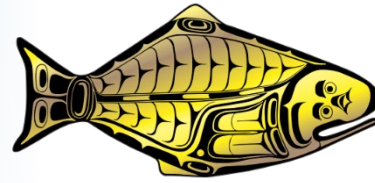


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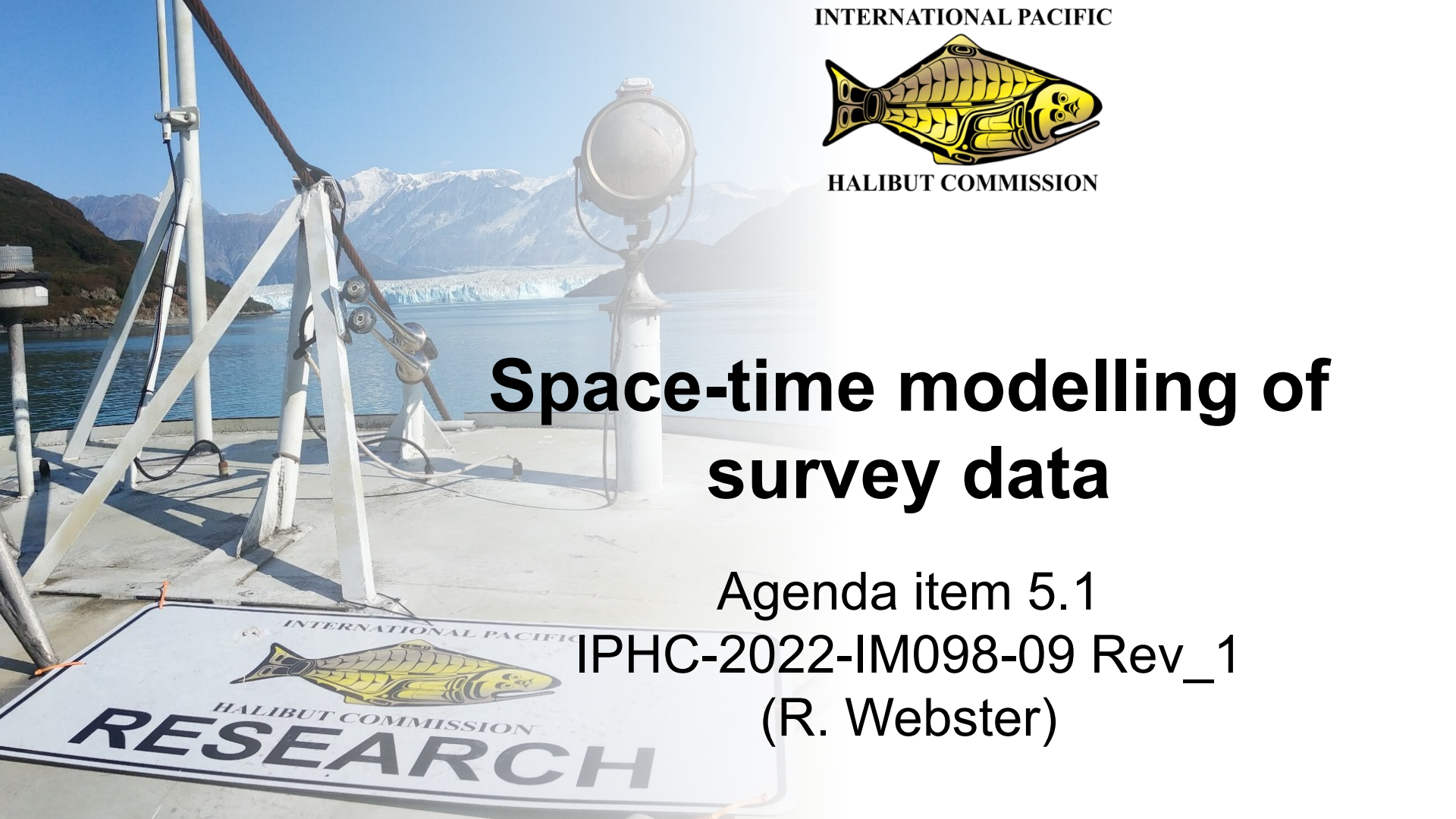
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# Space-time modelling of survey data

