Mitigating risk to whales from lobster fishing off the coast of Maine

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Atlantic Large Whale Take Reduction Team Meeting
Providence

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Motivation:

Entanglement in fishing gear is a significant cause of injury and mortality for Right Whales.

Lobster fishing off the coast of Maine contributes to this fishing gear risk.

If we can understand how lobster gear off Maine contributes to entanglement risk, we can identify possible ways to reduce risk to whales with minimal effect on the lobster fishery.

Objective:

To model changes in whale entanglement risk that follow from changes in lobster fishing effort and practice.

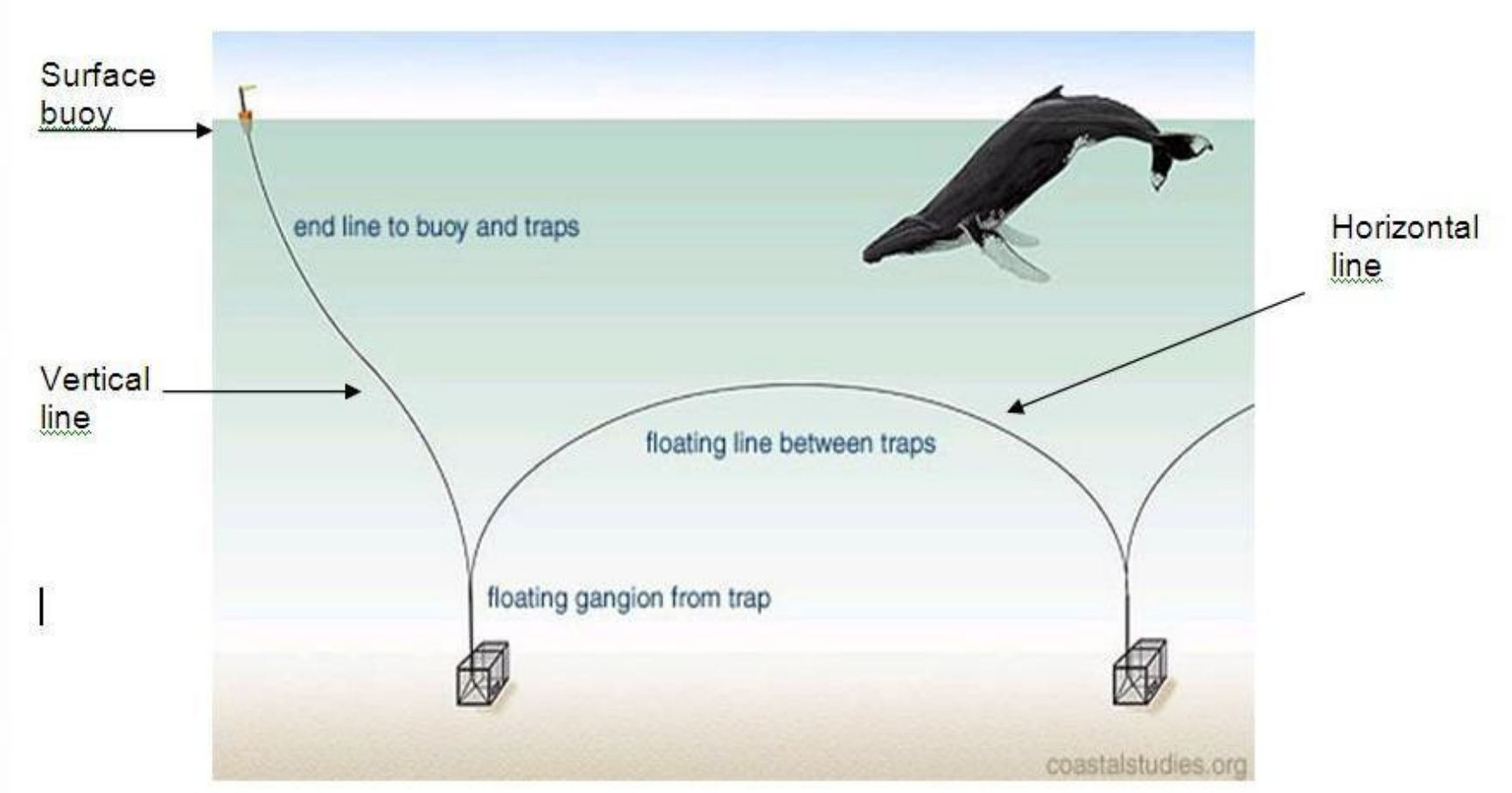
General approach:

Model the risk of entanglement (time, location) as a function of:

- fishing effort
  - vertical line density
  - trap string configuration
- whale activity
  - density
  - behavior (transiting, feeding, etc.)
- topography
  - water depth
  - currents
  - bottom characteristics

Vary fishing effort (time, location, gear configuration) to adjust risk.

Improved Risk Model:
Contribution to risk from vertical, horizontal lines

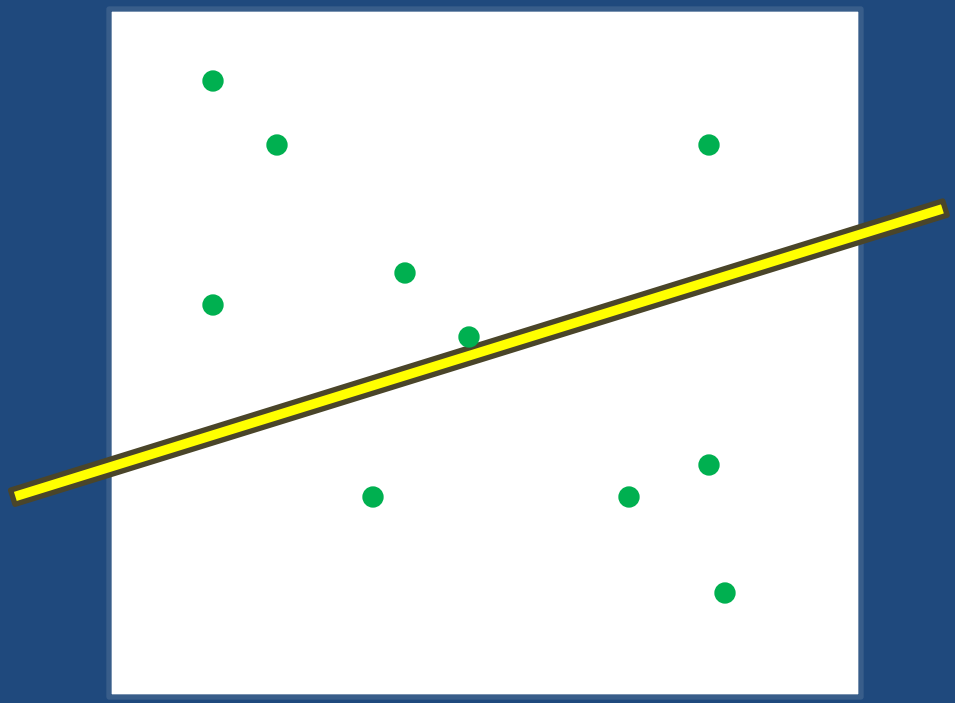


(source: Center for Coastal Studies)

Vertical Line Risk

Probability of whale-line encounter

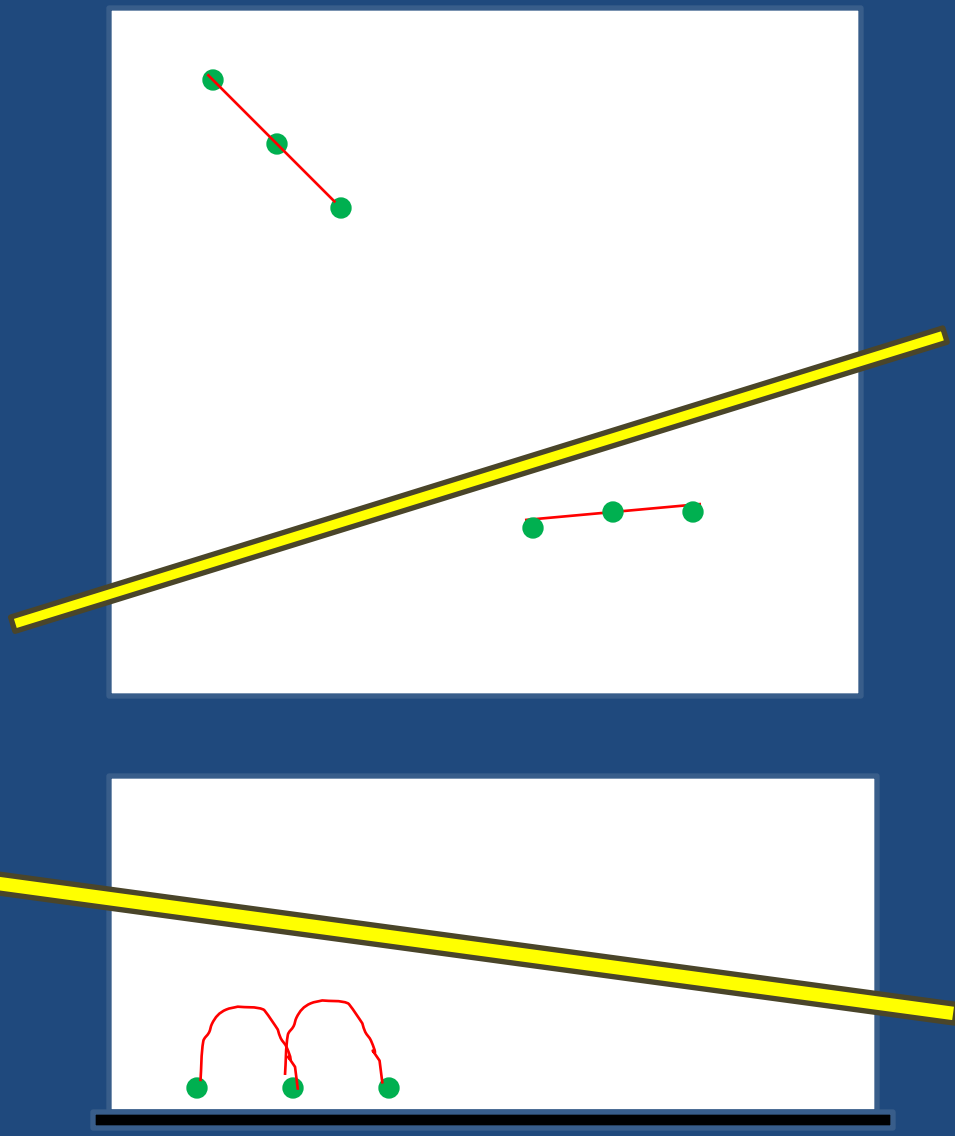
= f (lines/km^2
whale track/km^2
[whale size])



