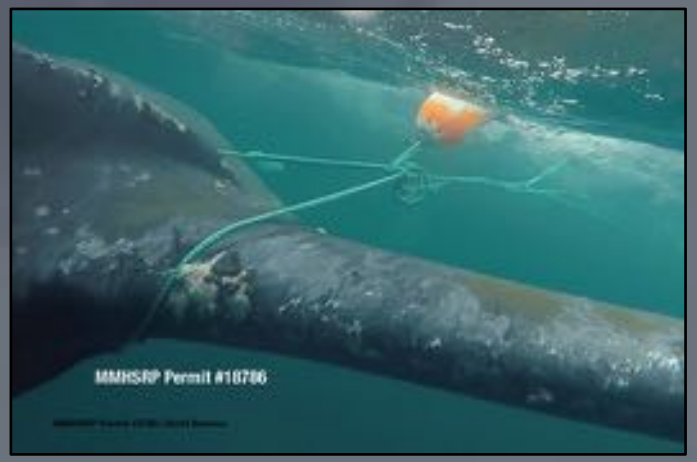
Using landings and vessel monitoring system (VMS) data to model fixed-gear fishing activity and its relationship to whale entanglements off the US west coast

Blake Feist[1], Jameal Samhouri[1], Owen Liu[1], Mary Fisher[1,2] Lauren Saez[3], Karin Forney[4], Dan Lawson[3]

[1] Northwest Fisheries Science Center
[2] University of Washington
[3] West Coast Regional Office
[4] Southwest Fisheries Science Center



West Coast Entanglement Science Workshop: Module 2 – 27 Aug 2020

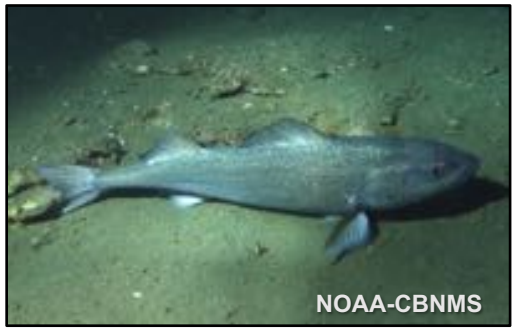
Whale entanglements in fishing gear on the US West Coast are on the rise

Has the fishery shifted in time or space, intensified?