Agenda item 5.1

IPHC-2022-IM098-09 Rev\_1

(R. Webster)



# Space-time model estimates of WPUE and NPUE

- As in 2016-21, space-time modelling was used to estimate O32 and all sizes WPUE, and all sizes NPUE indices from 1993 onwards
  - For IPHC Regulatory Areas 4A and 4CDE, modelling uses data from the FISS and agency trawl surveys (NMFS, ADFG)
    - A calibration is used to convert trawl data to FISS equivalent
  - Other areas use FISS data only
  - Raw station data are adjusted for hook competition and timing of FISS relative to the fishery

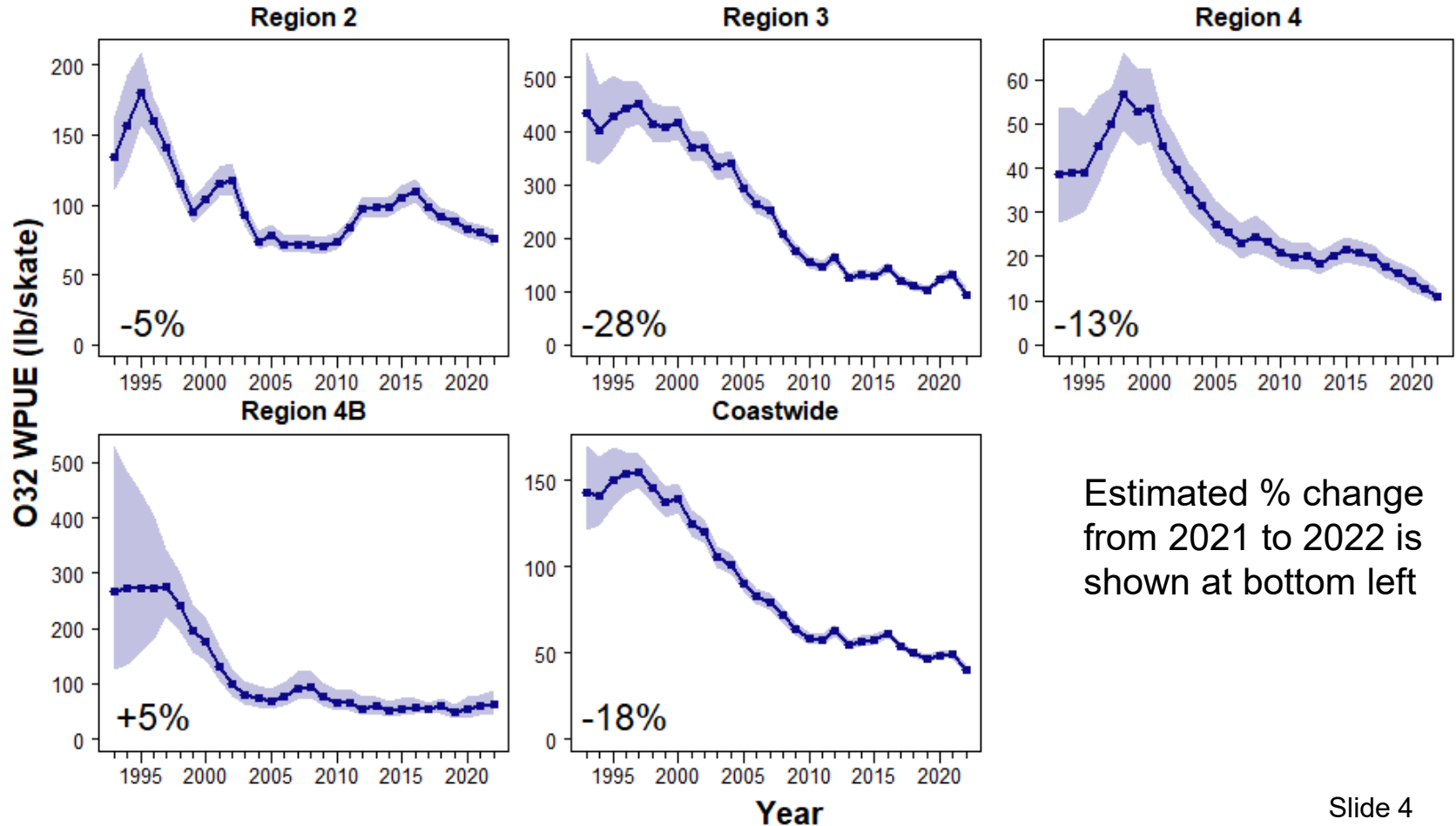


# Space-time model estimates of WPUE and NPUE

- The models predict WPUE and NPUE at all grid stations, whether they were surveyed in a given year or not
  - Estimates are calculated as averages across station predictions
  - Lack of sampling or reduced sampling is reflected in greater uncertainty (higher variances, CVs)
- Official estimates are computed for:
  - Biological Regions
  - IPHC Regulatory Areas
  - Coastwide IPHC Convention waters, from San Francisco Bay to Bering Strait
- Station-level output is supplied to the online IPHC Space-time Explorer tool

