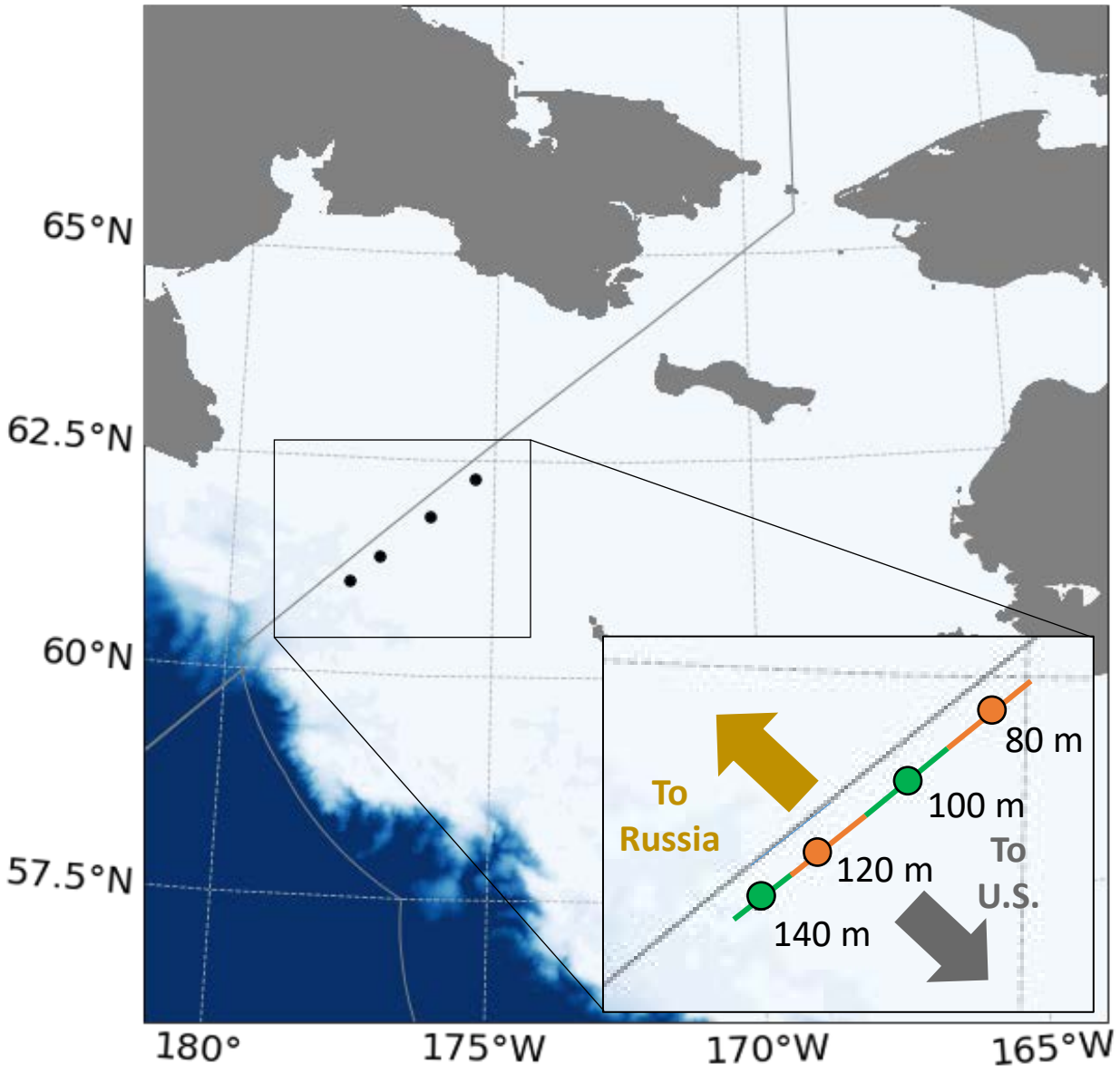




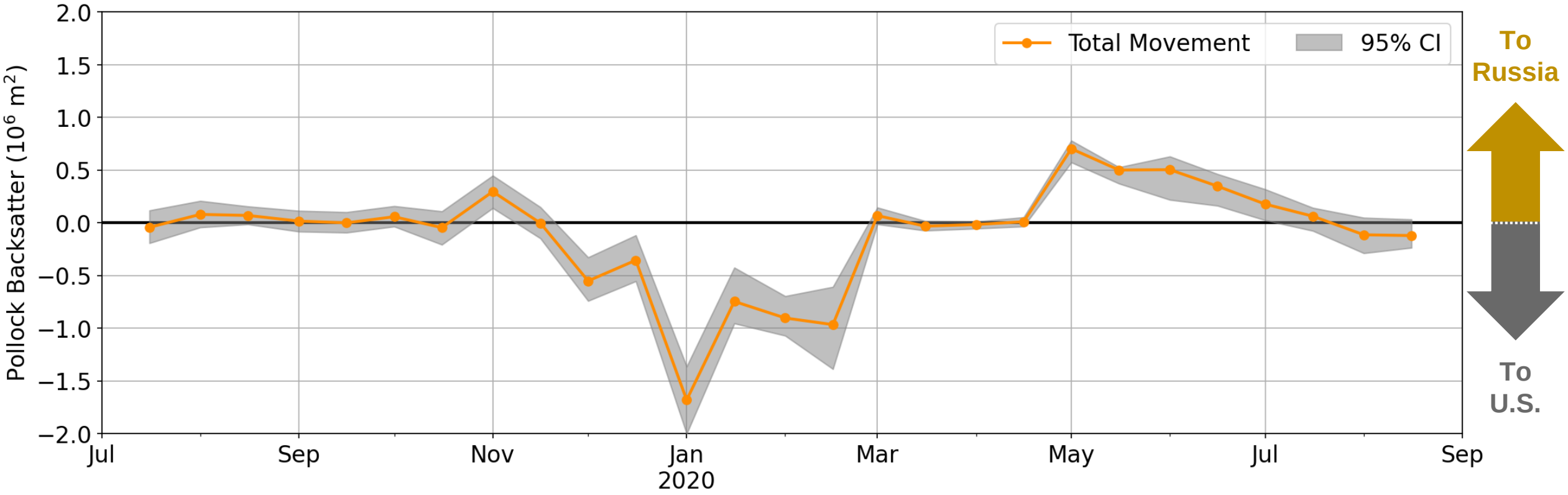
Estimating population movement across the mooring line

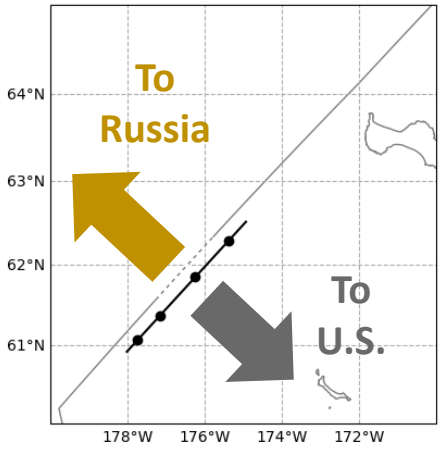
Observations from each mooring are extrapolated to