

# Vertical line estimation for the Dungeness crab fishery

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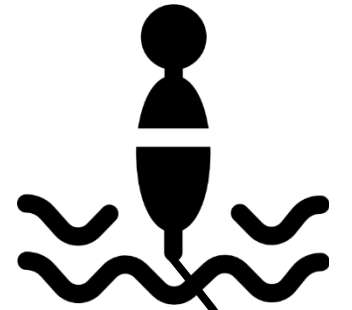
<sup>3</sup> West Coast Regional Office



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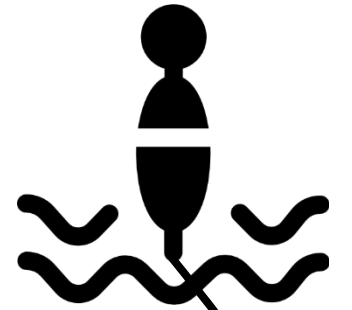
# Logic and approach

- Whales get entangled in fishing lines
- Can we estimate the number of “vertical lines” in the water at any given time?
- Relevance to risk assessment, monitoring, and management strategy evaluation



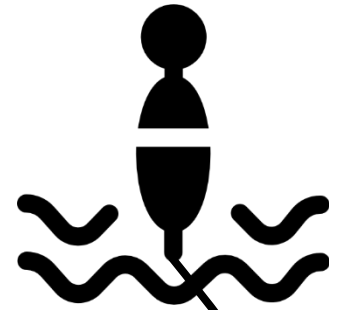
# Data sources

- Current
  - Vessel Monitoring System (VMS) data
  - Fishery landings and permit information
- In progress
  - Logbook data



# Processing of VMS data

- First, organize and clean VMS data by “trip”
- A trip is defined as all of the VMS pings between a landed PacFin ticket and the previous landed ticket, or 7 days, whichever is smaller
- After trips are defined, simulate traps for each trip based on **linear distance traveled**
- Assume 15 crab pots per linear mile traveled



# Processing of VMS trips

Hypothetical VMS track

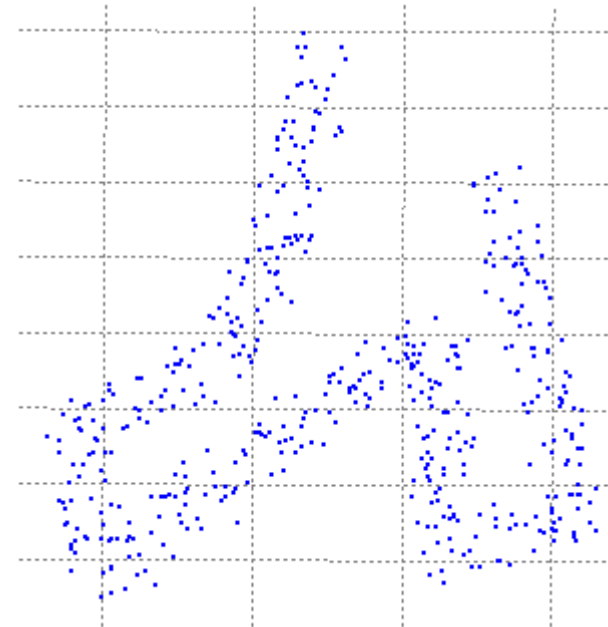


Likely track fished



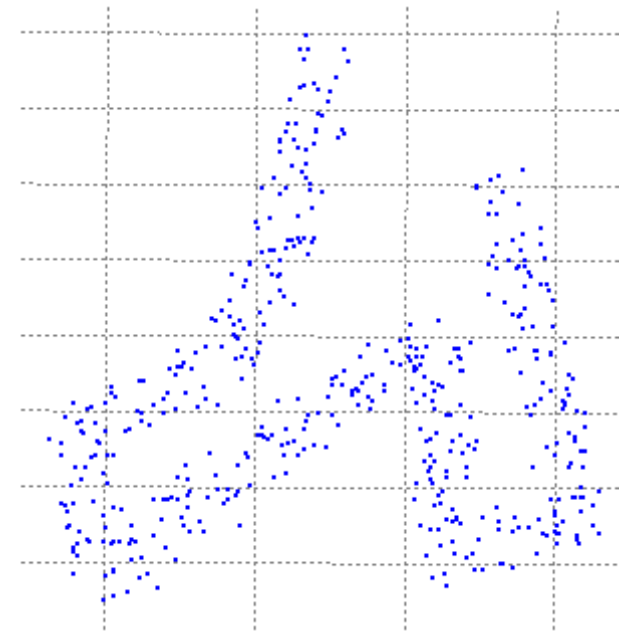
# Simulating Trap Locations

- Assume 15 pots per linear mile
- Distribute pots **along the VMS track**, with random error or “jitter”



