Space-time modelling of survey data

PREPARED BY: IPHC SECRETARIAT (R. A. WEBSTER; 31 OCTOBER 2023)

PURPOSE

To provide results of the space time modelling of Pacific halibut survey data for the period 1993-2023.

INTRODUCTION

Since 2016 space-time modelling has been used by the IPHC to produce estimates of mean O32 WPUE (weight per unit effort), all sizes WPUE and all sizes NPUE (numbers per unit effort) indices of Pacific halibut density and abundance. The modelling depends primarily on data from the IPHC's Fishery-Independent Setline Survey (FISS, Ualesi et al, 2023), but in the Bering Sea also integrates data from the National Oceanic and Atmospheric Administration - Fisheries annual trawl survey and the Alaska Department of Fish and Game's annual Norton Sound trawl survey. Both surveys are fishery-independent data sources.

Since 2019, weighing of Pacific halibut onboard FISS charter vessels has meant that the weight data used to compute WPUE now comes almost entirely from observed weights of fish rather than estimates from a length-net weight relationship. For fish without directly measured weights, weights are predicted from a year- and IPHC Regulatory Area-specific length-net weight relationship estimated from the FISS length and weight data. For U32 fish with round weight recorded, net weights are estimated from a round-net weight relationship estimated from coastwide sample data from the 2019 FISS.

RESULTS OF SPACE-TIME MODELLING IN 2023

Figure 1 shows the time series estimates of O32 WPUE (most comparable to fishery catch-rates) by IPHC Biological Region over the 1993-2023 period included in the 2023 space-time modelling. Coastwide, we estimate a small decline since 2022 of 3% for O32 WPUE, largely due to a 6% decline in IPHC Biological Region 3.

Estimated 1993-23 time series by IPHC Regulatory Area are in Appendix A. We note the high uncertainty for estimates in IPHC Regulatory Areas 2A, 4A and 4B in 2023 (Figure A.1). Little sampling (minimal 2A FISS, Bering Sea trawl on 4A edge only) or no sampling (4B) took place in these areas in 2023, and caution should be taken when interpreting estimates of change from 2022, as these are not well informed by data.

Results for all-sizes WPUE and all-sizes NPUE will be added to a Rev_1 document when modelling is completed.

Tables of model output (time series, stock distribution estimates) are updated annually on the IPHC website at https://www.iphc.int/data/time-series-datasets.

FISS model output may also be explored interactively using the link on this page of the IPHC website: https://www.iphc.int/data/datatest/fishery-independent-setline-survey-fiss.

TIMELINE FOR REVISION

The completed document (IPHC-2023-IM099-09 Rev_1) is anticipated to be available no later than **10 November 2023**.

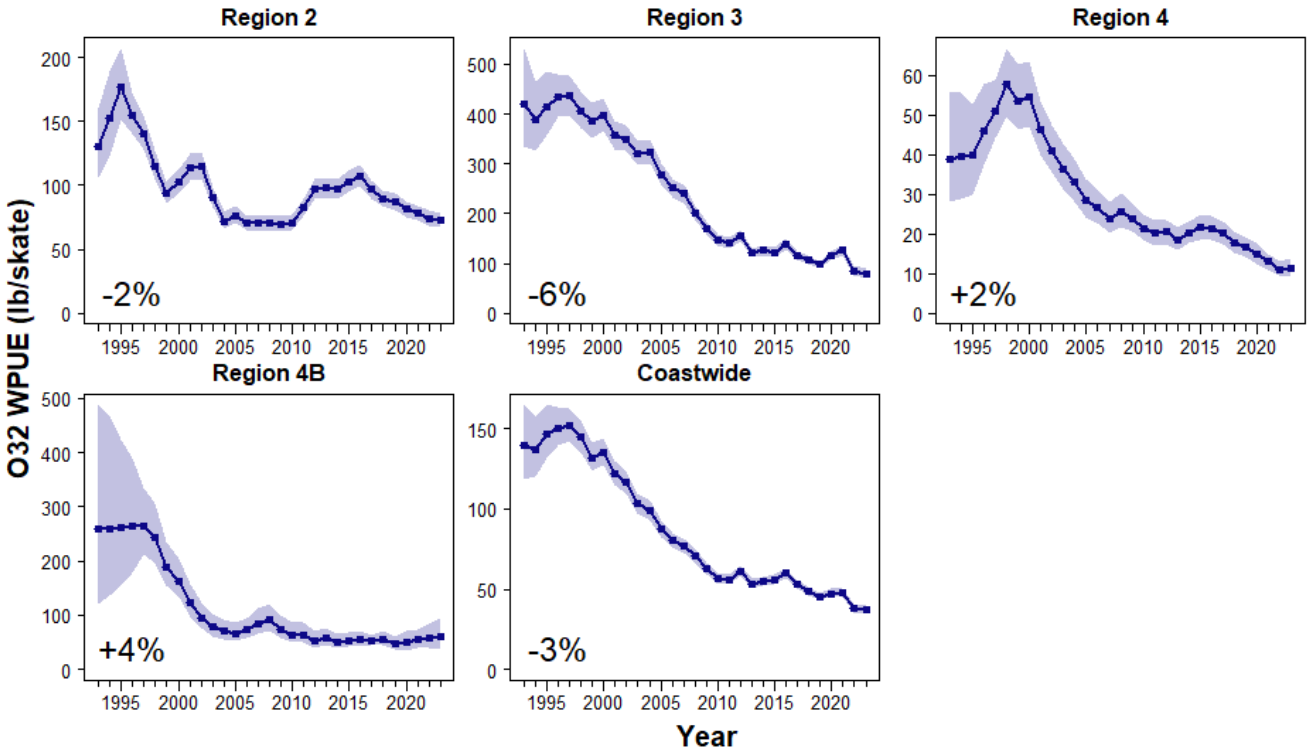

Figure 1. Space-time model output for O32 WPUE for 1993-2023 for Biological Regions. Filled circles denote the posterior means of O32 WPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean O32 WPUE from 2022 to 2023.