estimate total movement across a line

Fish speed towards Russia
×
Backscatter



There is substantial seasonal exchange between sectors





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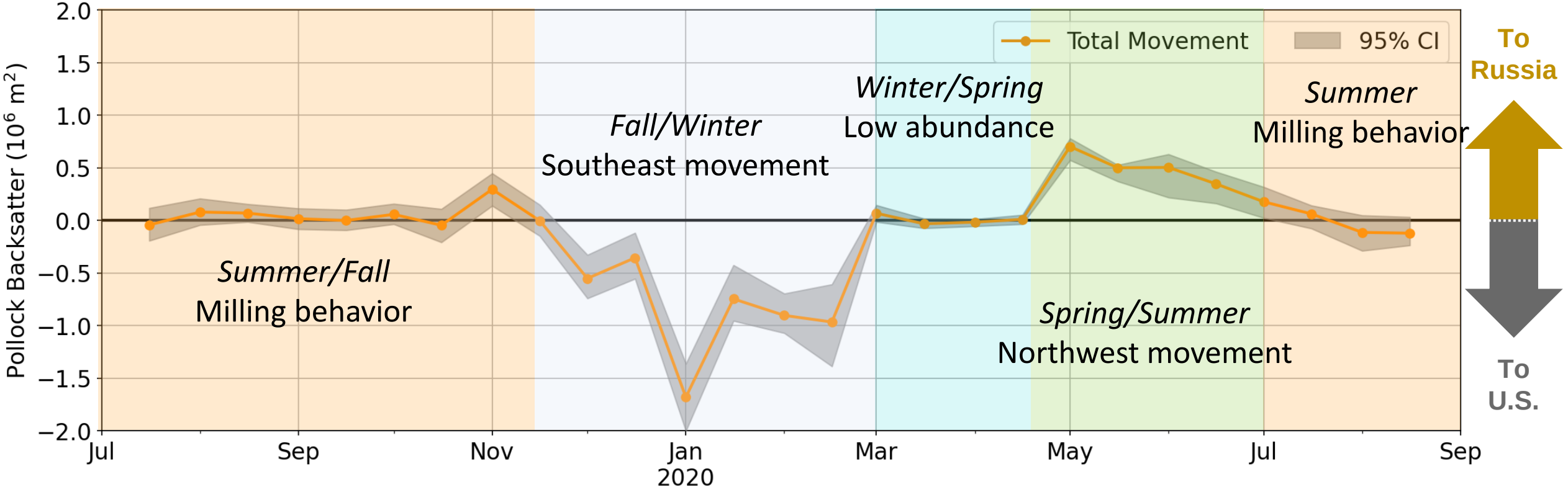