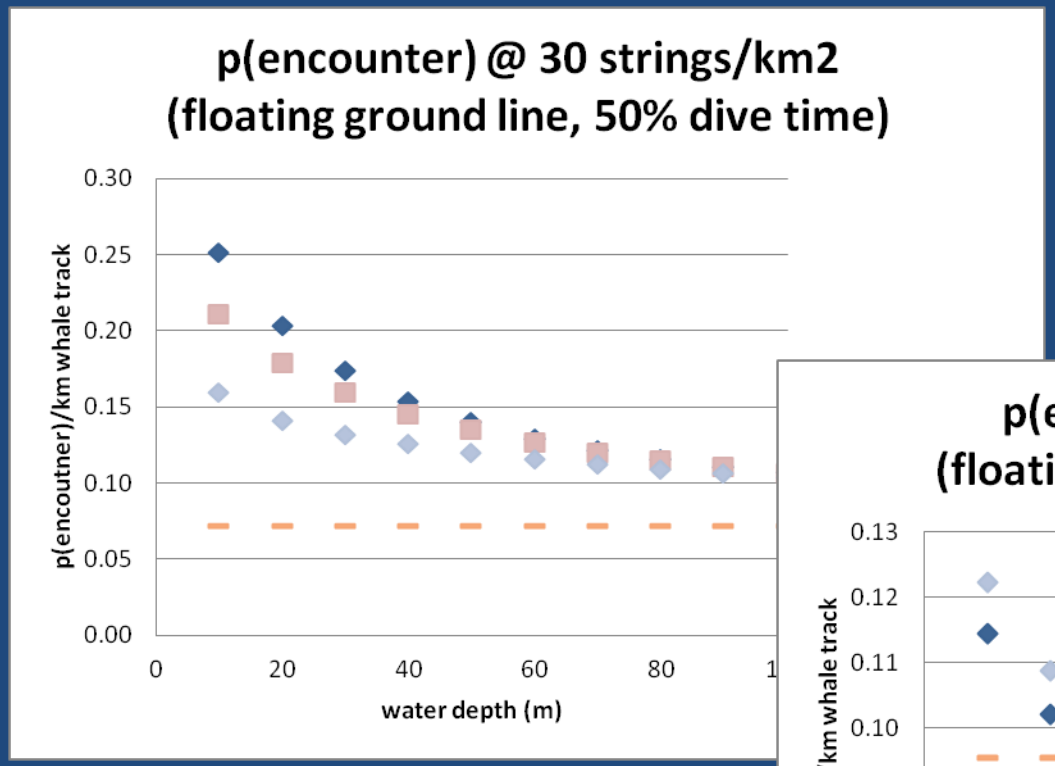
Horizontal Line Risk

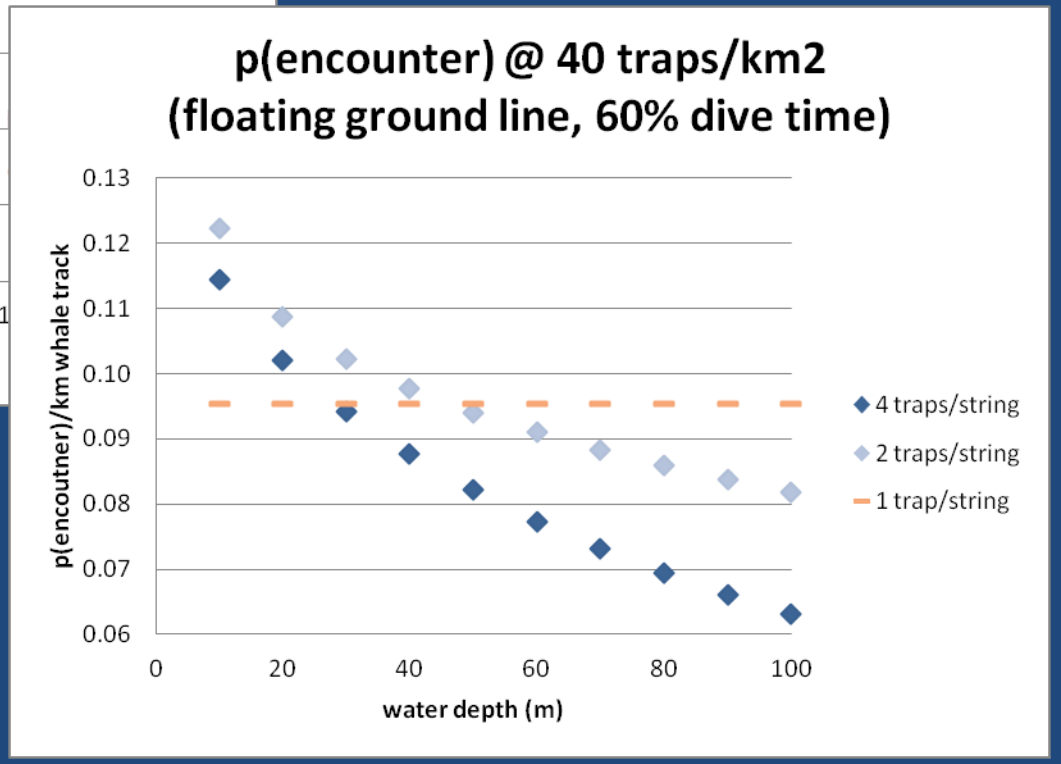
Probability of whale-line encounter

= f (h line length/km^2
whale track/km^2
[whale size]
h line vertical profile
water depth
whale diving)



Combined VL & GL Risk





Improving the model and data:

- capture trap string configuration and fishing practice
  - vertical profile of horizontal (floating/ground) lines
  - dense trap string aggregations
- incorporate information about topography
  - water depth
  - bottom type
- improve spatial resolution and coverage of fishing data
- improve spatial resolution and coverage of whale activity data
  - improve inshore risk estimates (lack of effort-corrected survey data for inshore areas)
  - seasonal changes in whale behavior (diving, etc.)
- test for sensitivity of results to gaps in parameters

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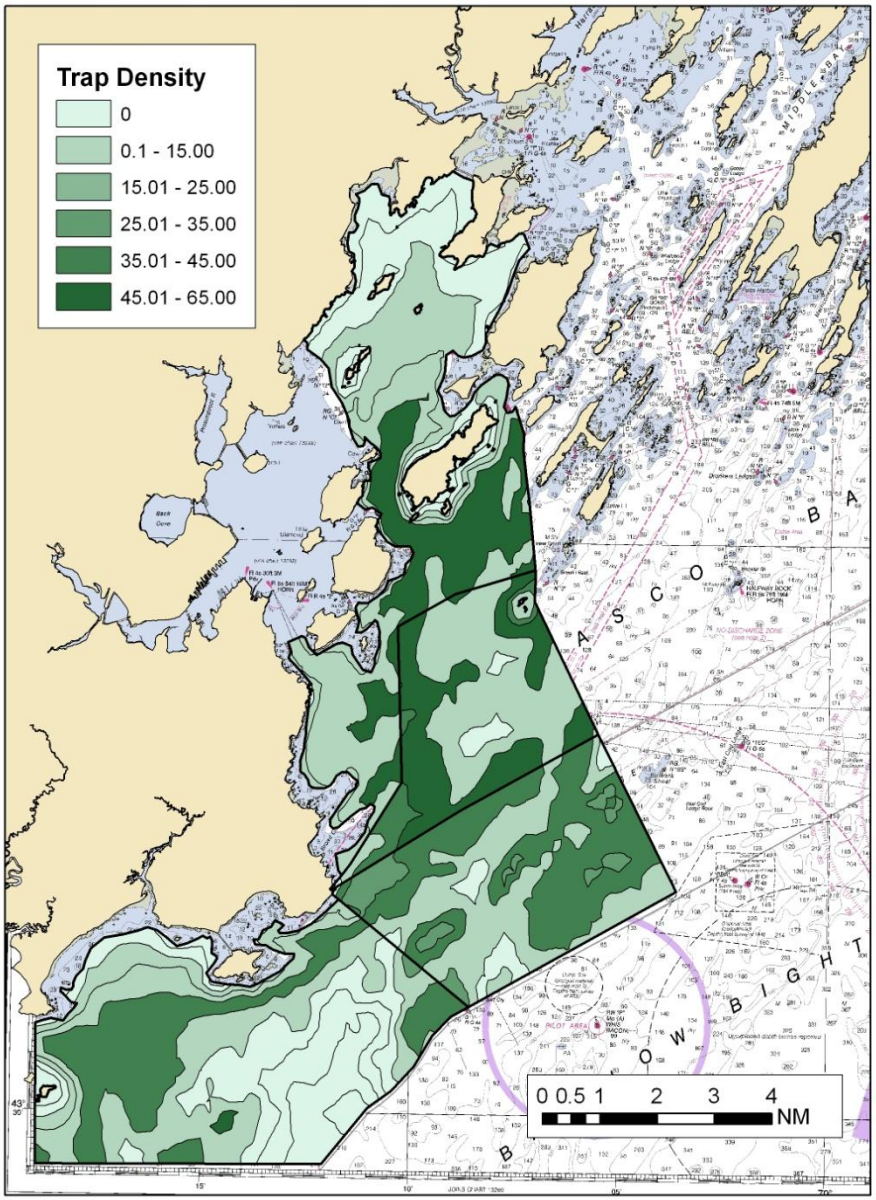
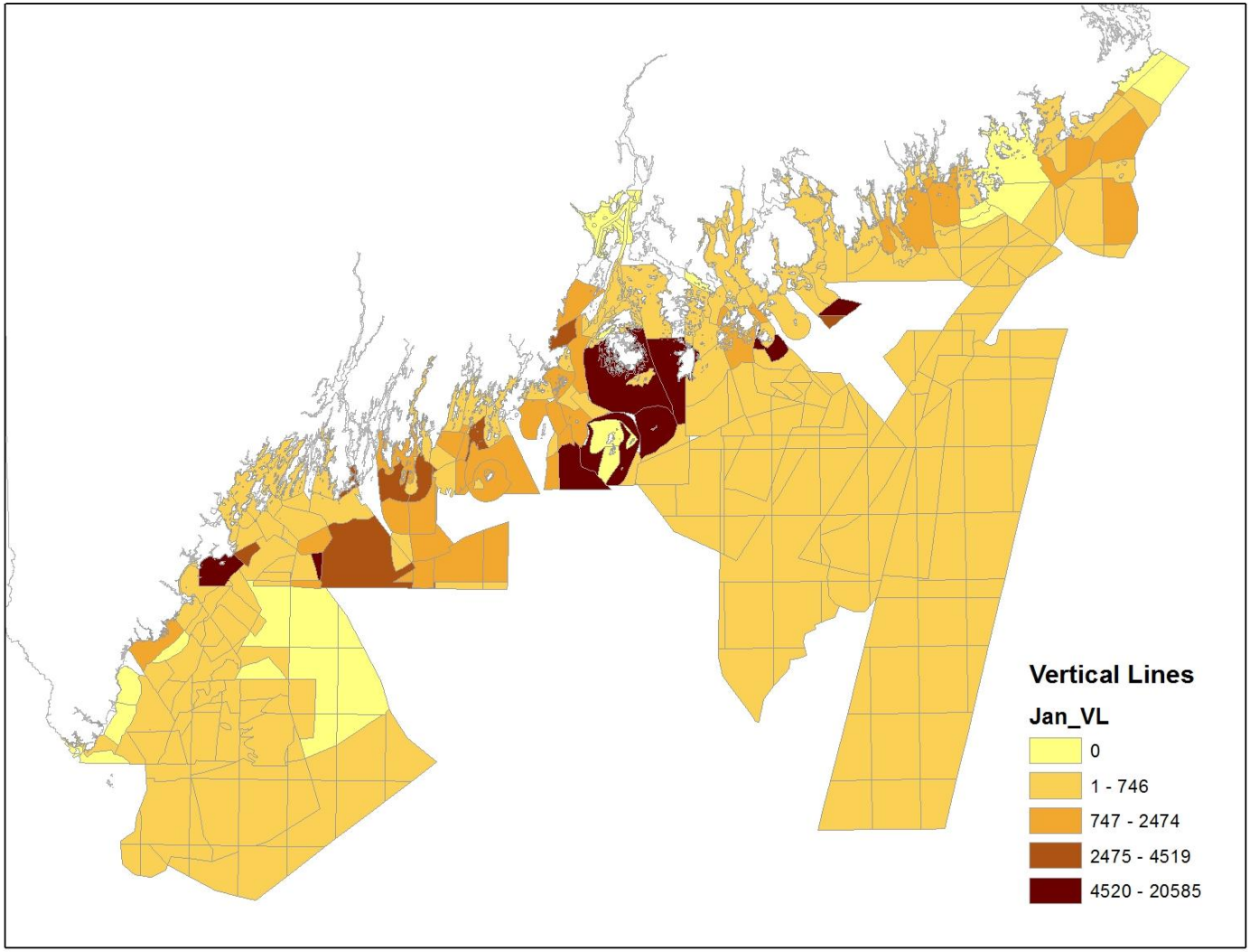
Data collected through interviews with local lobster fishing groups