Dungeness crab

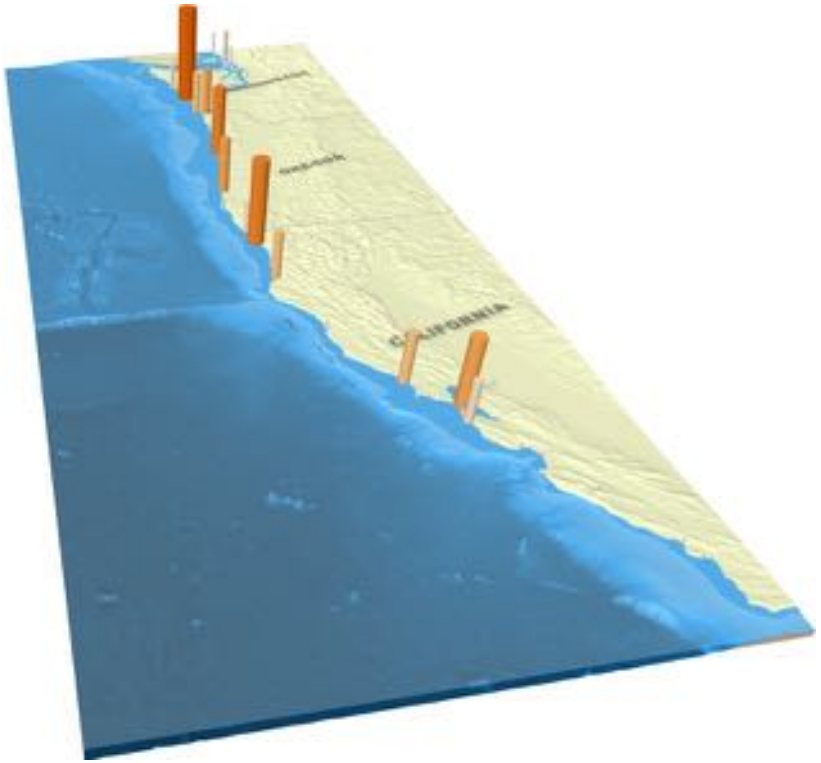
Spiny lobster

Sablefish



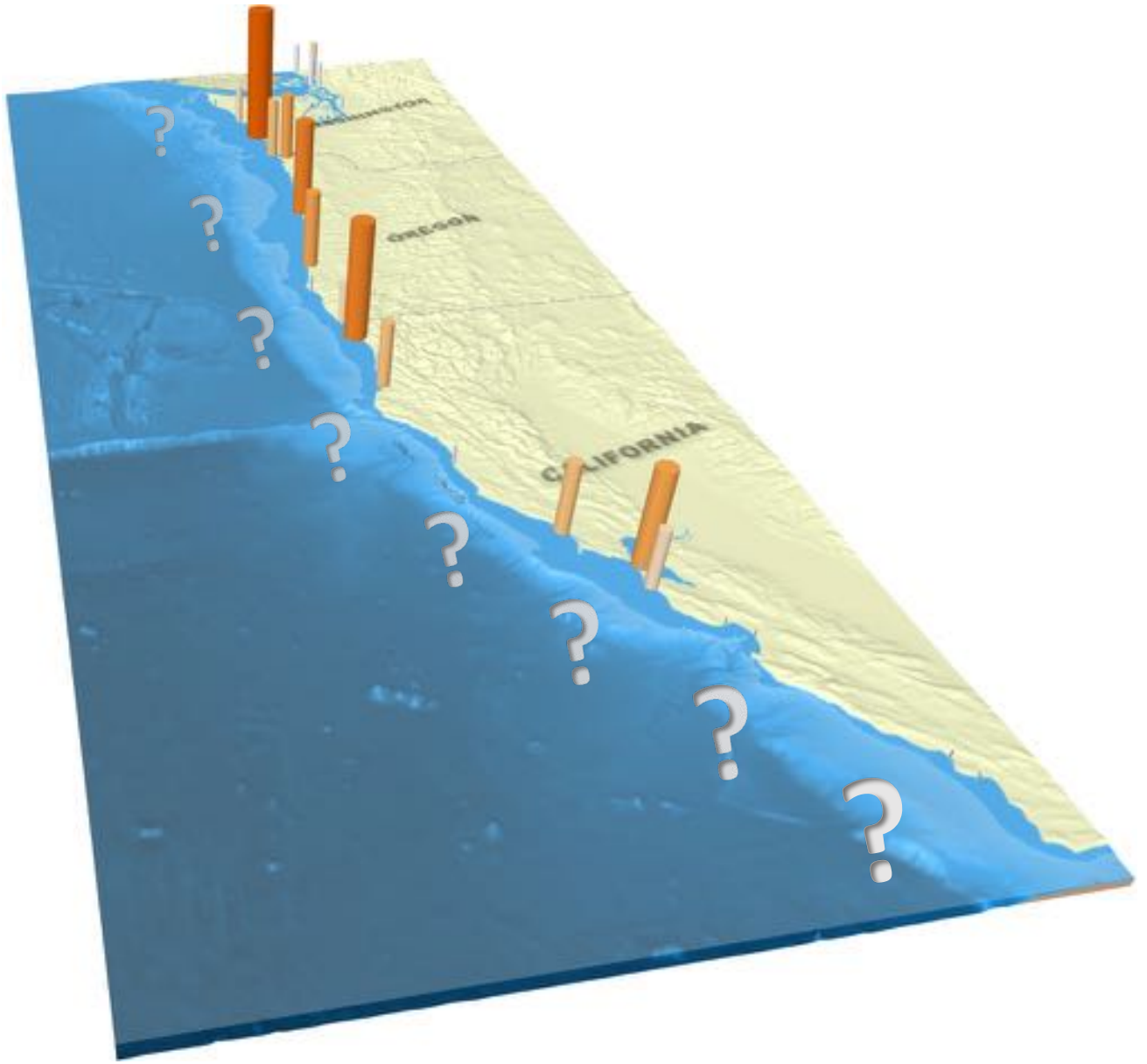
Spot prawn

The Whole Enchilada



Port Level Commercial Fishing - Landings

- Port level information comprehensive, too coarse
- Does not indicate where fishing occurred in the water

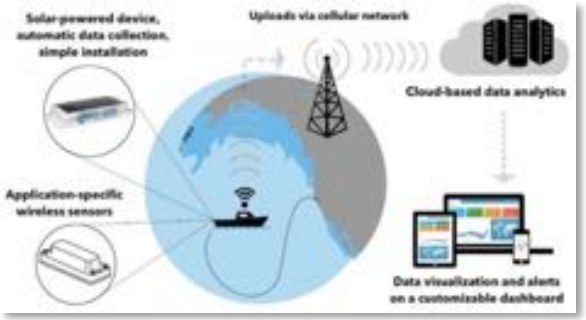


Spatially Explicit Options

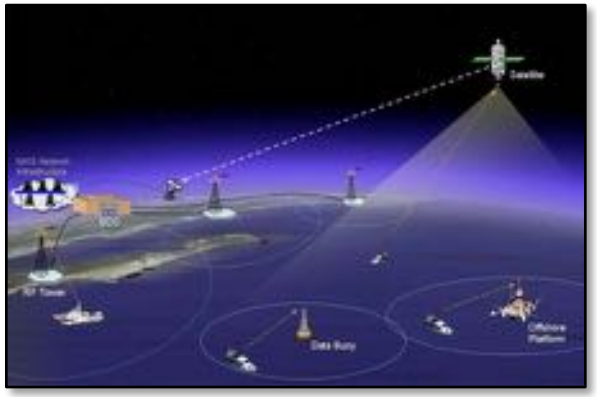
Logbook

NOAA Observer

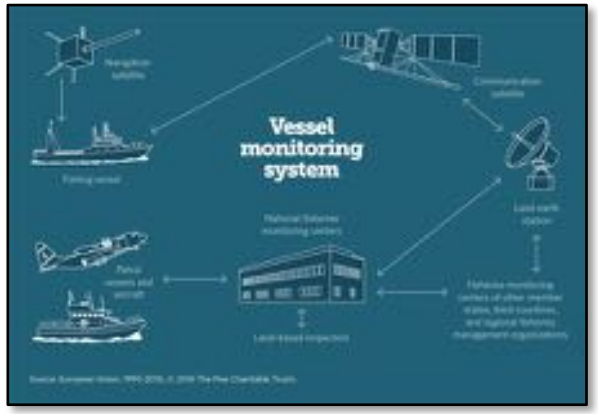
Solar logger



Automatic Identification System (AIS)