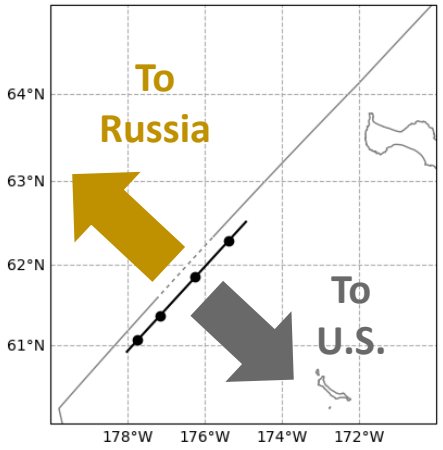

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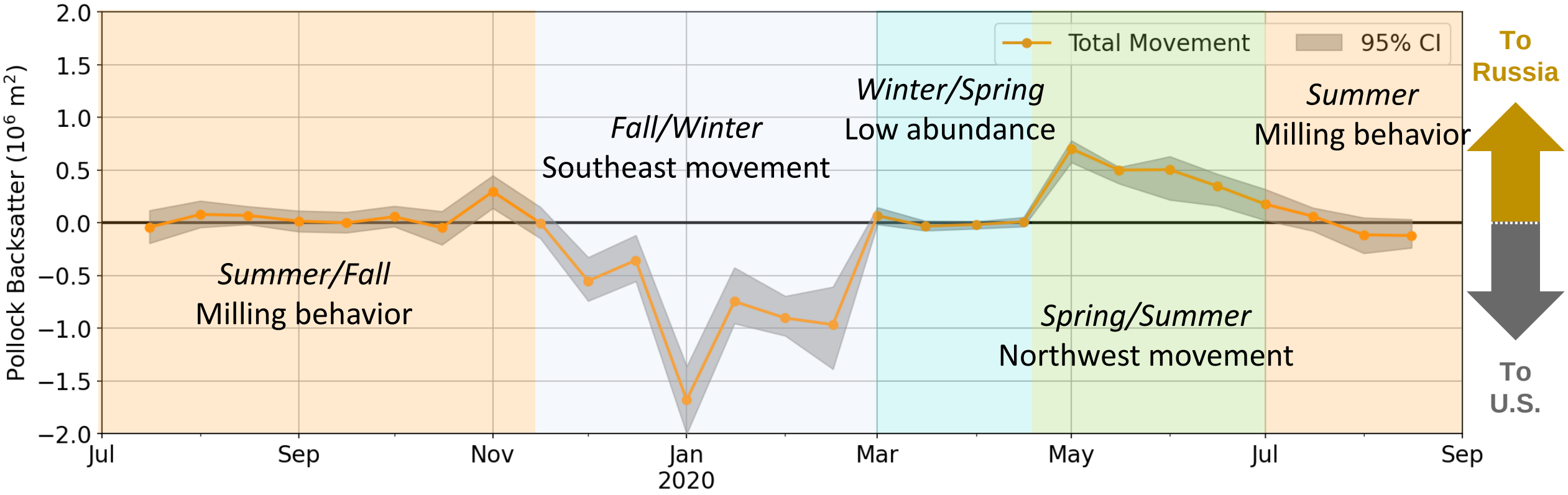