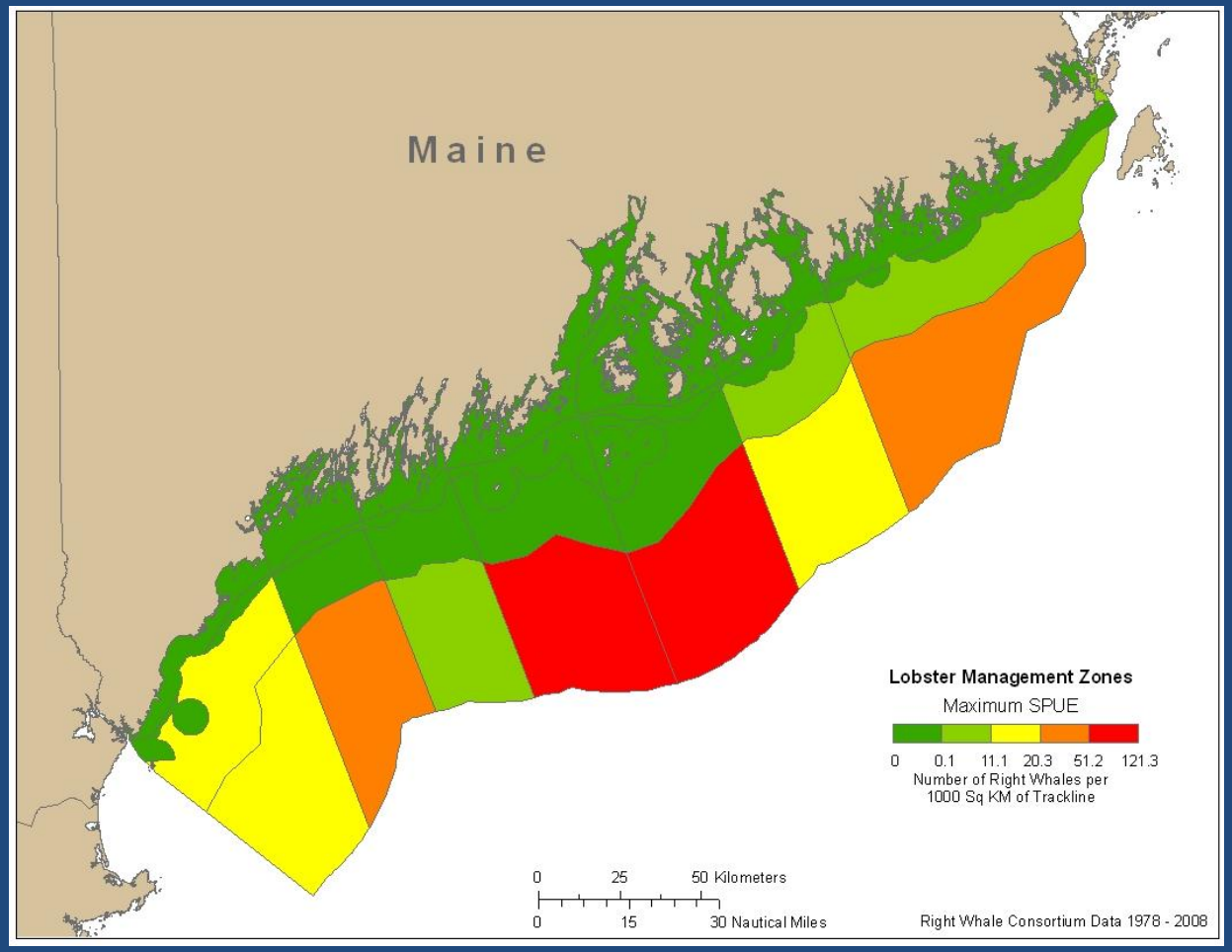
Permits fine-scale resolution of H, V lines density and water depth



Better Resolution of Fishing Effort



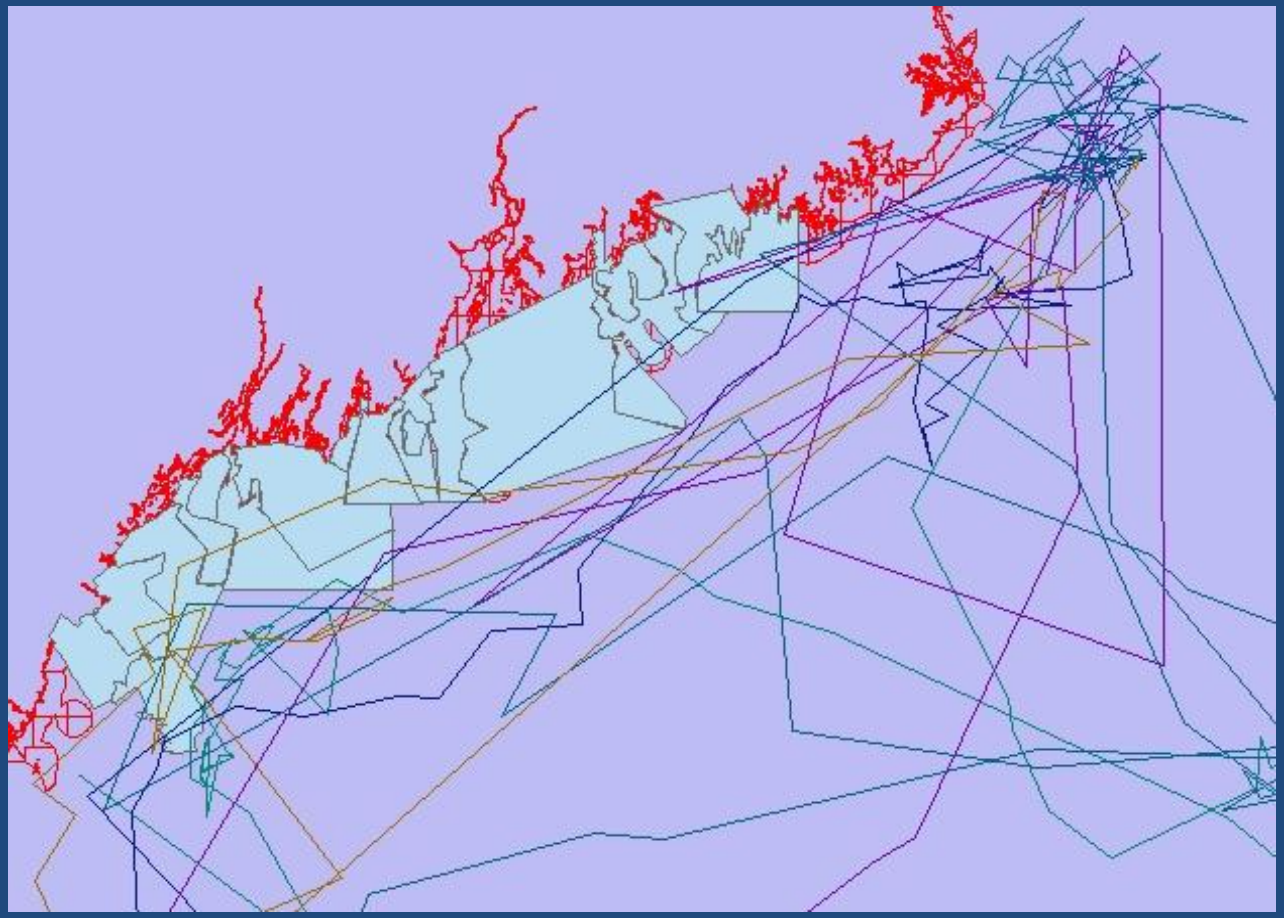
Whale Activity & Population Density: Limited Survey Effort in Nearshore Regions