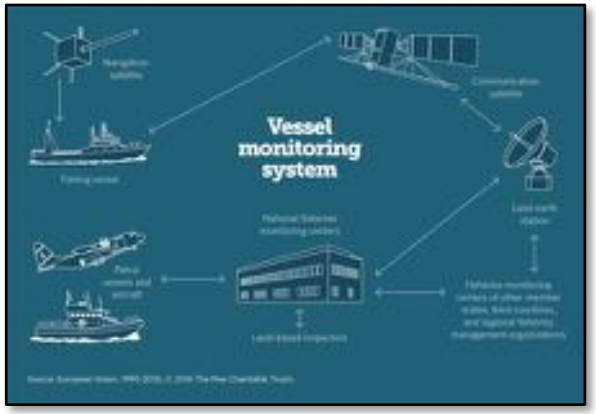


Vessel Monitoring System (VMS)



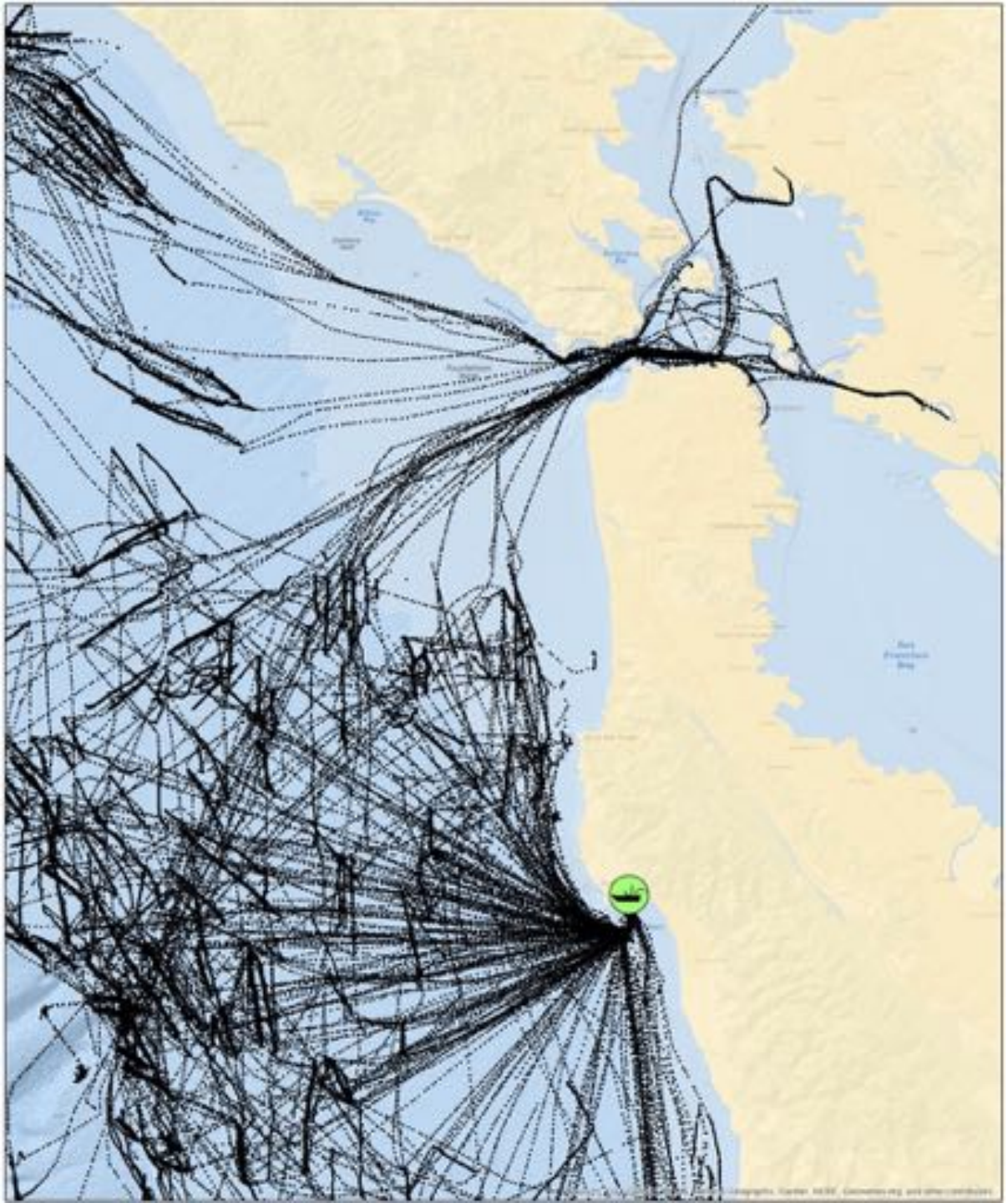
Has the fishery shifted in time or space, intensified?

- A piece of the enchilada – landings informed VMS
- Piece ranges from 10 – 95%



Link the geospatial information recorded by VMS transponders for each fishing trip with the corresponding landings data (2009 – 2016)