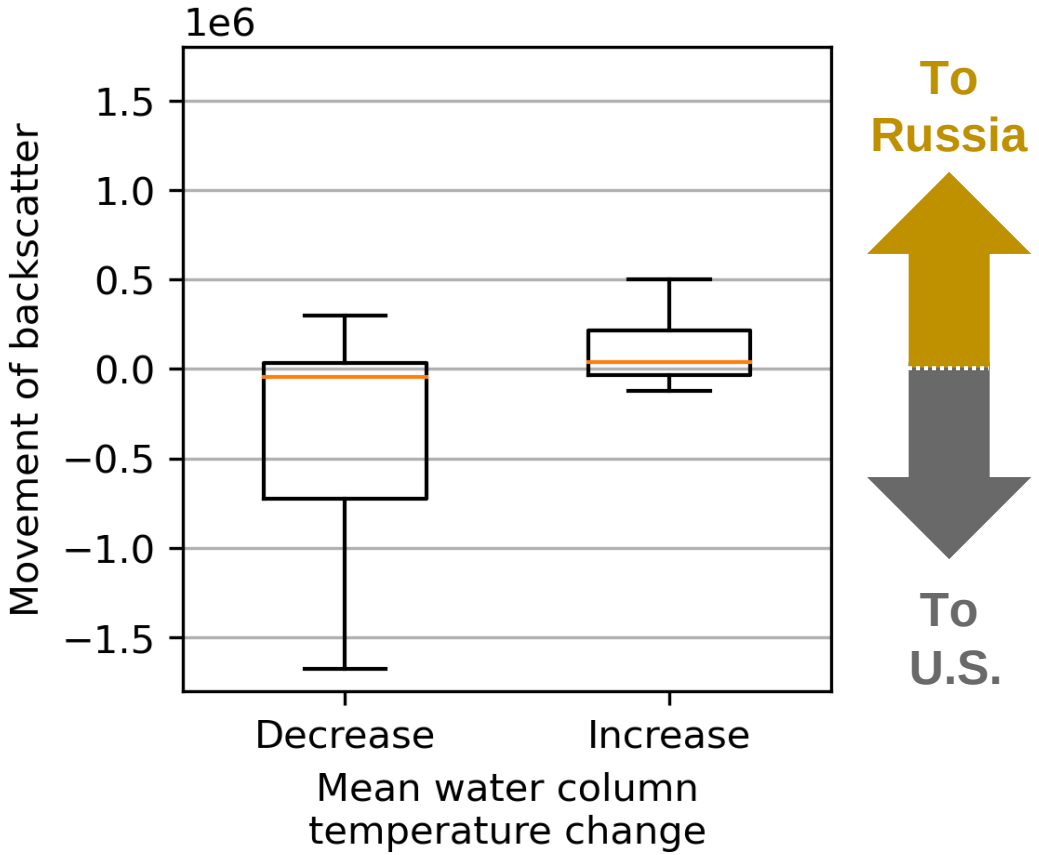
- Twice as much backscatter moved into the U.S. than into Russia during the 2019-2020 deployment period
- The total backscatter that moved into the U.S. in winter was 1.7x the total backscatter historically observed in summer AT surveys
- There's evidence that a large portion of this backscatter is coming from small fish

Why did more fish move into the U.S. during the deployment period?

Fish movement into the U.S. was associated with cooling

The net difference in movement during the deployment may be driven by the shift in population due to annual temperature differences

