



INTERNATIONAL PACIFIC



HALIBUT COMMISSION

Methods for spatial survey modelling updates

Agenda item: 4.2

IPHC-2020-SRB016-06

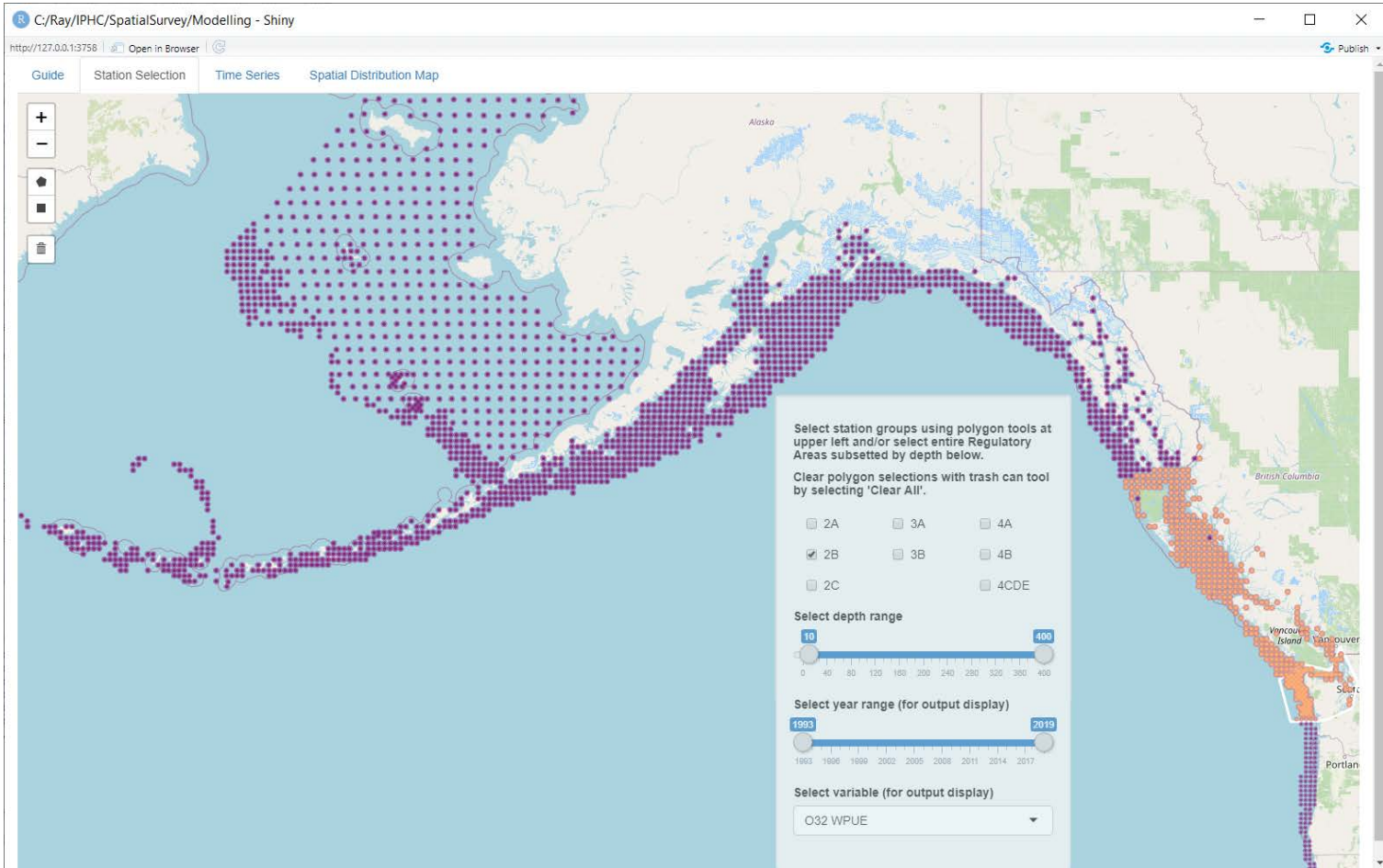
Space-time modelling output

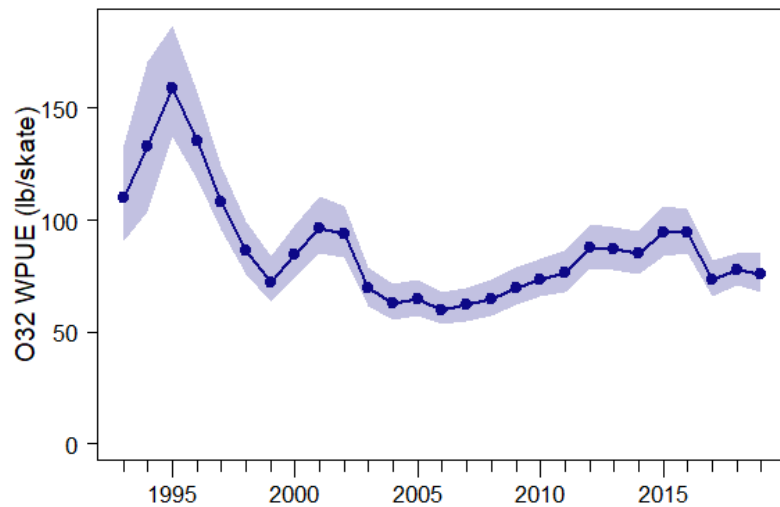