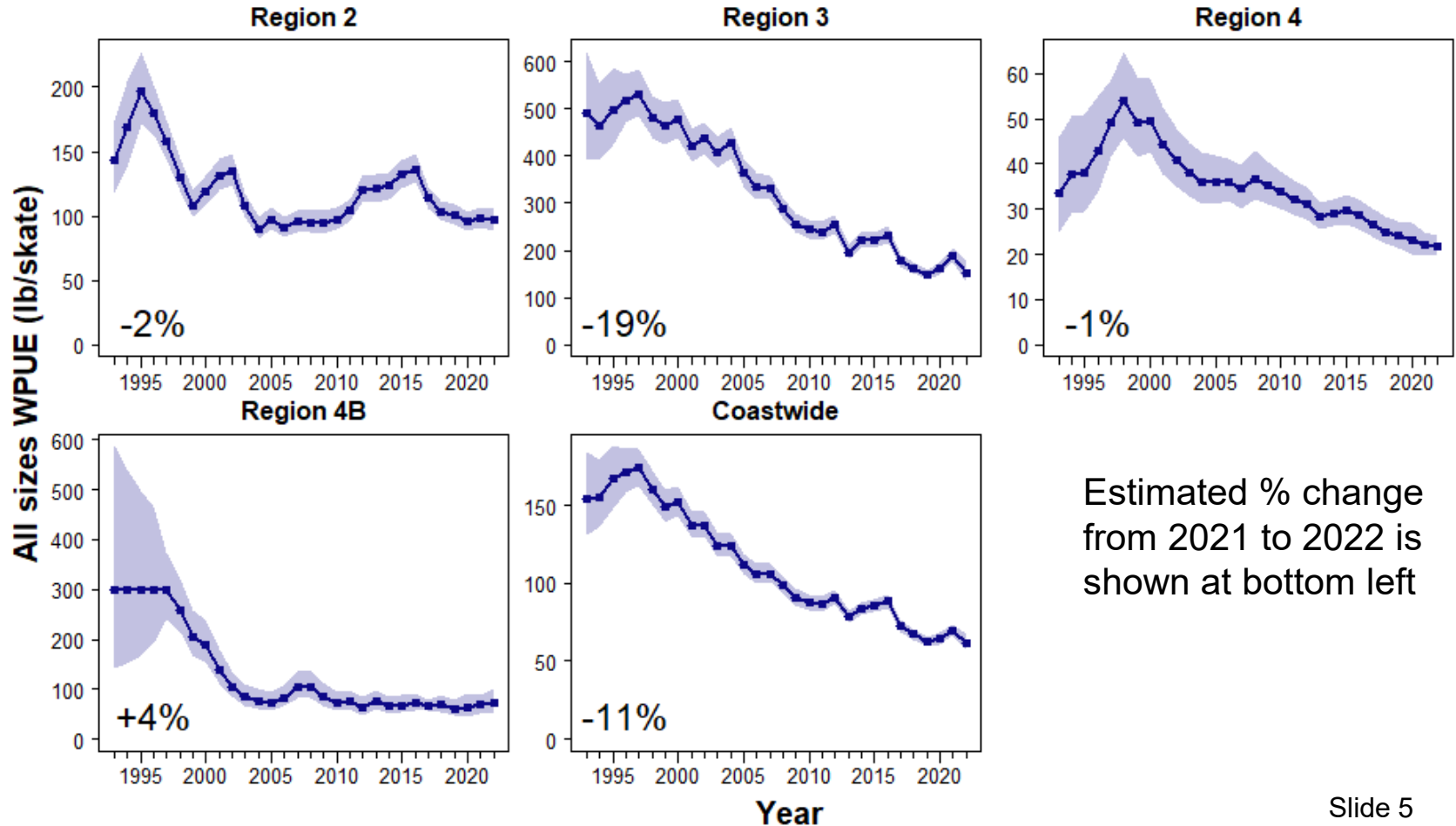


# O32 WPUE by biological region

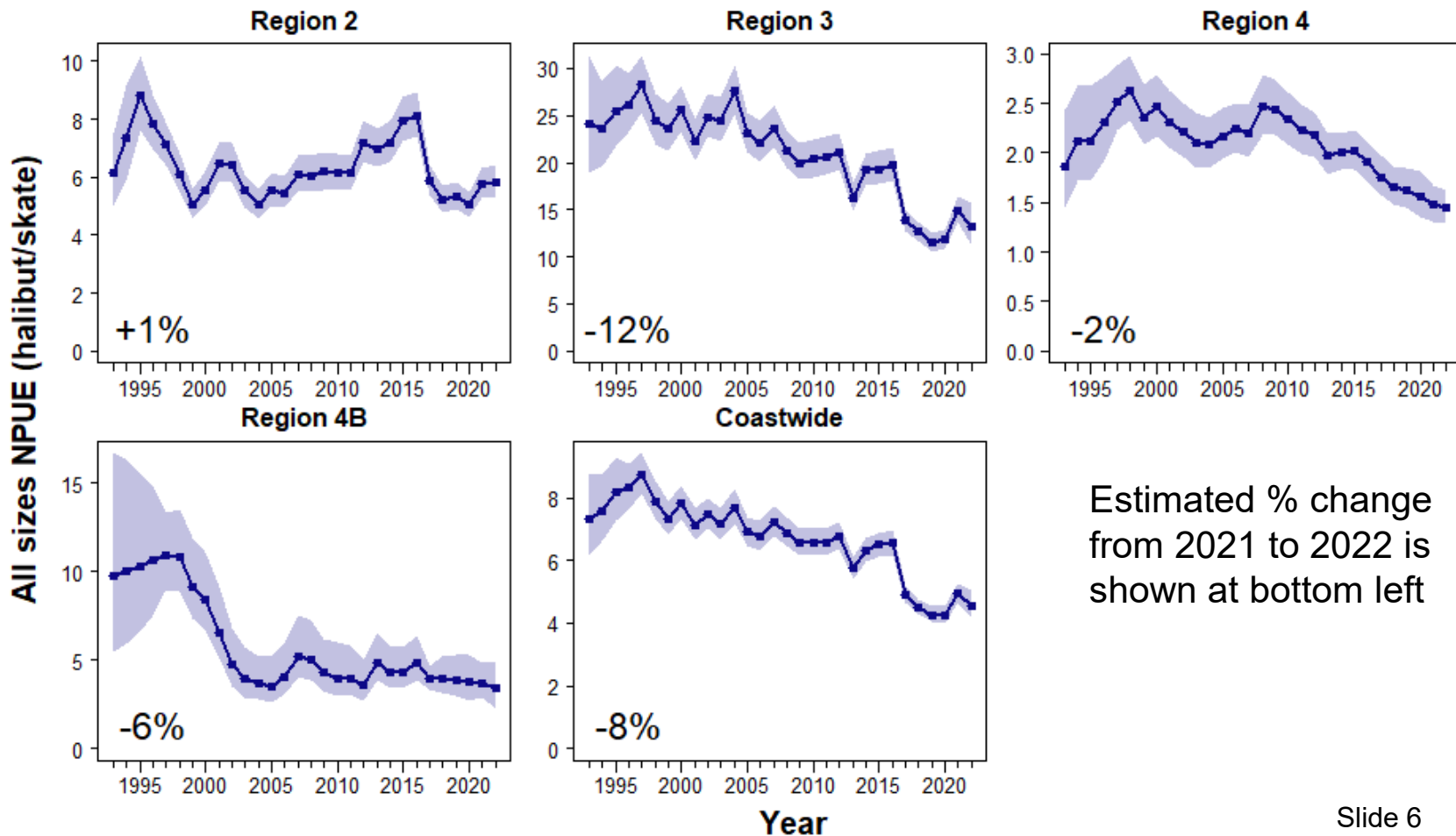


Estimated % change from 2021 to 2022 is shown at bottom left