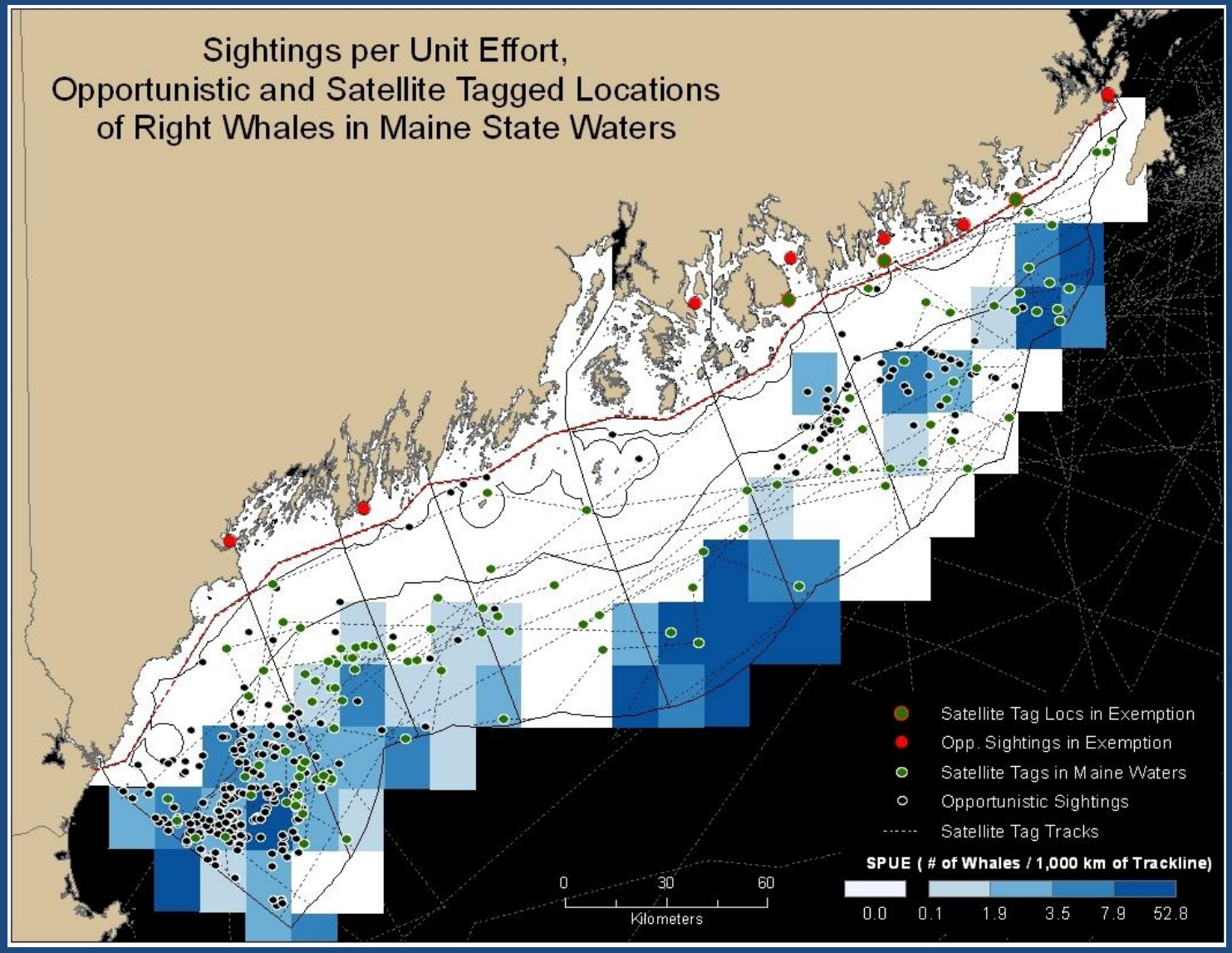
Data from Whale Tagging Studies (M. Baumgartner)

Potential approach:

- assume that aerial survey data give near-complete picture of whale activity in offshore zones
- assume that tagged whale tracks are representative of population
- infer nearshore whale activity



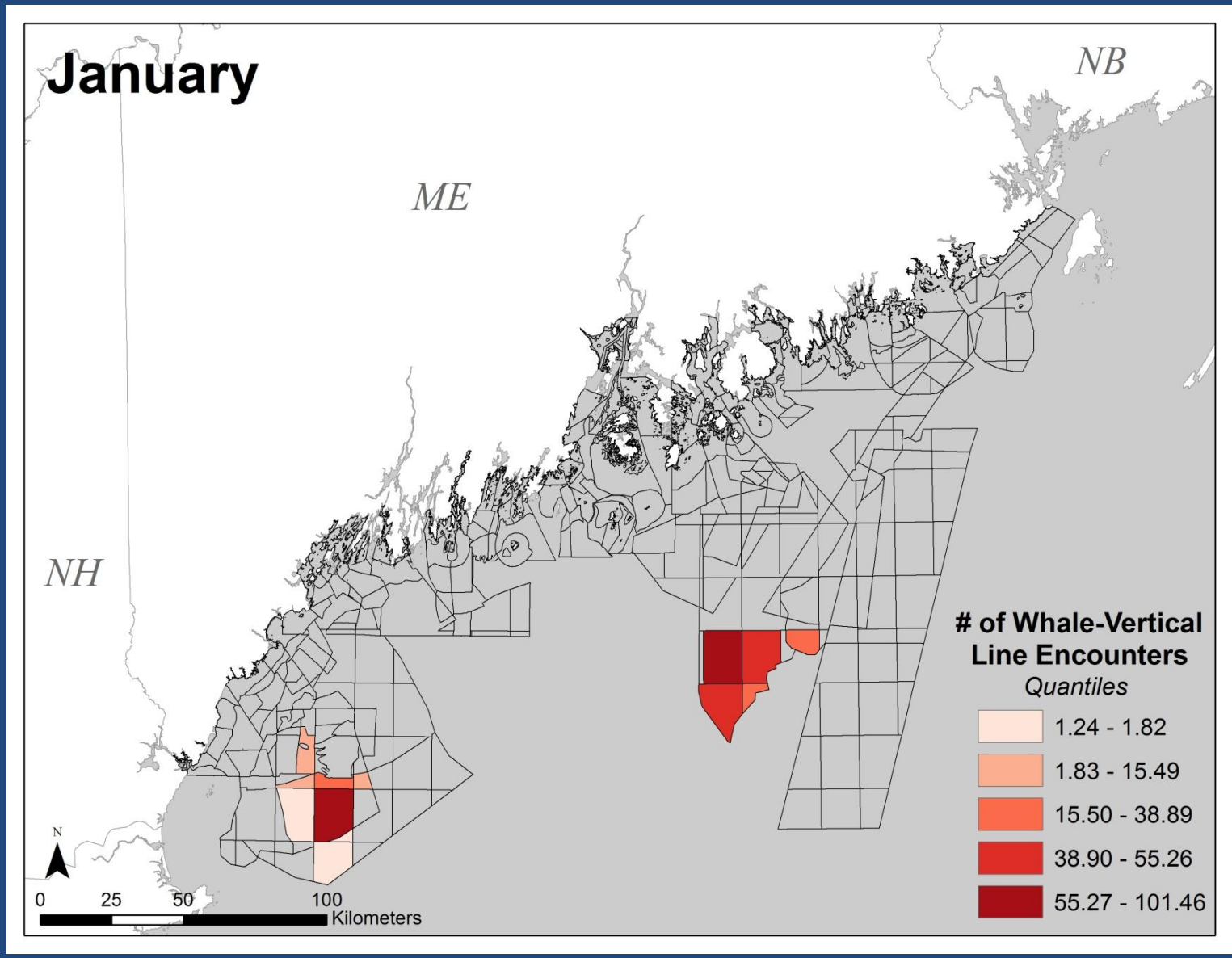
Synthesis of Whale Activity Data



VERY Preliminary Results (for illustration only)

- Vertical line risk only
- Whale activity based on NARWC SPUE data only
- Estimated number of whale-line encounters as proxy for entanglement risk