Linking landings data to VMS



Linking landings data to VMS

- Linking

Linking landings data to VMS

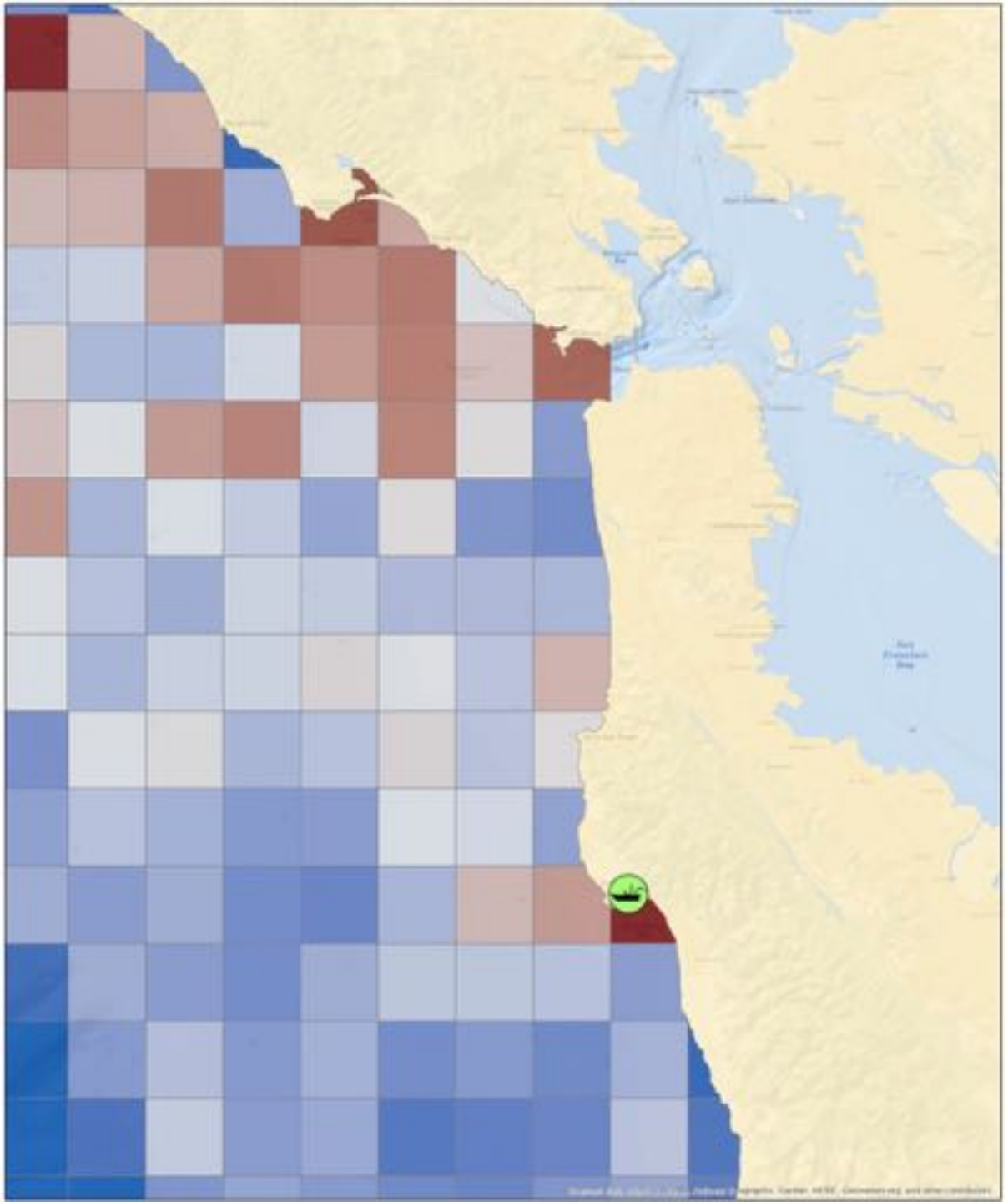
- Linking
  - “look back” window

Linking landings data to VMS

- Linking
  - “look back” window
- Filtering
  - Depth
  - Vessel speed

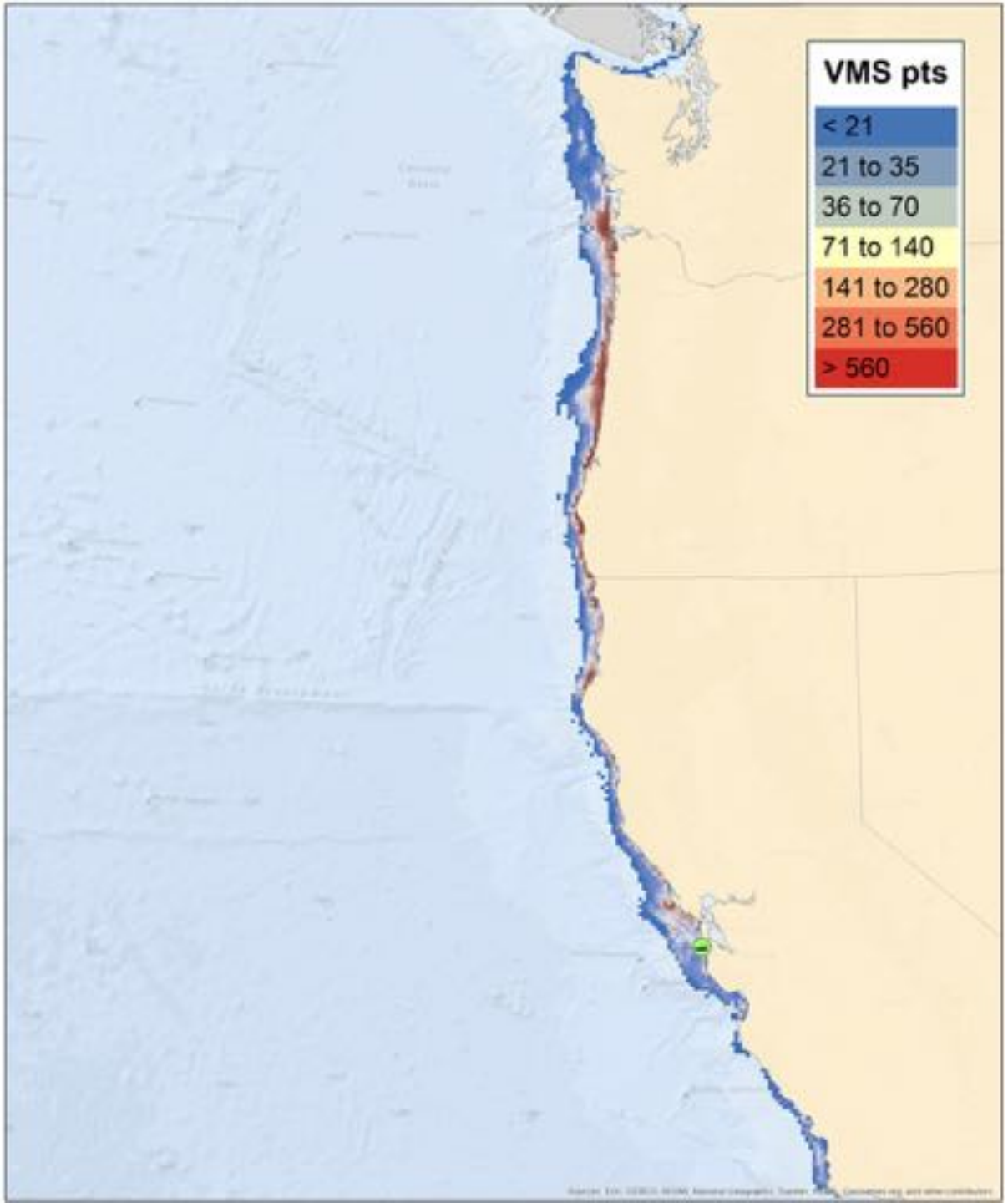