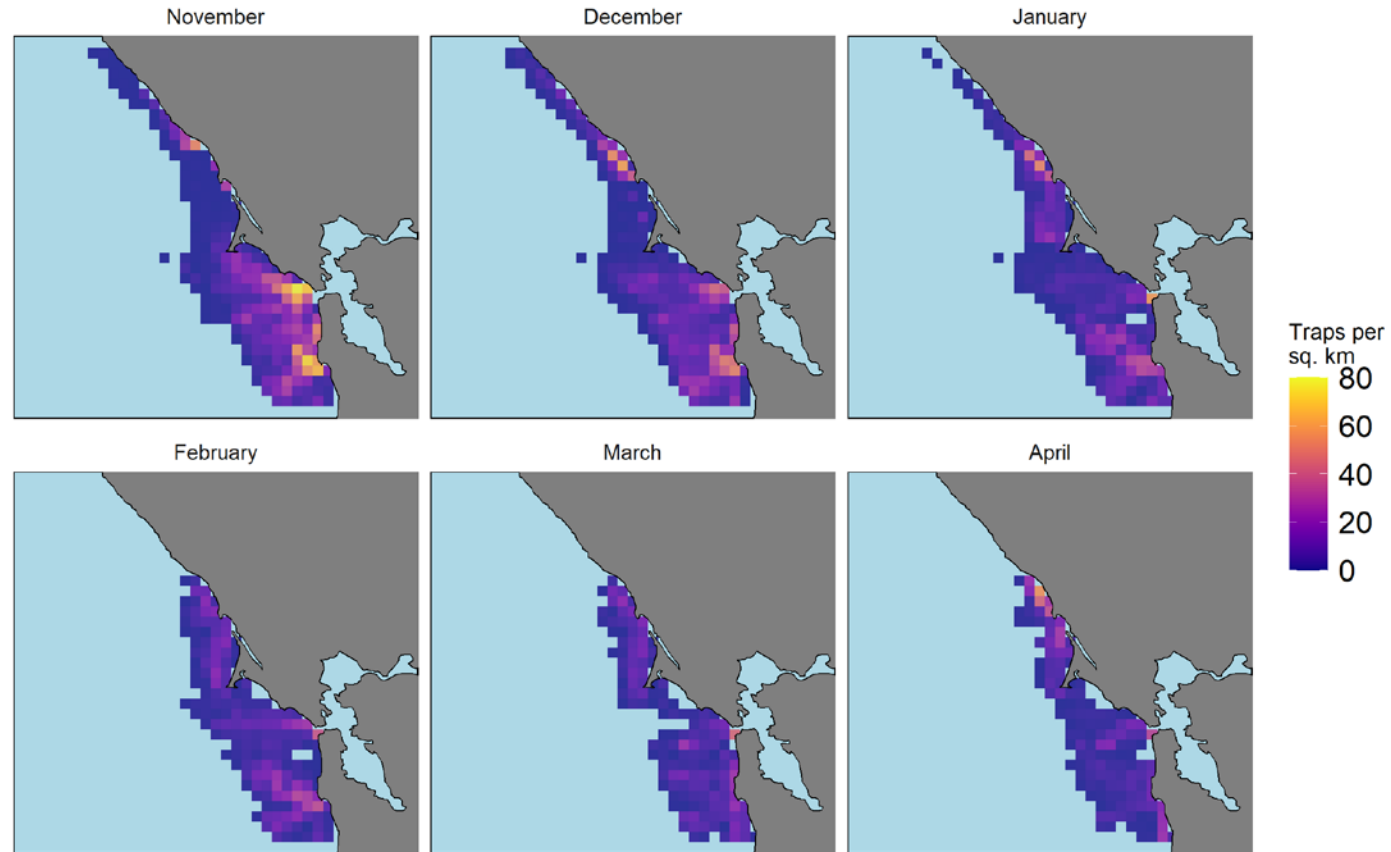
# Simulating Trap Locations

- Speed (<8.5 kts), depth (<100m)
- Maximum of 500 traps per trip. For CA, the trap limit is tier-specific
- More defined filters could be used in the future