Estimated RW-VL Encounters



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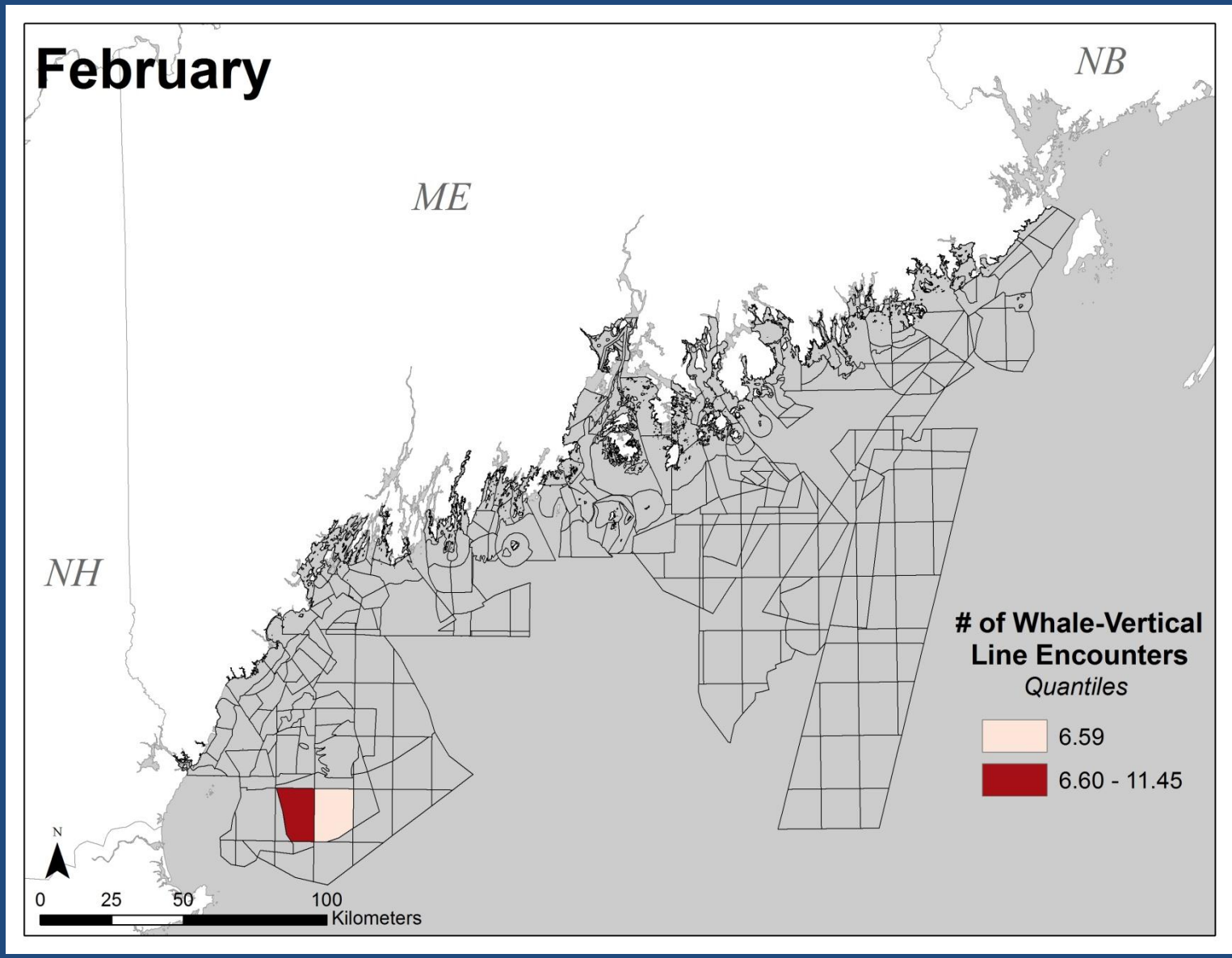

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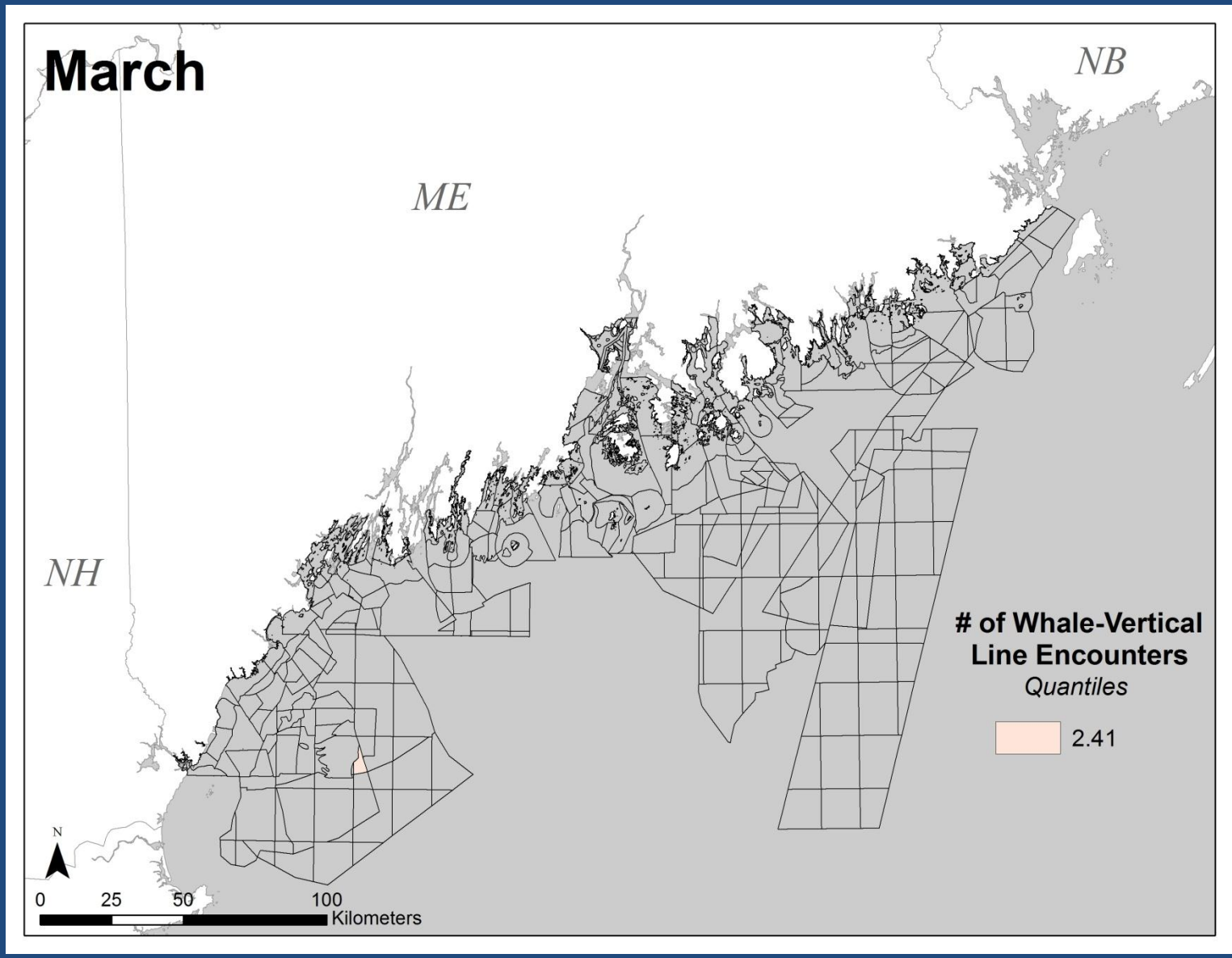

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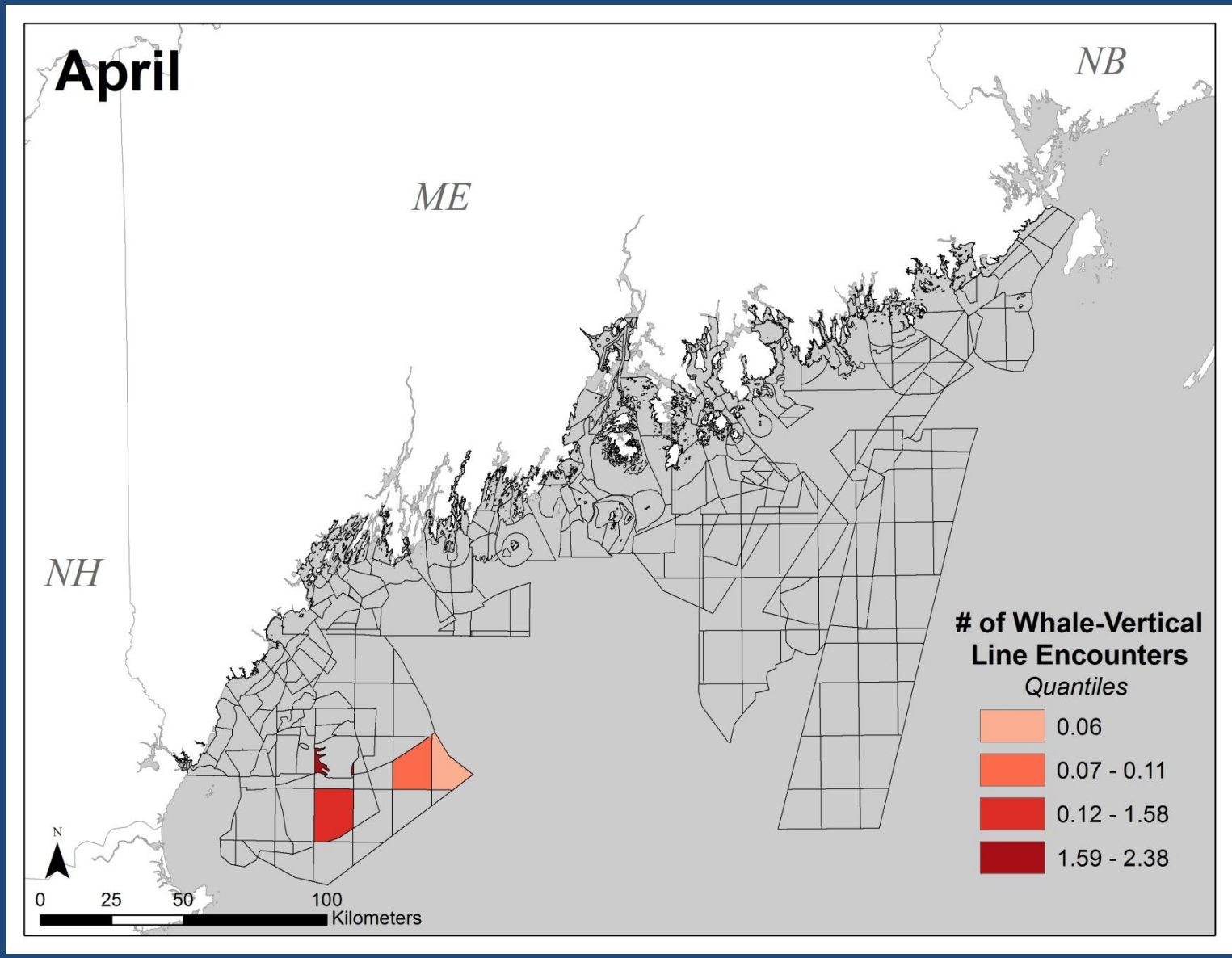