Linking landings data to VMS

- Linking
  - “look back” window
- Filtering
  - Depth
  - Vessel speed
- Overlay on grid



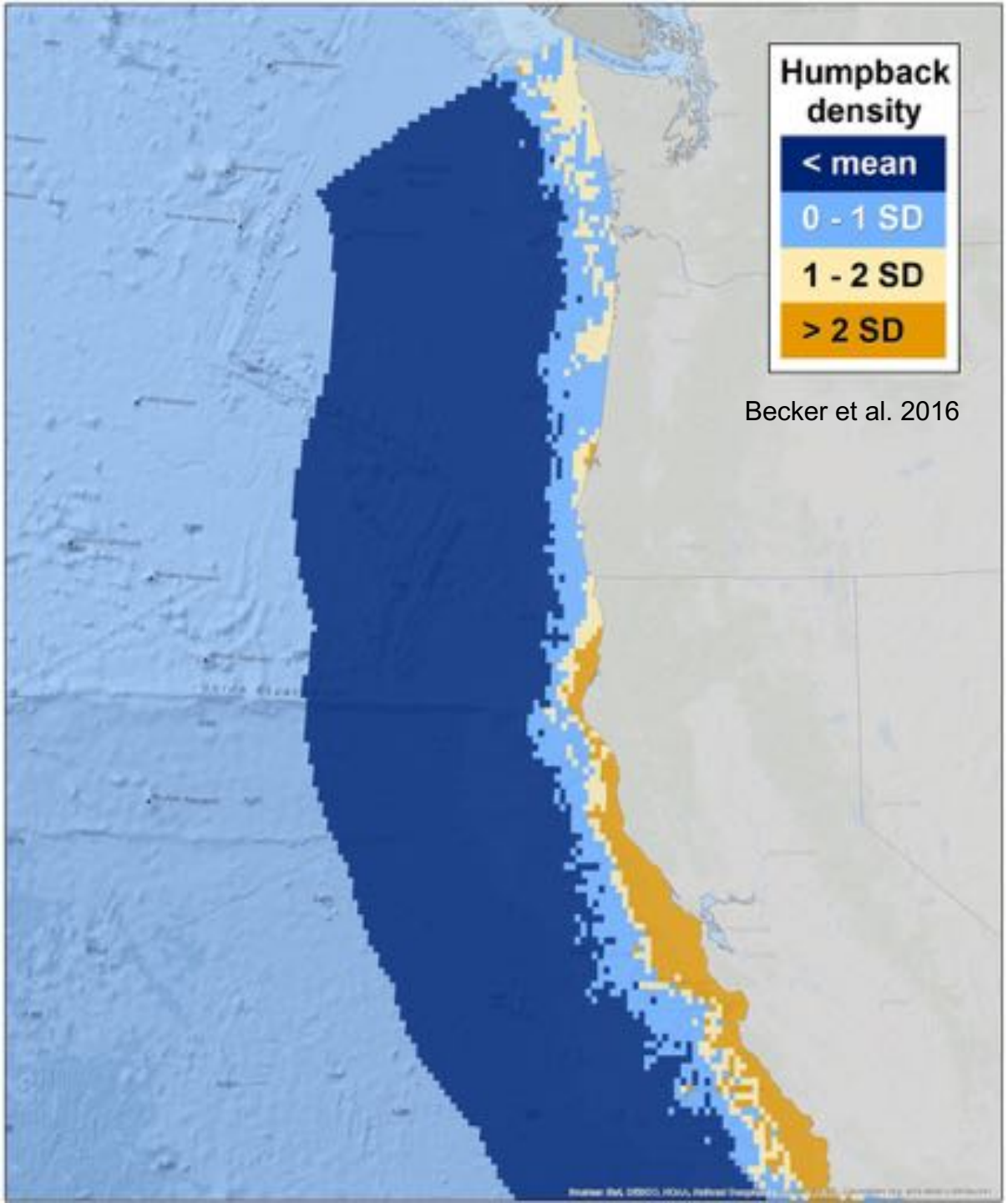
Linking landings data to VMS

- Linking
  - “look back” window
- Filtering
  - Depth
  - Vessel speed
- Overlay on grid
- Create heatmaps…