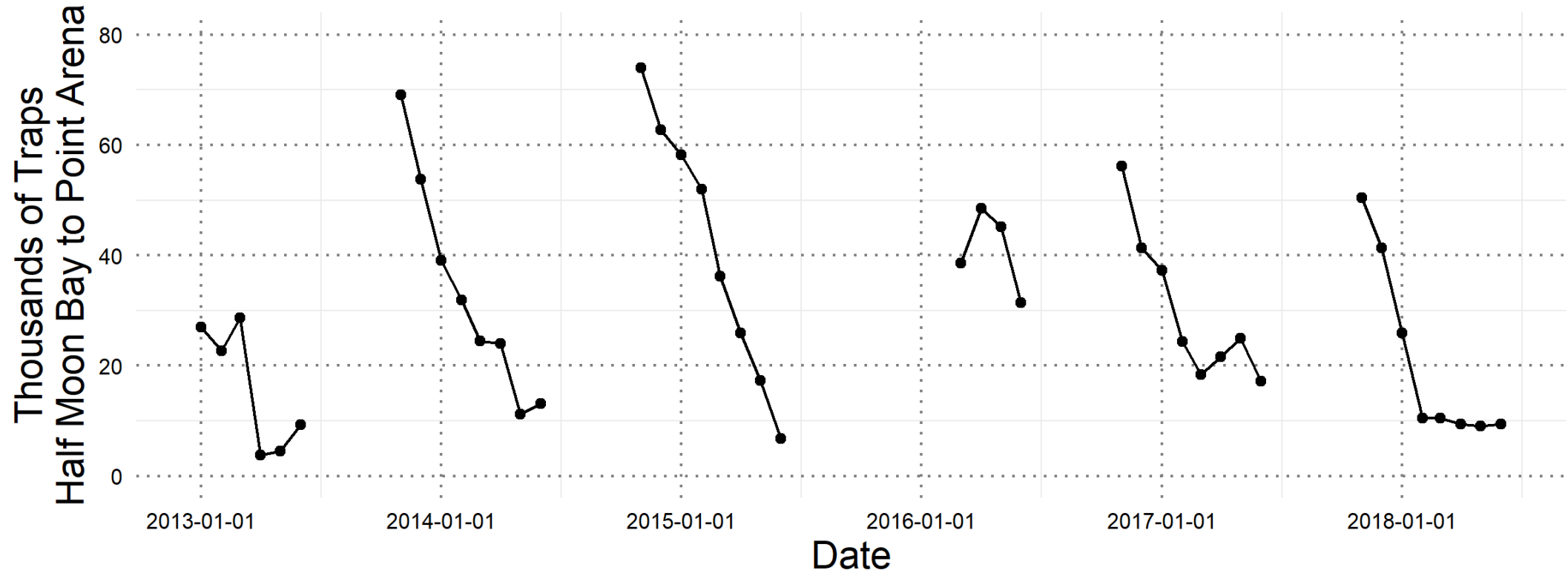
# Vertical line density can be estimated over space

Trap Density, 2013-14 Season



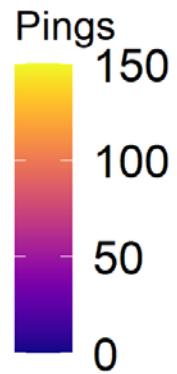
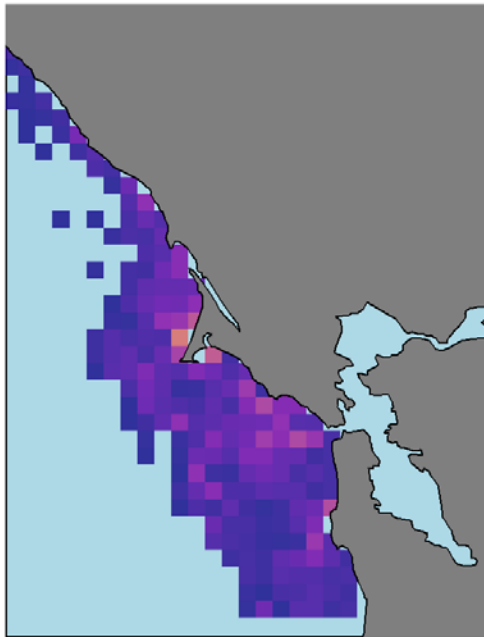