RECOMMENDATION

That the Commission **NOTE** paper IPHC-2023-IM099-09 which provides results of the space-time modelling of Pacific halibut survey data for 1993-2023.

REFERENCE

Ualesi, K., Rillera, R., Jack, T. and Coll, K. (2023) IPHC Fishery-independent setline survey (FISS) design and implementation in 2023. IPHC-2023-IM099-08.

APPENDIX A

Space-time modelling results by IPHC Regulatory Area

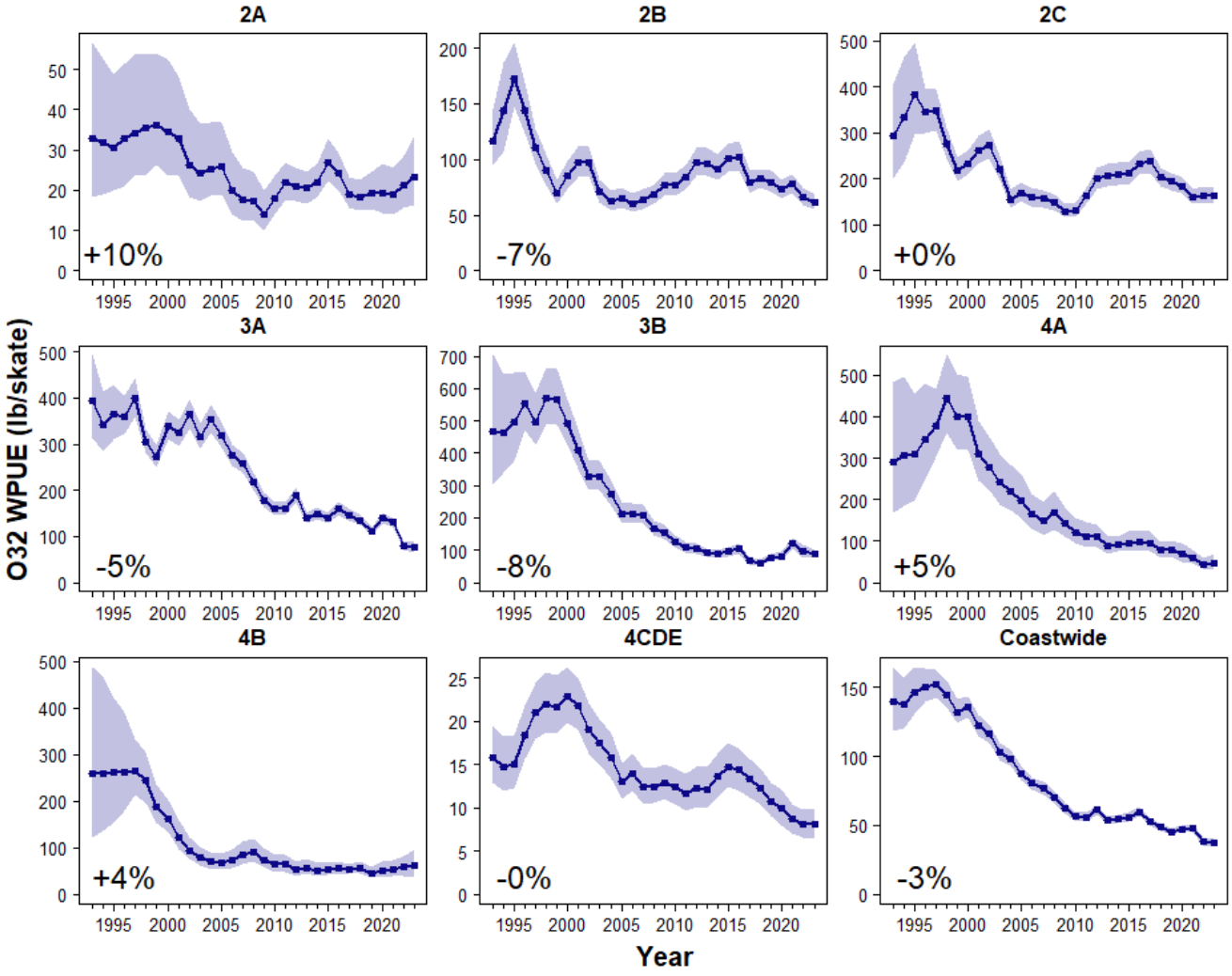

Figure A.1. Space-time model output for O32 WPUE for 1993-2023. Filled circles denote the posterior means of O32 WPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean O32 WPUE from 2022 to 2023.