Linking landings data to VMS

- Linking
  - “look back” window
- Filtering
  - Depth
  - Vessel speed
- Overlay on grid
- Create heatmaps…
- …for entire US west coast

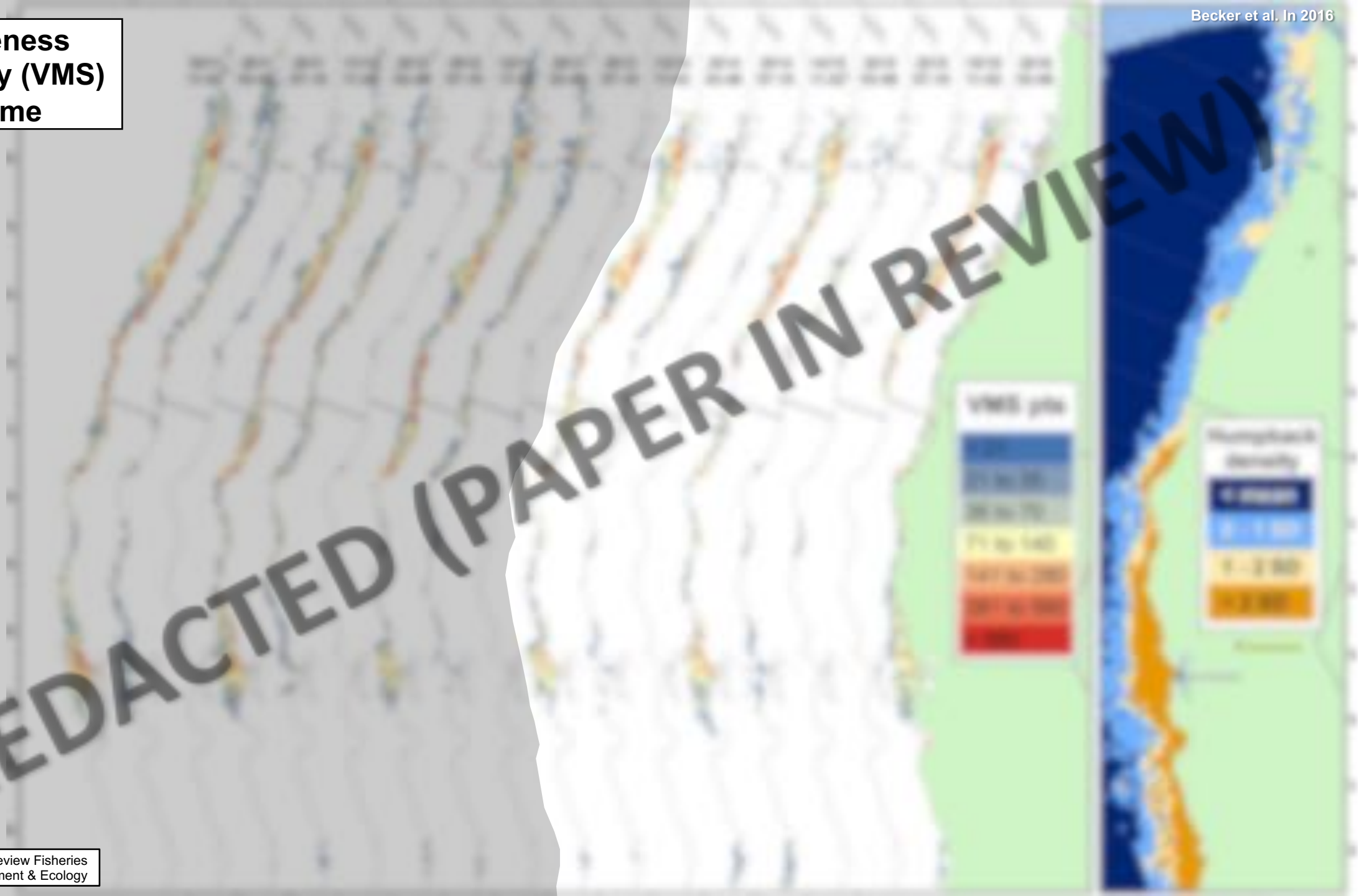


Becker et al. 2016

Linking landings data to VMS

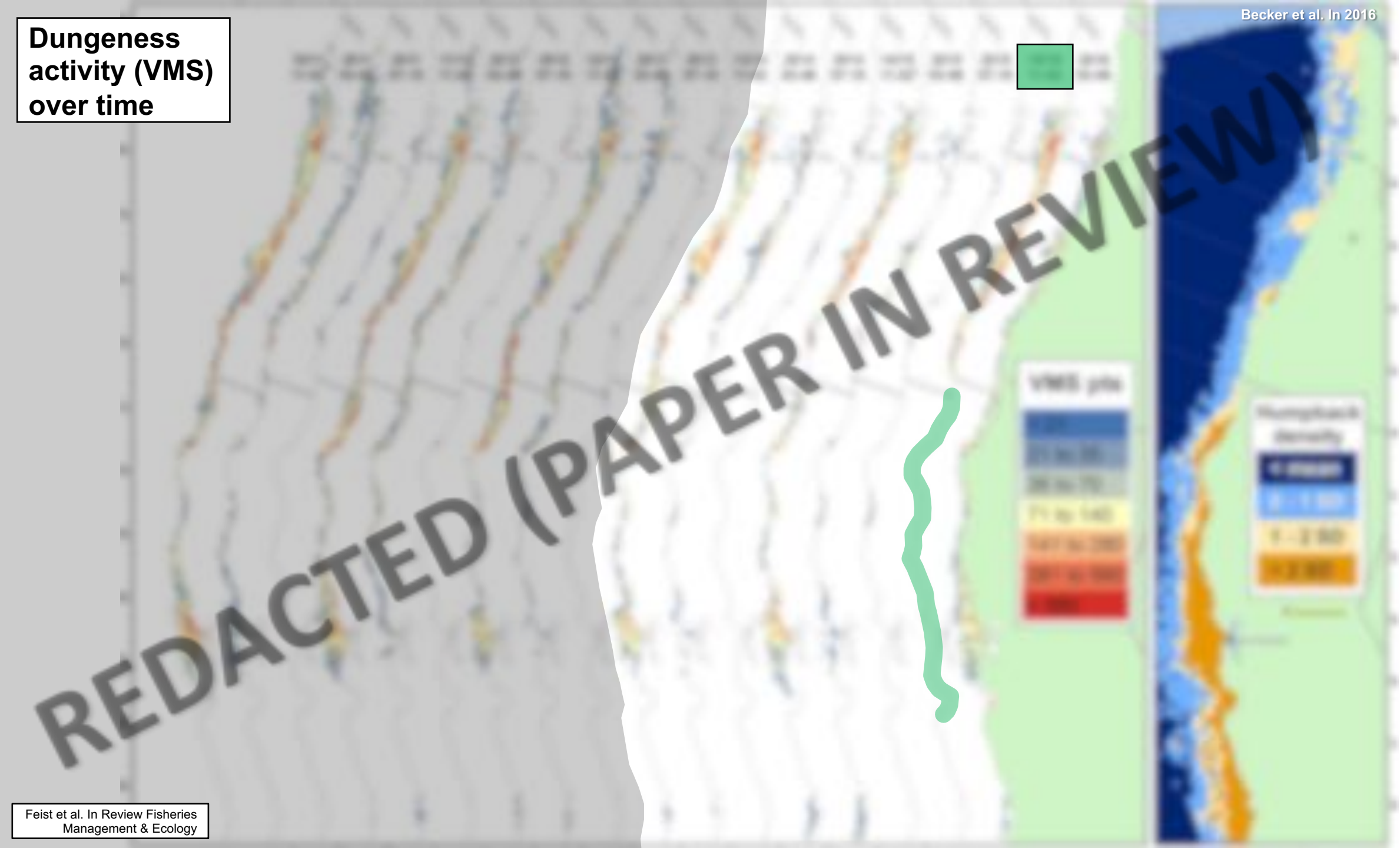
- Linking
  - “look back” window
- Filtering
  - Depth