# Vertical line numbers can be estimated over time

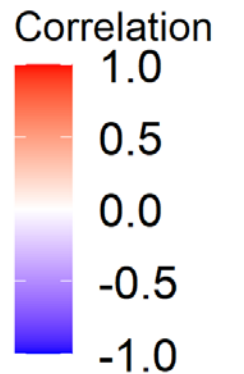
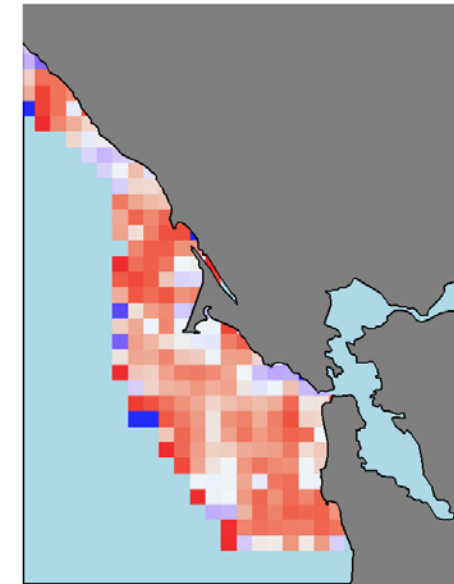
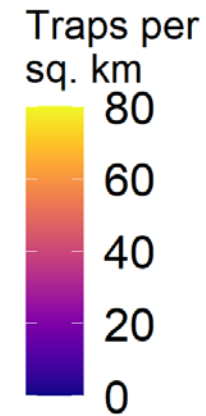
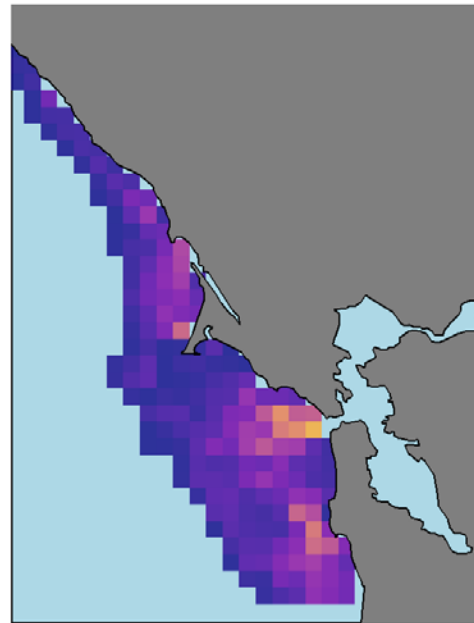


# Vertical line density can be compared to raw VMS pings

Dec 2014 VMS Pings

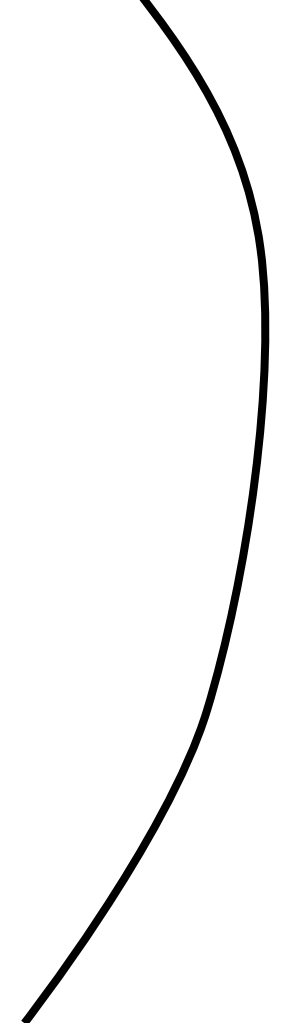
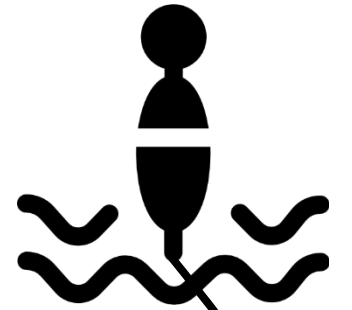


Dec 2014 Trap Density



# Applications

- Monitoring
- Risk assessment
- Predicting effects of management



# Moving forward

- Test effects of assumptions
- Refine definition of spatial fishing behavior
- Comparison to other sources of data
  - Logbook data
  - CDFW fishing block data
  - Aerial trap surveys
  - Solar logger data