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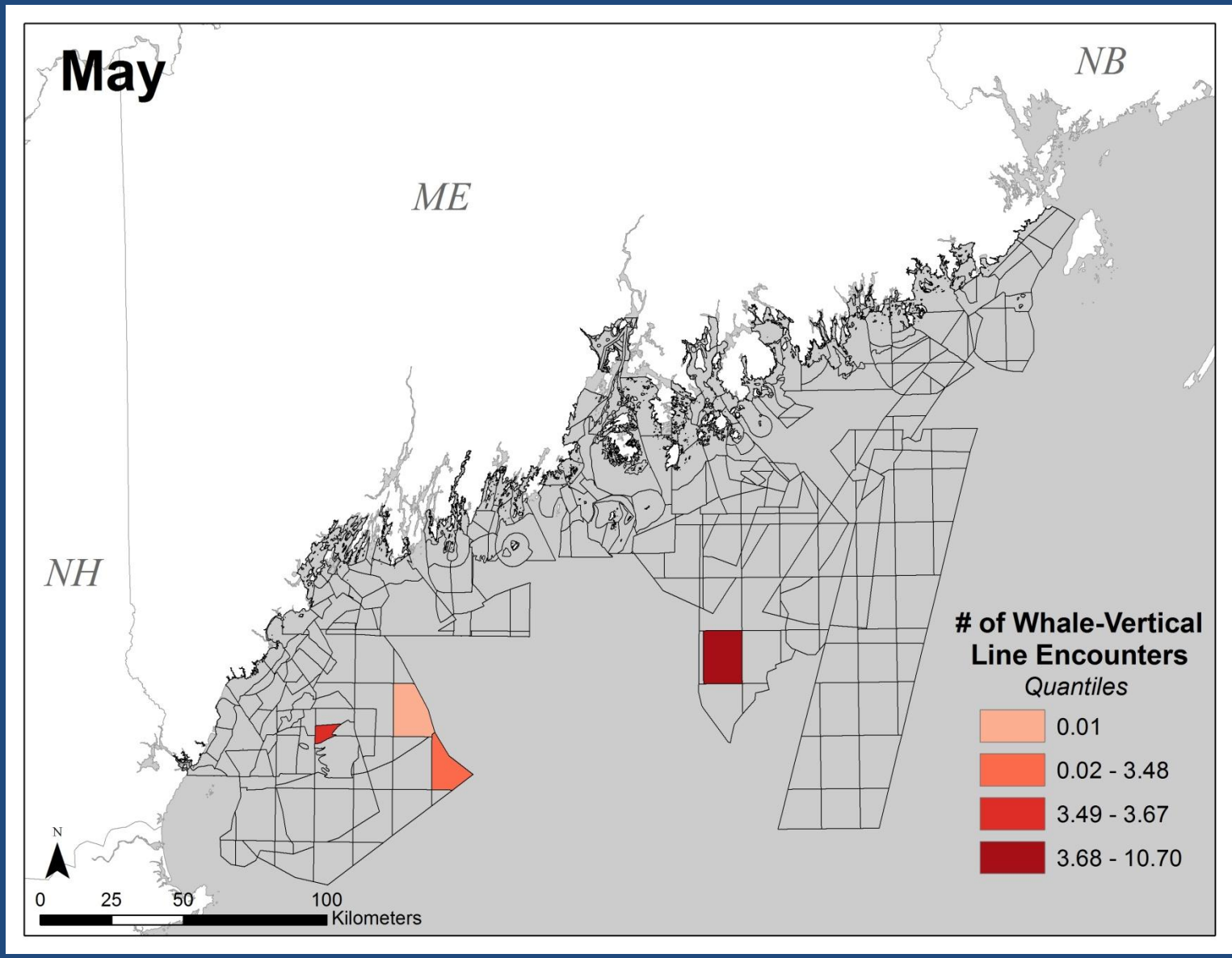

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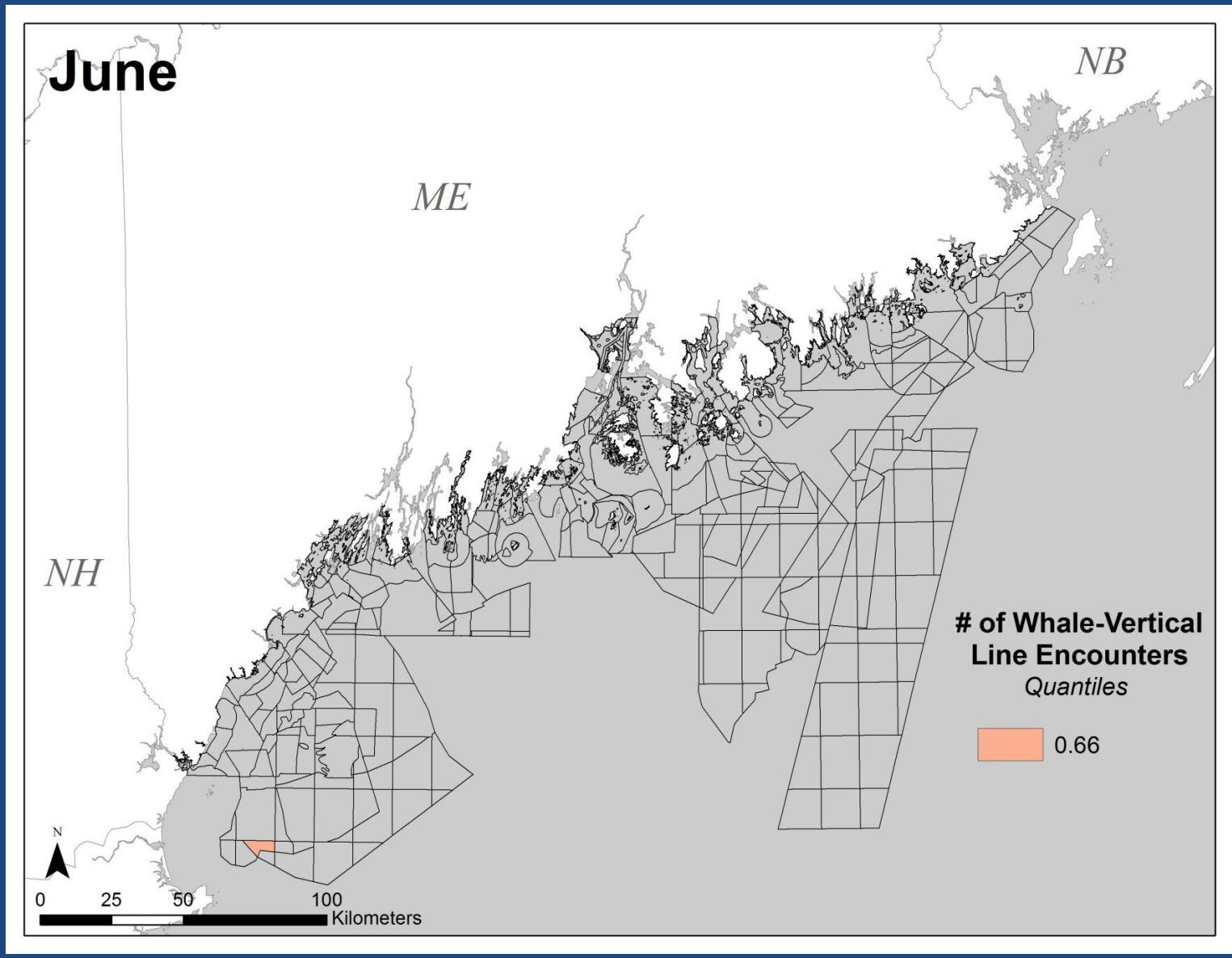

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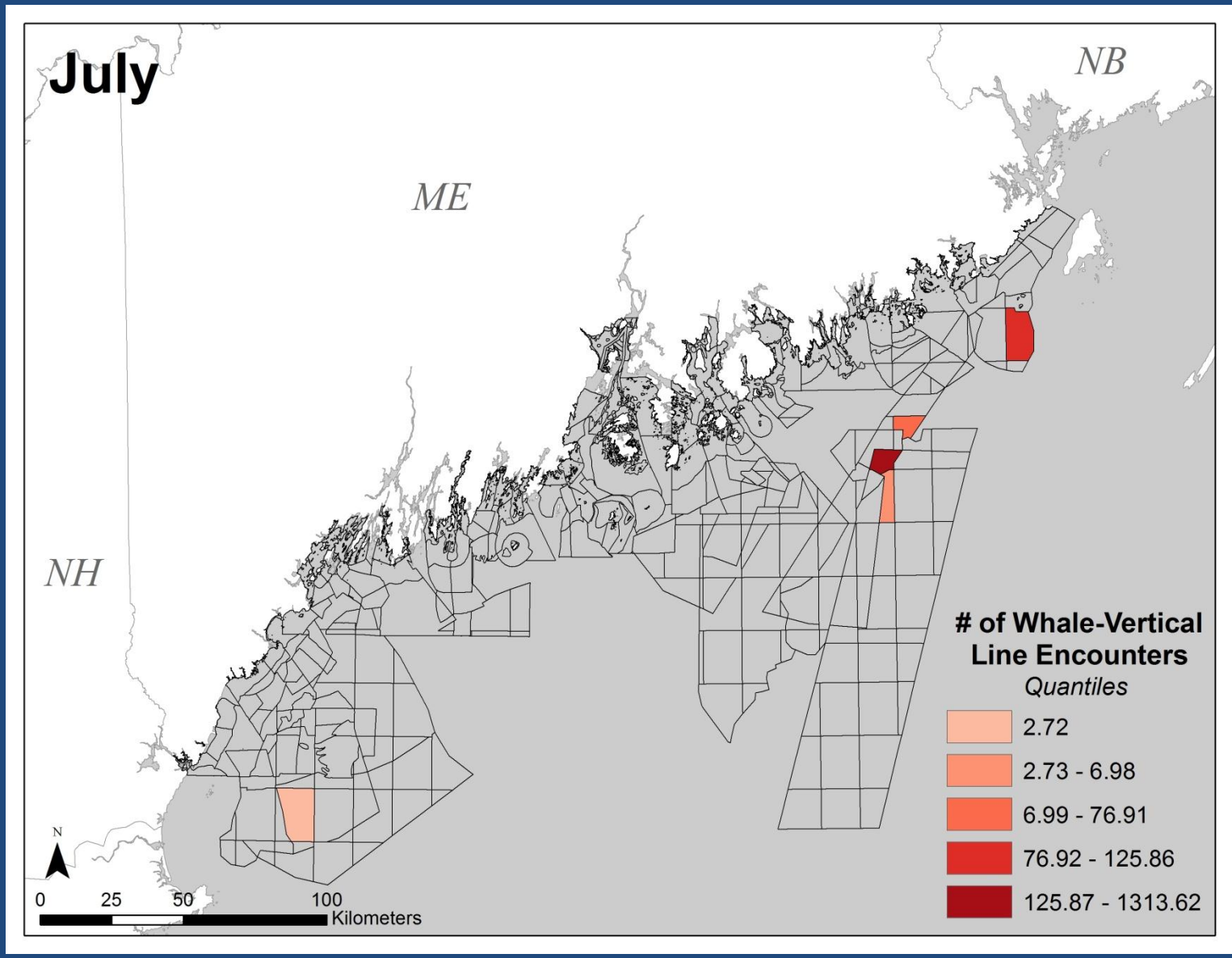