  - Vessel speed
- Overlay on grid
- Create heatmaps…
- …for entire US west coast
- Spatially explicit overlap in humpback feeding grounds

Dungeness activity (VMS) over time



Feist et al. In Review Fisheries Management & Ecology

Dungeness activity (VMS) over time



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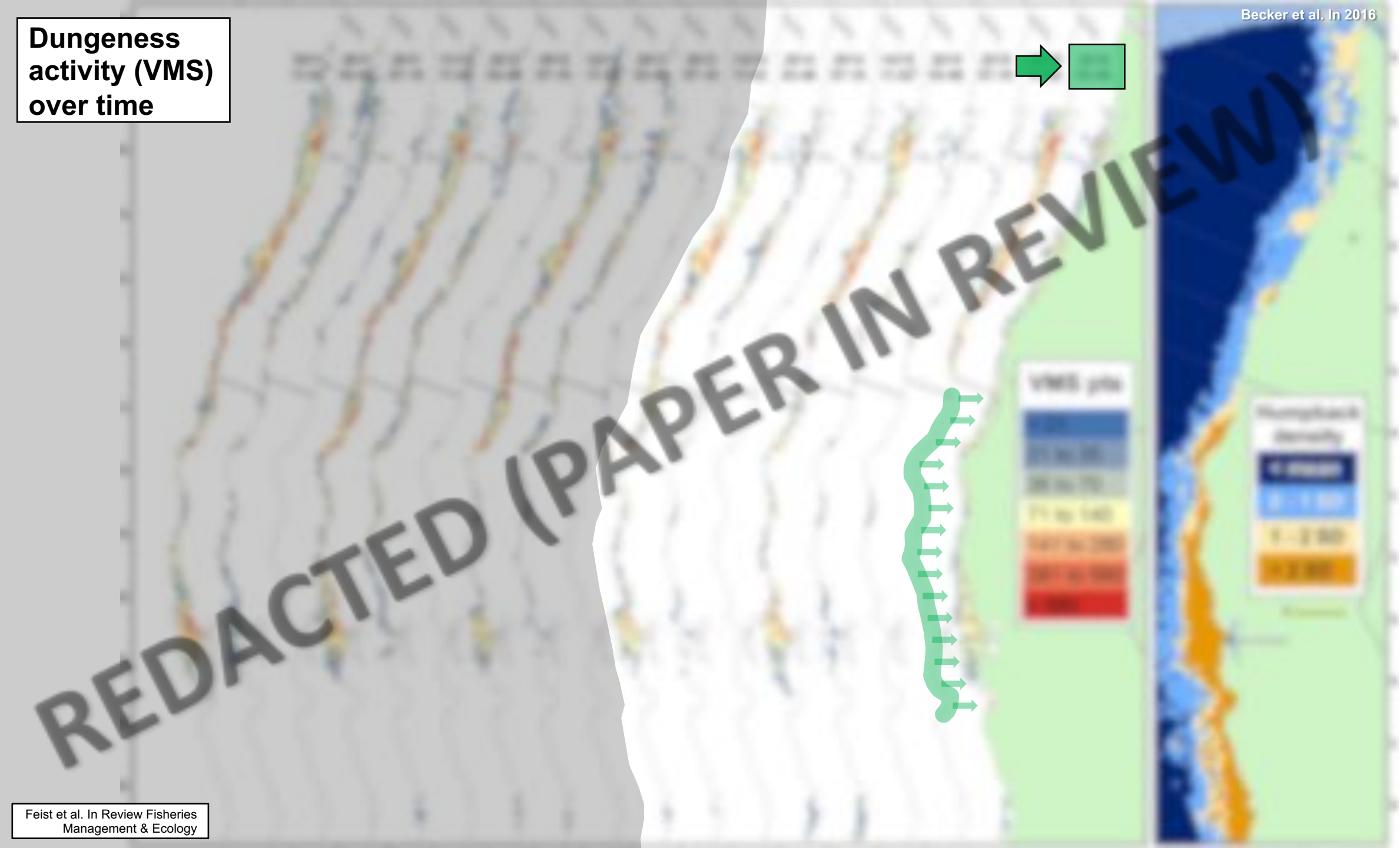