# All sizes WPUE by biological region



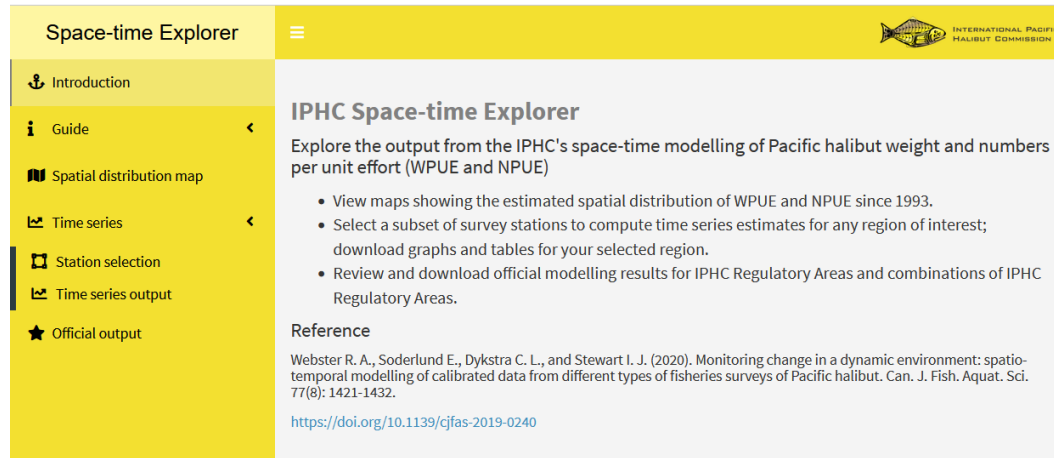
# All sizes NPUE by biological region



# Space-time explorer tool

- Modelling output is available online through the IPHC's Space-Time Explorer tool.