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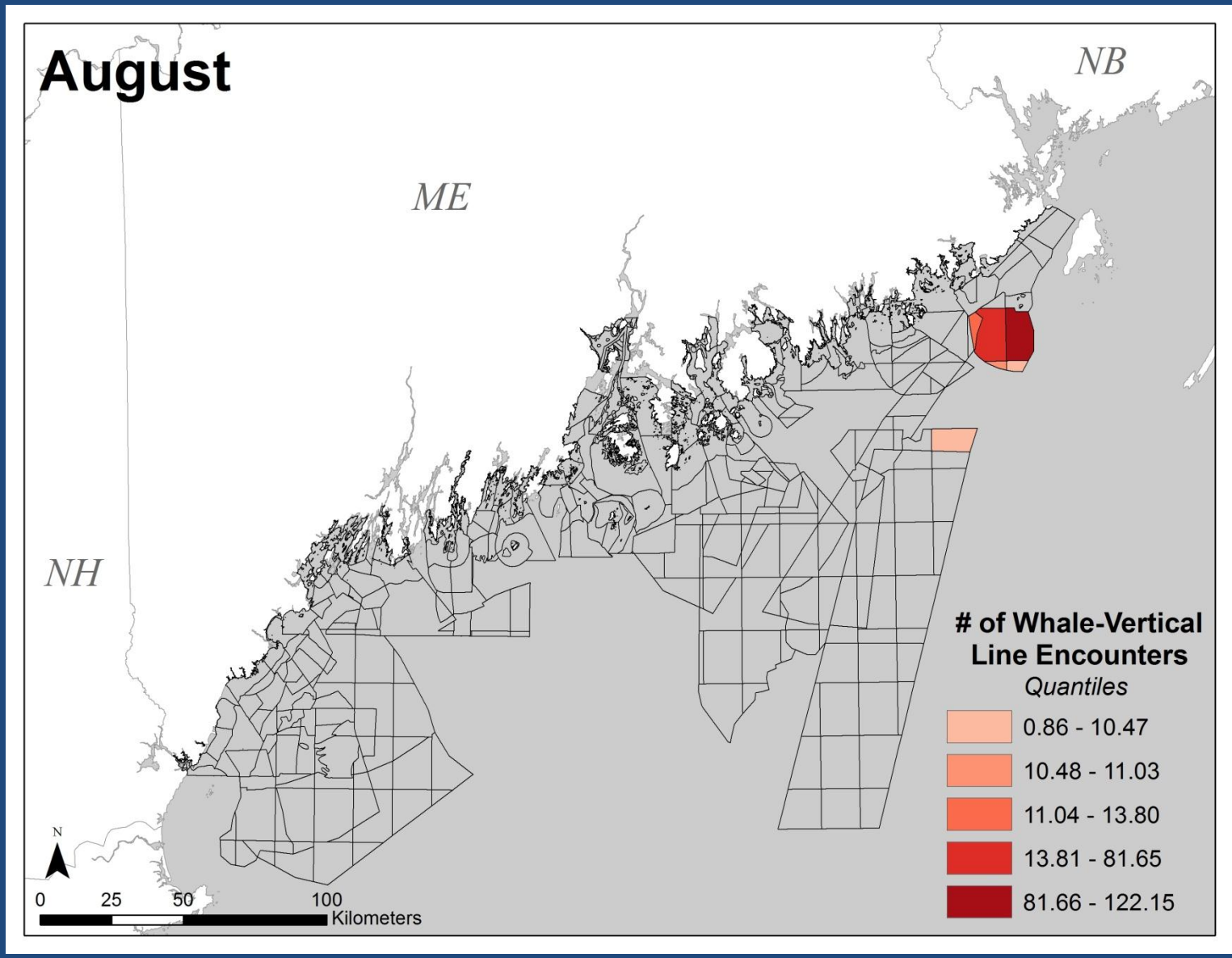

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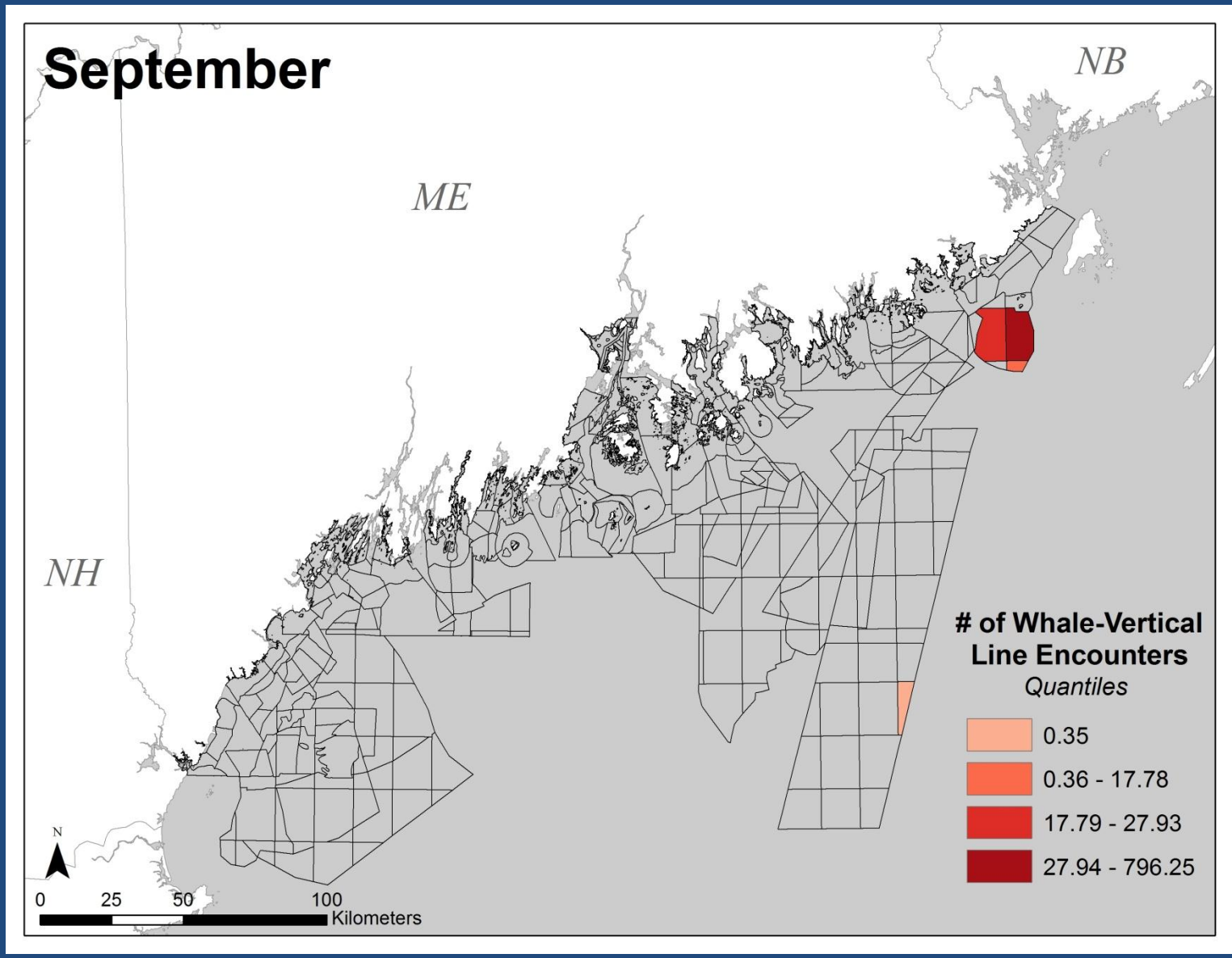

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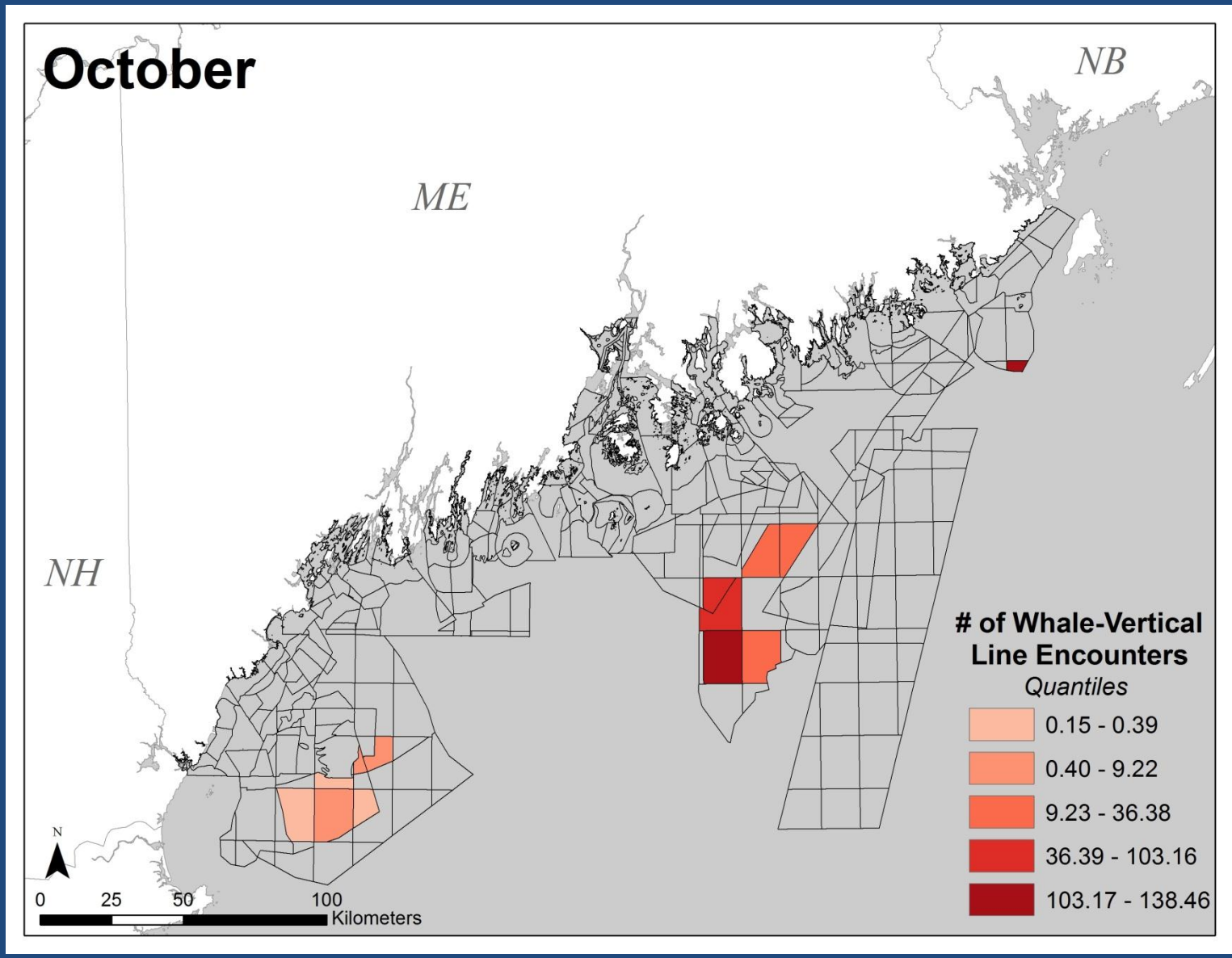