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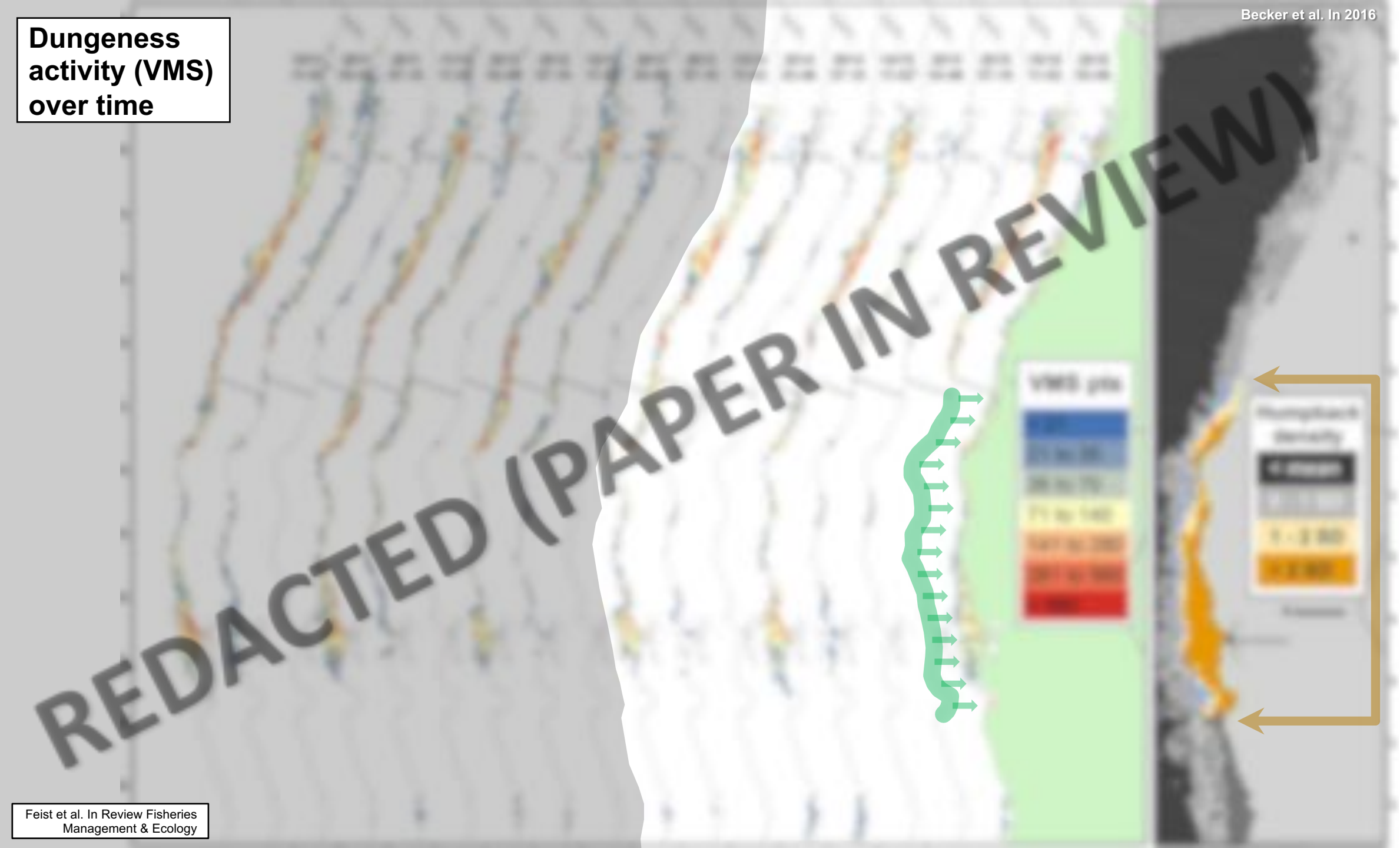

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Key Messages

- Landings informed VMS (LIVMS) are currently best available data source for coastwide analyses of fixed gear fishing activity and best information for CA where there isn't logbook data
- LIVMS data are a piece of the enchilada
  - Not all vessels
  - Biased toward larger vessels
  - Coverage inconsistent across states
- Fishing activity hasn't moved spatially. No spatio-temporal shifts in activity, except for 2015-16 delayed opening in CA Dungeness, where fishing and humpbacks were likely squeezed into the same areas

Second Generation Modeling

- Further refinements to landings informed VMS data algorithms to more accurately represent where, when and how much pot- and trap-based fishing occurs
- Incorporate tier info (pot limits), landed weight and logbook data
- Vertical line model