This may be linked with the associated changes in ice, salinity, and light



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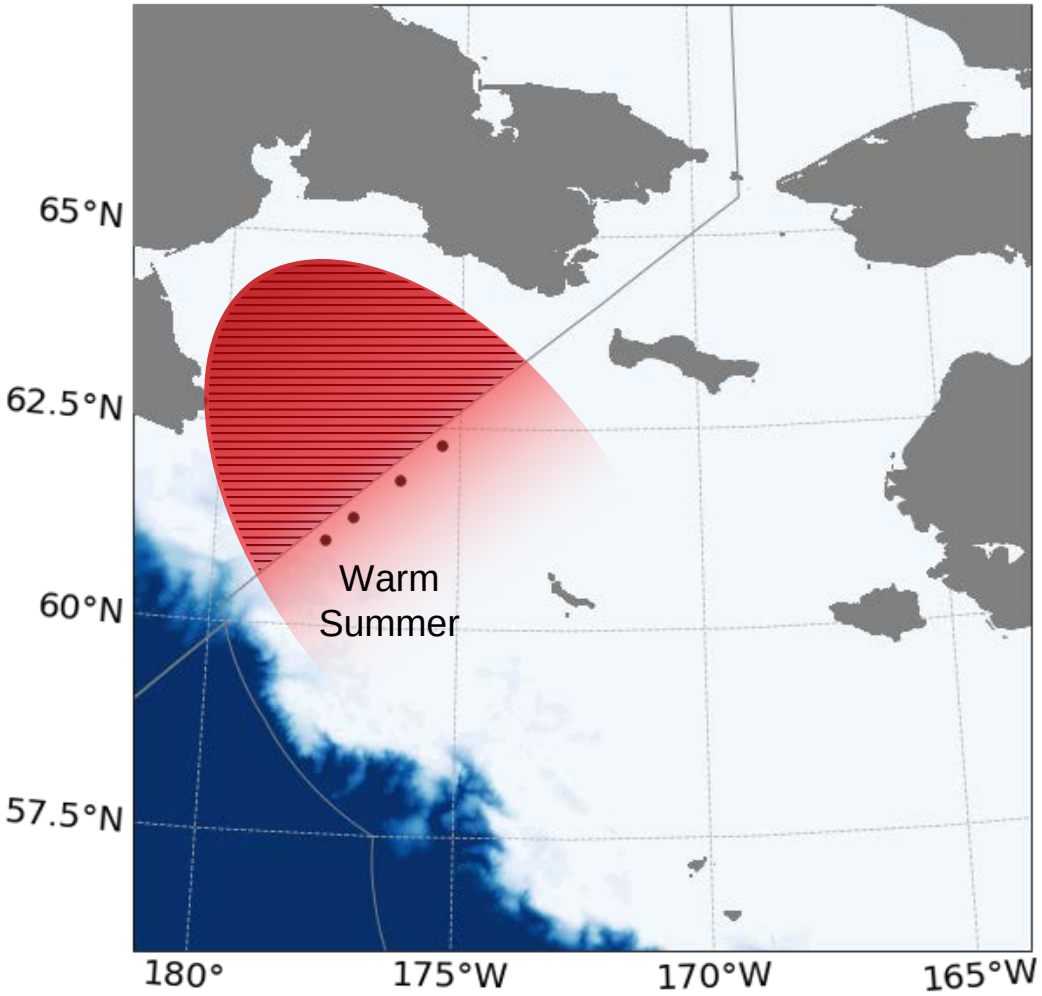