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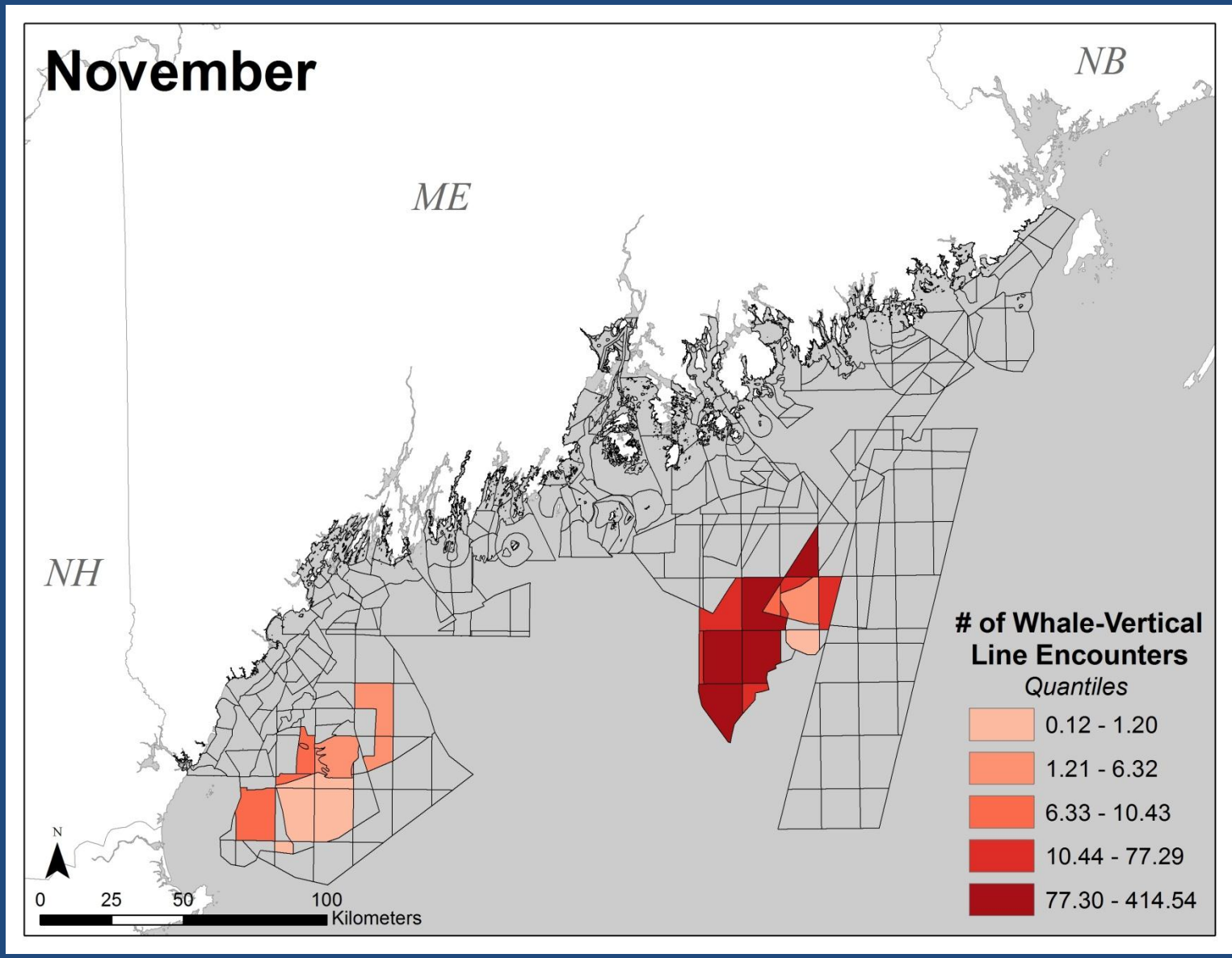

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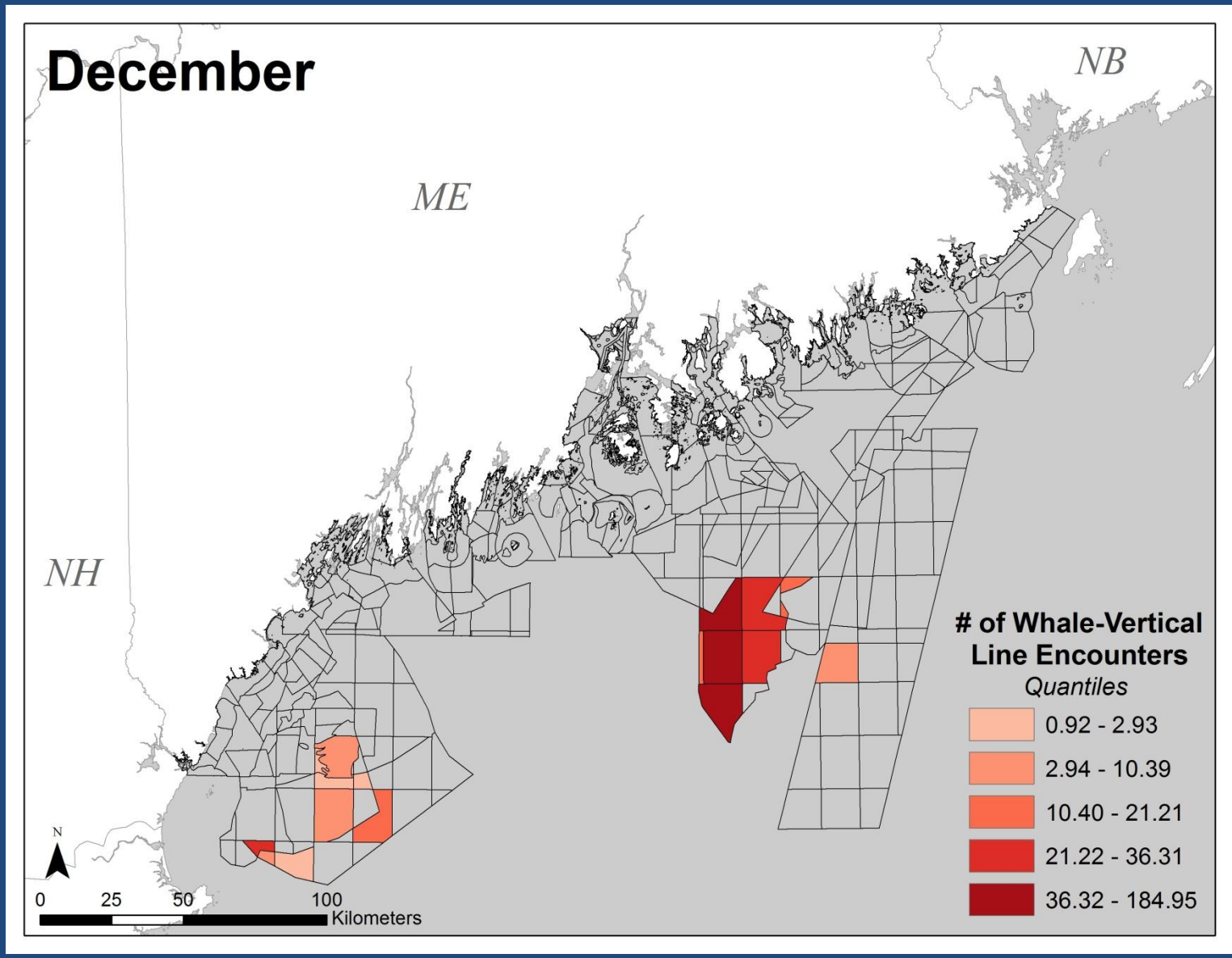

Next Steps

- Work in progress – results due this winter
- Focus for next months:
  - Details on fishing effort (string configuration, water depth, etc.)
  - More complete characterization of whale activity (inshore areas, behavior, etc.)
  - Sensitivity analysis around parameter assumptions
  - Review data and results with fishermen
  - Develop and assess management measures
- Goal: identify potential risk reduction from adjustments to fishing effort & practice

Acknowledgements

Collaborators:

Chris Brehme, Keene State College
Tara Hetz, WHOI Summer Student Fellow
Scott Kraus, New England Aquarium
Kerry Lagueux, New England Aquarium
Cris Lutazzi, WHOI Summer Student Fellow
Patrice McCarron, Maine Lobstermen's Association
Heather Tetreault, Maine Lobstermen's Association
Sophia Weinman, WHOI Guest Student
Brooke Wikgren, New England Aquarium

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