- A link to the tool is found on this page:

<https://www.iphc.int/data/datatest/fishery-independent-setline-survey-fiss>

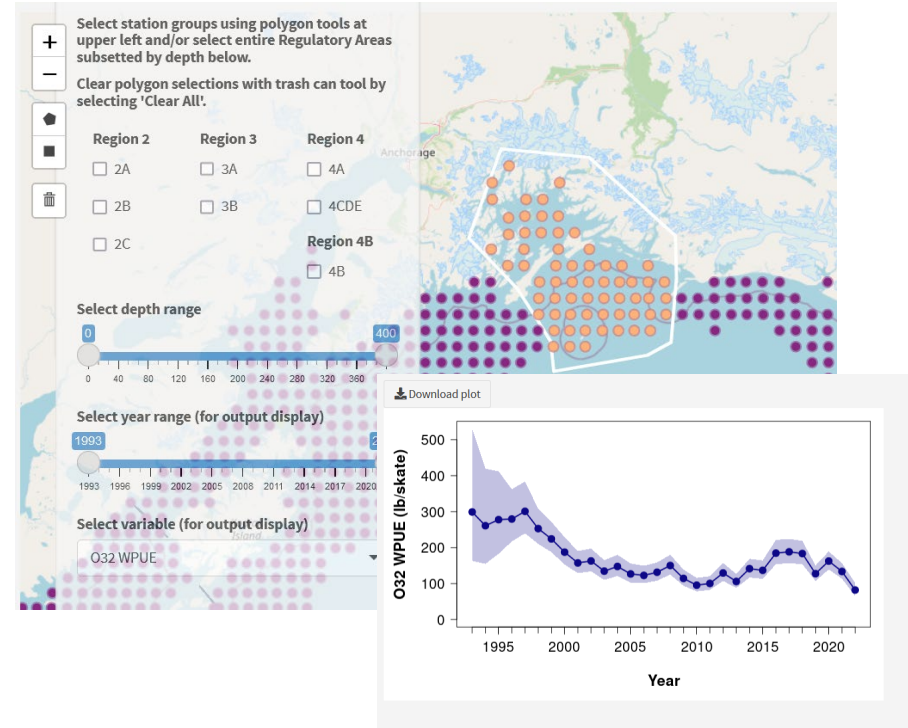
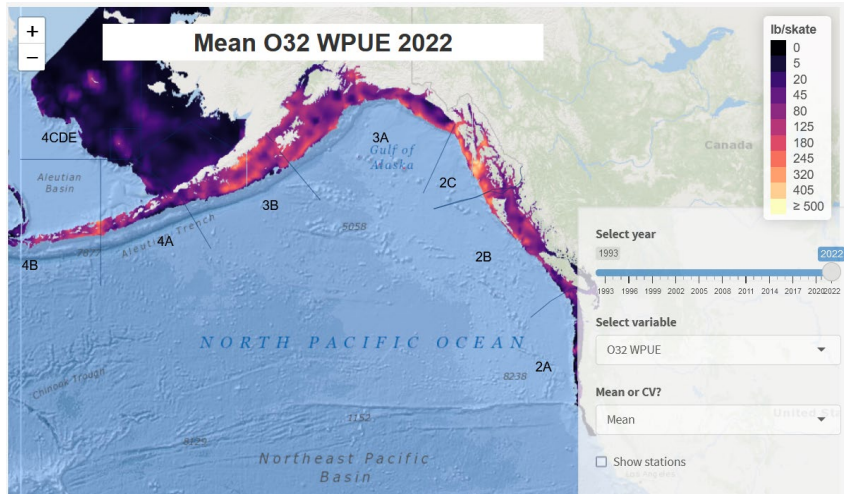