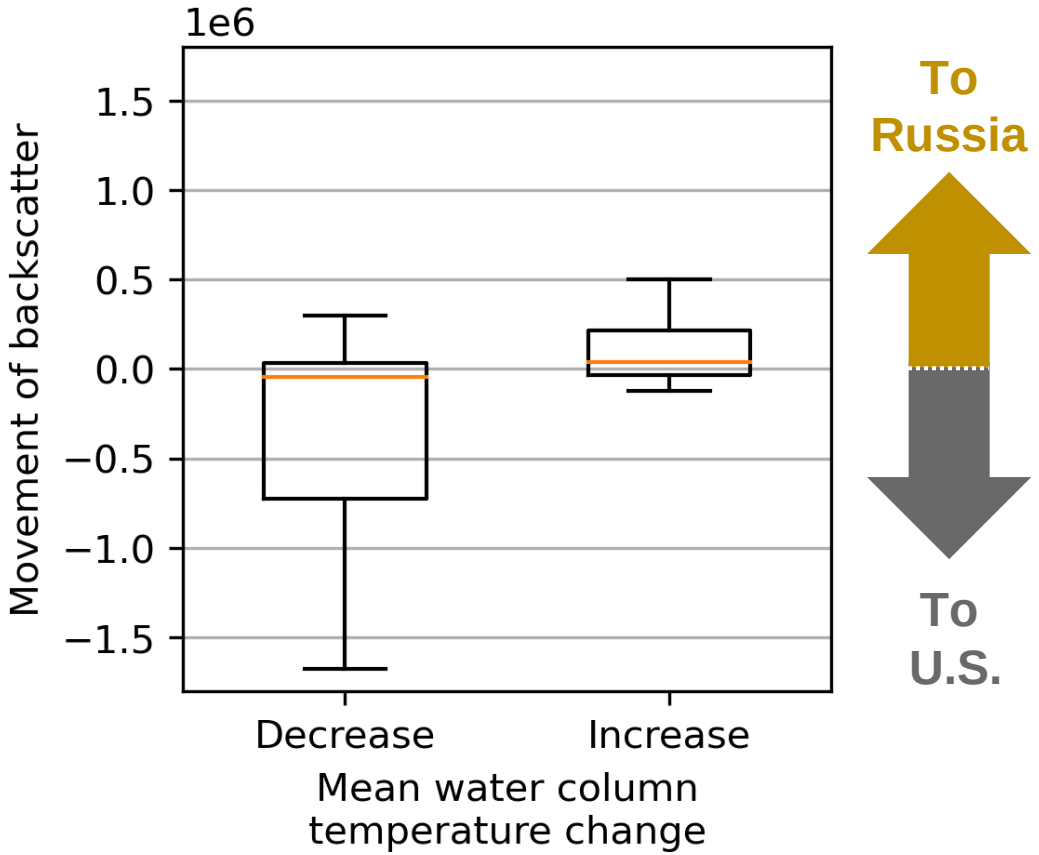

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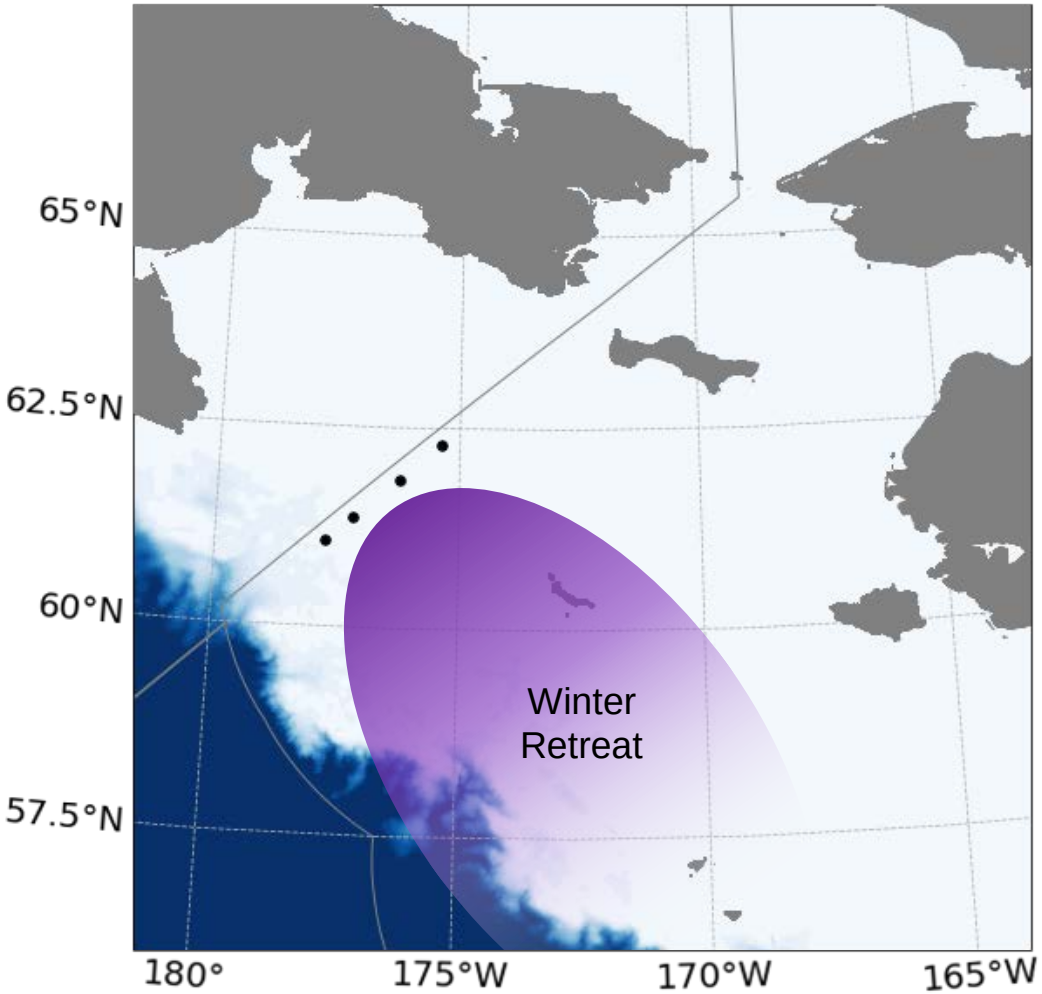