- An R Shiny app has been developed in order to make space-time output more accessible to scientists and stakeholders
- The app allows users to select any subset of FISS survey stations (and NMFS stations in Bering Sea) to compute WPUE and NPUE indices of density, along with estimates of uncertainty
- Users can also see maps of the Pacific halibut distribution over time



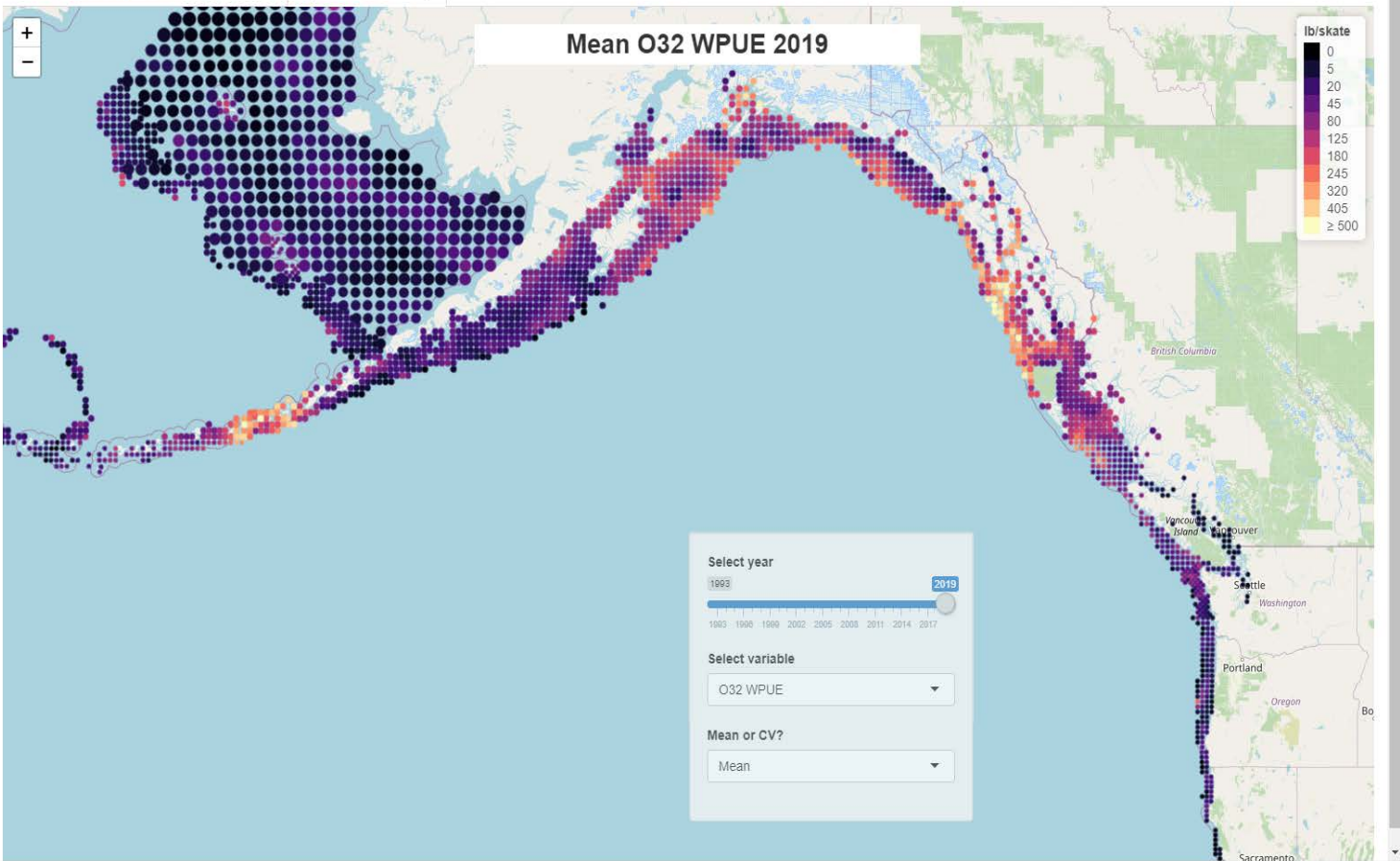
**Switch to Shiny App if possible;
otherwise discuss screenshots**