The screenshot shows the IPHC Space-time Explorer tool interface. The top navigation bar is yellow and contains the text "Space-time Explorer" on the left, a hamburger menu icon in the center, and the IPHC logo and name "INTERNATIONAL PACIFIC HALIBUT COMMISSION" on the right. A left sidebar is also yellow and contains a list of menu items: "Introduction" (with a location pin icon), "Guide" (with an information icon and a right-pointing arrow), "Spatial distribution map" (with a map icon), "Time series" (with a bar chart icon and a right-pointing arrow), "Station selection" (with a square icon), "Time series output" (with a document icon), and "Official output" (with a star icon). The main content area has a light gray background and features the title "IPHC Space-time Explorer" in bold. Below the title is a paragraph: "Explore the output from the IPHC's space-time modelling of Pacific halibut weight and numbers per unit effort (WPUE and NPUE)". This is followed by a bulleted list of three points: "View maps showing the estimated spatial distribution of WPUE and NPUE since 1993.", "Select a subset of survey stations to compute time series estimates for any region of interest; download graphs and tables for your selected region.", and "Review and download official modelling results for IPHC Regulatory Areas and combinations of IPHC Regulatory Areas." Below the list is a "Reference" section with a citation: "Webster R. A., Soderlund E., Dykstra C. L., and Stewart I. J. (2020). Monitoring change in a dynamic environment: spatio-temporal modelling of calibrated data from different types of fisheries surveys of Pacific halibut. Can. J. Fish. Aquat. Sci. 77(8): 1421-1432." and a DOI link: "https://doi.org/10.1139/cjfas-2019-0240".



# Space-time explorer tool

- View maps of estimated Pacific halibut distribution
- Create a time series from user-selected stations
- View official IPHC model output
  - By IPHC Regulatory Area
  - By combinations of areas
    - e.g. Biological Regions



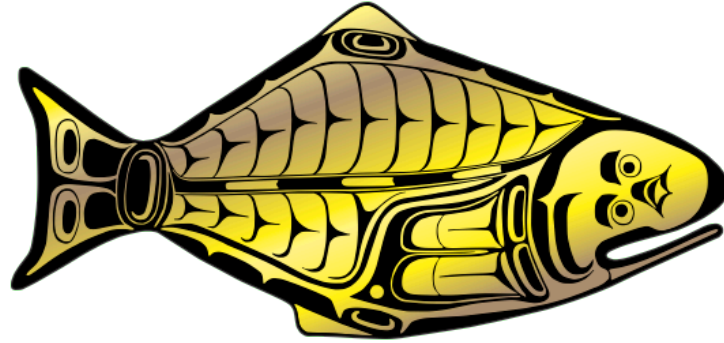


# Recommendation

That the Commission **NOTE** paper IPHC-2022-IM098-09 Rev\_1 which provides results of the space-time modelling of Pacific halibut survey data for 1993-2022.



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