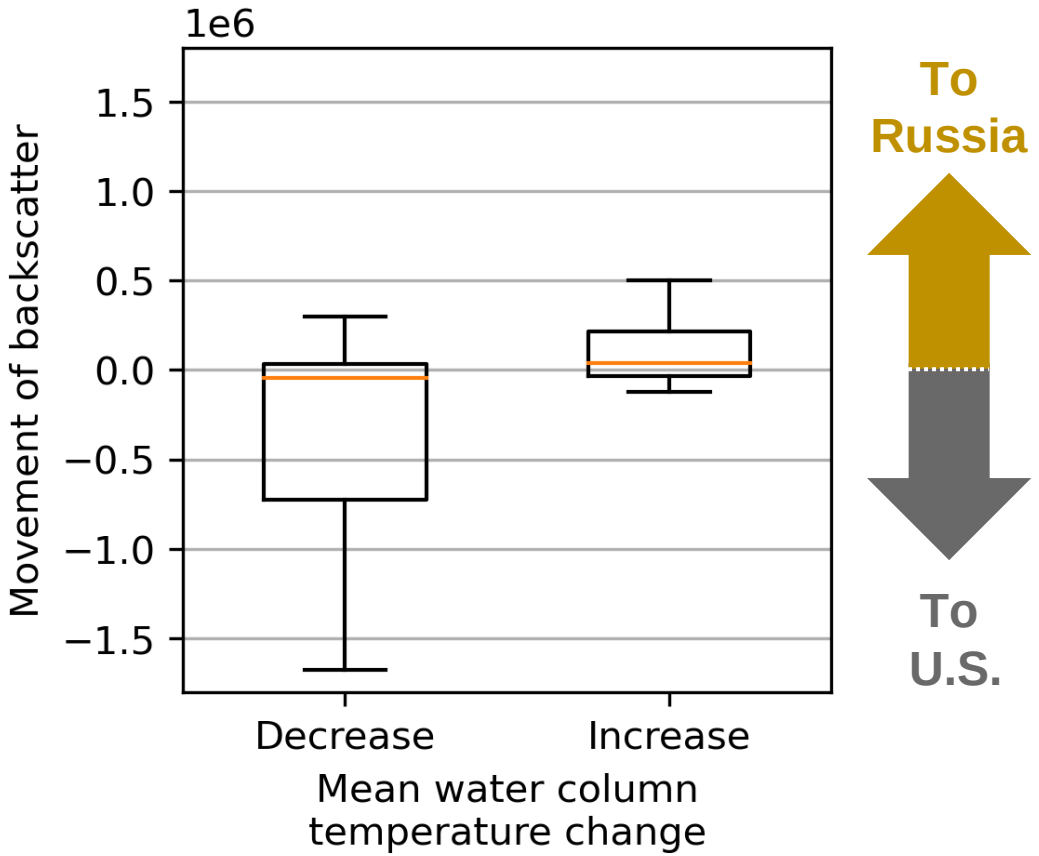

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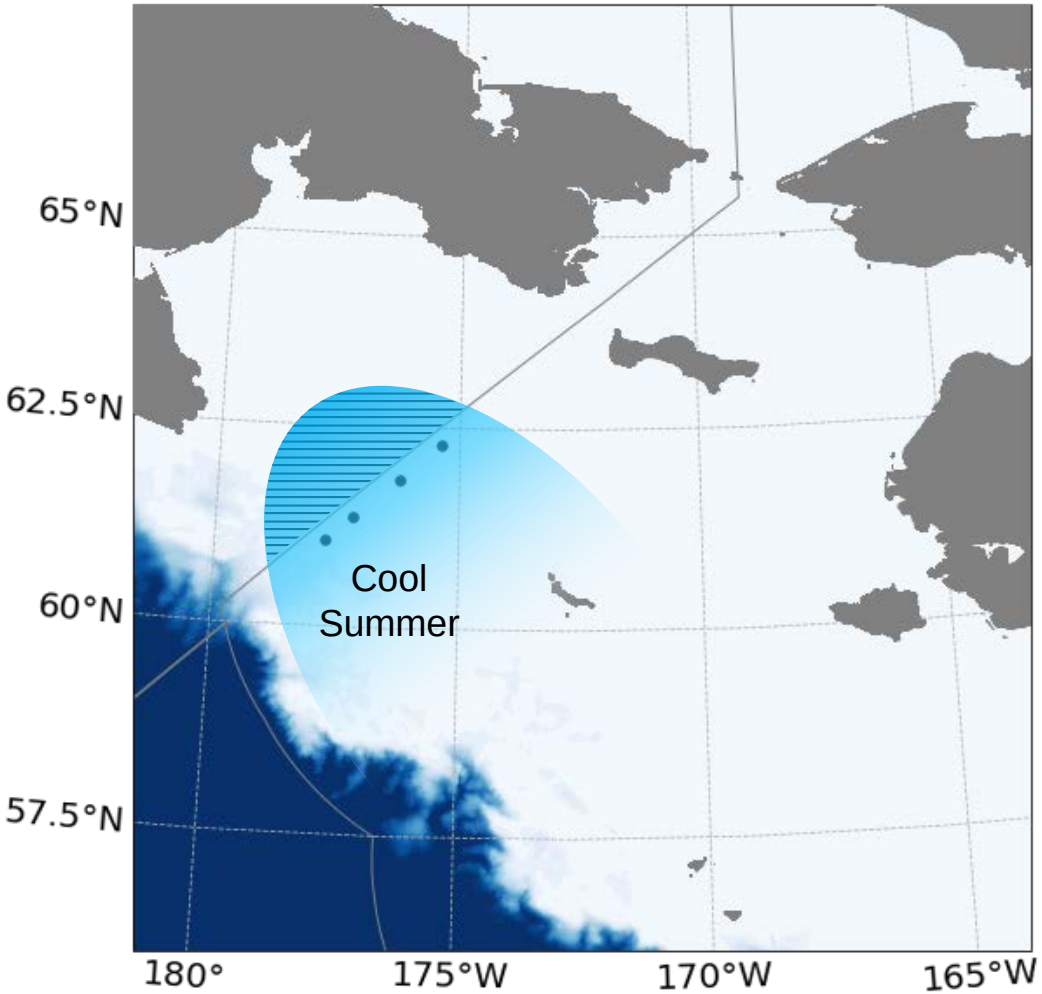