[Download plot](#)[Download table](#)

	mean	sd	CV	p2.5	p97.5	n
2019	76.1	4.6	6.0	67.7	85.5	396
2018	77.6	3.7	4.8	70.8	84.9	396
2017	73.3	4.2	5.7	65.8	82.3	396
2016	94.3	5.3	5.6	85.1	105.2	396
2015	94.3	5.6	5.9	83.9	106.4	396
2014	85.2	5.0	5.8	75.9	95.2	396



Spatially varying parameters

- It was noted at SRB015 that was evidence in some geographical areas of local lack of fit in posterior predictions of WPUE from the space-time model
- One explanation is that model parameters that quantify the strength of spatial dependence have been assumed to be constant throughout each IPHC Regulatory Area.
- Factors that affect the strength of spatial dependence, such as habitat type and the strength of ocean currents, do vary spatially and by allowing the model parameters to vary, we may be able to improve model fit.

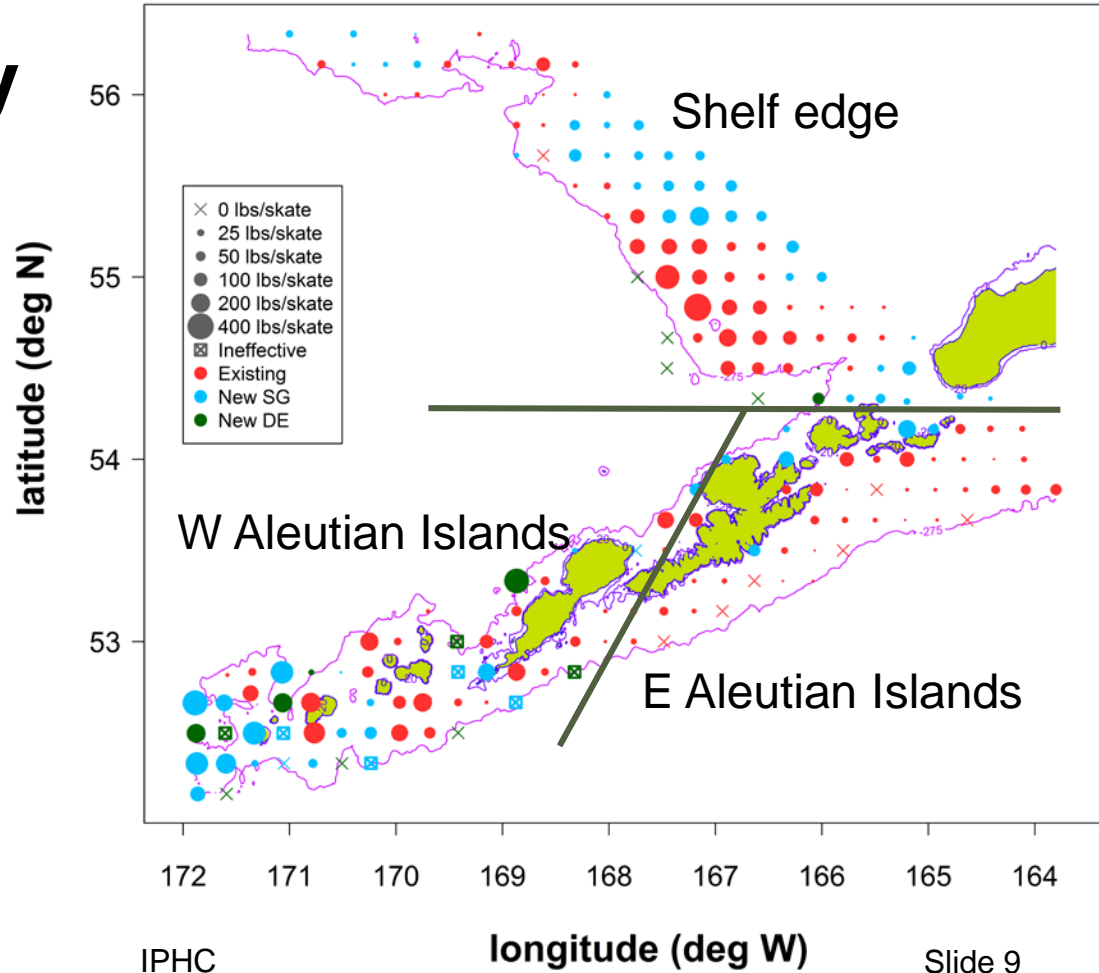


Spatially varying parameters

- We used IPHC Regulatory Area 4A as a test case:
 - It contains at least two distinct components, one along the Bering Sea shelf edge, and the other in the eastern Aleutian Islands.
 - The latter can be further divided into two parts, a western subregion with high density, and a low density region in the southeast.
- We examined changes in parameters and model fit by fitting models with spatial parameters that varied among these three subregions of IPHC Regulatory Area 4A.

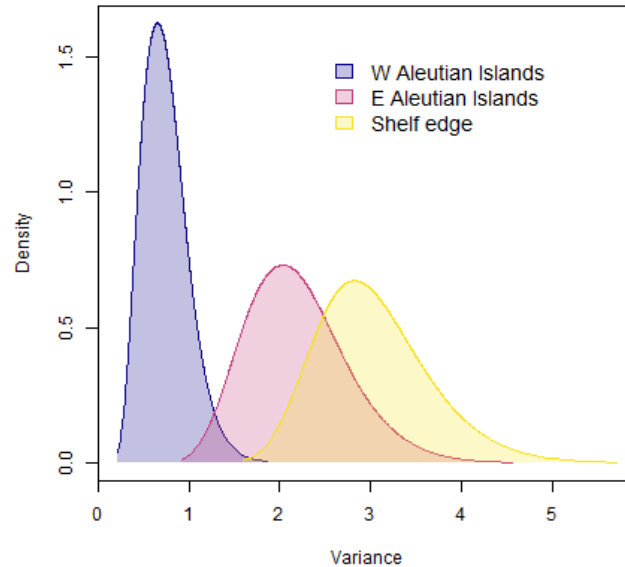
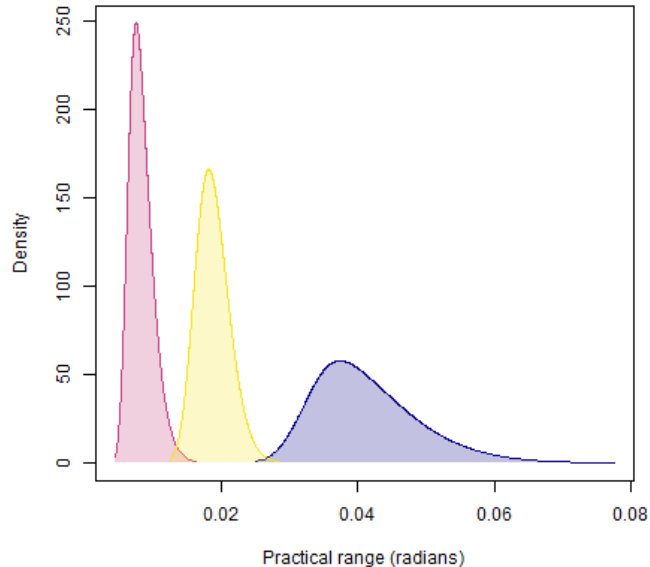


IPHC Regulatory Area 4A



Results

- Models that allowed spatial parameters to vary among the three subregions provided a better fit to the data than the model that assumed constant parameters throughout IPHC Regulatory Area 4A ($\Delta DIC = 66.5$).
- The range parameter was much higher for the western Aleutian portion of IPHC Regulatory 4A than for other subregions:
 - implies that spatial dependence remains strong for greater distances between two locations there
- The variance parameter was also lower in this subregion.



Results

- At the station level, differences in fit were small to modest
- Regardless of improvements in fit in this example, this approach expands options for future modelling:
 - Models can be fit across multiple Regulatory Areas while still allowing for spatial differences in correlation structure
 - In such multi-area models, information can be shared across areas
 - E.g., information from an experiment comparing snap and fixed gears in one area can be shared with another area in which both survey gears are used



Discussion

- The IPHC Secretariat plans to include spatio-temporal models that make simultaneous use of multiple IPHC Regulatory Areas where possible in 2020, particularly where residual patterns or gear-calibration warrant
- The IPHC Secretariat plans to make the R Shiny app publicly available at the time of release of the 2020 modelled survey results, likely in October 2020
- Progress on both of these topics will be revisited at SRB017.



Recommendations

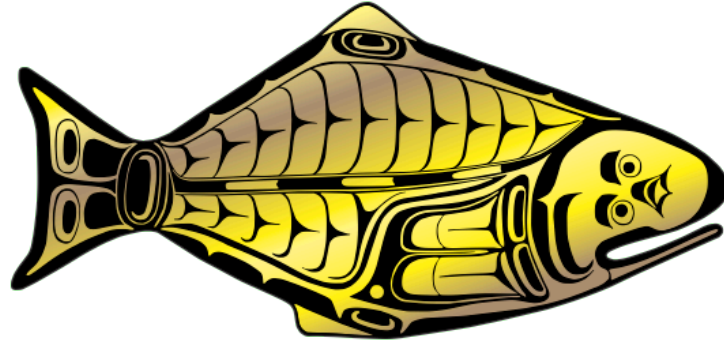
That the SRB:

NOTE paper IPHC-2020-SRB016-06 which
which provides an update on spatio-temporal
modelling and reporting development

REQUEST any further analyses related to this
work to be provided at SRB017.



INTERNATIONAL PACIFIC



HALIBUT COMMISSION