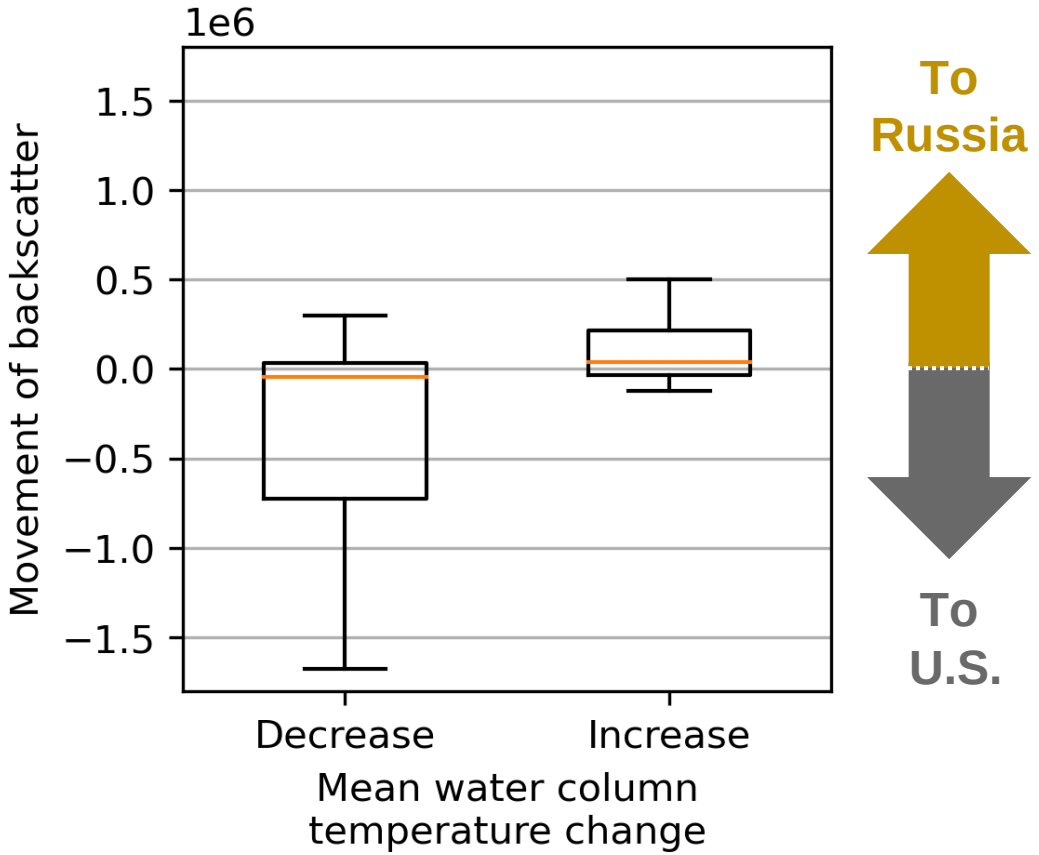

Conclusions

- There is a substantial exchange between U.S. and Russian sectors
- The majority of the movement occurs over two periods:
  - A winter southeastward migration
  - A late-spring/early-summer northwestward migration
- Seasonal patterns were consistent across all four moorings, with peak abundance in winter
- Fish migration follows the temperature gradient
  - Temperature affects the proportion of the stock found in each sector

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Next Steps: How might this data be applied in the context of the stock assessment?

Questions?